YAMATO

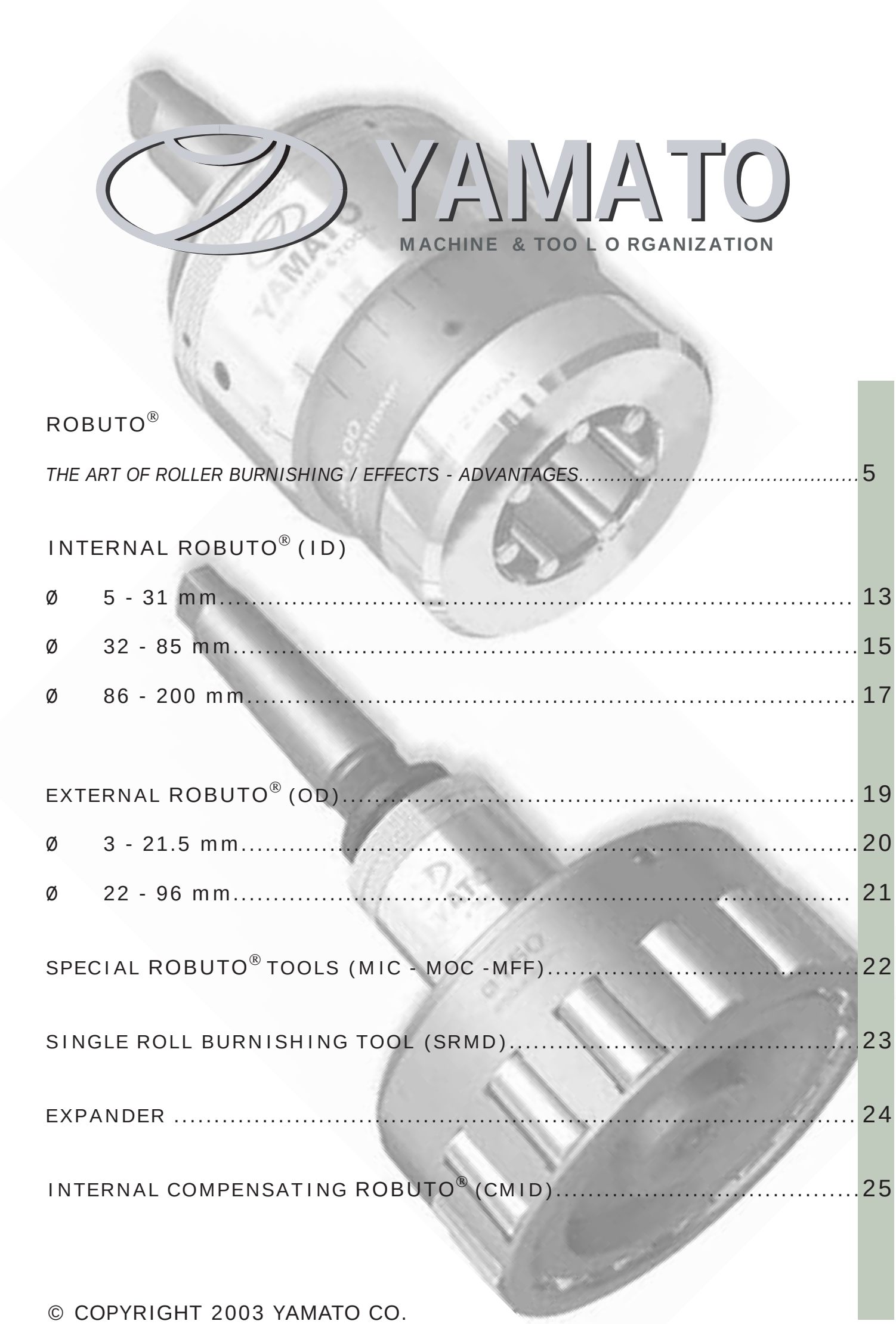
MACHINE & TOOL ORGANIZATION

ROBUTO® Roller Burnishing Tools

Mirror Like Surface Finishes In One Pass.....

YAMATO

MACHINE & TOO L O RGANIZATION



ROBUTO®

THE ART OF ROLLER BURNISHING / EFFECTS - ADVANTAGES 5

INTERNAL ROBUTO® (ID)

Ø 5 - 31 mm 13

Ø 32 - 85 mm 15

Ø 86 - 200 mm 17

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Ø 3 - 21.5 mm 20

Ø 22 - 96 mm 21

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YAMATO
MACHINE & TOO L O RGANIZATION

- mirror like surface in one pass
- for all types of metals
- can be used on all types of machines
- low micro finish of 0.05 µm (Ra)
- increased surface hardness

internal Robuto®

blind hole
machine feeding

through hole
self feeding

through hole
machine feeding

YAMATO
MACHINE & TOO L O RGANIZATION

external Robuto®

- reduced friction
- reduced noise level
- enhanced corrosion resistance
- elimination of tool marks
- replaces expansive operations such as grinding, honing or lapping
- sized, finished and work-hardened in seconds...

Surface operations by "Cold Working" are applied in order to:

1. Improve the surface finish,
2. Improve the fatigue life,
3. 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.

INTRODUCTION

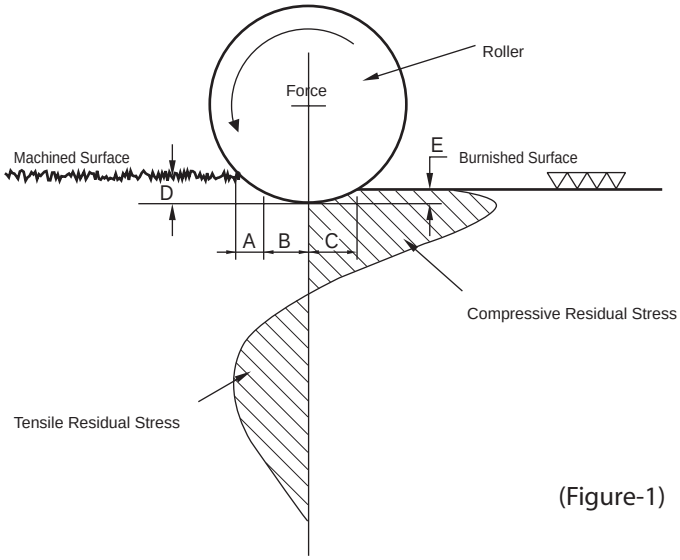
Roller Burnishing has been studied in the USSR and Japan, and applied most extensively in the USSR in the 1970's. Improvements in high cycle fatigue, corrosion-fatigue and stress corrosion cracking are documented. Optimum rolling parameters were established to minimize roughness and/or maximize surface hardening

Models have been developed to predict the residual stresses from the deformation process in England and in France.

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)

THE ART OF ROLLER BURNISHING / EFFECTS - ADVANTAGES

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.

Effects of Roller Burnishing Operation

. Surface roughness value of 0.05-0.10 µm. (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 and porosities
. Reduced friction up to 35 %
. Reduced noise level is achieved

Usage area of ROBUTO ®

1. Symmetrical / Semi Symmetrical work pieces
   a) Internal Cylindrical
   b) External Cylindrical
   c) Internal Tapered
   d) External Tapered
   e) Circular flat surfaces

2. Can be used on all types of machines (drill presses, lathes, machining centers, or any other rotating spindle).
3. Work pieces of max. 40 HRC

Advantages of Roller Burnishing against classical methods.

1. Roller Burnishing is a chipless finishing method different to grinding, honing or lapping.

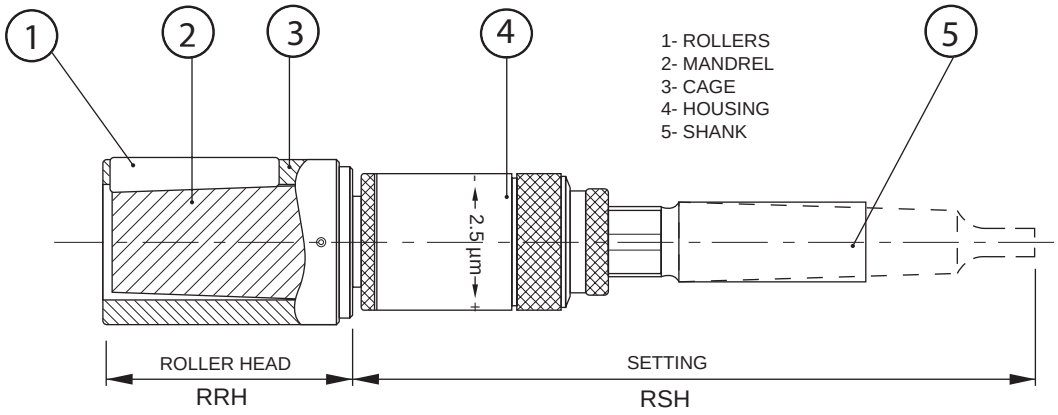
2. Surface roughness value of Roller Burnishing Operation is less or equal to these abrasive methods. Even the values are equal; roller burnished surface is smoother than the abraded surface because chip-generating operations leave sharp projections in the contact plane.

3. A workpiece with a diameter of 30 mm. and a length of 100 mm. can be burnished in 10 - 15 seconds.

4. No expensive investments are required.

5. Mechanical advantages. (Corrosion resistance, increase in surface hardness)

6. Faster production at a lower cost. 10,000 - 300,000 pieces can be burnished without any maintenance cost.



(Figure-2)

STRUCTURE OF ROBUTO®

Every ROBUTO® tool has an adjustment range that differs by type and diameter. Figure-2 presents a ∅ 35 mm. standard tool with 1mm. adjustment range, which means roller burnishing between the sizes ∅34.90 - ∅35.90 mm. is available.
This feature is possible by means of the micrometer mechanism mounted on the rear of the housing. Micrometer mechanism permits diameter changes with a precision of 2.5 µm. As an example, a roller burnishing tool previously adjusted to ∅35.2000 mm. can be set to ∅35.2025 mm. or ∅35.1975 mm., with one step of the micrometer mechanism.

ROBUTO® consists of two main parts

1 - Setting (RSH)
2 - Roller Head (RRH)

Setting;

- Shank, which attaches the tool to the machine (5 in Figure-2)

-Housing that contains micrometer mechanism (4 in Figure-2)

Roller Head;

- Cage (3 in Figure-2)
- Mandrel (2 in Figure-2)
- Rollers (1 in Figure-2)

A number of hardened tapered rolls are spaced evenly by a retaining cage, bearing around the surface of a hardened steel mandrel that is tapered inversely to the rollers. As the tool rotates, the rolling pressure applied by the rollers causes a displacement of the material as it smooths and compresses the peaks in to the valleys and a mirror like surface is obtained at the end of the operation.

ROBUTO® tools can be attached to any rotating spindle driven machine. During the process, either the workpiece or the tool rotates. In automated machines feeding rate can be set by the operator, while in manual machines self-feeding tools can be useful.

TOOL APPLICATION

The adjustment of the tool diameter and control of the operation parameters 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 peak - to - valley height. This must be allowed for at the preceding machining operation by leaving enough stock to compensate for the dimensional change.

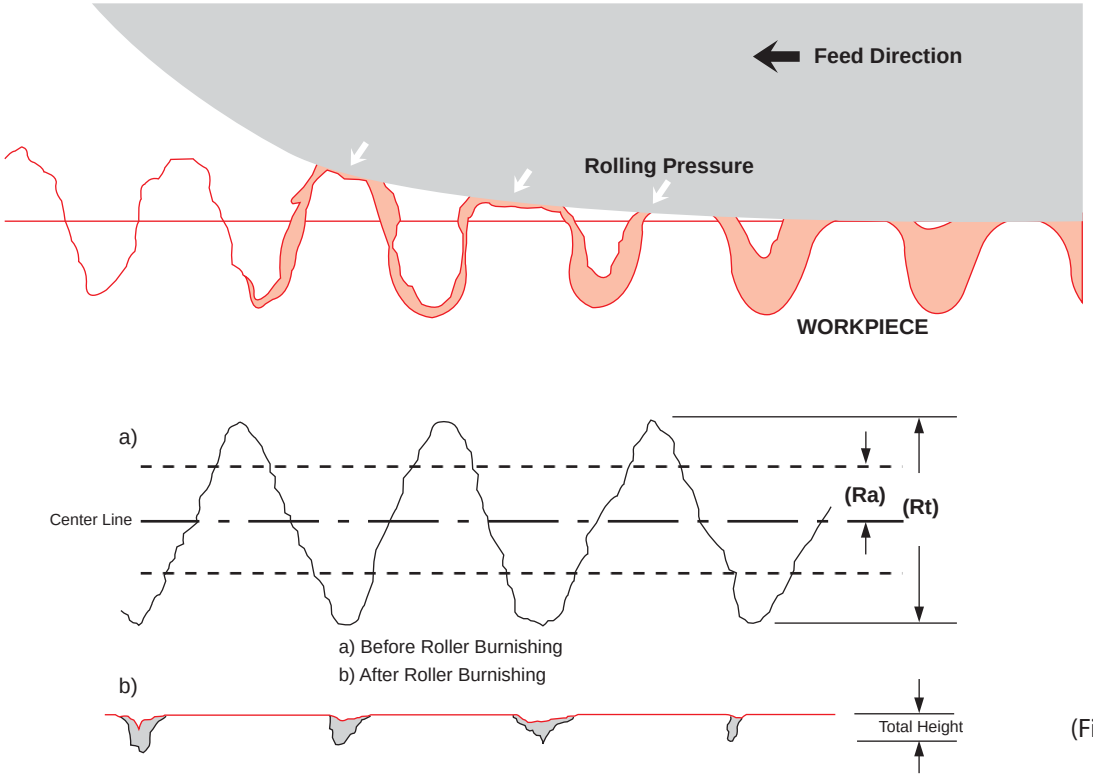
Table-1 is to give an idea about determining the stock allowance for the workpieces of different diameters.

(Table-1)

TOOL DIA (mm)	STOCK ALLOWANCE (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-3)



(Figure-3)

Roller burnishing process cold - works metal surfaces to produce a uniform, dense, low micro surface finish. The fact that ROBUTO® 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 forces. These forces slightly exceed 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)

There are several methods for determining the surface roughness value. But Ra (CLA, AA) is the international and the most common parameter for the roughness value. Ra Value is standardized in ISO system and symbolized with (N). For a better comparison Ra values are used in this document.
In Table-2, (Ra) values of different materials are listed. In Table-3, comparison of roller burnishing operation with other methods is given.

(Table-2)

SURFACE ROUGHNESS		
Material	Before Roller Burnishing Ra (µm)	After Roller Burnishing Ra (µm)
Cast Iron	1.5 - 2.5	0.35 - 0.50
Steel	2.5 - 5.0	0.05 - 0.15
Aluminium	2.5 - 3.0	0.10 - 0.20
Brass	2.5 - 3.5	0.10 - 0.20
Bronze	2.5 - 3.5	0.15 - 0.20

Sizing

As mentioned before, there is a built-in micrometer mechanism at the rear of the housing, which provides 2.5 µm (0.0025 mm.) sizing precision. When high dimensional accuracy is required, this feature of YAMATO ROBUTO® tools gives excellent results.

Sizing with Roller Burnishing Tools is influenced by the ductility of the material, the tolerance before burnishing and the profile of the premachined surface.

High ductility materials are classified as those which have an ultimate elongation δ_{10} of more than 18% and a hardness of less than 32 HRC. (Stainless Steel, Annealed Steel, Aluminium, Bronze, Brass, Malleable Iron)

(Table-3)

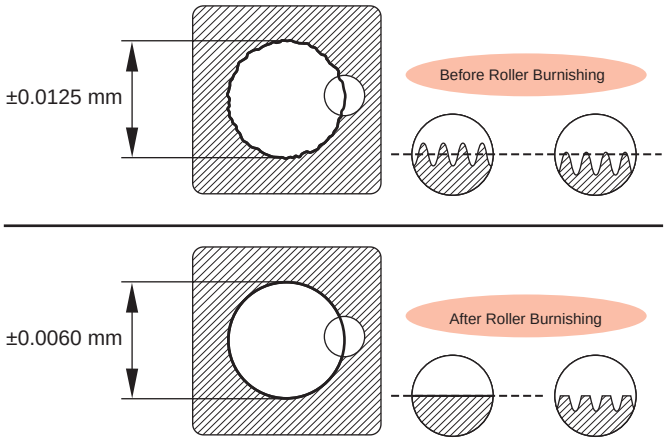
Ra(µm)	25	12.5	6.3	3.2	1.6	0.8	0.4	0.2	0.1	0.05	0.025	0.012
PROCESS												
Planing												
Drilling												
Milling												
Reaming												
Lathes												
ROBUTO												
Grinding												
Honing												
Lapping												

Less Frequent Application

Effective Range

Low ductility materials are classified as those which have an ultimate elongation of less than 18%. (Gray Cast Iron, Hard Copper Alloys, Magnesium Alloys, Some Heat-Treated Steels)

Due to the experimental results, tolerances in low ductility materials are 20% improved,while high ductility materials give an improvement of 25% - 50% (Figure-4).



(Figure-4)

Increase in Resistance to Fatigue Failure

Because fatigue failure damages are instantaneous and causes major harm, preventions are necessary. Metals can get cracked even if 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 operation of roller burnishing reduces the harmful 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%.

Work - Hardening

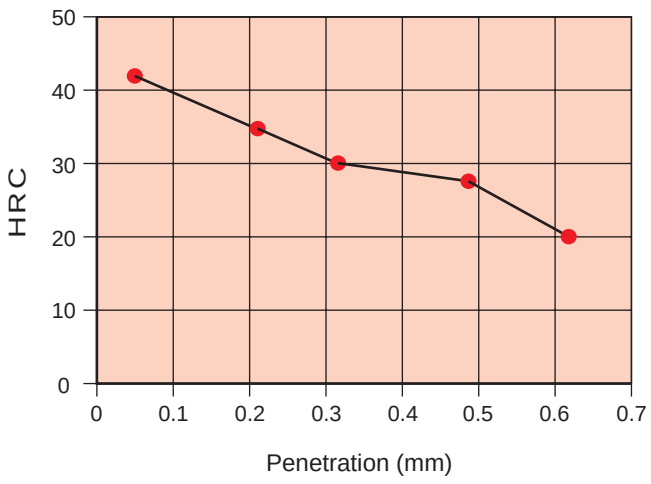
Roller burnishing compacts and compresses the workpiece metal where it is contacted by the tool. Subsequently, the grain structure is changed and the part becomes strain hardened. Through this granular dislocation and deformation, the grain size is decreased and the boundary volume is increased in the cold worked area.

Because we are dealing with surface hardness, hardness increase cannot be measured by means of Rockwell or Brinell testing. Instead, a method known as Tukon testing is used. Knoop value is obtained from the measurements of Tukon testing. The Knoop Hardness value can be converted to Brinell or Rockwell hardness values.

The Knopp hardness measurement shows a clear hardness increase at the surface, with hardness gradually decreasing to the original value at greater distances from the surface.

In Figure-5 the relation of surface hardness and penetration of the hardness (distance from surface) is shown.

(Figure-5)



Increase in surface hardness for different types of materials is shown in Table-4.

(Table-4)

			INCRESE IN SURFACE HARDNESS			
Material	DIA	Stock Amount	Brinell Hardness (BHN)	BHN%	Rockwell Hardness (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	0.012 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	-	-

Corrosion and Porosities

Workpieces that are roller burnished have high resistance to corrosion. Eliminating the pits, scratches and porosities, which could collect reactive substances and contaminants, provides high corrosion resistance.

A workpiece has the risk of cracking when it is under the affect of both reactive substances and tensile residual stresses. Cracking that occurs due to the interaction between static tensile stresses in the metal and a corrosive medium is called stress corrosion cracking. During roller burnishing, these tensile stresses are eliminated when the material is compressed, because compressive residual stresses are formed at the surface of the workpiece.

Roller burnishing successfully removes these factors causing stress corrosion cracking.

ROBUTO® TYPES

Roller Burnishing Tools can be used on all types of machines (drill presses, lathes, machining centers, or any other rotating spindle). All Roller Burnishing tools are designed for right-hand rotation, and either the tool or the workpiece can be rotated.

Two feeding options are available:

SF - Self Feeding
MF - Machine Feeding

Self Feeding (SF): Suitable for manual applications. The only parameter that user decides is the Rotation Speed. Feed rate is self adjusted, because when the tool is Self Feeding, the rolls are set at a slight helix angle to the axis of the mandrel and workpiece. This angular relationship causes the rolls to move in a helical path around the workpiece surface, thereby establishing a Self Feeding characteristic in the tool.

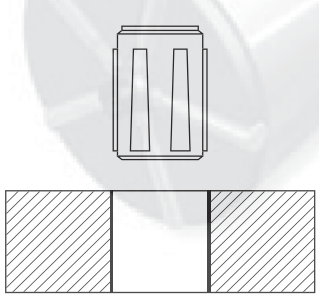
Machine Feeding (MF): Suitable for automatic machines. Rotation speed and feed rate must be set by the operator.

All ROBUTO® Tools finish the roller burnishing operation in a single pass and then the tool can be withdrawn rapidly. Because ROBUTO® Tools are equipped with an "automatic release mechanism". This means that when the rolling action is finished, the tool can be easily withdrawn, because, by the automatic release mechanism, the rolls are collapsed.

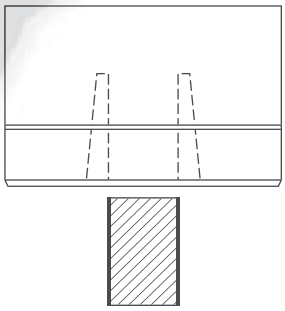
blind hole machine feeding | trough hole self feeding | trough hole machine feeding

ROBUTO®

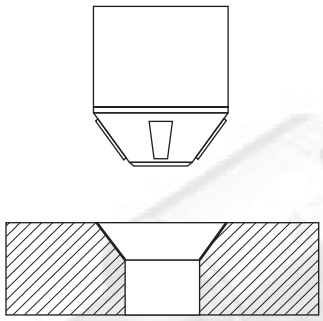
roller burnishing tools



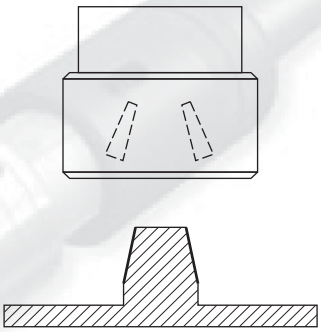
- Internal Robuto® -



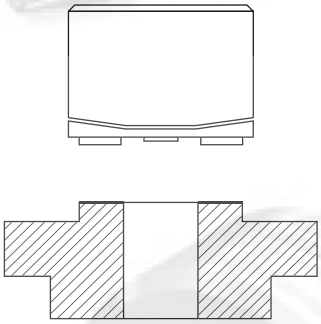
- External Robuto®-



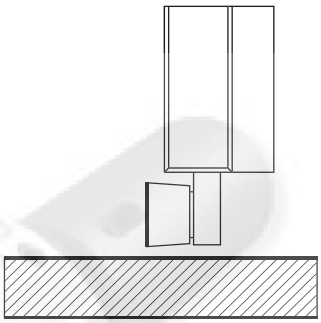
-Internal Angular Robuto®-



-External Angular Robuto®-



-Flat Face Robuto®-



-Single Roll Robuto®-

42 TYPES OF *ROLLS*

GROUP	DIA Ø mm	ADJUSTMENT RANGE (mm)		CODE
		SELF FEEDING	MACHINE FEEDING	
Ia	6 - 6.75	-0.05 +0.20	-0.05 +0.15	CPL 10XXXX03070 XX
	7 - 7.5	-0.10 +0.40	-0.10 +0.30	CPL 10XXXX05078 XX
	8 - 8.5	-0.10 +0.40	-0.10 +0.30	CPL 10XXXX05090 XX
	9 - 10	-0.10 +0.40	-0.10 +0.30	CPL 10XXXX05109 XX
	10.5 - 11	-0.10 +0.40	-0.10 +0.30	CPL 10XXXX05125 XX
	11.5 - 12.5	-0.10 +0.40	-0.10 +0.30	CPL 10XXXX05148 XX
	13 - 14	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05148 XX
	15 - 16	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05180 XX
Ib	17 - 18	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05180 XX
	19 - 24	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05218 XX
	25 - 27	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05265 XX
	28 - 31	-0.10 +0.90	-0.10 +0.80	CPL 10XXXX05310 XX

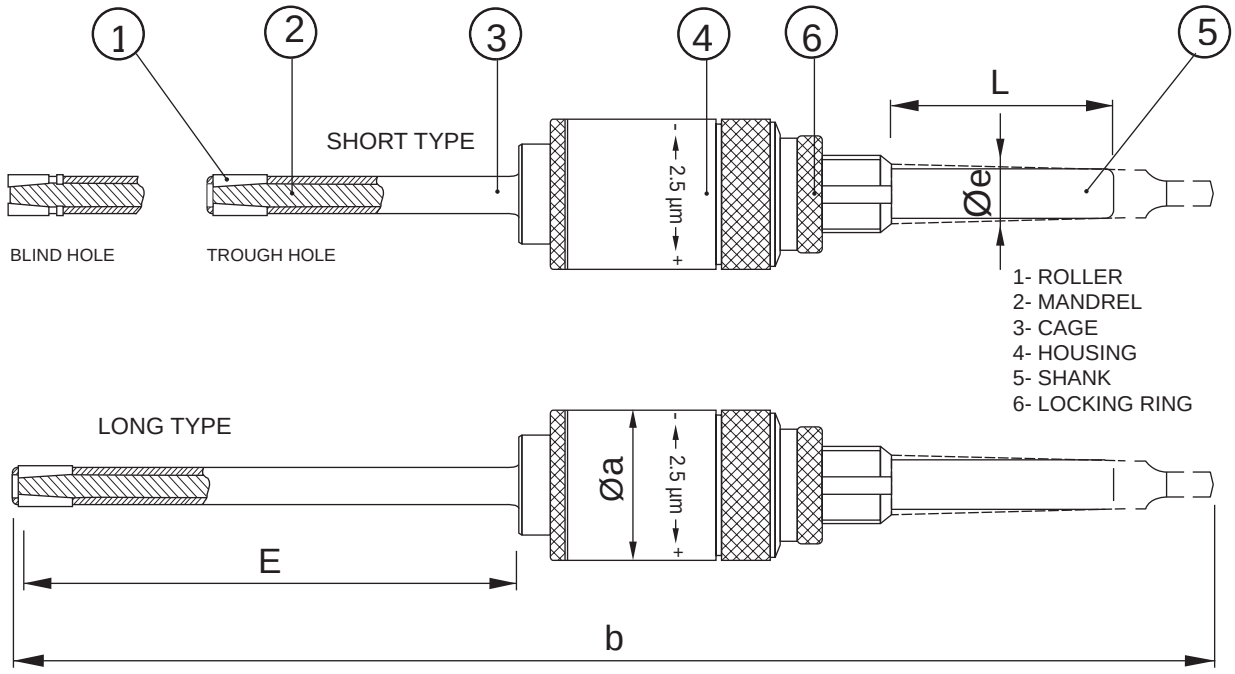
** THROUGH HOLE TYPE TOOLS CAN BE "SELF FEEDING" -SF- OR "MACHINE FEEDING" -MF-*

** BLIND HOLE TYPE TOOLS ARE "MACHINE FEEDING" -MF-*

BLIND HOLE TYPE TOOL MUST BE ORDERED AT ACTUAL DIAMETER

Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

Special working lengths (E), are available.



GROUP	DIA Ø mm	SHANK		DIMENSIONS		
		MT	STRAIGHT (Ø exL)	Ø a mm	E (WORKING LENGTH) mm	b* mm
Ia	6 - 6.75	1	Ø 10 x 45	30	55 / 90	200 / 245
	7 - 7.5	1	Ø 10 x 45	30	55 / 90	200 / 245
	8 - 8.5	1	Ø 10 x 45	30	55 / 90	200 / 245
	9 - 10	1	Ø 10 x 45	30	55 / 90	200 / 245
	10.5 - 11	1	Ø 10 x 45	30	55 / 90	200 / 245
	11.5 - 12.5	1	Ø 10 x 45	30	55 / 90	200 / 245
	13 - 14	1	Ø 10 x 45	30	55 / 90	200 / 245
	15 - 16	1	Ø 10 x 45	30	55 / 90	200 / 245
Ib	17 - 18	1	Ø 10 x 45	30	90	250
	19 - 24	1	Ø 10 x 45	30	90	250
	25 - 27	1	Ø 10 x 45	30	90	250
	28 - 31	1	Ø 10 x 45	30	90	250

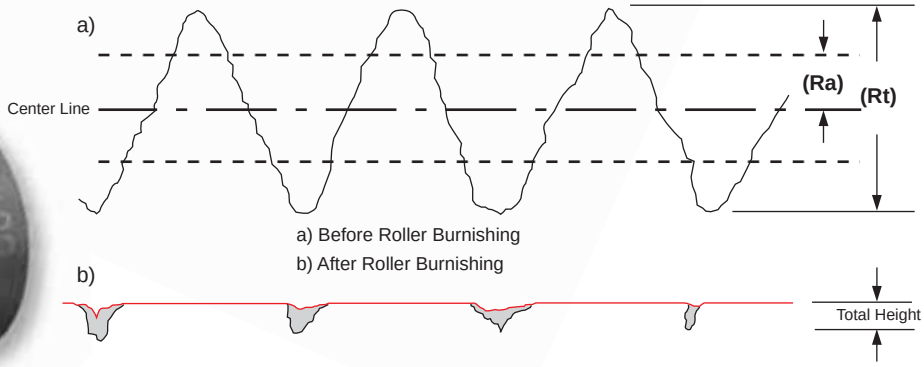
* FOR MT SHANK

WHEN ORDERING

- HOLE DIAMETER
- HOLE TYPE (BLIND - THRU)
- WORKING LENGTH
- SHANK TYPE (MT OR STRAIGHT)
- WALL THICKNESS / DIA (t/D) VALUE MUST BE SPECIFIED

Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

Special working lengths (E), are available.



GROUP	DIA Ø mm	ADJUSTMENT RANGE (mm)		CODE
		SELF FEEDING	MACHINE FEEDING	
IIa	32 - 33	-0.10 +0.90	-0.10 +0.80	CPL 20XXXX05310 XX
	34 - 39	-0.10 +0.90	-0.10 +0.80	CPL 20XXXX07310 XX
IIb	40 - 49	-0.10 +0.90	-0.10 +0.80	CPL 20XXXX07406 XX
III	50 - 55	-0.10 +0.90	-0.10 +0.80	CPL 30XXXX07406 XX
	56 - 62	-0.10 +0.90	-0.10 +0.80	CPL 30XXXX07466 XX
	63 - 70	-0.10 +0.90	-0.10 +0.80	CPL 30XXXX09466 XX
	71 - 80	-0.10 +0.90	-0.10 +0.80	CPL 30XXXX11466 XX
	81 - 85	-0.10 +0.90	-0.10 +0.80	CPL 30XXXX09530 XX

** THROUGH HOLE TYPE TOOLS CAN BE "SELF FEEDING" -SF- OR "MACHINE FEEDING" -MF-*

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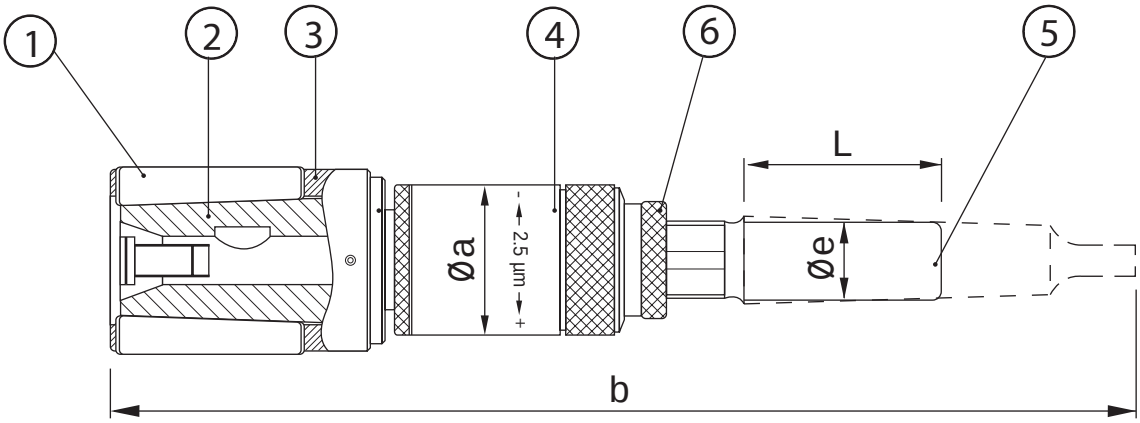
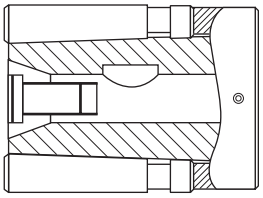


THROUGH HOLE



BLIND HOLE

1- ROLLER
2- MANDREL
3- CAGE
4- HOUSING
5- SHANK
6- LOCKING RING

GROUP	DIA Ø mm	SHANK		DIMENSIONS		
		MT	STRAIGHT (Ø exL)	Ø a mm	E (WORKING LENGTH) mm	b* mm
IIa	32 - 33	2	Ø16 x 40	30		215
	34 - 39	2	Ø16 x 40	30		215
IIb	40 - 49	2	Ø16 x 40	30		215
III	50 - 55	3	Ø20 x 75	48	∞	275
	56 - 62	3	Ø20 x 75	48	(unlimited)	275
	63 - 70	3	Ø20 x 75	48		275
	71 - 80	3	Ø 20 x 75	48		275
	81 - 85	3	Ø20 x 75	48		275

** WHEN MT SHANK*

through hole
machine feeding cage

blind hole
machine feeding cage

through hole
self feeding cage

Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

GROUP	DIA Ø mm	ADJUSTMENT RANGE (mm)		CODE
		SELF FEEDING	MACHINE FEEDING	
IV	86 - 100	-0.10 +0.90	-0.10 +0.80	CPL 4XXXXX09530 XX
	101 - 125	-0.10 +0.90	-0.10 +0.80	CPL 4XXXXX09687 XX
	126 - 140	-0.10 +0.90	-0.10 +0.80	CPL 4XXXXX11687 XX
	141 - 149	-0.10 +0.90	-0.10 +0.80	CPL 4XXXXX13687 XX
	150 - 160	-0.10 +0.90	-0.10 +0.80	CPL 4XXXXX11812 XX
V	161 - 180	-0.10 +0.90	-0.10 +0.80	CPL 5XXXXX13812 XX
	181 - 200	-0.10 +0.90	-0.10 +0.80	CPL 5XXXXX15812 XX

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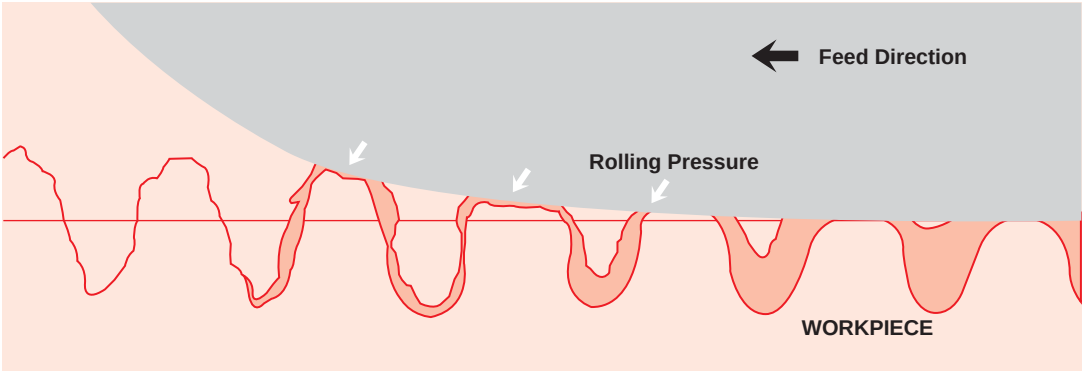
** BLIND HOLE TYPE TOOLS MUST BE "MACHINE FEEDING" -MF-*

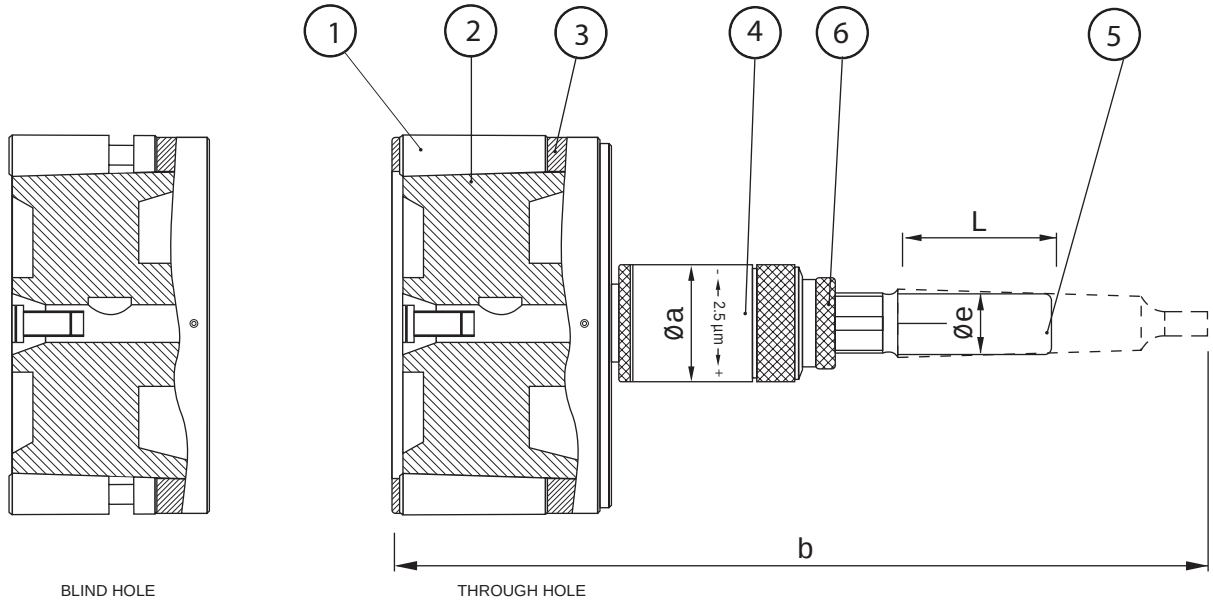
BLIND HOLE TYPE TOOL MUST BE ORDERED AT ACTUAL DIAMETER



Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

GROUP	DIA Ø mm	SHANK		DIMENSIONS		
		MT	STRAIGHT (Ø exL)	Ø a mm	E (WORK LENGTH) mm	b* mm
IV	86 - 100	4	Ø26 x 110	62		330
	101 - 125	4	Ø26 x 110	62		330
	126 - 140	4	Ø26 x 110	62	∞	330
	141 - 149	4	Ø26 x 110	62	(unlimited)	330
	150 - 160	4	Ø26 x 110	62		330
V	161 - 180	5	Ø40 x 100	89		440
	181 - 200	5	Ø40 x 100	89		440

* *WHEN MT SHANK*



BLIND HOLE THROUGH HOLE

1- ROLLER
2- MANDREL
3- CAGE
4- HOUSING
5- SHANK
6- LOCKING RING

WHEN ORDERING

- HOLE DIAMETER
- HOLE TYPE (BLIND - THRU)
- SHANK TYPE (MT OR STRAIGHT)
- "WALL THICKNESS / DIA" VALUE MUST BE SPECIFIED

Please contact for diameters over Ø 200 and ask for quotation.

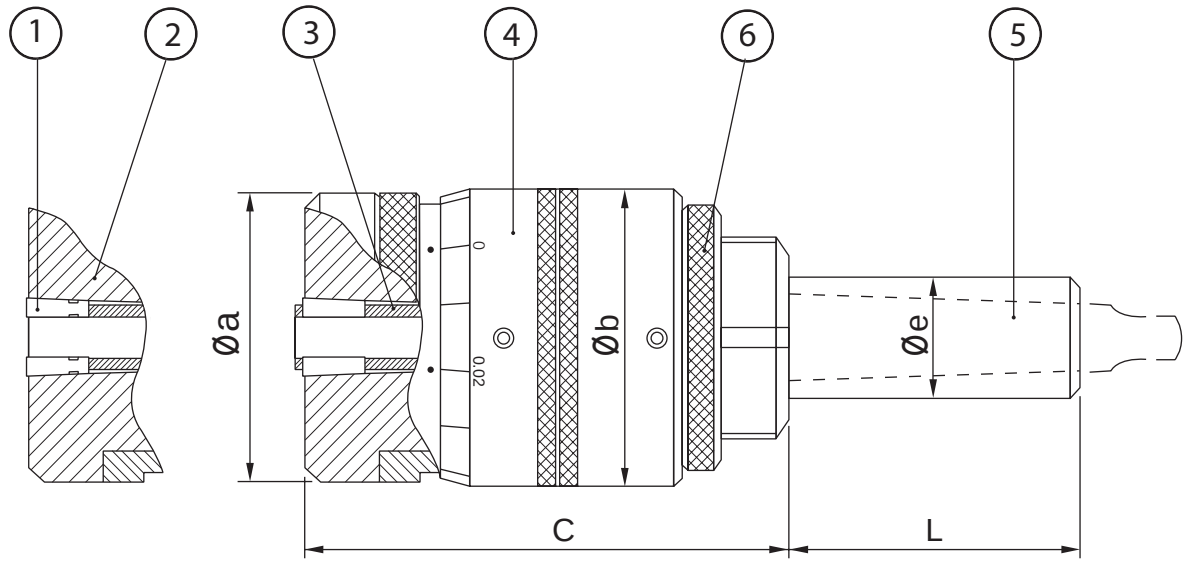
Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

- Easy to use with its compact design.
- Provides ideal surface for grease and oil seals.
- Appropriate to all working lengths.
- Bottoming style is available.
- Same type external tools (races and cages) are interchangeable.

EXTERNAL robuto®

OD

robuto®



1- ROLLER
2- RACE
3- CAGE
4- HOUSING
5- SHANK
6- LOCKING RING

TYPE	DIA Ø mm	ADJUSTMENT RANGE (mm)		CODE*
		SELF FEEDING	MACHINE FEEDING	
S1	3 - 4.5	+0.1 -0.4	+0.1 -0.3	MOD 1XXXXX03125 XX
	5 - 8.5	+0.1 -0.4	+0.1 -0.3	MOD 1XXXXX03148 XX
	9 - 10.5	+0.1 -0.4	+0.1 -0.3	MOD 1XXXXX05148 XX
S2	11 - 16.5	+0.1 -0.4	+0.1 -0.3	MOD 1XXXXX05180 XX
	17 - 21.5	+0.1 -0.4	+0.1 -0.3	MOD 1XXXXX07180 XX

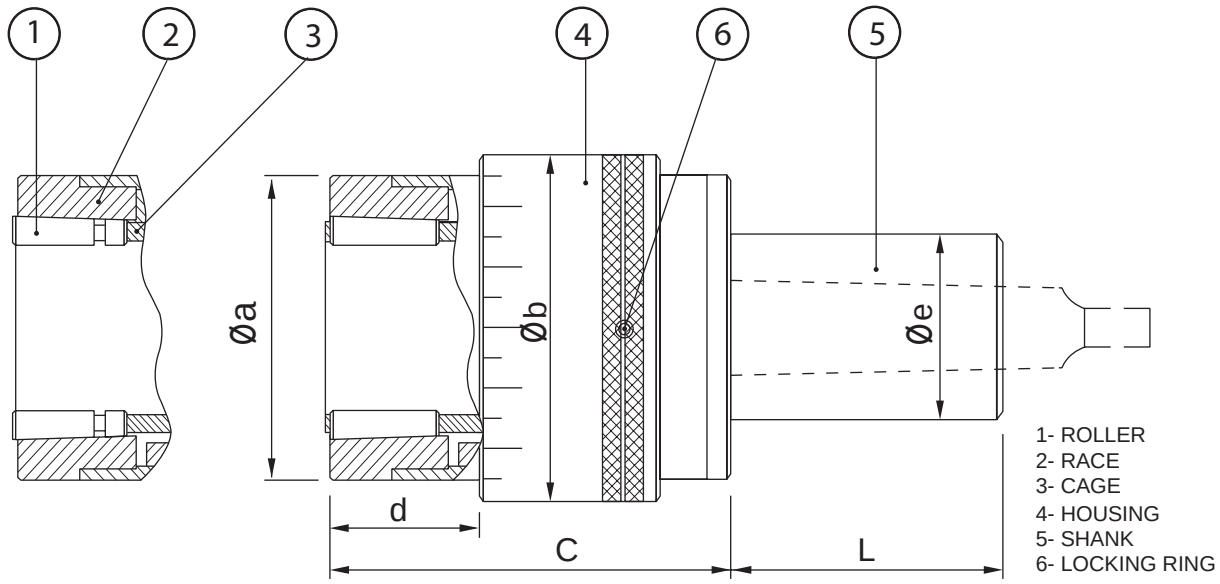
** TOOLS CAN BE "SELF FEEDING" -SF- OR "MACHINE FEEDING" -MF-*
BOTTOMING TOOLS ARE (MACHINE FEEDING)

TYPE	DIA Ø mm	SHANK		DIMENSIONS			
		MT*	STRAIGHT** (Ø exL)	Ø a mm	Ø b mm	c mm min.	c mm max.
S1	3 - 4.5	1	Ø 25 x 60	60	62	100	108
	5 - 8.5	1	Ø 25 x 60	60	62	100	108
	9 - 10.5	1	Ø 25 x 60	60	62	100	108
S2	11 - 16.5	2	Ø 40 x 70	73	77	115	123
	17 - 21.5	2	Ø 40 x 70	73	77	115	123

** LIMITED WORKING LENGTH*

*** UNLIMITED WORKING LENGTH*

Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.



TYPE	DIA Ø mm	ADJUSTMENT RANGE (mm)		CODE*
		SELF FEEDING	MACHINE FEEDING	
S3	22 - 32.5	+0.1 -0.5	+0.1 -0.4	MOD 3XXXXX05310 XX
	33 - 38.5	+0.1 -0.5	+0.1 -0.4	MOD 3XXXXX07310 XX
S4	39 - 41.5	+0.1 -0.5	+0.1 -0.4	MOD 3XXXXX07310 XX
	42 - 50.5	+0.1 -0.5	+0.1 -0.4	MOD 3XXXXX09310 XX
S5	51 - 65.5	+0.1 -0.5	+0.1 -0.4	MOD 4XXXXX09406 XX
S6	66 - 74.5	+0.1 -0.5	+0.1 -0.4	MOD 4XXXXX09406 XX
	75 - 80.5	+0.1 -0.5	+0.1 -0.4	MOD 4XXXXX11406 XX
S7	81 - 96	+0.1 -0.5	+0.1 -0.4	MOD 5XXXXX09530 XX

** TOOLS CAN BE "SELF FEEDING" -SF- OR "MACHINE FEEDING" -MF-*

BOTTOMING TOOLS ARE (MACHINE FEEDING)

TYPE	DIA Ø mm	SHANK		DIMENSIONS			
		MT*	STRAIGHT** (Ø exL)	Ø a mm	Ø b mm	c mm	d (min.) mm
S3	22 - 32.5	3	Ø 50 x 75	80	92	118	31
	33 - 38.5	3	Ø 50 x 75	80	92	118	31
S4	39 - 41.5	3	Ø 65 x 90	97	110	122	31
	42 - 50.5	3	Ø 65 x 90	97	110	122	31
S5	51 - 65.5	4	Ø 80 x 90	110	125	134	31
S6	66 - 74.5	4	Ø 110 x 110	132	147	142	32.5
	75 - 80.5	4	Ø 110 x 110	132	147	142	32.5
S7	81 - 96	5	Ø 150 x 120	160	180	147	32.5

** LIMITED WORKING LENGTH*

*** UNLIMITED WORKING LENGTH*

Please contact for diameters over Ø 96 and ask for quotation.

Custom tools may be available for some applications.Please submit part print or detailed sketch and request quotation.

Angular roller burnishing tools are designed to burnish conical sections with uniform taper, internal or external, as well as flat surfaces which are symmetrical with the axis of the workpiece. These surfaces are generally sealing surfaces, and require high quality finishes to control leakage.

MIC

Internal Angle Robuto® (MIC)

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.

MOC

External Angle Robuto® (MOC)

MFF

YAMATO ROBUTO® Tools are designed with tapered rolls for true planetary rolling action to prevent skidding effect and produce a superior burnished surface.

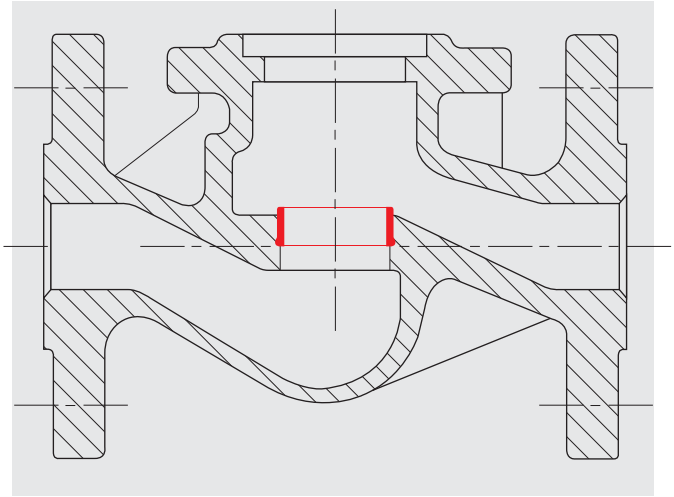
Flat Face Robuto® (MFF)

YAMATO
MACHINE & TOO L O RGANIZATION

SRMD
SINGLE ROLL BURNISHING TOOL

- Low surface finishes
- Suitable for burnishing shafts, faces, tapers and large IDs
- Adjustable for optimum burnishing pressure.
- Functional on CNC, NC, Classic lathes.

Single Roll Burnishing Tool (SRMD)



Send us a part print or detailed sketch and request a quotation.

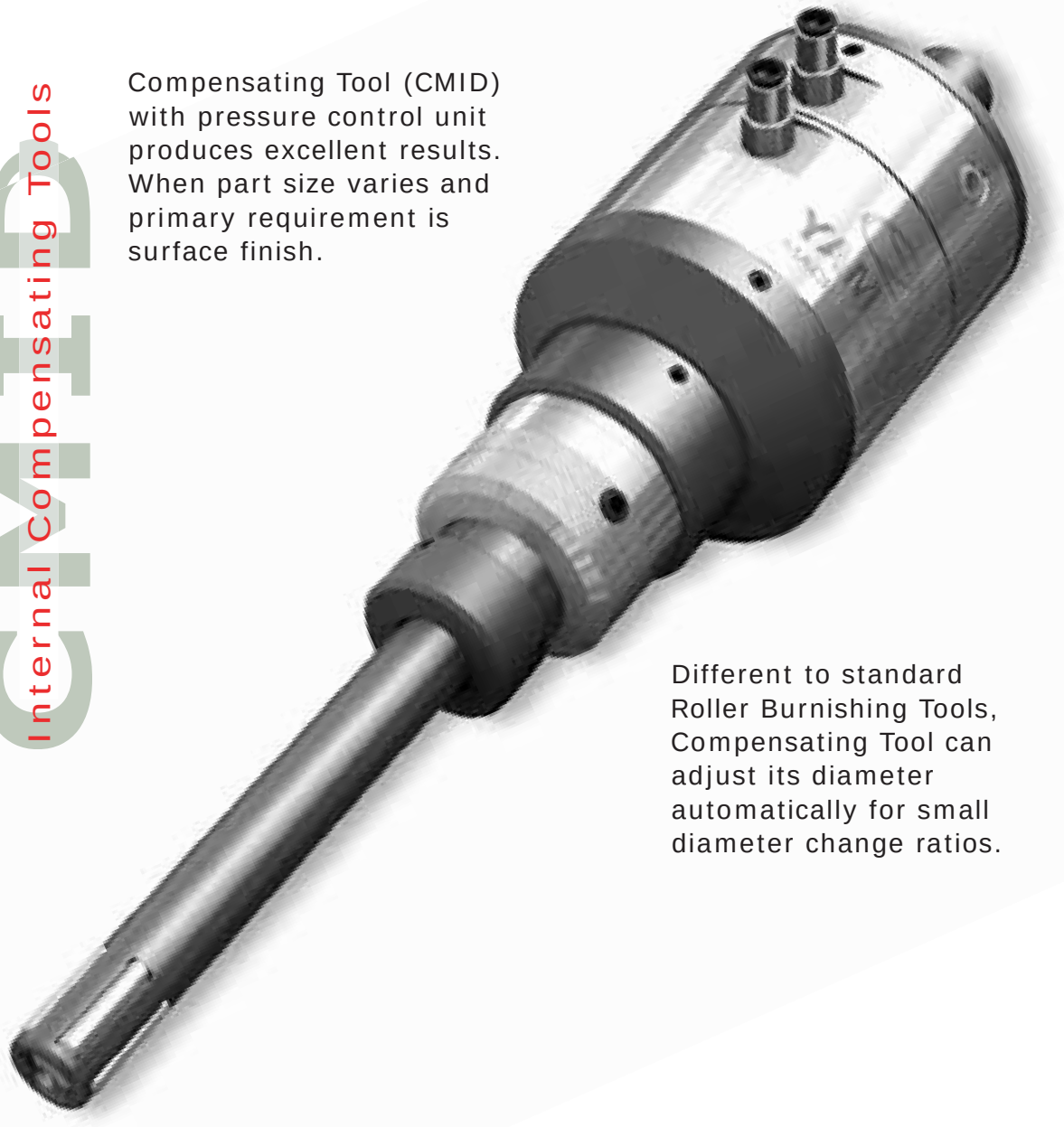
Ø25-27 EXPANDER

Ø169-200 EXPANDER

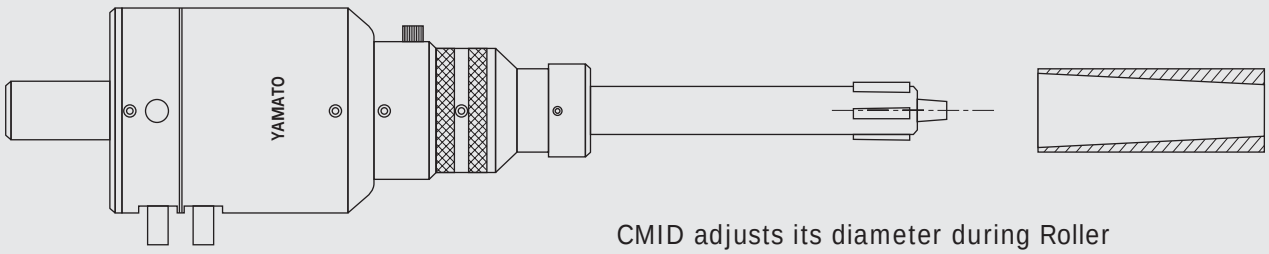
YAMATO
MACHINE & TOO L O RGANIZATION

CMID
Internal Compensating Tools

Compensating Tool (CMID) with pressure control unit produces excellent results. When part size varies and primary requirement is surface finish.



Different to standard Roller Burnishing Tools, Compensating Tool can adjust its diameter automatically for small diameter change ratios.



CMID adjusts its diameter during Roller Burnishing Operation.