



SINGLE CRYSTAL RUBY  
BONDING CAPILLARIES

Orbray



Single crystal ruby capillary is economical and environmental-friendly product.



Single crystal ruby capillary has many advantages over standard ceramic capillary in that surface smoothness, bending strength, chemical resistance, and others. These advantages can perform smooth wire bonding procedure with a little maintenance, and improvement of productivity. Furthermore, repetition of rework and cleaning for reuse process (re-processing at the capillary tip) is eco-friendly. Only Orbray can manufacture single crystal ruby capillary in the world. DCL COATING (Option) on the ruby capillary enhance the wear resistance, achieve longer life span, and adapt to narrower pitch bonding and Pb-free production procedure.

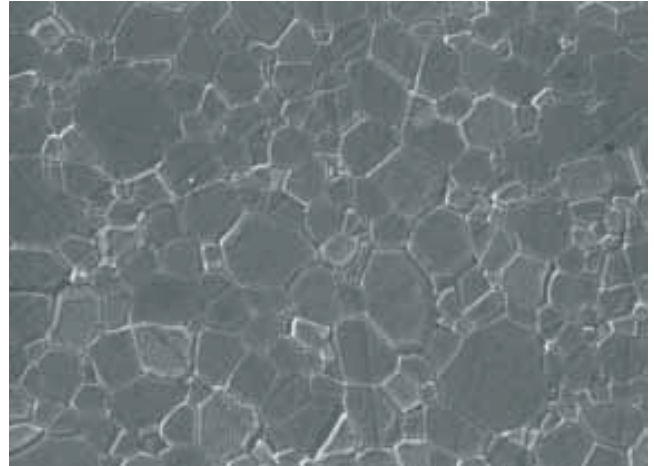
# Material Characteristics

**Excellent smoothness of single ruby crystal capillary prevents the scratch and contamination accumulation of gold wire.**

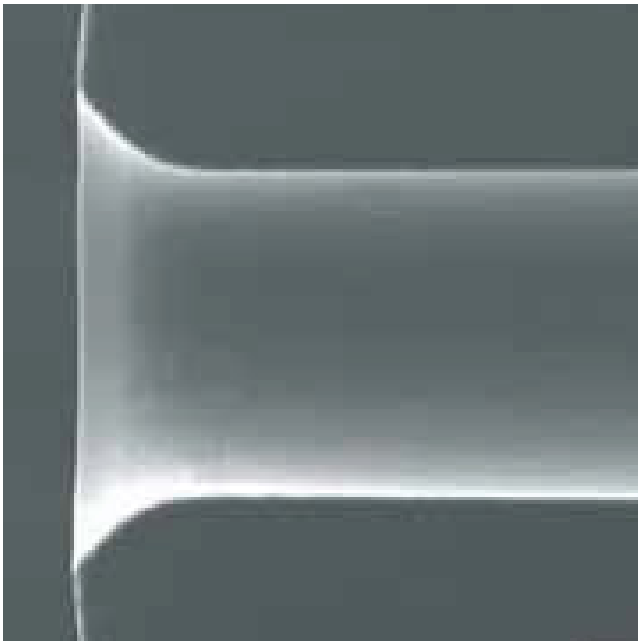
Our ruby capillary is made from single crystal ruby. Since the surface smoothness is superior to standard 99.99% Alumina ceramic capillary, the damage of gold wire is reduced. In addition, the hardness is suitable to bottleneck form.



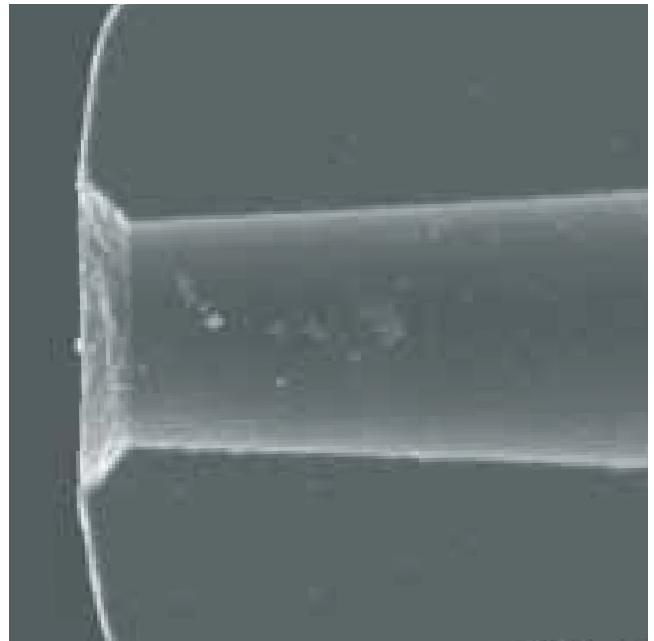
Single Crystal Ruby



99.99% Alumina



Orbray Capillary



Conventional Capillary

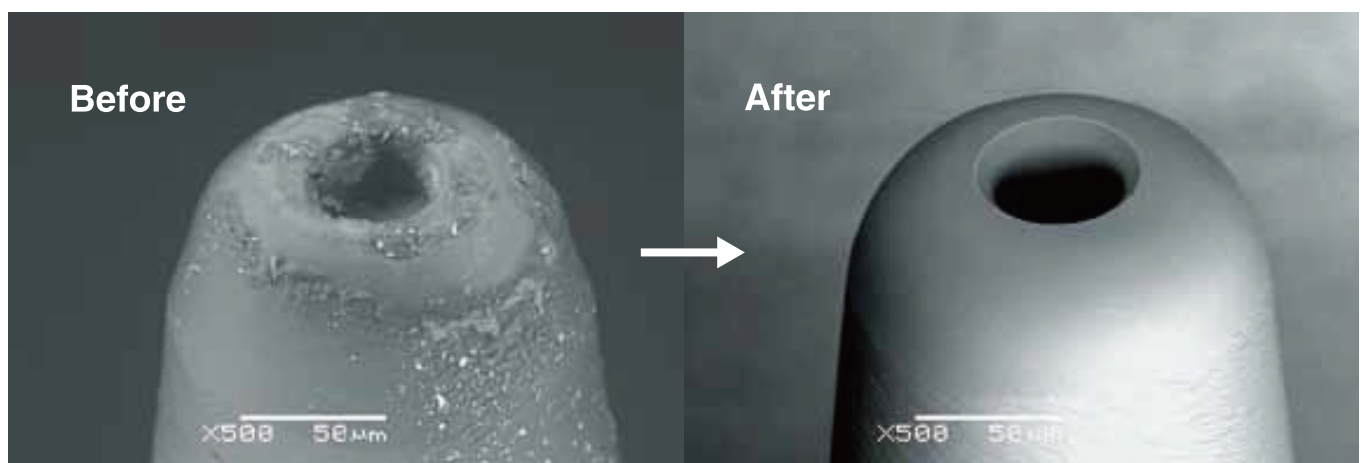
	Single Crystal Ruby	99.99% Alumina
Bending Strength	1,026(N/mm <sup>2</sup> )	820(N/mm <sup>2</sup> )
Hardness Vickers	2,000(HV)	2,000(HV)
Density	3.99(g/cm <sup>3</sup> )	3.98(g/cm <sup>3</sup> )
Average Grain Size	Single crystal	≤1.2μm
Color Appearance	Red	White

# Rework and Cleaning for reuse

By adoption of single crystal ruby which is excellent in chemical resistance, repetition of rework and cleaning for reuse of the capillary become possible. Ruby capillary is thus environmental-friendly product.

## Cleaning for Reuse

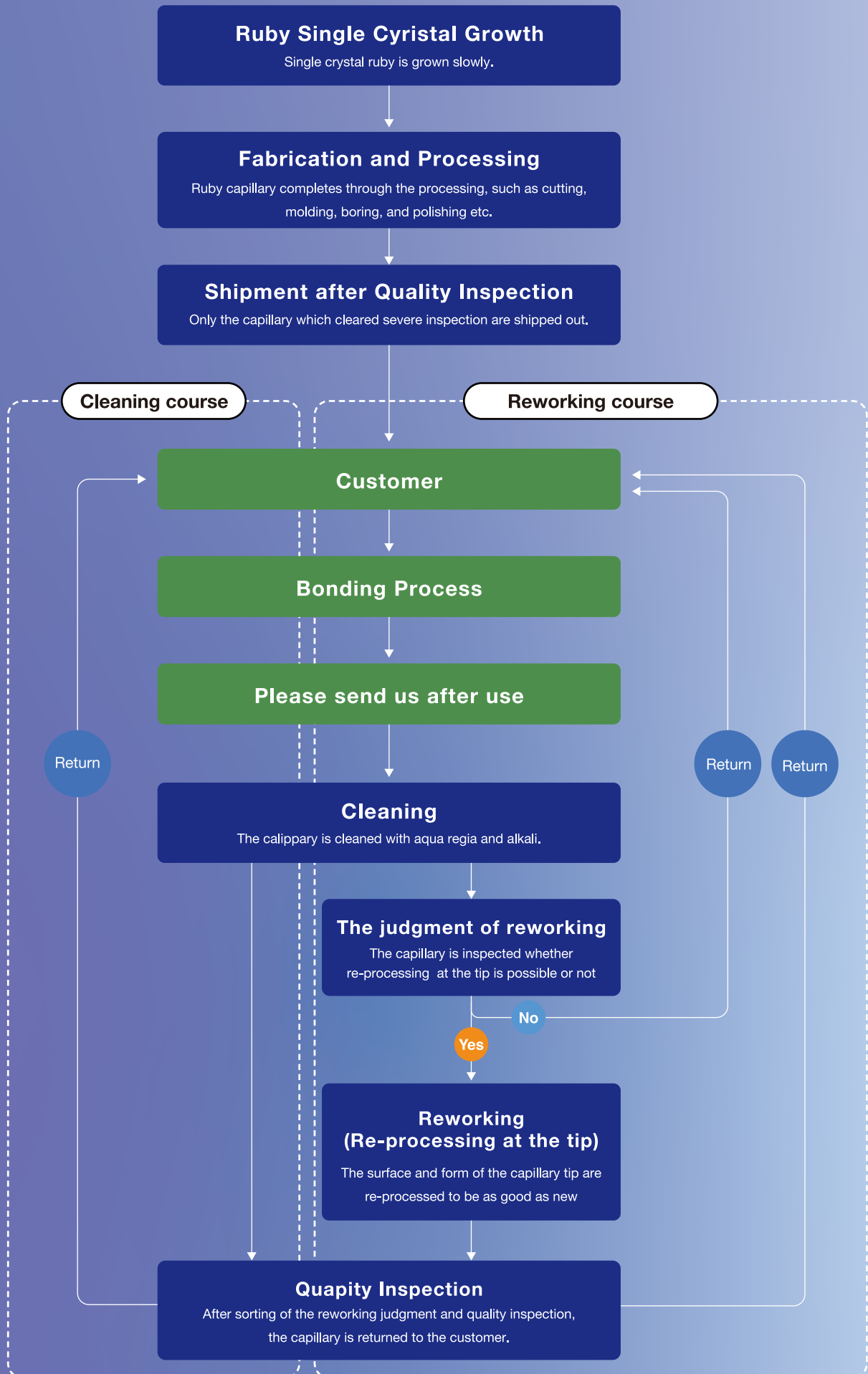
At the cleaning process, aqua regia and alkali remove adhesion of gold and carbide, respectively. Chemical residue doesn't adhere to the single crystal ruby capillary, so damage of gold wire can be eliminated. Because the capillary seldom has got bruises, it can be repeatedly used only by cleaning. We clean and inspect the capillary responsibly, so the quality is promised as good as new products.



## Rework

Rejected capillary can be re-new as reworked capillary with re-polish and re-processing onto the capillary tip. Reworking(re-processing at the tip) of capillary can be repeated until it becomes unfitted form for wire bonding. By using reworked capillary, the cost and environmental load can be reduced.

# Life cycle of Ruby Capillary

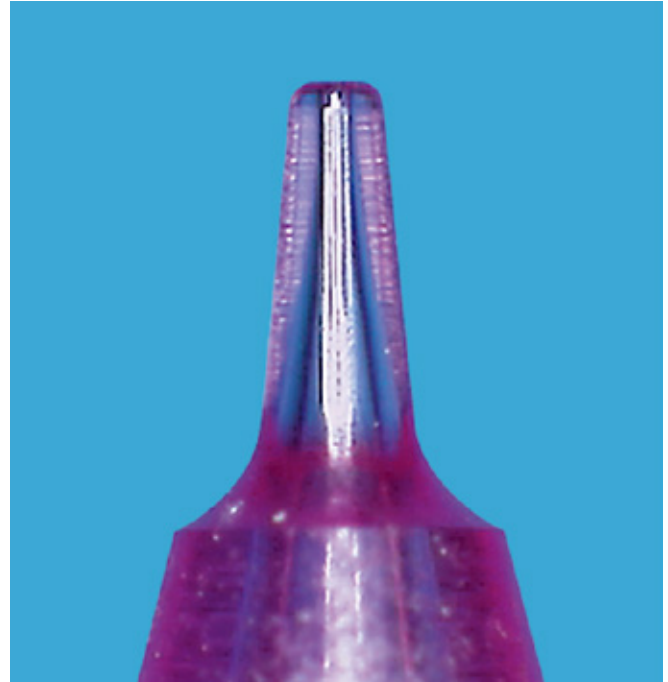


# DLC Coating

Narrow pitch. Adaptation to the Low-temperature bonding.  
DLC(DIAMOND LIKE CARBON) Coating achieve excellent wear resistance and threefold longer life span.



DLC coating Ruby Capillary



Non-coating Ruby Capillary

## The advantages of DLC coating

Recently, higher wear resistance is required for capillary at the adaptation to narrow pitch and low temperature bonding process.

DLC coating single crystal ruby capillary is three times higher in wear resistance than DLC uncoated. It is possible to increase the number of usage from 300k wire to 900k wire. Reduction of capillary change frequency provide benefits such as reduction of maintenance time, increasing controllable machine number, improvement in productivity, and contributes to increase your profits.

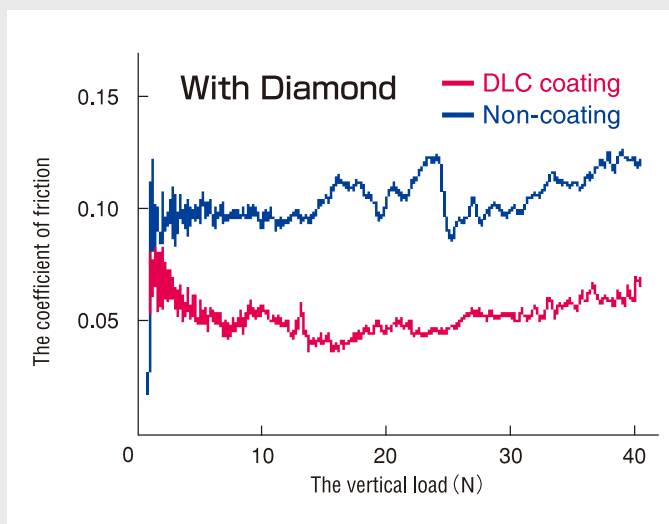
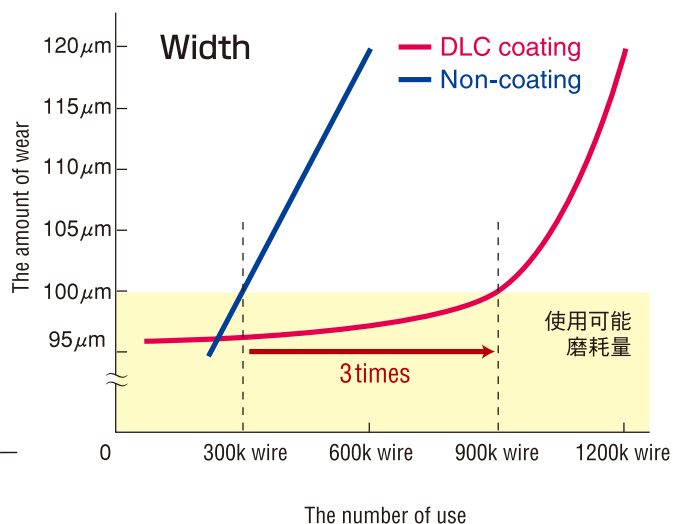
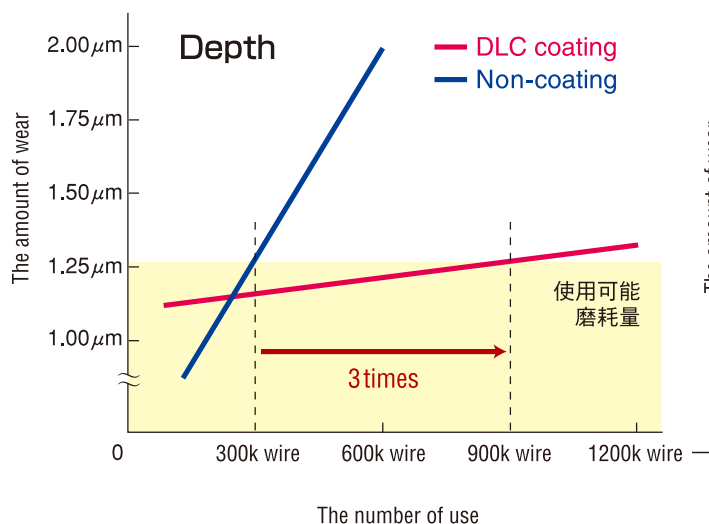


Since wear resistance increased three times, usage of capillary also increased threefold. Stable CD form of capillary enables improvement in bonding ability.

### DLC Coating Ruby Capillary



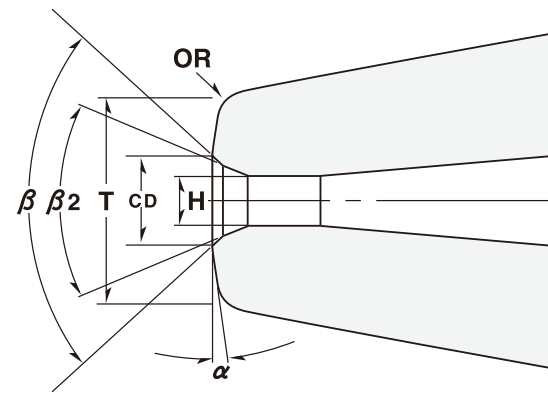
### Non-Coating Ruby Capillary



Since DLC coated Ruby Capillary has low coefficient of friction surface, the dirt rarely adheres to the capillary's tip. This coating achieves longer life span of capillary.

At the bonding process, the dirt which adheres to the capillary's tip is one of the factors to reduce the capillary life span. Since coefficient of friction is decreased by the DLC coating, adhesion of dirt on the capillary tip is reduced.

# Standard Type



## ADR-A

Series  
BPP:140 μm

Part NO.	WD	H	T	CD	OR	α	θ	β
ADR-A-1	38/1.5	51/2.0	229/9.0	102/4.0	38/1.5	8°	30°	120°
ADR-A-2	38/1.5	51/2.0	152/6.0	67/2.6	10/0.4	0°	30°	90°
ADR-A-3	38/1.5	51/2.0	229/9.0	86/3.4	102/4.0	0°	30°	90°
ADR-A-4	38/1.5	51/2.0	203/8.0	86/3.4	61/2.4	0°	30°	90°
ADR-A-5	38/1.5	56/2.2	239/9.4	102/4.0	38/1.5	8°	30°	120°
ADR-A-6	38/1.5	56/2.2	229/9.0	96/3.8	102/4.0	0°	30°	90°
ADR-A-7	38/1.5	56/2.2	203/8.0	86/3.4	61/2.4	0°	30°	90°
ADR-A-8	38/1.5	64/2.5	239/9.4	102/4.0	38/1.5	8°	30°	120°
ADR-A-9	38/1.5	64/2.5	203/8.0	89/3.5	61/2.4	0°	30°	90°
ADR-A-10	51/2.0	64/2.5	191/7.5	81/3.2	8/0.3	0°	30°	90°
ADR-A-11	51/2.0	64/2.5	292/11.5	102/4.0	127/5.0	0°	30°	90°
ADR-A-12	51/2.0	76/3.0	356/14.0	122/4.8	152/6.0	0°	30°	90°
ADR-A-13	51/2.0	89/3.5	419/16.5	135/5.3	178/7.0	0°	30°	90°
ADR-A-14	51.64/2.0,3.0	76/3.0	330/13.0	140/5.5	64/2.5	8°	30°	120°
ADR-A-15	64,76/2.5,3.0	89/3.5	330/13.0	127/5.0	64/2.5	8°	30°	120°
ADR-A-16	64,76/2.5,3.0	102/4.0	330/13.0	140/5.5	64/2.5	8°	30°	120°
ADR-A-17	76/3.0	102/4.0	483/19.0	168/6.6	203/8.0	0°	30°	90°

(μm/mil)

## ADR-B

Series  
BPP:100 μm

Part NO.	WD	H	T	CD	OR	α	θ	β
ADR-B-1	22/0.9	33/1.3	140/5.5	60/2.3	20/0.8	8°	30°	120°
ADR-B-2	25/1.0	38/1.5	165/6.5	74/2.9	25/1.0	8°	30°	120°
ADR-B-3	25/1.0	38/1.5	89/3.5	53/2.1	8/0.3	0°	30°	90°
ADR-B-4	25/1.0	38/1.5	114/4.5	53/2.1	8/0.3	0°	30°	90°
ADR-B-5	25/1.0	38/1.5	178/7.0	64/2.5	76/3.0	0°	30°	90°
ADR-B-6	25/1.0	38/1.5	203/8.0	53/2.1	89/3.5	0°	30°	90°
ADR-B-7	25/1.0	43/1.7	165/6.5	74/2.9	25/1.0	8°	30°	120°
ADR-B-8	25/1.0	43/1.7	203/8.0	53/2.1	89/3.5	0°	30°	90°
ADR-B-9	25.30/1.0,1.2	43/1.7	229/9.0	74/2.9	30/1.2	8°	30°	120°
ADR-B-10	25.30/1.0,1.2	43/1.7	152/6.0	59/2.3	8/0.3	8°	30°	120°
ADR-B-11	25.30/1.0,1.2	43/1.7	203/8.0	74/2.9	89/3.5	0°	30°	90°
ADR-B-12	25.30/1.0,1.2	46/1.8	229/9.0	74/2.9	38/1.5	8°	30°	120°
ADR-B-13	30/1.2	46/1.8	203/8.0	76/3.0	89/3.5	0°	30°	90°

(μm/mil)



# Fine Pitch Series

## ADR-C

Series  
BPP:100  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-C-1	25/1.0	38/1.5	130/5.1	53/2.1	30/1.2	11°	30°	90°
ADR-C-2	30/1.2	38/1.5	130/5.1	56/2.2	30/1.2	11°	30°	90°
ADR-C-3	30/1.2	38/1.5	130/5.1	56/2.2	30/1.2	8°	30°	90°
ADR-C-4	30/1.2	38/1.5	200/7.9	74/2.9	51/2.0	4°	30°	90°
ADR-C-5	30/1.2	41/1.6	130/5.1	59/2.3	30/1.2	11°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-D

Series  
BPP:90  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-D-1	25/1.0	33/1.3	109/4.3	51/2.0	13/0.5	11°	30°	90°
ADR-D-2	25/1.0	33/1.3	109/4.3	51/2.0	13/0.5	8°	30°	90°
ADR-D-3	25/1.0	33/1.3	109/4.3	51/2.0	13/0.5	4°	30°	90°
ADR-D-4	25/1.0	35/1.4	109/4.3	51/2.0	20/0.8	11°	30°	90°
ADR-D-5	30/1.2	38/1.5	109/4.3	51/2.0	20/0.8	11°	30°	90°
ADR-D-6	30/1.2	38/1.5	109/4.3	53/2.1	13/0.5	8°	30°	90°
ADR-D-7	30/1.2	38/1.5	109/4.3	53/2.1	13/0.5	4°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-E

Series  
BPP:80  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-E-1	25/1.0	33/1.3	99/3.9	48/1.9	13/0.5	4°	30°	90°
ADR-E-2	25/1.0	33/1.3	99/3.9	48/1.9	13/0.5	8°	30°	90°
ADR-E-3	25/1.0	33/1.3	99/3.9	48/1.9	13/0.5	11°	30°	90°
ADR-E-4	25/1.0	35/1.4	99/3.9	46/1.8	13/0.5	11°	30°	90°
ADR-E-5	30/1.2	38/1.5	99/3.9	51/2.0	13/0.5	4°	30°	90°
ADR-E-6	30/1.2	38/1.5	99/3.9	51/2.0	13/0.5	8°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-F

Series  
BPP:70  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-F-1	25/1.0	30/1.2	91/3.6	43/1.7	10/0.4	8°	30°	90°
ADR-F-2	25/1.0	30/1.2	91/3.6	43/1.7	13/0.5	11°	30°	90°
ADR-F-3	25/1.0	33/1.3	99/3.9	48/1.9	13/0.5	4°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-G

Series  
BPP:60  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-G-1	23/0.9	28/1.1	81/3.2	35/1.4	13/0.5	11°	30°	90°
ADR-G-2	25/1.0	30/1.2	81/3.2	35/1.4	13/0.5	11°	30°	90°

( $\mu\text{m}/\text{mil}$ )

# Ultra Fine Pitch Series

## ADR-H

Series  
BPP:50  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-H-1	18/0.7	23/0.9	64/2.5	28/1.1	10/0.4	11°	30°	90°
ADR-H-2	20/0.8	25/1.0	64/2.5	30/1.2	10/0.4	11°	30°	90°
ADR-H-3	23/0.9	28/1.1	64/2.5	33/1.3	10/0.4	11°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-I

Series  
BPP:45  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-I-1	18/0.7	23/0.9	56/2.2	28/1.1	8/0.3	11°	30°	90°
ADR-I-2	20/0.8	25/1.0	56/2.2	30/1.2	8/0.3	11°	30°	90°

( $\mu\text{m}/\text{mil}$ )

## ADR-J

Series  
BPP:40  $\mu\text{m}$

Part NO.	WD	H	T	CD	OR	$\alpha$	$\theta$	$\beta$
ADR-J-1	15/0.6	18/0.7	51/2.0	25/1.0	8/0.3	11°	30°	90°
ADR-J-2	18/0.7	23/0.9	51/2.0	28/1.1	8/0.3	11°	30°	90°

( $\mu\text{m}/\text{mil}$ )

# Custom-made

### Tolerances

	H	T	CD	OR	$\alpha$	$\theta$	L	$\beta$	$\theta\text{B}$	BNH
High Spec	+2/0 $\mu\text{m}$ +0.08/0mil	$\pm 3\mu\text{m}$ $\pm 0.12\text{mil}$	+2/0 $\mu\text{m}$ +0.08/0mil	$\pm 5\mu\text{m}$ $\pm 0.2\text{mil}$						
Standard	$\pm 2\mu\text{m}$ $\pm 0.08\text{mil}$	$\pm 5\mu\text{m}$ $\pm 0.2\text{mil}$	$\pm 5\mu\text{m}$ $\pm 0.2\text{mil}$	$\pm 5\mu\text{m}$ $\pm 0.2\text{mil}$	$\pm 1^\circ$	$\pm 1^\circ$	$\pm 100\mu\text{m}$ —	$\pm 1^\circ$	$\pm 1^\circ$	+50/0 $\mu\text{m}$ —

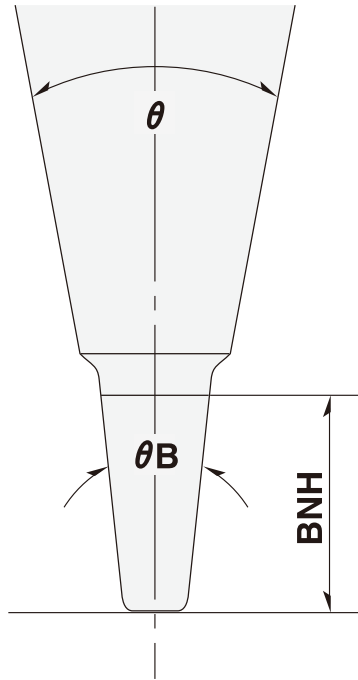
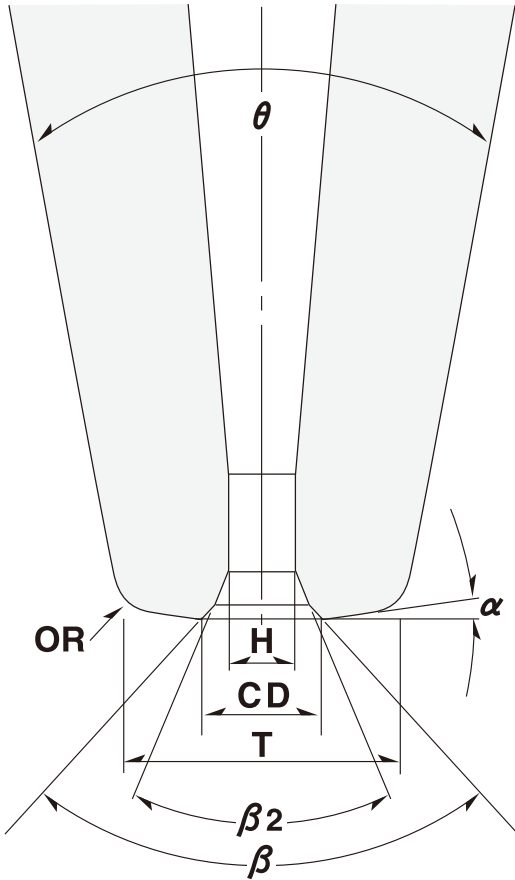
### Example1

Material	H	T	CD	OR	$\alpha$	$\theta$	L	Type	Finish	$\beta$	$\theta\text{B}$	BNH	Tolerances
Ruby	33 $\mu\text{m}$ 1.3mil	91 $\mu\text{m}$ 3.6mil	41 $\mu\text{m}$ 1.6mil	13 $\mu\text{m}$ 0.5mil	8°	20°	11100 $\mu\text{m}$ 437mil	Bottle	Matte	90°	10°	203 $\mu\text{m}$ 8.0mil	High Spec

### Example2

Material	H	T	CD	OR	$\alpha$	$\theta$	L		Finish	$\beta$	$\theta\text{B}$	BNH	Tolerances
Ruby	43 $\mu\text{m}$ 1.7mil	150 $\mu\text{m}$ 5.9mil	71 $\mu\text{m}$ 2.8mil	33 $\mu\text{m}$ 1.3mil	4°	18°	11100 $\mu\text{m}$ 437mil		Polish	90°			Standard

# Custom-made Order Sheet



**H** ... Hole Diameter

**T** ... Tip Diameter

**CD** ... Chamfer Diameter

**OR** ... Outer Radius

$\alpha$  ... Face Angle

$\theta$  ... Cone Angle

**L** ... Tool Length

**Type** ... Standard or Bottleneck

**Finish** ... Polish or Matte

$\beta$  ... Chamfer Angle

$\theta B$  ... Bottleneck Angle

**BNH** ... Bottle Neck Height

**Tolerances** ... Standard or High Spec

**Material** ... Ruby or Ceramic

Please describe a size.

Material	H	T	CD	OR	$\alpha$	$\theta$	L	Type	Finish	$\beta$	$\theta B$	BNH	Tolerances	Option

<b>Customer</b>	
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# Orbray

Orbray Co., Ltd.

3-8-22 Shinden, Adachi-ku, Tokyo 123-8511 Japan

TEL : +81-3-3919-2200 / FAX : +81-3-5390-7657

Specifications and product design subject to change without notice.

Adamant Namiki Precision Jewel Co., Ltd., has changed its name to Orbray Co., Ltd., effective January 1, 2023.