



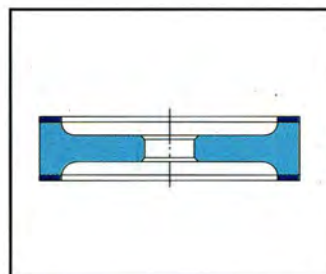
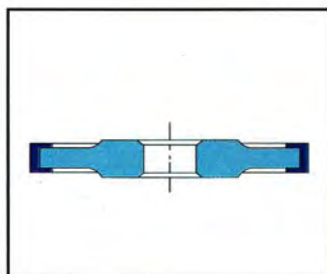
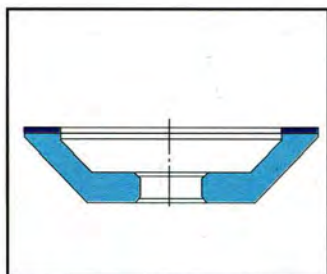
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DIAMOND AND CBN WHEELS RESINOID, METAL & VITRIFIED



EHWA DIAMOND INDUSTRIAL CO.,LTD.

www.uranusz.hu

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HOW TO ORDER DIAMOND AND CBN WHEELS

When placing your orders, please provide us with the following information.

1. SHAPE

2. DIMENSION

Please give us the shape and dimensions in detail.
If possible, please include a drawing.

3. ABRASIVE

4. GRIT SIZE

5. GRADE

6. CONCENTRATION

7. BOND

8. QUANTITY

In order to handle your orders properly, we would also like to be informed of the following.

1) Work

- A) Material(kind & quality)
- B) Shape
- C) Dimensions and dimensional tolerance(precision)
- D) Hardness
- E) Grinding removal
- F) Required surface roughness(Rmax, Ra, Rz)

2) Machine used

- A) Type
- B) Horse power

3) Grinding condition

- A) Wheel speed : r. p. m.
- B) Infeed : u. mm
- C) Table speed : m/min
- D) Cross feed : mm
- E) Coolant : (dry or wet, coolant type)

This catalog does not reflect all of the products that can be manufactured at Ehwa. For information on wheel shapes not shown in this catalog, please contact the Sales Dept. of Ehwa Diamond Ind. Co., Ltd.

MARKINGS FOR DIAMOND AND CBN WHEELS

Resinoid and Vitrified Bonds

| D | 200 | N | 100 | B | A | 3 |
|----------------|------------------|------------------|---------------|---------------------|-------------------|-------|
| Abrasive | Grit size (mesh) | Grade | Concentration | Bond | Bond modification | Depth |
| Diamond | Normal | | | | Resinoid | |
| ·D | ·60 ·80 | J soft | ·25=1.1ct/cc | B " resinoid | ·BA | ·1.5 |
| ·ND | ·100 ·120 | | ·50=2.2 | | ·BB | ·2 |
| ·DM | ·140 ·170 | | ·75=3.3 | | ·BC | ·3 |
| ·CSD | ·200 ·230 | N medium | ·100=4.4 | V " vitrified | ·BD | ·4 |
| | ·270 ·325 | | ·125=5.5 | | ·BE | ·5 |
| | ·400 | | ·150=6.6 | | ·BG | ·6 |
| | | | ·175=7.7 | | ·BH | ·7 |
| | | R hard | ·200=8.8 | | ·BN | ·8 |
| CBN | Micron | | | | ·BP | ·10 |
| ·B | ·40/60 | | | | ·BX | |
| ·NB | ·40/50 | | | | ·BXT | |
| ·BM | ·30/40 | | | | ·B34 | |
| ·NBM | ·22/36 | | | | ·B39 | |
| | ·20/30 | | | | Vitrified | |
| | ·15/25 | | | | ·VC | |
| | ·10/20 | | | | ·VD | |
| | ·8/16 ·6/12 | | | | | |
| | ·4/8 ·3/6 | | | | | |
| | ·2/4 ·0/2 | | | | | |

MARKINGS FOR DIAMOND AND CBN WHEELS

Metal Bond

| MVD | 200 | N | 100 | M | A | 3 |
|----------|------------------|------------------|---------------|------------------|-------------------|-------|
| Abrasive | Grit size (mesh) | Grade | Concentration | Bond | Bond modification | Depth |
| Diamond | Normal | | | | | |
| ·MVD | ·20 ·30 | J soft | ·25=1.1ct/cc | M metal | ·MB2 | ·1.5 |
| ·SDS | ·40 ·50 | | ·50=2.2 | | ·MB2-1 | ·2 |
| ·HD | ·60 ·80 | | ·75=3.3 | | ·M6P5 | ·3 |
| ·MMD | ·100 ·120 | N medium | ·100=4.4 | | ·ME | ·4 |
| | ·140 ·170 | | ·125=5.5 | | ·MG6 | ·5 |
| | ·200 ·230 | | ·150=6.6 | | ·MG8 | ·6 |
| | ·270 ·325 | R hard | | | ·MAC | ·7 |
| | ·400 | | | | ·MA | ·8 |
| | | | | | ·MS | ·10 |
| | | | | | ·MS1 | |
| | | | | | ·MF | |
| | | | | | ·MH | |
| | | | | | ·MSC | |
| CBN | Micron | | | | | |
| ·MB | ·40/60 | | | | | |
| ·MBH | ·30/40 | | | | | |
| | ·22/36 | | | | | |
| | ·15/25 | | | | | |
| | ·10/20 | | | | | |
| | ·8/16 | | | | | |

DIAMOND AND CBN TYPES

Resinoid and Vitrified bond manufactured abrasives

DIAMOND

- D** None-coated type. Friable, irregular shape.
General grinding of cemented carbide.
Resinoid and Vitrified bond. Mainly used in wet grinding.
Grit size : #60 - #400
- ND** Nickel-coated type. Good bondability, used primarily for grinding of all kinds of workpieces.
(cemented carbide, ceramic, cermet, glass, ferrite, etc.).
Resinoid bond. Wet and dry grinding.
Grit size : #60 - #400
- DM** Micron type. Friable, regular shape.
Used in lapping and polishing (cemented carbide, ceramic, glass, etc.).
Resinoid and Vitrified bond.
Only used in wet grinding.
Grit size : micron D 40/60 - D 0/2
- CSD** Nickel-coated type. High strength, excellent bondability.
Used in cemented carbide and hardened steel combinations grinding.
Grit size : #60 - #325
Grit size : micron D 40/60 - D 20/30

CBN

- B** None-coated type.
Used in general grinding (bearing, cam shaft, roll, dies, etc.).
Vitrified bond. Only used in wet grinding.
Grit size : #60 - #325
- NB** Nickel-coated type. Good bondability, used primarily for grinding of hardened steel (HSS, SKD-11, SUS, etc.).
Resinoid bond. Wet and dry grinding.
Grit size : #60 - #325
- BM** None-coated micron type. Used in lapping and polishing.
Vitrified bond. Only used in wet grinding.
Grit size : micron G45, G30, G15
- NBM** Nickel coated micron type.
Used in lapping and polishing.
Resinoid bond. Mainly used in wet grinding.
Grit size : micron G45, G30, G15

DIAMOND AND CBN TYPES

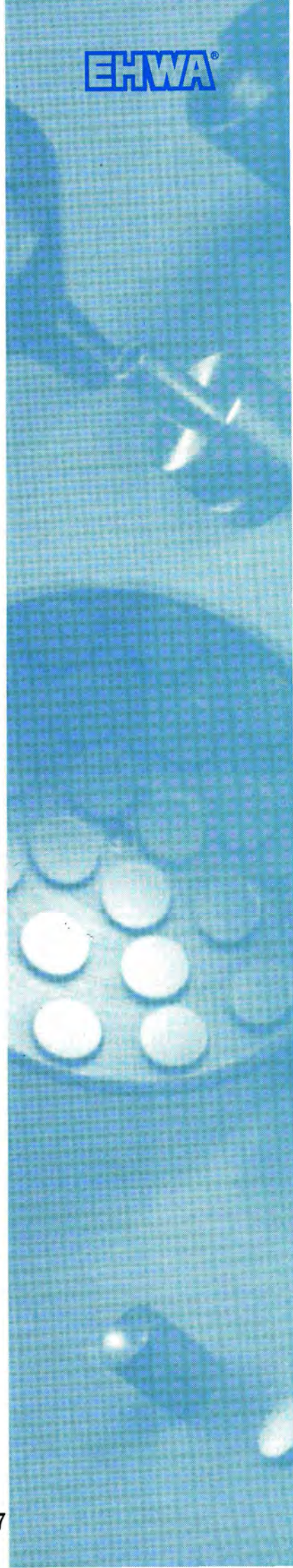
Metal bond manufactured abrasives

DIAMOND

- MVD** Metal Versatile Diamond.
Widely used in wet grinding of glass, ceramic and non-metallic materials.
Grit size : #60 - #400
- SDS** Synthetic Diamond Special.
Blocky, special diamond with higher toughness than MVD.
Grit size : #80 - #325
- HD** Hardened Diamond.
Blocky, extremely tough crystal with a smooth surface.
Used in grinding of stone.
Grit size : #20 - #50
- MMD** Metal Micron Diamond.
Blocky, regular shape.
Used in polishing application and precision grinding.
Grit size : micron D 40/60 - D 8/16

CBN

- MB** Used in grinding of ferrous alloy and cast steel.
Grit size : #60 - #325
- MBH** Blocky, high-toughness monocrystalline CBN abrasive.
Used in precision grinding of cemented carbide, dies, and HSS.
Grit size : #60 - #325



BOND MODIFICATIONS

RESINOID

- BA** Good elasticity. Depth of grinding is about 10 μ m.
Mainly used in micron size abrasive and grinding of cemented carbide, hardened steel and PCD. (Polycrystalline Diamond).
- BB** Heat transfer is excellent for dry grinding.
Especially effective for CBN wheels.
Mainly used in cup type wheel.
- BC** Heat transfer and shape maintenance are very good.
Applied to flute grinding of endmill, reamer and drill (HSS).
- BD** Very soft. Low noise and good finished shape.
Used in general grinding of cemented carbide.
- BE** Used in heavy duty dry grinding with diamond cup type wheel.
- BG** Standard bond for all kinds of workpieces.
Applied to profile, face and centerless grinding.
- BH** Shape maintenance and heat transfer are very good.
Applied to profile and face grinding.
- BN** Same applications as BB, but harder.
- BP** Lubricant bond.
Same applications as BG, but softer.
- BX** Good cutting ability.
Applied to flute grinding of endmill, reamer and cemented carbide by down feed method.
- BXT** Used in grinding of cermet, ceramic and cemented carbide.
- B34**
B39 Used in finish grinding of glass.

*NOTE : The bond application according to hardness is as follows.

| Wheel Type | Soft ----- Hard |
|--------------|--|
| D11V9 | BP-----BE----BH |
| B11V9 | BB-----BN-----BE----BH |
| 1A1 | BA----BP---BG---BH---BX |
| 1A1R | BD-----BG-----BH |
| 4A2/6A2/2A2T | BA---BB---BG---BE---BH---BC---BX---BXT |

BOND MODIFICATIONS

VITRIFIED

- VC** Used in CBN wheel.
Available for grinding of bearing, cam shaft, roll, velocity ball joint and dies.
- VD** Used in Diamond wheel.
Available for grinding of cemented carbide, PCD and PCBN.

METAL

- MB2** Bronze.
Widely used as metal bond suited for grinding of glass and lens.
- MB2-1** Bronze.
Especially suited for finishing work in lens grinding.
- M6P5** Bronze.
Used in grinding of lens.
Harder than MB2-1.
- ME** Cobalt.
Used primarily for grinding of architecture glass on a manual working machine.
- MG6** Iron.
Used primarily for grinding of vehicle glass on an automatic operating machine.
- MG8** Iron.
Used primarily for grinding of vehicle glass on an automatic operating machine.
Harder than G6.
- MAC** Bronze.
Available in core drill type for boring of glass.
- MA** Bronze.
Suited for grinding of hardened steel and cemented carbide.

BOND MODIFICATIONS

- MS** Bronze.
Used in grinding of cemented carbide, HSS and ceramic.
Harder than MA.
- MS1** Bronze.
Especially suited for grinding of brown tube.
- MF** Bronze.
Available in profile type wheels which need an edge for sharp grinding of hardened steel.
- MH(MH1-MH3)** Bronze, Cobalt. Suited for honing
of hardened steel, cast iron and aluminum alloy.
- MSC** Bronze.
Especially suited for grinding of ferrite and ceramic.

BOND LISTS

RESINOID

| WORKPIECE | GRADE | APPLICATION | WORK CONDITION | BOND |
|------------------|-------|----------------------|----------------|---------|
| CEMENTED CARBIDE | J | General grinding | wet | BA |
| | N | | wet or dry | BP |
| | R | | | BG, BH |
| | R | Centerless | wet | BG |
| | R | Profile | wet or dry | BG, BH |
| | R | Creep feed | wet | BC |
| HARDENED STEEL | J | Lapping Polishing | wet | BA, BD |
| | N | Tool grinding | wet or dry | BB, BP |
| | R | | | BN, BE |
| | R | Cutting | wet or dry | BG, BH |
| CERAMIC | R | General grinding | wet | BG, BXT |
| | | Centerless | wet | BG |
| CERMET | R | General grinding | wet | BX, BXT |
| FERRITE | R | General grinding | wet | BG |
| GLASS | J | Finish grinding | wet | B34 |
| | N | | | B39 |
| PCD PCBN | J | Finish grinding | wet | BA |
| HARDENED STEEL | None | Honing | wet | BA, BG |
| | None | Hand stone | wet or dry | |

* NOTE : Not all grades/bonds listed above are available in all wheel shapes.

BOND LISTS

VITRIFIED

| WORKPIECE | APPLICATION | BOND |
|---------------------|---|--------|
| CEMENTED CARBIDE | Drill, Endmill, Hob, Cutting tool grinding | VC, VD |
| HARDENED STEEL | Thread die grinding | VC |
| PCD, PCBN | Cutting tool grinding | VD |
| CAST STEEL | Cam shaft, Compressor grinding | VC |
| CAST IRON | Cylinder grinding | |
| BEARING STEEL | Various bearing grinding | |
| ALLOY STEEL | Cam shaft, Gear, Sewing machine part, Fuel injector pump grinding | |

* NOTE : Not all grades/bonds listed above are available
in all wheel shapes.

BOND LISTS

METAL

| WORKPIECE | GRADE | APPLICATION | | BOND |
|------------------|-------|-------------------------------------|---|---------|
| CEMENTED CARBIDE | J | General grinding | | MA |
| | N | | | MB2 |
| HARDENED STEEL | R | Edge profile grinding | | MF |
| GLASS | J | Pencil edge wheel | Manual working Architecture glass | ME, MB2 |
| LENS | N | | Automatic operating Automobile glass | MG6 |
| | R | | | MG8 |
| QUARTZ | N | Lens finish grinding | | MB2-1 |
| | R | | | M6P5 |
| | N | Brown tube grinding | | MS1 |
| HARDENED STEEL | J | Honing | | MH1 |
| CAST STEEL | N | | | MH2 |
| | R | | | MH3 |
| FERRITE | N | General grinding | | MS |
| | R | | | MSC |
| CERAMIC | R | Centerless wheel for screw grinding | | MF |

* NOTE : Not all grades/bonds listed above are available in all wheel shapes.

WHEEL SHAPES AND AVAILABILITY

Quick Reference Guide

The first section of the Wheel Shapes and Availability section is designed to provide you with a quick reference guide in determining the appropriate wheel shape(type).

A drawing of each shape is presented along with letter codes used to indicate the various dimensional characteristics.

The Key to Letter Dimensions listed below applies to wheels.

The remaining pages in the Wheel Shapes and Availability section provide a listing of the most common dimensions and bonds offered for the most popular wheel types.

Key to Letter Dimensions for Diamond and CBN Wheels.

| | |
|---|---|
| B.C. : Bolt Circle | U : Diamond Face for Types 3A1, 14A1, 14EE1, 14U1 and Pencil Edgers |
| D : Wheel Diameter | Insert Length for Types 1E6Q, 6A9, 11C9, 11V9, 11Y9, 12V9 |
| d : Description of Mounting Hole | V : Face Angle for Types 1V1, 4B2, 11B2, 12V4 |
| E : Back Thickness | Included Angle for Types 1E1, 1EE1, 1E6Q, 14EE1 |
| H : Hole size | W : Rim Width |
| J : Hub Diameter | X : Diamond and CBN Depth |
| R : Radius | K : Inside Flat Diameter |
| T : Wheel Thickness | Y : Spindle Diameter for Type DW, 6F2 |
| S : Back Angle | |
| L : Length of Types DW, HH1, HMF, 2FF2, 6F2 | |
| n : Number of Mounting Holes | |

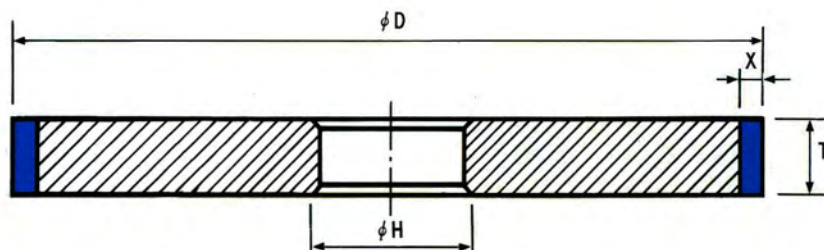
* Please specify the dimensions not filled in our tables.

Wheel Shapes

| TYPE | PAGE | TYPE | PAGE | TYPE | PAGE |
|-------|------|------|------|-------|------|
| 1A1 | 16 | 4A2 | 23 | 11V9 | 29 |
| 1A8 | 17 | 4B2 | 23 | 11Y9 | 29 |
| 1A1R | 17 | 4M1 | 24 | 12A2 | 30 |
| 1E1 | 18 | 6A2 | 24 | 12V4 | 31 |
| 1EE1 | 18 | 6A2C | 25 | 12V9 | 31 |
| 1E6Q | 19 | 6A9 | 25 | 14A1 | 32 |
| 1V1 | 19 | 6F2 | 26 | 14EE1 | 32 |
| 1FF1 | 20 | 6P5 | 26 | 14U1 | 33 |
| 1FF6Y | 21 | 9A3 | 27 | DW | 33 |
| 2A2T | 21 | 11A2 | 27 | HH1 | 34 |
| 2FF2 | 22 | 11B2 | 28 | HMF | 34 |
| 3A1 | 22 | 11C9 | 28 | P | 34 |

Wheel Availability

TYPE 1A1



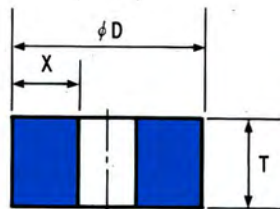
| D | T | X | BOND | |
|---------------|---------|-----------|-----------|------|
| 15 | 3 - 13 | 1.5, 2, 3 | B, M | |
| | | 3 | V | |
| 20 | | 1.5, 2, 3 | B, M | |
| | | 3 | V | |
| 22 | | 1.5, 2, 3 | B, M | |
| | | 3 | V | |
| 25 - 35 | | 3 - 20 | 1.5, 3, 5 | B, M |
| | | | 3, 5 | V |
| 40 - 70 | 3 - 22 | 1.5, 3, 5 | B, M | |
| | | 3, 5 | V | |
| 75, 100, 125 | 3 - 10 | 3, 5 | B, M | |
| 150, 175, 200 | 3 - 25 | | B, M, V | |
| 250, 300 | 5 - 25 | | B, M, V | |
| 350, 400, 450 | 13 - 30 | | B, M, V | |
| 500, 550, 600 | 20 - 45 | | B, M, V | |

TYPE 1A1 -- over 50MM thick

| D | T | X | BOND |
|---------------|---------------|------|---------|
| 250, 300, 350 | 50, 75 | 3, 5 | B, M, V |
| 400, 450, 500 | 100, 125, 150 | | |

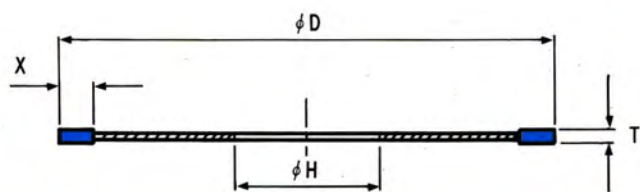
Wheel Availability

TYPE 1A8



| D | T | X | BOND |
|---------|---------|---------|---------|
| 10 | 3 - 13 | 3 | B, M, V |
| 13 | 3 - 15 | 3, 5 | |
| 15 | 10 - 20 | 3, 5, 6 | |
| 20 - 30 | | 3, 5, 8 | |

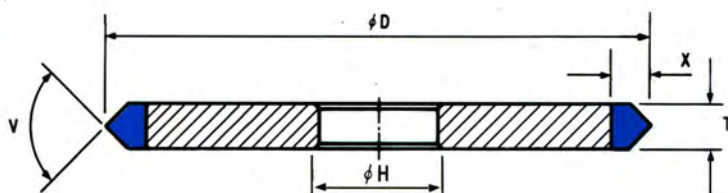
TYPE 1A1R



| D | T | X | BOND |
|----------|------------|------|------|
| 75, 100 | 0,5 - 0,65 | 4 | B |
| 125, 150 | 0,66 - 3,0 | 4, 7 | |
| 175 | 0,7 - 3,0 | | |
| 200 | 0,8 - 3,0 | | |
| 250 | 1,0 - 3,0 | 7 | |
| 300, 350 | 1,2 - 3,0 | | |
| 400 | 2,2 - 3,0 | | |

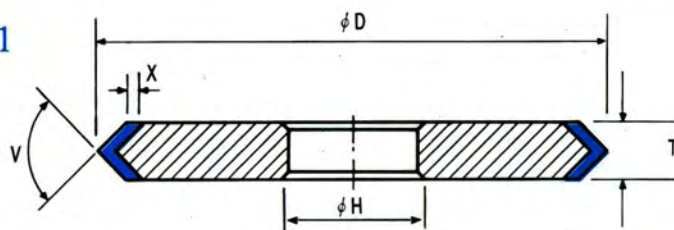
Wheel Availability

TYPE 1E1



| D | T | X | V | BOND |
|---------------------|---|----|--------------|---------|
| 75, 100 125, 150 | 3 | 3 | 90° & larger | B, M, V |
| | | 5 | 60° & larger | |
| | | 6 | 45° & larger | |
| | | 8 | 30° & larger | |
| 175, 200 | 5 | 5 | 90° & larger | |
| | | 8 | 60° & larger | |
| | | 10 | 45° & larger | |

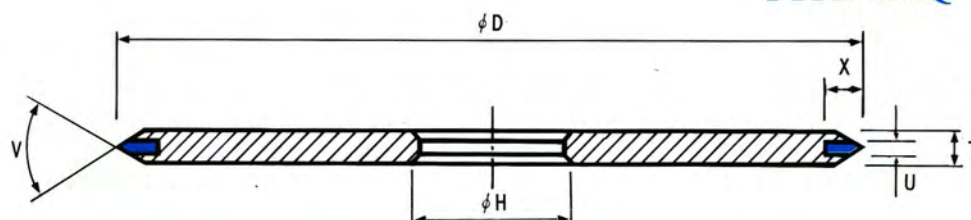
TYPE 1EE1



| D | T | X | V | BOND |
|---------------------|-----------|---|--------------|------|
| 75, 100 125, 150 | 3, 5 | 3 | 30° & larger | B, M |
| | 10 | | 45° & larger | |
| | 13 | | 60° & larger | |
| | 20 | | 90° & larger | |
| 175 | 10 | | 45° & larger | |
| | 13 | | 60° & larger | |
| | 20 | | 90° & larger | |
| 200, 250, 300 | 5, 10, 13 | | 60° & larger | |
| | 15, 20 | | 90° & larger | |

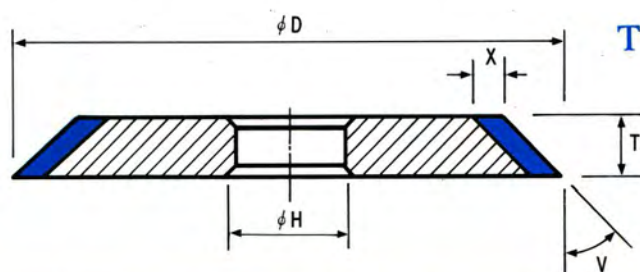
Wheel Availability

TYPE 1E6Q



| D | T | X | U | V | BOND |
|----------|-----------|--------|-----------|---------------|------|
| 75, 100 | 5, 6 | 5, 10 | 1.3 - 2.0 | 45°, 60°, 90° | B |
| 125, 150 | 5, 10, 13 | 10, 13 | 1.3 - 3.0 | | |
| 175, 200 | | | | | |

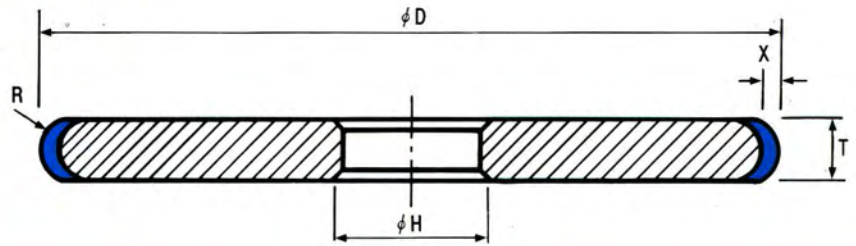
TYPE 1V1



| D | T | X | V | BOND |
|----------|-----------|----------|-----------|------|
| 75, 100 | 3 - 13 | 3, 5 | 5° | V |
| | | | 5° - 45° | B, M |
| 125 | | | 5° | V |
| | | | 5° - 45° | B, M |
| 15, 20 | 10° - 30° | | | |
| 150 | 3 - 13 | 3, 5, 6 | 5° | V |
| | | | 5° - 45° | B, M |
| | | | 10° - 30° | |
| 175, 200 | 5 - 13 | | 5° | V |
| | 15 - 25 | | 5° - 45° | B, M |
| 250, 300 | 5, 10, 13 | | 10° - 30° | |
| | | 5° | V | |
| | | 5° - 45° | B, M | |
| 15 - 25 | 10° - 30° | | | |

Wheel Availability

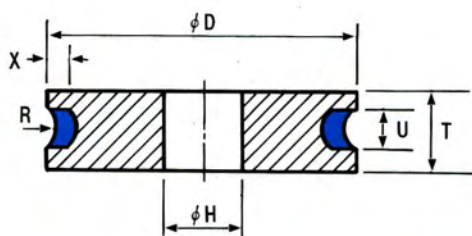
TYPE 1FF1



| D | T | X | R | BOND |
|----------------------|----|------|-----|------|
| 50, 75 | 3 | 3, 5 | 1,5 | B, M |
| | 5 | | 2,5 | |
| | 6 | | 3 | |
| | 8 | | 4 | |
| | 10 | | 5 | |
| | 12 | | 6 | |
| 100, 125 | 3 | | 1,5 | |
| | 5 | | 2,5 | |
| | 6 | | 3 | |
| | 8 | | 4 | |
| | 10 | | 5 | |
| | 12 | | 6 | |
| | 15 | | 7,5 | |
| 150, 175 200, 250 | 5 | | 2,5 | |
| | 6 | | 3 | |
| | 8 | | 4 | |
| | 10 | | 5 | |
| | 12 | | 6 | |
| | 15 | 7,5 | | |
| | 20 | 10 | | |
| | 22 | 11 | | |
| | 25 | 12,5 | | |

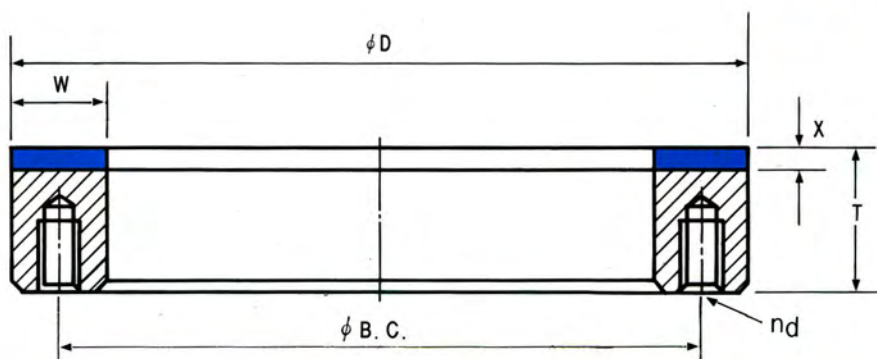
Wheel Availability

TYPE 1FF6Y



| D | T | X | U | BOND |
|--------------------|----|------|--------|------|
| 100, 125 | 20 | 3, 5 | 5 - 13 | M |
| 150, 175, 200, 250 | 15 | | 2 - 5 | |

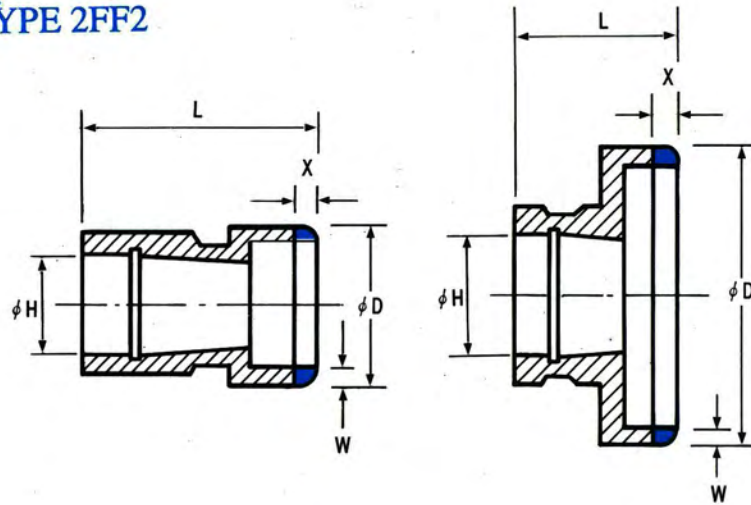
TYPE 2A2T



| D | T | W | X | BOND |
|---------------|------------|-------------------|------|------|
| 200, 250, 300 | 20, 22, 25 | 5, 10, 15, 20, 25 | 3, 5 | B, M |
| 350, 400 | | 10, 15 | | |
| 450, 500, 550 | | 20, 25 | | |

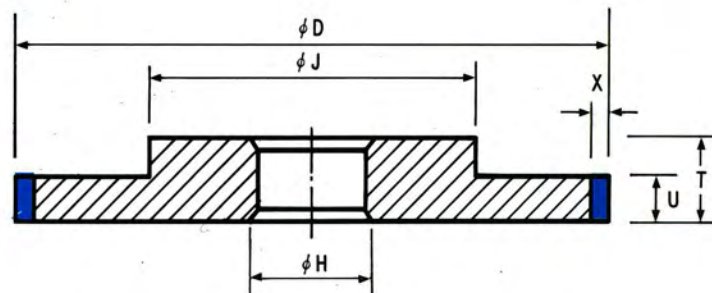
Wheel Availability

TYPE 2FF2



| D | W | X | BOND |
|----------|---|------|------|
| 10 - 125 | 2 | 6, 8 | M |

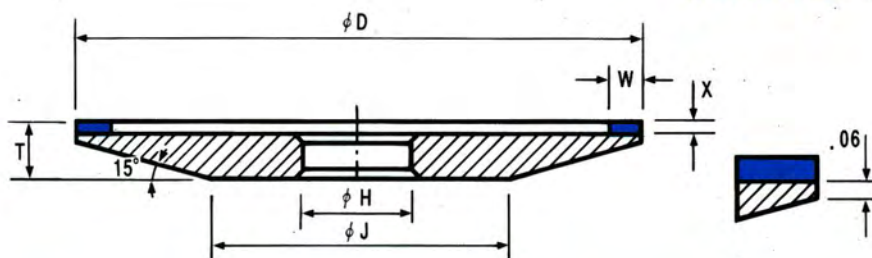
TYPE 3A1



| D | T | U | X | BOND |
|---------------|------------|------------|---------|---------|
| 75, 100, 125 | 15, 20, 25 | 3, 5 | 3, 5 | V |
| 150, 175, 200 | 15, 25, 30 | | 2, 3, 5 | B, M |
| 250, 300, 350 | 25, 35 | 3, 5, 10 | 3, 5 | B, M, V |
| 400, 450 | 35, 50 | 5, 13, 20 | | |
| 500, 550, 600 | | 13, 20, 25 | | |

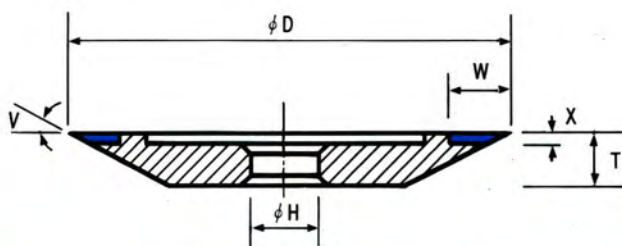
Wheel Availability

TYPE 4A2



| D | T | W | X | BOND |
|-------------------|---------|-----------|---------|------|
| 75, 100, 125, 150 | 6 - 25 | 3, 5, 10 | 1.5, 3 | B, M |
| 175, 200, 250 | 13 - 25 | 5, 10, 13 | 3, 5, 6 | |

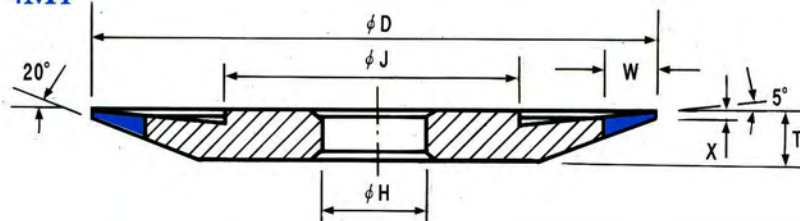
TYPE 4B2



| D | T | W | X | V | BOND |
|---------------|----|----|-----|---------------|------|
| 100 | 6 | 5 | 1.5 | 15°, 30°, 45° | B, M |
| | | 8 | | | |
| | | 10 | 2.0 | | |
| 125 | 10 | 8 | 1.5 | | |
| | | 10 | 2.0 | | |
| | | 12 | 3.0 | | |
| 150, 175, 200 | 13 | 5 | 1.5 | | |
| | | 8 | | | |
| | | 10 | 2.0 | | |
| | | 12 | 3.0 | | |

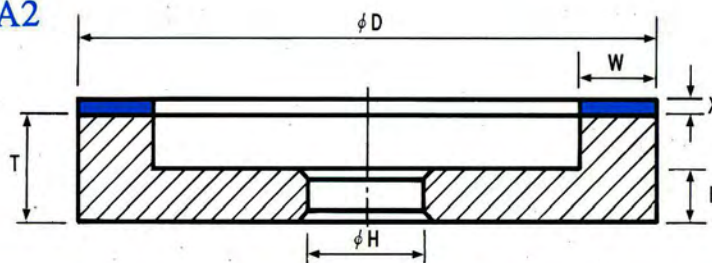
Wheel Availability

TYPE 4M1



| D | T | W | X | BOND |
|----------|----|----------|----------|------|
| 75 | 6 | 5, 6 | 1.0, 2.0 | B, M |
| 100 | 10 | 5, 6, 10 | | |
| 125, 150 | 13 | | | |
| 175, 200 | 15 | | | |

TYPE 6A2



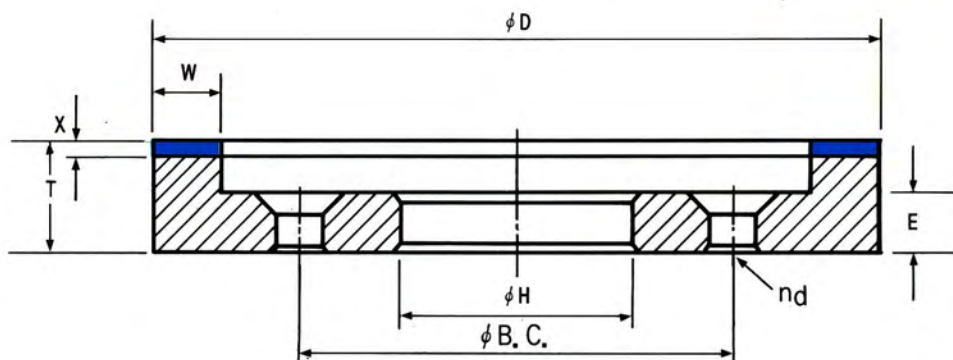
| D | T | W | X | E | BOND | | |
|----------|--------|------------|--------------|----------------|---------|------|------|
| 50 | 15 | 3 | 1.5, 3 | 5 | B, M | | |
| | | | 3 | | V | | |
| 75 | | 3, 5, 10 | 1.5, 3 | | B, M | | |
| | | | 3 | | V | | |
| 100, 125 | | 20, 25, 30 | 3, 5, 10, 15 | | 1.5, 3 | 10 | B, M |
| | | | | | 3, 5 | | V |
| 150 | 20 | 5, 10 | 1.5, 3 | 10 | B, M, V | | |
| | 25, 30 | | 15, 20, 25 | | 3, 5 | B, M | |
| 300, 350 | | 30 - 95 | | 10, 15, 20, 25 | | 3, 5 | 15 |

TYPE 6A2 - over 25MM rim width

| D | T | W | X | E | BOND |
|---------------|------------|----------------------|------|----|------|
| 150, 175, 200 | 25 | 25, 50 | 3, 5 | 20 | B, M |
| 250, 300, 350 | 25, 50 | 25, 50, 75 | | | |
| 400, 450, 500 | 25, 50, 75 | 25, 50, 75, 100, 125 | | | |

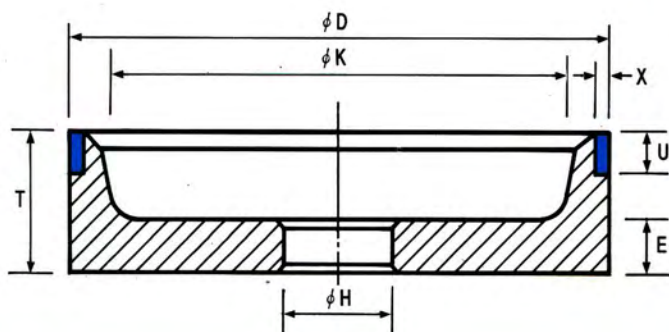
Wheel Availability

TYPE 6A2C



| D | T | W | X | E | BOND |
|---------------|--------|---------------------|---------|----|---------|
| 150 | 20 | 5, 10 15, 20, 25 | 1, 5, 3 | 10 | B, M |
| 175, 200, 250 | 25, 30 | | 3, 5 | | B, M, V |
| 300, 350 | | 20, 25, 50 | | 13 | |

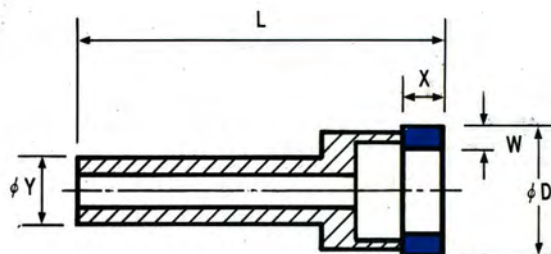
TYPE 6A9



| D | T | U | X | E | BOND |
|--------------------|------------|--------|---------|--------|------|
| 100, 125 | 30, 38, 45 | 5 - 12 | 1, 5, 3 | 10, 13 | B, M |
| 150 | | | 3 | | |
| 175, 200, 250, 300 | 38, 45 | | | | |

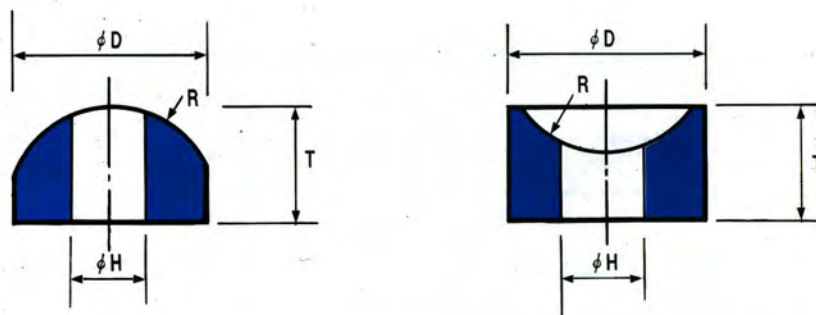
Wheel Availability

TYPE 6F2



| D | W | X | L | BOND |
|----------|----------|---|---------|------|
| 5 - 25 | 1,0, 1,3 | 5 | 75, 100 | M |
| 27 - 100 | 1,5 | 9 | | |

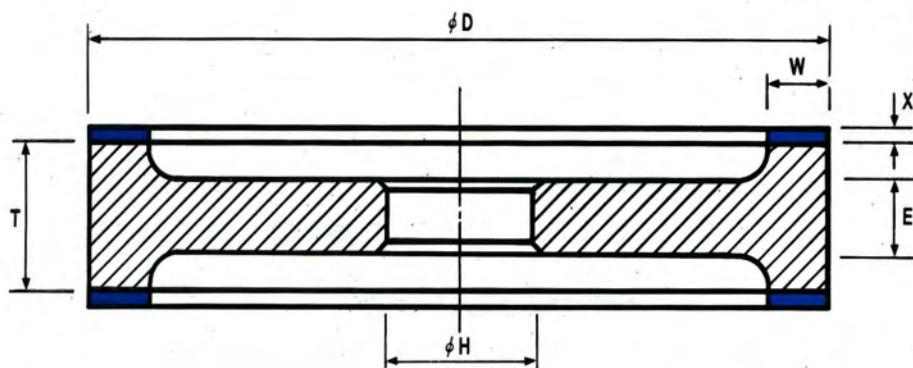
TYPE 6P5



| D | T | BOND |
|--------|------------|------|
| 5 - 30 | 10, 13, 20 | M |

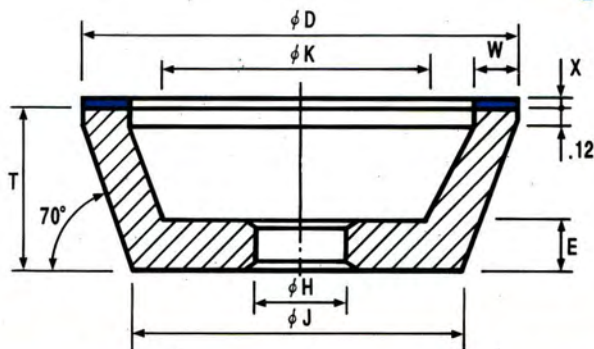
Wheel Availability

TYPE 9A3



| D | T | W | X | E | BOND |
|---------------|------------|-----------|-----------|----|------|
| 100, 125 | 22, 25, 30 | 5, 10 | 1.5, 3 | 10 | B, M |
| 150, 175, 200 | 25, 30 | 5, 13, 20 | 1.5, 3, 5 | | |
| 250, 300, 350 | 30, 50 | | 3, 5 | 13 | |

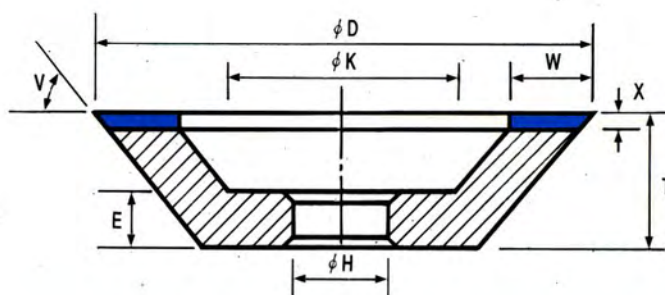
TYPE 11A2



| D | T | W | X | E | BOND |
|---------------|---------|-----------|-----------|----|---------|
| 75 | 22 - 30 | 3, 5, 10 | 1.5, 3 | 10 | B, M |
| 100, 125 | | | 3 | | V |
| | 150 | 25 - 45 | 1.5, 3 | | B, M |
| 3 | | | V | | |
| 175, 200, 250 | 25 - 45 | 5, 10, 13 | 1.5, 3, 5 | | B, M |
| | | | 3, 5 | | B, M, V |

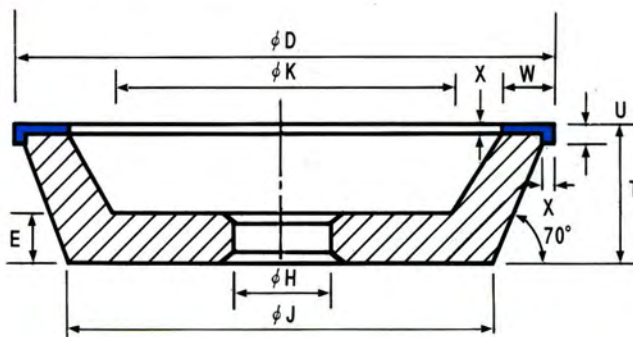
Wheel Availability

TYPE 11B2



| D | T | W | X | E | V | BOND |
|---------------|--------|--------------|-----------|----|---------------|------|
| 75 | 25 | 3, 5 | 1.5, 3, 5 | 10 | 70° | B |
| 100, 125 | | 3, 5, 10 | | | 60°, 70° | |
| 150, 175, 200 | 25, 38 | 3, 5, 10, 12 | 3, 5 | | 45°, 60°, 70° | |

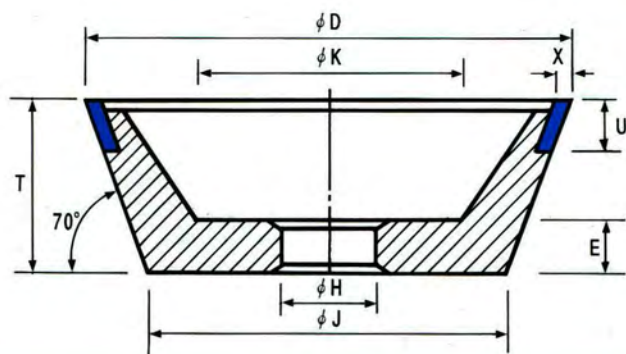
TYPE 11C9



| D | T | W | X | U | E | BOND |
|---------------|--------|-----------|------|------|----|------|
| 75, 100, 125 | 25, 30 | 5, 10 | 2, 3 | 5, 6 | 10 | B, M |
| 150, 175, 200 | 38 | 5, 10, 15 | | 6, 8 | | |
| 250 | | | | 6, 8 | | |

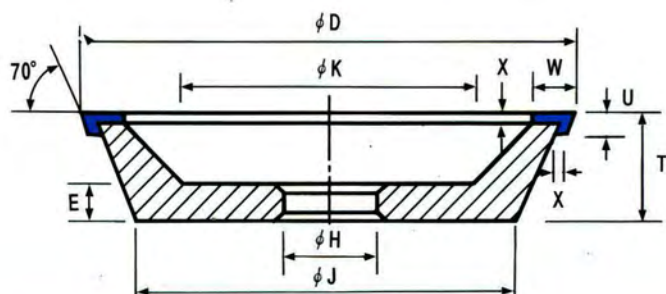
Wheel Availability

TYPE 11V9



| D | T | U | X | E | BOND |
|----------|--------|--------|------|----|------|
| 75 | 30 | 5 - 12 | 2, 3 | 10 | B |
| 100 | 30, 35 | | | | |
| 125, 150 | | | | | |

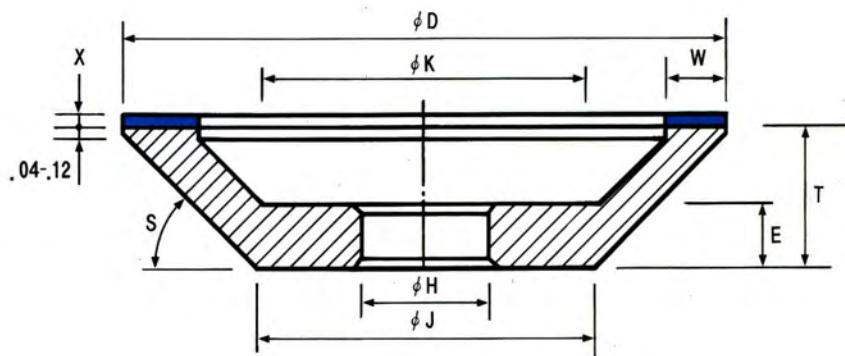
TYPE 11Y9



| D | T | W | X | U | E | BOND |
|---------------|--------|-----------|------|------|----|------|
| 75, 100, 125 | 25, 38 | 5, 10 | 2, 3 | 5, 6 | 10 | B, M |
| 150, 175, 200 | 38 | 5, 10, 15 | | 6, 8 | | |
| 250 | | | | | | |

Wheel Availability

TYPE 12A2



(S=45°)

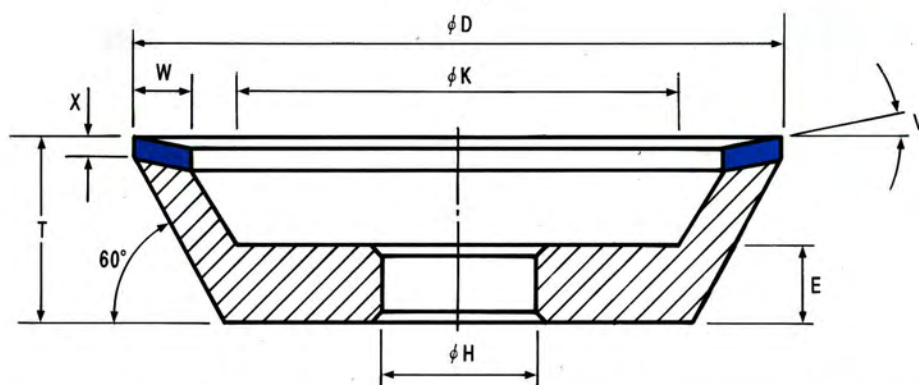
| D | T | W | X | E | BOND |
|--------------|----|---------------------|-----------|----|---------|
| 75, 100, 125 | 20 | 3, 5 | 1.5, 3 | 6 | B, M |
| | | | 3 | | V |
| 150 | 25 | 5, 10, 13 | 1.5, 3, 5 | 10 | B, M |
| | | | 3, 5 | | V |
| 175, 200 | 30 | 5, 10 15, 20, 25 | 1.5, 3, 5 | 10 | B, M |
| 250, 300 | | | 3, 6 | | B, M, V |

(S=20°)

| D | T | W | X | E | BOND |
|----------|----|-----------|--------|----|---------|
| 75, 100 | 13 | 3, 5 | 1.5, 3 | 6 | B, M |
| | | | 3 | | V |
| 125 | 20 | 3, 5, 10 | 1.5, 3 | 10 | B, M |
| | | | 3 | | V |
| 150, 175 | 30 | 5, 10, 15 | 1.5, 3 | 10 | B, M |
| 200, 250 | | | 3, 5 | | B, M, V |

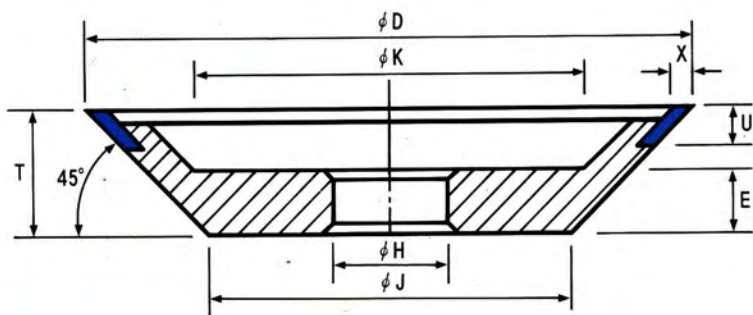
Wheel Availability

TYPE 12V4



| D | T | W | X | E | V | BOND |
|---------------|----|------|------|----|-----|------|
| 40 | 25 | 3 | 3, 5 | 10 | 10° | B |
| 50, 75 | | | | | | |
| 100, 125, 150 | 40 | 3, 5 | | | 20° | |

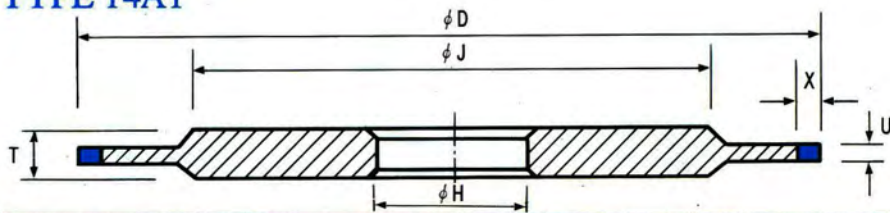
TYPE 12V9



| D | T | U | X | E | BOND |
|--------------------|----|-----------|--------|----|------|
| 75, 90 | 20 | 5, 10, 12 | 1.5, 3 | 10 | B |
| 100 | 22 | | | | |
| 125, 150, 175, 200 | 25 | | | | |

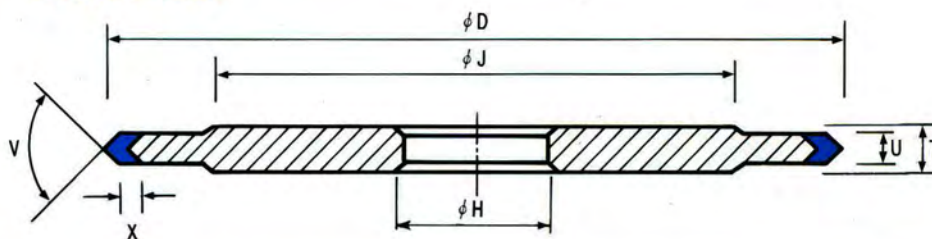
Wheel Availability

TYPE 14A1



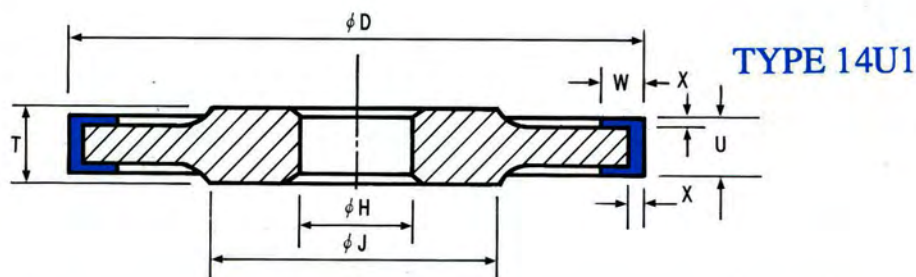
| D | T | X | U | BOND |
|--------------------|--------|------|----------|---------|
| 75, 100, 125 | 10 | 3 | 1,5 | B, M |
| | 13, 25 | 3, 5 | 3, 5, 10 | B, M, V |
| 150 | 10 | 3, 5 | 1,5 | B, M |
| | 13, 25 | | 3, 5, 10 | B, M, V |
| | 25, 30 | | 13 - 20 | |
| 175, 200, 250 | 25, 30 | 3, 5 | 3 - 20 | B, M, V |
| 300, 350, 400 | | | 10 - 20 | |
| 450, 500, 550, 600 | | | 35, 50 | |

TYPE 14EE1

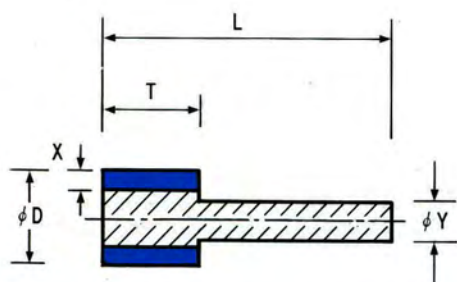


| D | T | U | X | V | BOND |
|---------------|--------------|-----------|--------------|--------------|------|
| 75, 100 | 15, 22, 25 | 3, 5 | 3 | 30° & larger | B, M |
| | | 10 | | 45° & larger | |
| | | 125, 150 | | 25, 30 | |
| 20 | 90° & larger | | | | |
| 175 | 15, 22, 25 | 10 | | 45° & larger | |
| | 25, 30 | 13 | | 60° & larger | |
| | | 20 | 90° & larger | | |
| 200, 250, 300 | 22, 25 | 5, 10, 13 | 60° & larger | | |
| 350, 400 | 30 - 40 | 10 - 25 | 90° & larger | | |
| | | 13 - 25 | | | |

Wheel Availability



| D | T | W | X | U | BOND |
|----------|------------|------------|---|----|------|
| 100, 125 | 15, 20, 22 | 3, 5, 10 | 3 | 10 | B, M |
| 150, 175 | 22, 25 | 5, 10, 15 | | | |
| | 200, 250 | | | 40 | |
| 300, 350 | | 10, 15, 20 | | | |

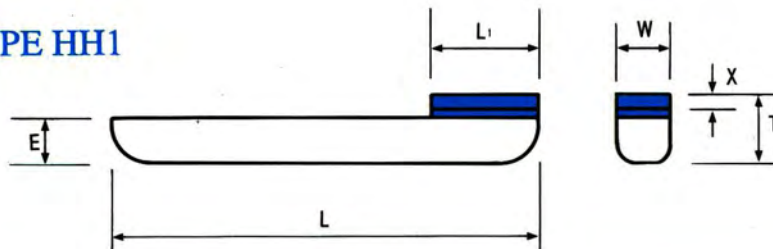


TYPE DW

| D | T | X | BOND |
|----------------|---------------|-------|---------|
| 5 | 3, 5 | 1,5 | B, M, V |
| | | solid | B, M |
| 8 | 5, 8, 10 | 1,5 | B, M, V |
| | | solid | B, M |
| 10, 12 | 5, 10, 12 | 2, 3 | B, M, V |
| | | solid | B, M |
| 15, 20, 25 | 5, 10, 12, 15 | 2, 3 | B, M, V |
| | | solid | B, M |
| 25, 30, 35, 40 | 5, 10, 12 | 3 | B, M, V |
| | | | B, M |
| | 15, 20, 25 | solid | B, M |

Wheel Availability

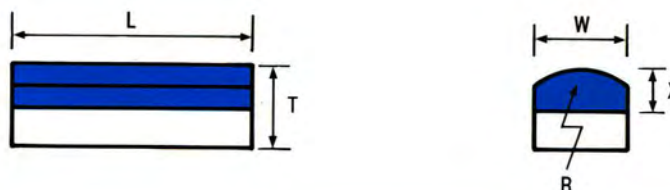
TYPE HH1



| L | W | X | T | L ₁ | BOND |
|-----|----|--------|----------|----------------|------|
| 120 | 10 | 1,5, 3 | 11,5, 13 | 40 | B |

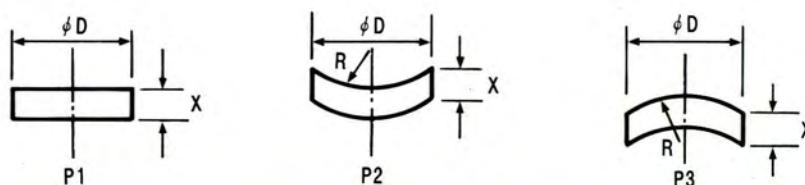
L₁: Length of Abrasive Section

TYPE HMF



| L | W | X | R | BOND |
|----------|---------|------|---------|---------|
| 25 - 100 | 3, 5, 6 | 3, 6 | specify | B, M, V |
| | | | flat | |

TYPE P



| D | X | BOND |
|---------|---------|------|
| 10 - 25 | 3, 5, 6 | M |

GENERAL INFORMATION

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DIAMOND GRINDING WHEELS

• Diamond

The diamonds used in the manufacture of Ehwa diamond grinding wheels can be classified into two categories: natural diamonds and synthetic diamonds. Ever since synthetic diamonds were first introduced in 1957, their applications have been steadily increasing. Now they are accepted as the principal material for diamond grinding wheels.

Two important achievements in the history of synthetic diamonds are the development of strong, tough diamond grits used for saw blades and the improvement of grits for resinoid bonds. Some grits for resinoid bonds are coated with metal which enables the resinoid bond grinding wheels to achieve better performance.

Diamond powder is commercially available in 50 grades, and each grade has its own unique features. Diamonds may be classified into the following two categories in terms of bonding method:

- Resinoid Bond
- Metal Bond or Vitrified Bond

The grit types and grit sizes of grinding wheels can be selected depending on workpieces, bonds, and grinding conditions. To help us design the grinding wheels best suited to your purpose, please refer to "HOW TO ORDER" on page 3 and provide us with the necessary information.

• Concentration

Concentration is the content of diamonds in a unit volume of a grinding wheel.

When content is 25 volume %, concentration is 100, which is equivalent to 4.4cts/cc of diamond in the grinding wheel. The relationship among grit content (in volume %), concentration, and diamond content (in cts/cc) is as follows:

| Grit content (volume%) | Concentration | Diamond content (cts/cc) |
|------------------------|---------------|--------------------------|
| 25 | 100 | 4.4 |
| 18.75 | 75 | 3.3 |
| 12.5 | 50 | 2.2 |
| 6.25 | 25 | 1.1 |

As illustrated above, the price of a grinding wheel largely depends on its concentration.

Since the appropriate concentration of a wheel depends on work materials, grinding conditions, etc., please see "HOW TO ORDER" and supply us with the necessary details.

• Grit Size

Diamond grit sizes are classified into 22 grades as shown in the following table. The nominal grit size of a grinding wheel indicates the coarsest size grits which are present in the wheel. For instance, the grits in the #140/170 range pass through a #140 sieve and are trapped by a #170 sieve. The grit size in this range is noted as #140.

Grit size classification by sieves is only feasible up to #325 mesh. After this, the grit size is still indicated by number (#...), but the method of classification is different. Grit sizes can be more accurately understood by correlating them to their respective mesh sizes and grit size scatter in diameter (see chart below).

| Nominal grit size (mesh) | Grit size range in mesh of the grits use | FEPA | Nominal grit size (mesh) | Grit size range in mesh of the grits use | FEPA |
|--------------------------|--|-------|--------------------------|--|------|
| 16 | 16/20 | | 200 | 200/230 | D 76 |
| 20 | 20/30 | D 852 | 230 | 230/270 | D 64 |
| 30 | 30/40 | D 602 | 270 | 270/325 | D 54 |
| 40 | 40/50 | D 426 | 325 | 325/400 | D 46 |
| 50 | 50/60 | D 301 | 400 | | |
| 60 | 60/80 | D 252 | 600 | | |
| 80 | 80/100 | D 181 | 800 | | |
| 100 | 100/120 | D 151 | 1000 | | |
| 120 | 120/140 | D 126 | 1500 | | |
| 140 | 140/170 | D 107 | 2000 | | |
| 170 | 170/200 | D 91 | 3000 | | |

• Bond

There are three alternative bonding methods: resinoid bond, metal bond, and vitrified bond.

• Resinoid Bond

Resinoid bond grinding wheels are manufactured by using resinoid bonds to bond diamond grits.

There are two types of resinoid bonds: the phenol resin type and the polyimide resin type. The phenol resin type is currently in more common usage.

Resinoid bond grinding wheels have good elasticity, fine surface finish, and high grinding performance. They are effective for

- (1) grinding of cemented carbide
- (2) combination grinding of cemented carbide and hardened steel
- (3) grinding of cermet

GENERAL INFORMATION

(4) precision grinding of magnetic materials, glass, ceramics, etc.

Polyimide wheels are recommended for heavy grinding and creep-feed grinding.

• Metal Bond

Metal bond grinding wheels are manufactured by sintering metal powder to bond diamond grits. These wheels are superior in grit retention, and therefore preferred

(1) when a long service life is required

(2) when wear of the grinding wheel needs to be minimized (such as in form grinding)

(3) in hand grinding of cemented carbide

(4) in profile grinding

(5) in the cutting and grinding of hard, and brittle materials such as ceramics, glass, and quartz

(6) in the cutting and grinding of magnetic materials such as ferrite

(7) in the cutting and grinding of stone

(8) in the cutting and grinding of graphite, etc.

The high grit retention quality of metal bond can also cause grazing or loading. The increase of grinding pressure and of heating due to loading may cause thermal damage to the workpiece. In order to prevent thermal damage, please choose the grinding process, conditions, coolant, dressing intervals, etc. carefully.

• Vitrified Bond

Vitrified bond grinding wheels are manufactured by using vitrified bonds to bond diamond grits. As vitrified bonds are porous, vitrified bond wheels can overcome the forming and dressing difficulties encountered with resinoid bond and metal bond grinding wheels. Vitrified bond wheels are used to grind cemented carbide, sintered diamond tools, etc.

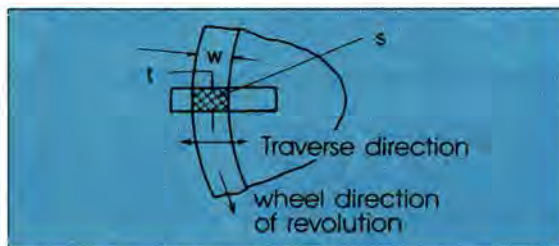
• Wheel Diameter

The heat produced by grinding with diamond wheels is cooled by the grinding fluid and by air. If the diameter of the wheel is small, the grits heated in the grinding process may not have sufficient time to be cooled before they come into contact with the workpiece in the next rotation. This results in progressive heat accumulation as grinding continues. And this in turn accelerates the wear of the diamond grits themselves as well as the deterioration of the resinoid bond in the vicinity of each grit, resulting in the early pull-out of the diamond grits.

It is always recommended that the diameter of the grinding wheel be made as large as possible. In high removal grinding, the heating is increased and the wheel life is shortened; thus, the costs of grinding are also increased. For this reason, too, it would be advantageous to make the diamond wheel diameter as large as possible.

• Wheel Rim Width

When the workpiece and the diamond wheel come into surface contact, stock removal is performed on the contact surface(s). The size of the contact surface is determined by the wheel rim width (w) and the contact length (t).



Stock removal is the cutting of the workpiece by the diamonds at the contact surface.

The force between the diamond wheel and the workpiece depends on the machine rigidity, the work supporting system, and the work type.

When the pressing force is constant, the surface pressure on the diamond wheel (kg/mm^2) increases as the wheel width decreases. The diamond grits then give a higher cutting performance, and the stock removal rate increases. This is of great practical significance in plunge grinding with a cup wheel or a straight wheel.

For greater efficiency, the wheel-workpiece contact area should be made as small as possible.

On the other hand, the life of the diamond wheel increases as the wheel width increases. The width of the wheel should be determined after taking into consideration the required working efficiency, the machine rigidity, and other pertinent factors.

• Machine

The grinding machine should have sufficient rigidity. Vibration of the table or the spindle will most likely cause the forming of an "oscillation mark" or severe wheel wear. In order to achieve the optimum grinding efficiency, enough machine power is required to ensure stabilized peripheral speed of the wheel and stabilized infeed. A machine without sufficient power will result in insufficient wheel speed, abnormal wear, and decreased grinding efficiency.

It is always best to use a vibration-free, highly rigid grinding machine with sufficient horse power.

• Mounting of Grinding Wheel

If the wheel is not properly set and if the periphery and the sides of the grinding wheel attached to the machine spindle are subject to vibration, problems arise during grinding, including

(1) oscillation marks on the workpiece,

(2) machine begins to vibrate; grinding noise increases

(3) wheel life is notably shortened.

To avoid these problems, the grinding wheel must be mounted properly.

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When a cup wheel or dish wheel is mounted on the machine, side runout should be less than 0.02mm. Likewise, peripheral runout should be less than 0.02mm when a straight wheel is mounted. If the wheel runout is over 0.02mm, reduce runout by following the procedures below.

- (1) Fasten the grinding wheel gently on the flange fixed to the machine.
- (2) Check the periphery runout using a dial indicator.
- (3) Reduce the periphery runout by gently hammering the periphery of the grinding wheel.
- (4) After adjusting as instructed above and tightly fastening the grinding wheel, recheck the periphery runout with the dial indicator.

The above procedures are valid only if there is a space between the internal diameter of the grinding wheel and the flange.

If there is no space, the runout of the grinding wheel itself must be adjusted.

• Truing and Dressing

If the periphery runout is severe when the grinding wheel is mounted, or if profile wear of the straight wheel or cup wheel is found, the runout and profile of the wheel must be adjusted.

Truing is the procedure of adjusting the runout and profile of the wheel. It involves shaving off the diamond grits and the bond to correct the runout and the profile of the wheel.

The diamond grinding wheel cannot be used immediately after the truing procedure as the diamond grits are not properly exposed; therefore, the wheel is not in prime condition to be used.

To improve free-cutting ability, the bond must be dug out and the diamond grits exposed onto the surface of the wheel. This process is called dressing.

Diamond grinding wheels cannot satisfactorily perform unless the above procedures are followed correctly.

• Selection of Silicon Carbide Wheel for Truing

In order for the truing of the diamond grinding wheel to be effectively performed in a timely manner, the grit size of the silicon carbide truing wheel must be 2 grades coarser than that of the diamond grinding wheel. As shown below, the grade of the silicon carbide wheel must be relatively hard.

| Grit size of diamond wheel | Silicon carbide wheel for truing |
|----------------------------|----------------------------------|
| #80 or coarser | C46-M |
| #100~#200 | C60-M |
| #230~#325 | C80-M |
| #400 or finer | WA200-G |

• Truing Methods

There are four truing methods.

- (1) Brake dresser
- (2) Abrasive stick
- (3) Mild steel
- (4) Tool post grinder

1. Brake Dresser

For truing with the wheel still mounted on the machine, the brake dresser is the best option of the above four methods by providing fast, simple, and stable truing.

2. Abrasive Stick

Truing of the diamond grinding wheel can also be performed by grinding the abrasive stick fixed on the chuck with the grinding wheel. Please pay careful attention during truing, as this method tends to make the wheel edge round.

3. Mild Steel

This method does not require any special devices and is easy to accomplish by grinding the mild steel with the diamond wheel. The diamond wheel could be damaged, however, if it is not sufficiently flooded with grinding fluid while grinding.

4. Tool Post Grinder

This truing method involves removing the diamond grinding wheel from the machine and grinding it with a silicon carbide wheel on another machine. Vibration of the diamond grinding wheel could possibly occur during the resetting of the trued on the first machine.

• Selection of Dressing Stick

Since the purpose of dressing the diamond grinding wheel is to expose the diamond grit by removing the bond only, the grit size of the stick should be 2 grades finer than that of the diamond grinding wheel.

Below is a guide to selecting a dressing stick.

| Grit size of diamond grinding wheel | Stick for dressing |
|-------------------------------------|--------------------|
| #80 or coarser | WA120-G |
| #100~#200 | WA200-G |
| #230~#325 | lapping stick |
| #400 or finer | lapping stick |

GENERAL INFORMATION

• Dressing with Stick

A diamond wheel is dressed by pushing the stick on the surface of the diamond grinding wheel by hand. Coolant must be used. In case of dry dressing, a wet stick should be used. When using a lapping stick, dry dressing is recommended.

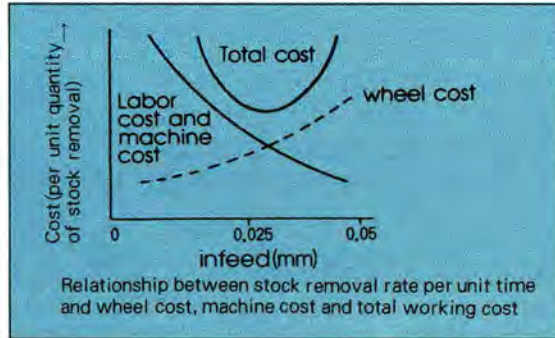
• Analysis of Work Conditions

In the past, when diamond wheels were "expensive and precious tools", the life of the wheel was considered the most important factor. Today, however, diamond grinding wheels are often evaluated based on total working costs. Total working costs are:

(Wheel cost) + (Other expenses, including cost of labor).

Recently, as labor costs have been soaring, the component of "other expenses" has been increasing steadily. Consequently, grinding efficiency has become more important.

Making a graph such as the one shown below can help in finding optimum working conditions which minimize the total working costs.



• Peripheral Speed

Wheel life, stock removal rate, and surface finish all depend largely on the peripheral speed of the wheel.

It is therefore very important to find the optimum peripheral speed for the diamond wheel. The table below shows recommended peripheral speeds.

| Resinoid bond | Metal bond |
|---------------------|---------------------|
| Wet 1400~1600 m/min | Wet 1000~1800 m/min |
| Dry 900~1200 m/min | Dry 600~900 m/min |

Peripheral speed is a function of wheel diameter and spindle speed(rpm).

• Grinding Fluid

Since regrinding is performed by physically watching the point of contact between the wheel and the workpiece, dry grinding is usually employed.

When the wheel--workpiece contact area is relatively large, the heat from grinding increases. For this reason, dry grinding may result in workpiece burning, wheel loading, bond wear, and other conditions which lead to a shortened wheel life. Consequently, the proportion of wheel cost to total costs increase. In such a situation, then, wet grinding is recommended. In wet grinding, the grinding fluid should be applied directly to the point of contact between the wheel and the workpiece. In heavy grinding or in creep-feed grinding, when heat increases, use a grinding fluid with a high lubricating performance and apply the fluid to the grinding point under high pressure.

• Infeed

Infeed is an important factor in determining grinding efficiency. However, a too-high increase in infeed in an attempt to improve the grinding efficiency can shorten the wheel life.

To determine the proper infeed, follow the guide given below. In form grinding, however, increase the depth of the cut and decrease the feeding speed to prevent deviation from the shape.

| Crit size of diamond grinding wheel | Depth of cut |
|-------------------------------------|-----------------|
| #100~#120 | 0.02~0.03 mm |
| #140~#200 | 0.01~0.02 mm |
| #230 or finer | 0.01 mm or less |

• Surface Finish

Because the surface finish of the workpiece depends on many factors--the grinding method and the workpiece material as well as the grit size of the diamond--it is difficult to make specific recommendations for surface finishing. In order to achieve a high rate of material removal and a good surface finish, grinding should be accomplished in two separate processes. The diamond grit sizes should be as follows:

| Rough | Finish |
|-------|--------|
| #100 | #270 |
| #120 | #325 |
| #140 | #400 |
| | #600 |

In any case, surface finish can be improved by sparkout.

GENERAL INFORMATION

CBN GRINDING WHEELS

● **CBN**

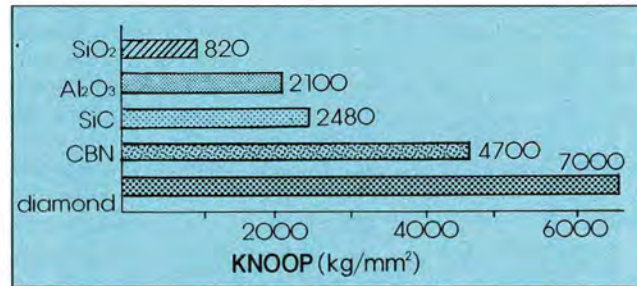
CBN(Cubic Boron Nitride) is the superabrasive used for steel grinding. CBN is crystallized from the nitric material in boron using a high pressure, high temperature method similar to the one used in diamond synthesis.

● **Characteristics of CBN**

Next to diamond, CBN is the second hardest material known on the earth. As shown by the figures below, it is harder than both Al_2O_3 (abrasive for WA and A grinding wheels) and SiC(abrasive for GC and C grinding wheels).

When considering the hardness only, diamonds would seem to grind steel easily, being the hardest materials. But at temperatures of 600~700°C, diamonds in contact with air begin to wear due to oxidation.

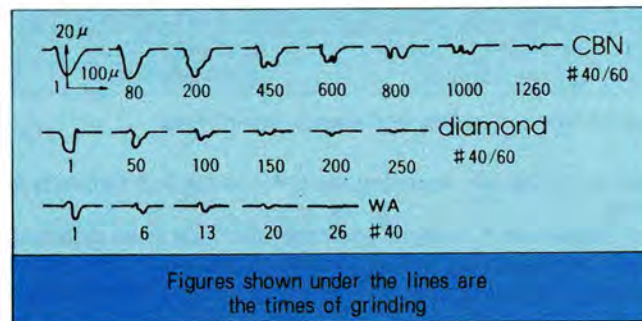
Also, since diamonds are basically composed of carbon, they react to the iron in steel, resulting in diamond wear. In contrast, CBN does not wear in these conditions, as it is stable up to 1370°C and does not react to iron.



● **Performance of CBN**

The following test was conducted to determine the respective durability of CBN, diamond, and WA. One grit of each abrasive was fixed to a 6" disc, and they each inflicted one scratch per turn on a workpiece of M2, HRC63 composition. The results are shown below.

The wear of CBN on its 1260th turn is almost equivalent to the wear of diamond on its 150th turn. This data clearly shows the outstanding performance and the superiority of CBN in steel grinding.



● **Availability of CBN Abasives**

CBN abrasives are classified into two types: metal- coated and uncoated. Metal-coated CBN is used mainly in resinoid bond grinding wheels, and uncoated CBN is used in electroplated metal bond and vitrified bond grinding wheel.

● **Concentration(see page 36)**

● **Grit Size**

| Nominal grit size (mesh) | Grit size range in mesh of the grits use | FEPA | Nominal grit size (mesh) | Grit size range in mesh of the grits use | FEPA |
|--------------------------|--|-------|--------------------------|--|------|
| 60 | 60/80 | B 252 | 325 | 325/400 | B 46 |
| 80 | 80/100 | B 181 | 400 | G 45 | |
| 100 | 100/120 | B 151 | 800 | G 30 | |
| 120 | 120/140 | B 126 | 1000 | G 15 | |
| 140 | 140/170 | B 107 | 1500 | G 9 | |
| 170 | 170/200 | B 91 | 2000 | G 6 | |
| 200 | 200/230 | B 76 | 3000 | G 3 | |
| 230 | 230/270 | B 64 | 5000 | G 1 | |
| 270 | 270/325 | B 54 | | | |

● **Bond**

There are three alternative bonding methods: resinoid bond, metal bond, and vitrified bond.

● **Resinoid Bond**

Resinoid bond grinding wheels are manufactured by using resinoid bonds to bond CBN grits. The resinoid bond CBN grinding wheel has a wider range of uses than other bond wheels. It is mainly used for surface grinding, cylindrical grinding, creep-feed grinding, centerless grinding, double-disc grinding, and internal grinding.

CBN grinding wheel is economical in cases where the workpiece is an iron material with hardness of over HRC50.

Ehwa has succeeded in developing a resinoid bond which enables the full performance of the CBN grit.

● **Metal Bond**

Metal bond grinding wheels are manufactured by sintering metal powder to bond CBN grits. They are used for the honing and cutting of hardened steel and for accomplishing a high removal rate in the grinding of mid-range hard steel.

● **Vitrified Bond**

Vitrified bond grinding wheels are manufactured by using vitrified bonds to bond CBN grits. They have good cutting ability, excellent wear-resistance, and free-cutting, and they are also used for internal grinding.

● **Wheel Diameter(see page 37)**

● **Wheel Rim Width(see page 37)**

● **Machine(see page 37)**

● **Mounting of Grinding Wheel(see page 37)**

● **Truing and Dressing(see page 38)**

● **Analysis of Work Conditions**

● **Peripheral Speed**

Wheel life, stock removal rate, and surface finish depend largely on the peripheral speed of the wheel. Finding the optimum peripheral speed for the CBN wheel is therefore very important. The table below shows recommended peripheral speeds.

| Resinoid bond |
|---------------------|
| Wet 1750-1850 m/min |
| Dry 900-1200 m/min |

Peripheral speed is a function of wheel diameter and spindle speed(rpm).

However, if the coolant pressure for grinding is kept high enough to keep the wheel from heating, the peripheral speed of the grinding wheel can be raised up to 13000ft/min. If the wheel speed(rpm) increases, the material removal speed can also be increased while maintaining a long wheel life.

● **Grinding Fluid**

There are two types of grinding fluids. One is straight oil(water immiscible) and the other is water soluble.

Straight oil is a coolant with an oily ingredient immiscible in water. It lubricates well, but it is an ineffective coolant with poor usability. However, straight oil enable CBN grinding to achieve maximum performance when grinding tough but soft workpieces such as stainless steel, inconel, and waspaloy. Straight oil also enables superior performance in heavy duty grinding.

Water soluble coolants are subdivided into three types: emulsion, soluble, and chemical.

The emulsion type becomes milky and opaque in water. Compared with straight oil, it has the next best lubricating effect, and emulsion type is better than straight oil for cooling. If the working place is not suited to straight oil, the emulsion type is recommended, but the concentration of coolant must be high -- above 5%.

The soluble type becomes translucent in water. Compared with emulsion type, it has the next best lubricating effect, and soluble type is better than emulsion type for cooling. In general grinding, soluble type is sufficient.

The chemical type becomes transparent in water. It is the best fluid for cooling, but the least effective for lubrication. If the chemical type is being used for general grinding, there is no need to change to the soluble type.

● **Infeed(see page 39)**

● **Surface Finish(see page 39)**

● **Conversion Table of Surface Finish**

| Rmax(μm) | Ra(μm) | Rrms(μm) | Rz(μm) | Rrms(μin)' | Rmax(μm) | Ra(μm) | Rrms(μm) | Rz(μm) | Rrms(μin)' |
|----------|--------|----------|--------|------------|----------|--------|----------|--------|------------|
| 0.1 | 0.02 | 0.02 | 0.1 | 1 | 2.4 | 0.41 | 0.46 | 2.2 | 24 |
| 0.2 | 0.03 | 0.04 | 0.2 | 2 | 2.8 | 0.48 | 0.53 | 2.5 | 28 |
| 0.3 | 0.05 | 0.06 | 0.3 | 3 | 3.2 | 0.54 | 0.61 | 2.9 | 32 |
| 0.4 | 0.07 | 0.08 | 0.4 | 4 | 3.6 | 0.61 | 0.68 | 3.2 | 36 |
| 0.5 | 0.09 | 0.10 | 0.5 | 5 | 4.0 | 0.68 | 0.76 | 3.6 | 40 |
| 0.6 | 0.10 | 0.11 | 0.5 | 6 | 4.5 | 0.77 | 0.86 | 4.1 | 45 |
| 0.7 | 0.12 | 0.13 | 0.6 | 7 | 5.0 | 0.85 | 0.96 | 4.5 | 50 |
| 0.8 | 0.14 | 0.15 | 0.7 | 8 | 5.5 | 0.94 | 1.05 | 5.0 | 55 |
| 0.9 | 0.15 | 0.17 | 0.8 | 9 | 6.0 | 1.02 | 1.14 | 5.4 | 60 |
| 1.0 | 0.17 | 0.19 | 0.9 | 10 | 7.0 | 1.19 | 1.33 | 6.3 | 70 |
| 1.2 | 0.20 | 0.23 | 1.1 | 12 | 8.0 | 1.36 | 1.52 | 7.2 | 80 |
| 1.4 | 0.24 | 0.27 | 1.3 | 14 | 9.0 | 1.53 | 1.71 | 8.1 | 90 |
| 1.6 | 0.27 | 0.30 | 1.4 | 16 | 10.0 | 1.70 | 1.90 | 9.0 | 100 |
| 1.8 | 0.31 | 0.34 | 1.6 | 18 | | | | | |
| 2.0 | 0.34 | 0.38 | 1.8 | 20 | | | | | |



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