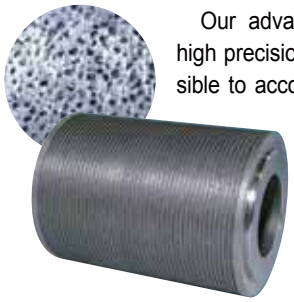
# Dresser

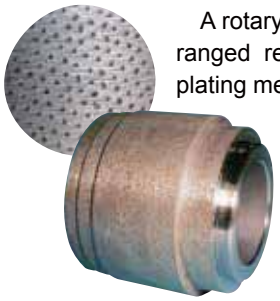
Rotary Dresser is a Diamond tool to form a conventional or cBN grinding wheels. Complex and Precise profile accuracy.

## RZ Type



Our advanced and unique technology in high precision electro-deposition make it possible to accommodate complex and fine profiles. Diamond grits which fixed by reverse plating method are arranged randomly and its consentration is very high, so it is also suitable for longer life applications. Various optional specifications are also available.

## SZ Type



A rotary dresser with diamond grits arranged regularly made by the reverse plating method. Concentration of the diamond can be controlled according to requirements. The SZ Type provides efficient plunge dressing of large size rotary dressers.

## Z Type

The diamond grits of Z type rotary dresser are fixed on the precise body by use of electro-plating process. This type can be made relatively easily and is suitable for small lot production and trial production.

## SX Type

SX type rotary dresser is produced by integration of our prominent technologies the original arrengement design of diamonds, the precise sintering technology and the excellent truing technology. Therefore SX type has a high valuation in grinding applications that require sharpness.It can also be effective in traverse dressing and contour dressing.

## X Type

X type rotary dresser is a metal bond type impregnated with diamond grits. High performance is made possible by free selection of concentration and uniform distribution of diamond grits. This type is suitable for traverse dressing of our VITMATE and EG Wheel.

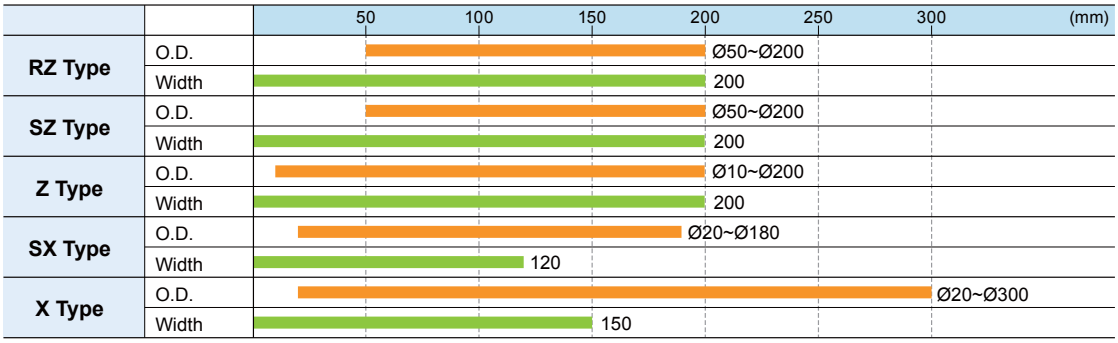
## ☐Process grouping & possible production ranges

### ■Process grouping

| Item | RZ Type | SZ Type | Z Type | SX Type | X Type |
|---|---|---|---|---|---|
| Manufacturing Method | Electro-deposition | Electro-deposition | Electro-plating | Sintering | Sintering |
| Diamond Grit Distribution | Random | Regular | Random | Regular | Random |
| Applicable Grit Size | #20~#140 | #16~#20 | #30~#140 | #16~#20 | #30~#80 |
| Profile | Complex<br>Fine | Form | Form | Form | Cup<br>Straight |
| Dress Method | Plunge | Plunge | Plunge<br>Traverse | Plunge<br>Travese | Traverse |
| Principal use | ●Bearing<br>●Injection Needles | ●Shafts | ●Gear Grinding | ●Turbine Blades<br>●Camshafts | ●Internal Grinding<br>●Centerless Grinding |
| Profile accuracy | ◎ | ○ | ○ | ○ | – |
| Surface Roughness | ◎ | ○ | ○ | ○ | △ |
| Dressing Force | ○ | ◎ | ○ | ◎ | ◎ |
| Major Features | Highest precision/<br>Fine profile/Complex profile | Large diameter/<br>High dressing ability | Gear Grinding | Any concentration settable/<br>High dressing ability | Consistant dressing ability |

### ■Possible production ranges

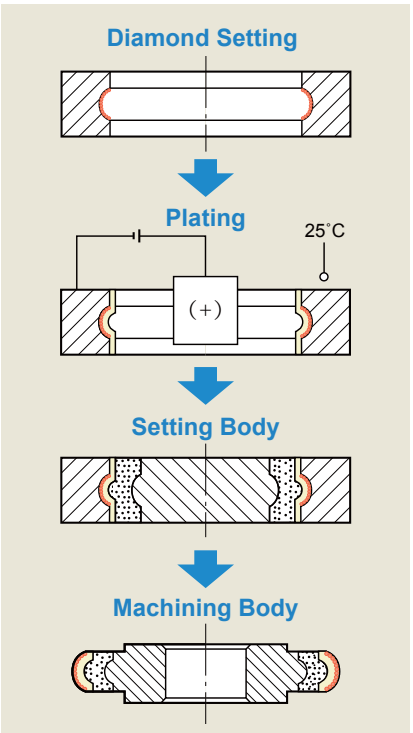
・Ranges vary depending on profile or specification etc




## ☐Outline of Production Processes for Rotary Dressers

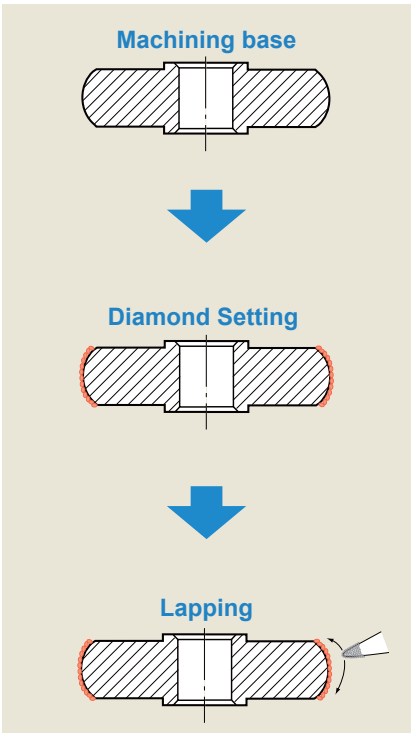
### Electro-deposition Method / RZ・SZ Type

As the product is processed under room temperature, the accuracy is not changed by thermal expansion.



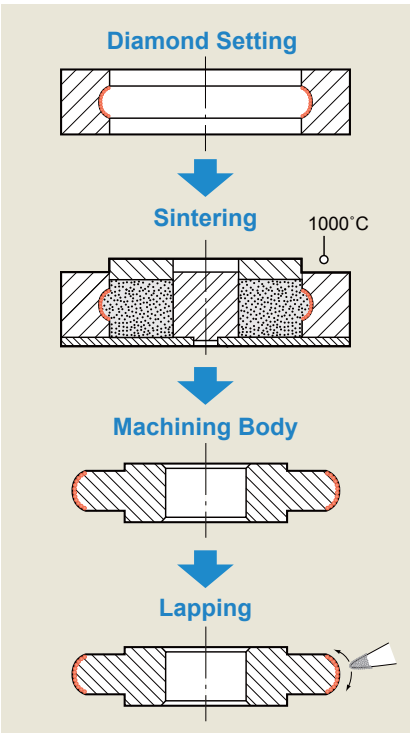

### Electro-plating Method / Z Type

Diamond is fixed directly on the body and finished by on the surface of diamond layer.

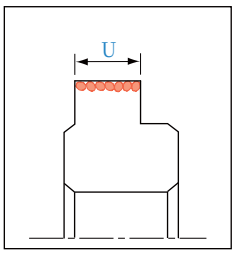



### Sintering Method / SX Type

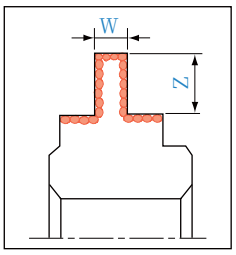
Surface of the diamond layer is lapped in the final process to achieve specified accuracy.



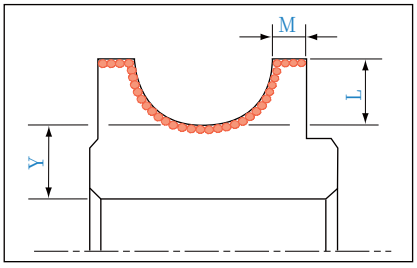
## ☐Tolerances of Rotary Dresser Designs (mm)



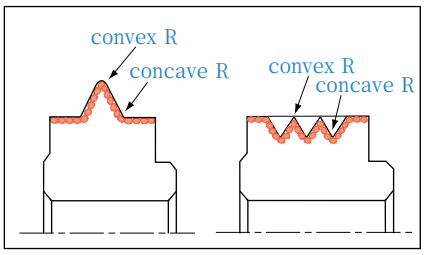

| | U Value |
|---|---|
| RZ Type | ≧10 |
| SZ Type | ≧10 |
| SX Type | ≧ 3 |
| Z Type | ≧ 3 |
| X Type | ≧ 3 |




| | W Value |
|---|---|
| RZ Type | ≧0.5Z |
| SZ Type | ≧0.5Z |
| SX Type | ≧ 4Z |
| Z Type | ≧ 4Z |
| X Type | ≧ 2Z |

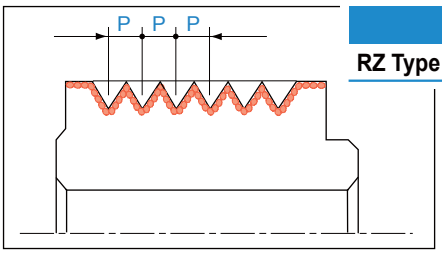



| | Y Value | M Value |
|---|---|---|
| RZ Type | ≧10 | ≧ L |
| SZ Type | ≧10 | ≧ L |
| SX Type | ≧ 4 | ≧0.5L |
| Z Type | ≧ 4 | ≧0.5L |
| X Type | ≧ 4 | ≧0.5L |




| | *Convex R Value | *Concave R Value |
|---|---|---|
| RZ Type | ≧0.1 | ≧0.03 |
| SZ Type | ≧0.2 | ≧0.15 |
| SX Type | ≧0.2 | ≧0.15 |
| Z Type | ≧0.3 | ≧0.3 |

*Value depending on diamond grain sizes

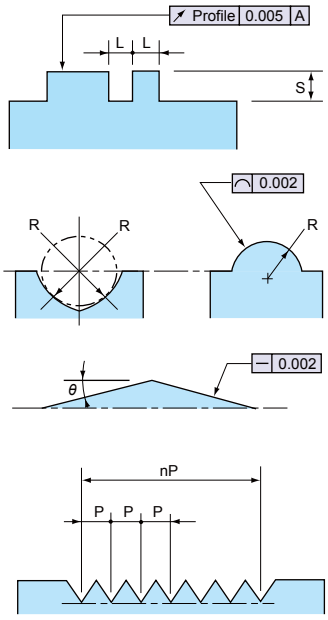



| | P Value |
|---|---|
| RZ Type | ≧0.3 |

## ☐Accuracy of Rotary Dressers

Other tolerances available upon request

| Item | Factor | Symbol | Accuracy (mm) | Illustration |
|---|---|---|---|---|
| Profile | Runout | ↗ | 0.005 | |
| | Width | L | ± 0.005 | |
| | Radius | R | ± 0.002 | |
| | Step | S | ± 0.001 | |
| | Contour | ⌒ | 0.002 | |
| | Angle | θ | ± 2′ | |
| | Straightness | — | 0.002 | |
| | Pitch | P | ± 0.002 | |
| | Accumulative Pitch | nP | ± 0.004 | |
| Body | Bore | ØH | + 0.005 – 0 | |
| | Parallel | // | 0.002 | |
| | Perpendicularity | ⊥ | 0.002 | |
| | Runout | ↗ | 0.002 | |



## ☐Optional Specifications of Rotary Dressers

Various options available upon request

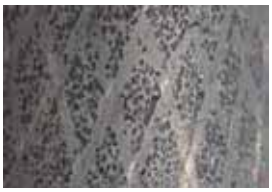
*Availability depending on profile or specification

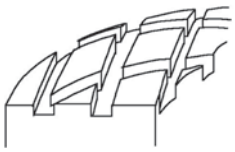
## Optional Specifications for RZ Type

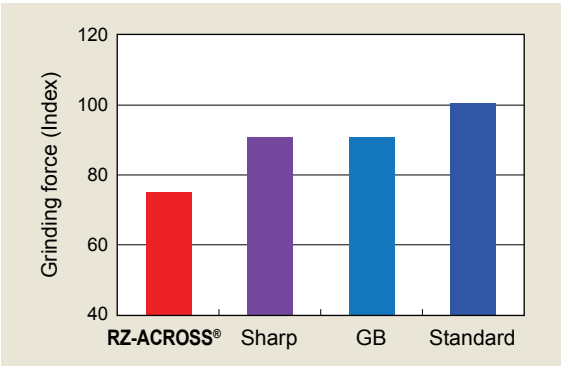
### 1. Improved Dressing Ability (for fast dressing)

- **GB (controlled diamond concentration)**
  High dressing rate with lower concentration by setting the glass balls for hard-to-concentration control electro-deposition type.
- **Sharp type (controlled diamond projection)**
  Our unique process not by etching the bond layer realizes the diamond projection control without pulling-off the diamond grit.
- **RZ-ACROSS (controlled diamond concentration)**
  Improves the discharge of chips and coolant

■ RZ-ACROSS Surface and Profile








### 2. Improving Wear Resitance (for longer life)

- **Strong**
  Reinforcing the peak of convex portion by pre-shaped diamond stones leads stable accuracy and high wear resistance.

## Optional Specifications for SX Type

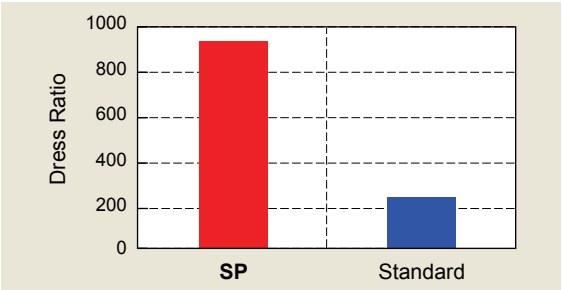
### For Improving Wear Resistance

- **Super High Concentration**
  By the unique pattern of diamond setting, maximum 100 pcs/cm² diamond stones provides longer life.
- **Strong**
  Reinforcing the peak of convex portion by pre-shaped diamond stones leads stable accuracy and high wear resistance as same as RZ type.

## Optional Specifications for Vitrified cBN Wheels (SP Type)

### Stable performance and longer life

- **SP**
  Special development for high-wear-proof vitrified and cBN forming wheels performing stable dressing as well as long life. Available both for RZ and SX.




- **Polycrystalline Prism Diamond**

Product : Crown dresser

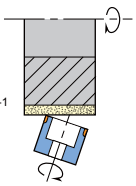
Arranging isotropic polycrystalline prism diamond provides stable tool life and performance solving the problem of short life and instability caused by anisotropy and cleavage characteristic of mono-crystal diamond.

■ Dressing Example

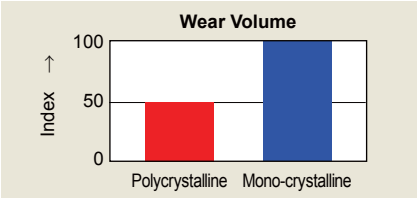
●**Dresser : Monocrystalline, Polycrystalline**

●**Dressing Condtions**

| | |
|---|---|
| Wheel specs | : cBN230G125V3 Ø30×20×5 1200min$^{-1}$ |
| RD specification | : 0.4□ 2L 25pcs Ø25×18 250min$^{-1}$ |
| Dressing unit | : Toolpet |
| Feed rate | : 240mm/min |
| D.O.C. | : 0.002mm/pass (Total 1.0mm in 500 dressing cycles) |



●**Results**




*Mono crystalline shown with index of 100.

## ☐Inspection of Rotary Dressers

### For higher accuracy・・・

Required accuracy of rotary dressers is becoming more strict, ranging from microns to submicrons. To ensure required accuracy, we have established an excellent inspection system with the most up-to-date equipment.

## ■Description of Inspection

■Inspection with transfer test pieces

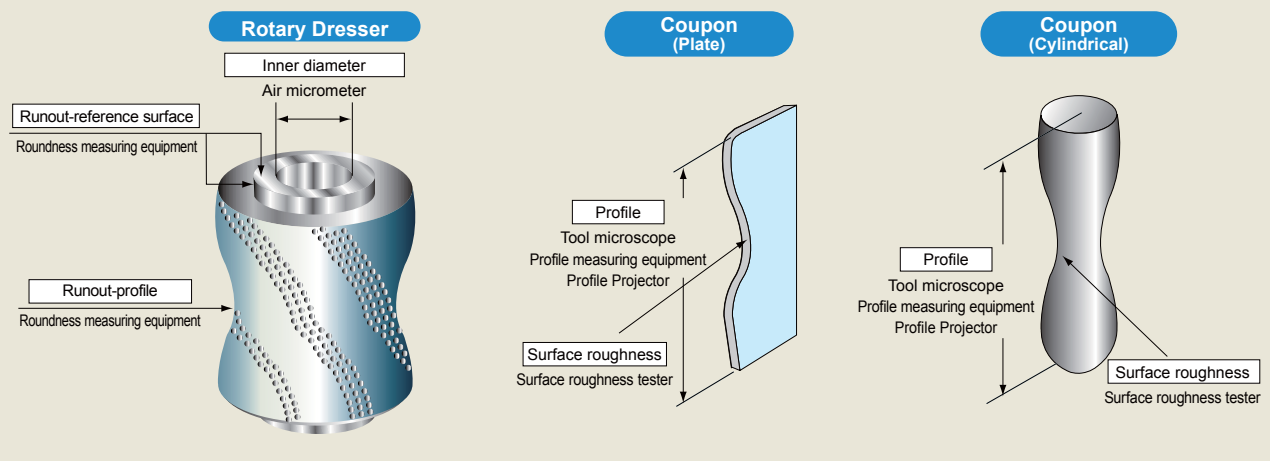
1. Measuring dimensional accuracy and profile
   ····· (tool microscope, profile measuring equipment, projector)
2. Surface roughness ····· (surface roughness tester)

■Body accuracy

1. Bore ····· (Air micrometer)
2. Parallelism, squareness ····· (Roundness measuring equipment)
3. Reference surface(controlØ) runout ····· (Roundness measuring equipment)
4. Profile runout ····· (Roundness measuring equipment)

■Slip Test Results

An inspection sheet showing measurements taken by the transfer test is attached.




## ☐Recommended Dressing Conditions

### ■Plunge Dress

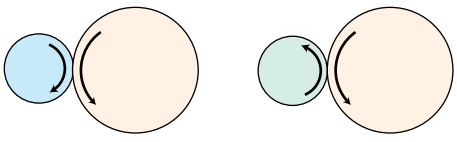
| | Conventional Grinding Wheel | Hard Conventional Grinding Wheel | cBN Wheel |
|---|---|---|---|
| Dress Direction | Down | Down | Down |
| Peripheral Speed Ratio | 0.25~0.5 | 0.3~0.9 | 0.3~0.9 |
| Dress Amount | 0.02~0.03mm | 0.02~0.03mm | 0.01~0.015mm |
| Infeed Rate | 0.5~1μm/rev.of wheel | 0.1~0.5μm/rev.of wheel | 0.01~0.5μm/rev.of wheel |
| Dress Out | 0~3 sec. | 0~3 sec. | 0~3 sec. |

### ■Traverse Dress

| | Conventional Grinding Wheel | Hard Conventional Grinding Wheel | cBN Wheel |
|---|---|---|---|
| Dress Direction | Down | Down | Down |
| Peripheral Speed Ratio | 0.25~0.5 | 0.3~0.9 | 0.3~0.9 |
| Dress Amount | 0.02mm | 0.02mm | 0.01mm |
| Infeed Rate | 0.005~0.03mm/pass | 0.003~0.005mm/pass | 0.002~0.003mm/pass |
| Dress Out (Traverse cycles) | 0～4times | 0~4times | 0~4times |
| Feed Rate | 80~140mm/min | See below | See below |

### ■Feed Rate

**Down Dressing** **Up Dressing**



Feed rate = C × RD width × grinding wheel revolution

$$\text{Peripheral speed ratio} = \frac{Vr}{Vs}$$

Vr (RD peripheral speed) =RD revolution ($min^{-1}$) ×RD O.D.×π

Vs (grinding wheel peripheral speed) =grinding wheel revolution ($min^{-1}$) ×O.D.×π

| Operation | C |
|---|---|
| Standard | 0.025~0.1 |
| Efficient grinding High speed grinding | 0.125~0.2 |
| Centerless grinding | 0.005~0.01 |

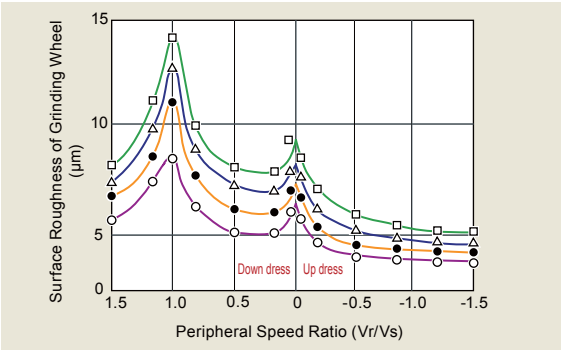
## ☐Technical Data

In dressing, the surface roughness of grinding wheels is influenced by elements such as:
1. Peripheral speed ratio (Vr/Vs), 2. Infeed per revolution of wheel (Ar), and 3. dress out (Na).

# 1. Peripheral Speed Ratio

### ① Influence of Peripheral Speed Ratio on grinding Wheel Surface Roughness

- Control of the grinding surface accuracy by up-dressing is easier than by down-dressing
- Higher feed rate creates more open grinding surface (grinding ability increases)

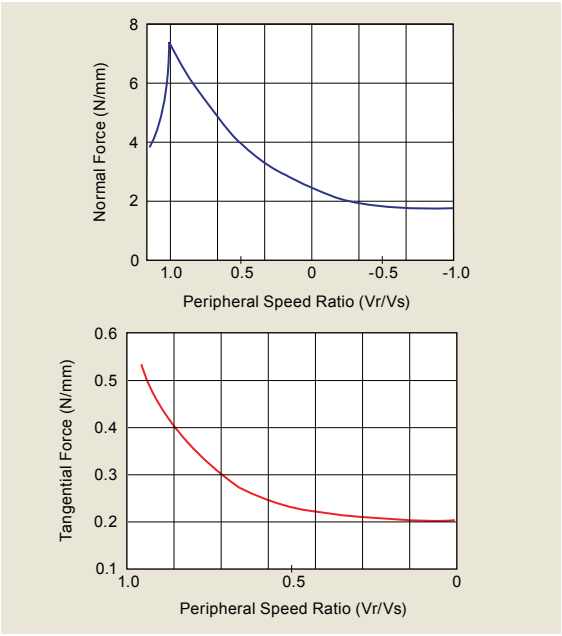



| Test Conditions | |
|---|---|
| Grinding Wheel | WA60K |
| Rotary Dresser | #20/30 |
| Grinding Wheel Peripheral Speed | Vs=29m/s |
| Dress Out | Na=0 |

Infeed per rev.of grinding wheel
Ar = 0.18μm/rev
= 0.36μm/rev
= 0.54μm/rev
= 0.72μm/rev

### ② Influence of Peripheral Speed Ratio on Dressing Force

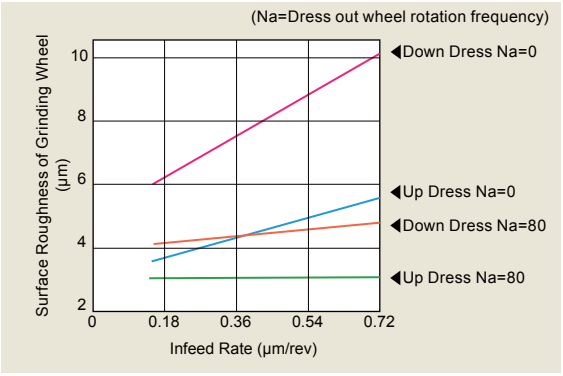
- Larger peripheral speed ratio allows higher normal force (increasing in grinding ability)
- Tangential force shows the same tendency as normal force, but the value is much smaller




# 2. Infeed Rate

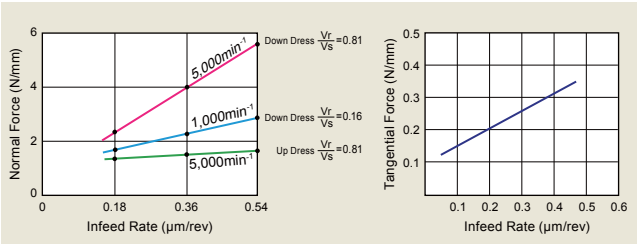
### ① Influence of Infeed Rate of Grinding Wheel Surface Roughness

- Higher feed rates create a more open grinding surface (grinding ability increases)
- Longer dress-out time diminishes sharpness of the grinding surface




### ② Influence of Infeed Rate on Dressing Force

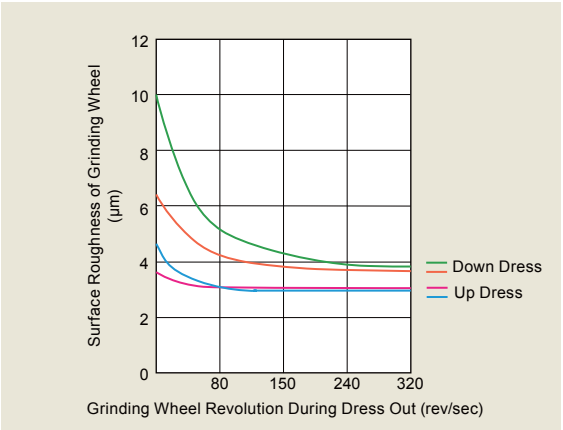
- Larger feed rate increases normal force (grinding ability increases).
- Tangential force shows the same tendency as normal force, but the value is much smaller.




# 3. Dress Out

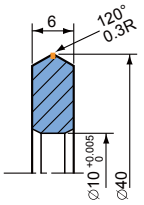
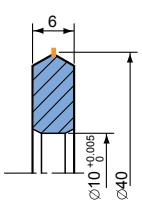
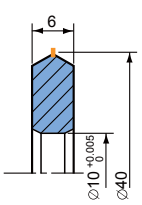
### Influences of Dress out on Grinding Wheel Surface Roughness

- Longer dress out time increases roundness of the grinding surface, but reduces sharpness.

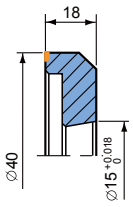
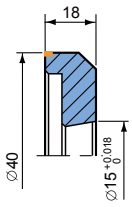
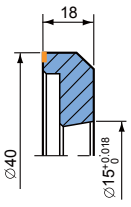


# Rotary Dresser for internal grinding machine

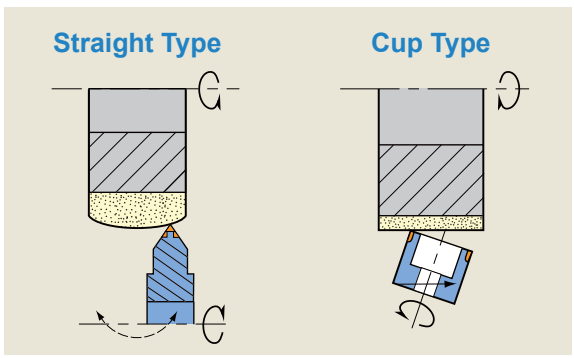
## Straight Type

| Model Number | S40-N | S40-C | S40-I |
|---|---|---|---|
| Profile |  |  |  |
| Diamond layer | Disposition | CVD Prism | Inpregnated |
| Diamond size | 100SPC | 0.4×0.4 | SD#40 |
| Concentration | 60pcs/Circumference | 90pcs/Circumference | 3.3ct/cm³ |

## Cup Type

| Model Number | C40-N | C40-C | C40-I |
|---|---|---|---|
| Profile |  |  |  |
| Diamond layer | Disposition | CVD Prism | Inpregnated |
| Diamond size | 100SPC | 0.4×0.4 | SD#40 |
| Concentration | 40pcs/Circumference | 90pcs/Circumference | 3.3ct/cm³ |

Other sizes and spedicications available upon request



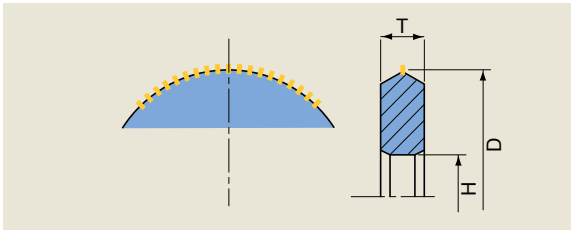

# Crown Dresser

## ■Features

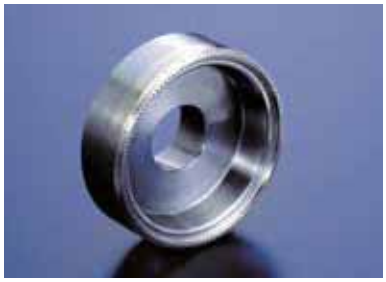
1. CVD diamond provide high-wear-proof performance like monocrystal diamond.
2. Constant and stable active area with prism diamond.
3. Cost effective with no reworking.
4. Adjusting the diamond size and distribution enable to optimaze the dressing performance.

## Straight Type

| Size | | CVD Size | Pitch |
|---|---|---|---|
| D | Ø35~180 | 0.2□, 0.4□, 0.6□, 0.8□ | 0.8~2mm |
| H | Ø 8~ 30 | | |
| T | 6~ 20 | | |

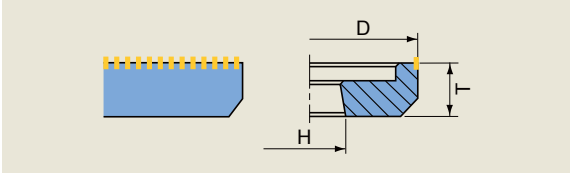



## Cup Type



| Size | | CVD Size | Pitch |
|---|---|---|---|
| D | Ø40~80 | 0.2□, 0.4□, 0.6□, 0.8□ | 0.8~2mm |
| H | Ø10~20 | | |
| T | 15~20 | | |

*Other sizes and spedicications available upon request




Please refer to the ultra precision dressing system “Tacumino Dress” on page 50.

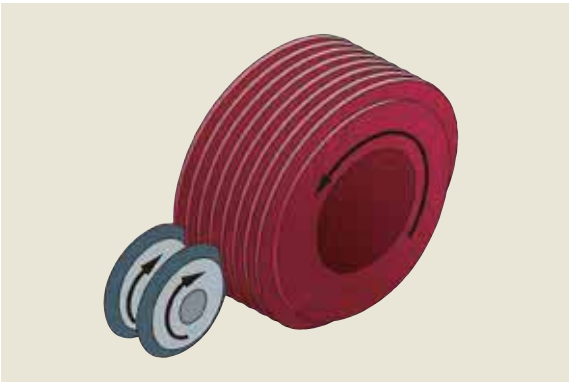
# Diamond Disc Dresser

Worm-shaped gear grinding wheels require high tooth form accurancy, a capable and accurate dresser is needed. Our high precision electroplating technology and abrasive surface truing technology can realize “higher accuracy” and “longer life” in gear grinding.

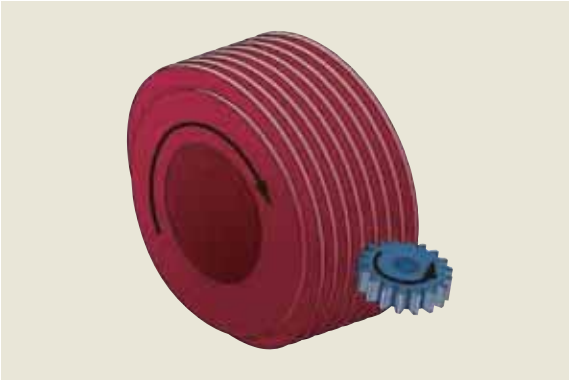
## ■Application

• Tooth profile forming of gear grinding

**Dressing for worm gear grinding wheel**

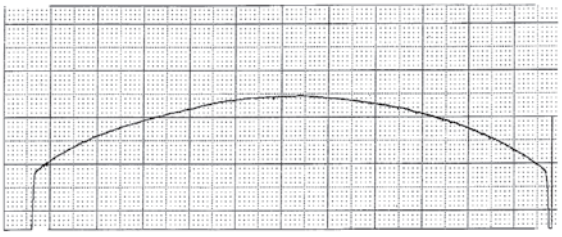


**Gear Grinding**

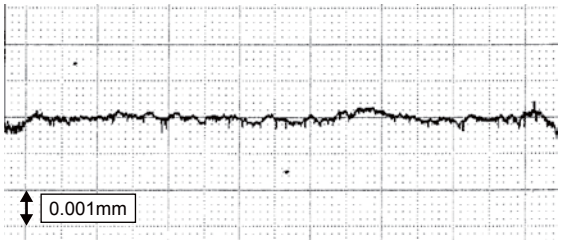


## ■Features

1. High tooth form accuracy
   Profile accuracy of 0.001 mm or less. This ensures a high tooth form accuracy.



**(1) Crowning shape of the disc dresser**

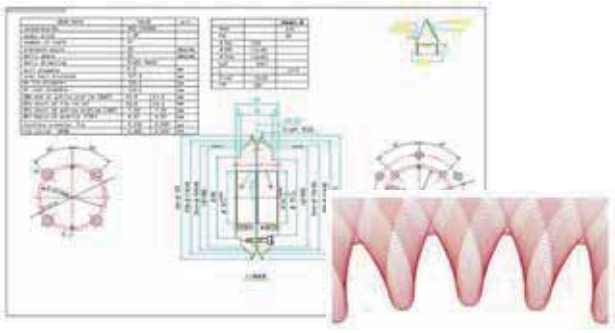



**(2) Profile accuracy of the crowning part**

2. Long & stable tool life
   Long-lasting tooth form accuracy with good dresser life contribute to great reduction of gear grinding cost.

## ■Original design technology

Based on gear dimensions and specifications, we will analyze and design a dresser according to the required tooth profile.



## ■An example of fabrication

Outside diameter ø123-52H
Outside diameter ø110-12H

Types such as composite and other specials are available upon request.