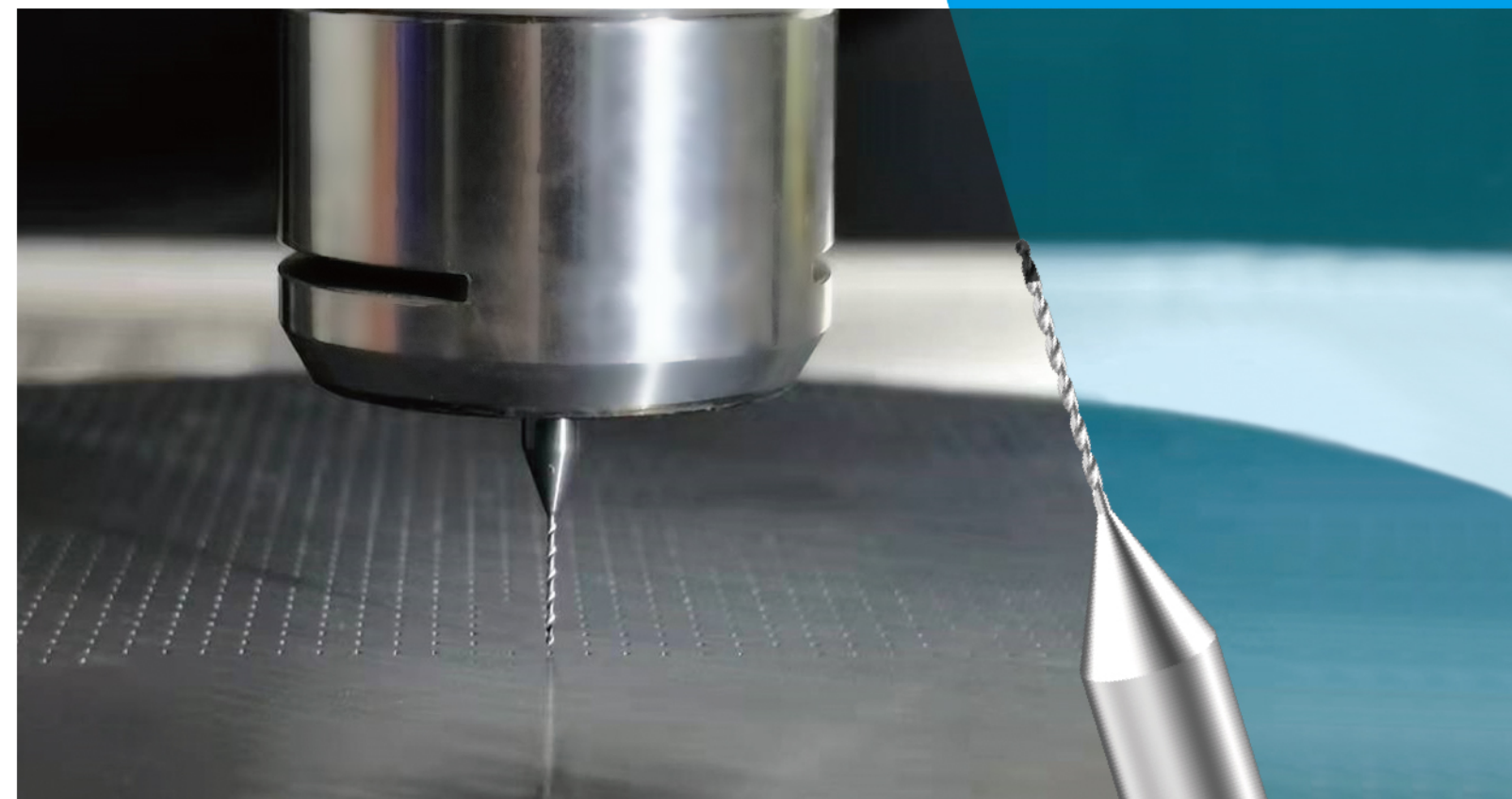




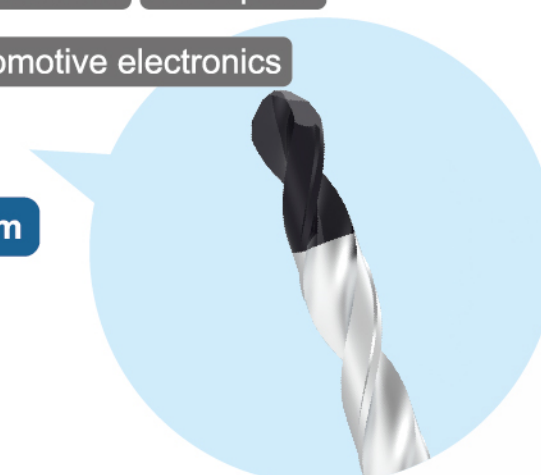
## PCD MICRO DRILL

Semiconductor industry National defense field Aerospace

Chip&Communication electronics Automotive electronics

High-end medical equipment field

**Super-Precision Maching  $\phi 0.2\text{-}\phi 2\text{ mm}$**



**BEIJING WORLDIA DIAMOND TOOLS CO.,LTD.**

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Add: No. 1136 Bazi Road, Xiuzhou District, Jiaxing City 314000, Zhejiang Province, China



BEIJING WORLDIA DIAMOND TOOLS CO.,LTD.



# ABOUT US

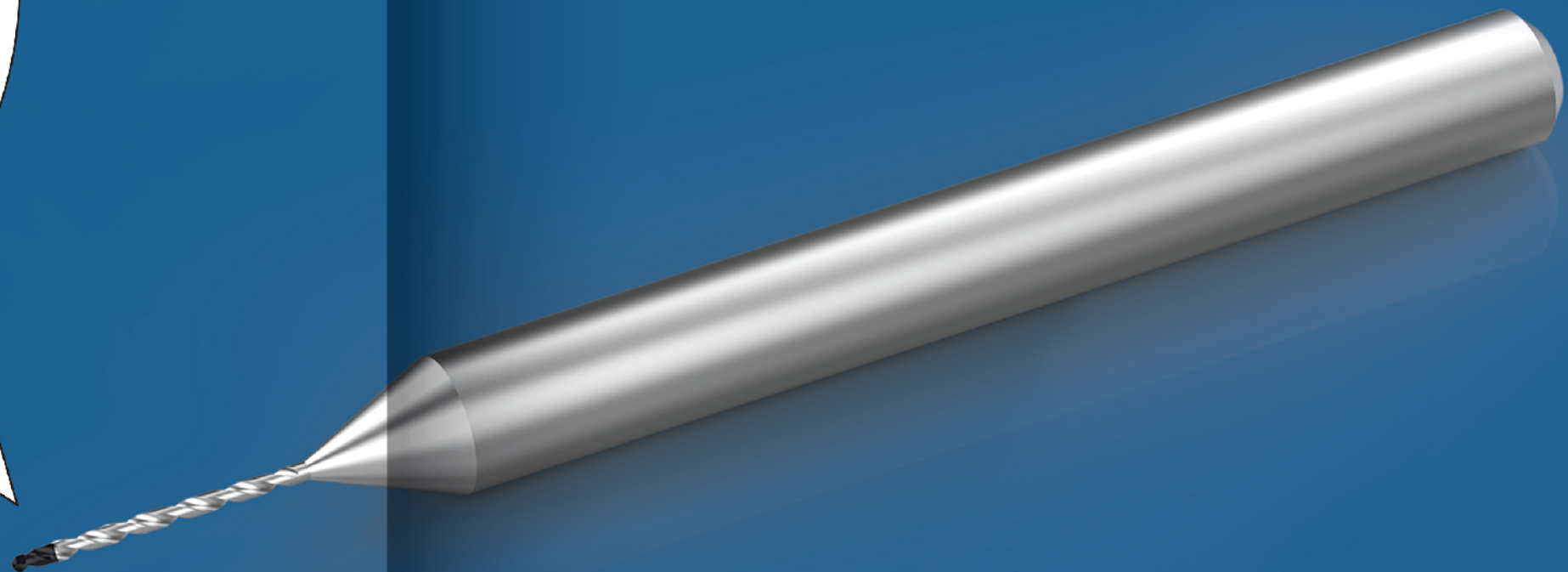


## COMPANY PROFILE

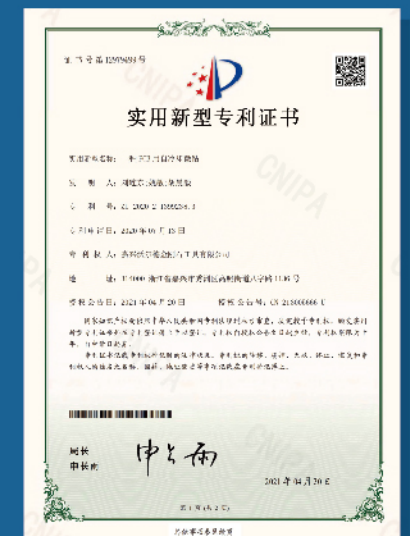
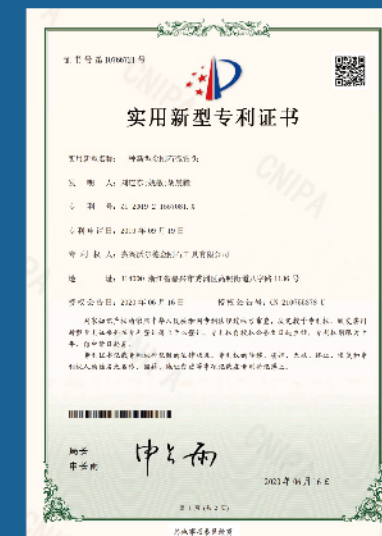
- Beijing Worldia Diamond Tools Co., Ltd. was founded in 2006 in Beijing Zhongguancun Science and Technology Park;
- The Worldia Group currently has one branch and several wholly-owned subsidiaries. Among them, the two largest subsidiaries are Jiaxing Worldia Diamond Tools Co., Ltd. and Langfang Supower Diamond Technology Co., Ltd.;

- The company is a high-tech enterprise mainly engaged in the research and development, production and sales of superhard cutting tools and superhard material products;
- Our products are involved in many well-known enterprises in the fields of optoelectronic display industry, aerospace, nuclear industry, photovoltaic, wind power, semiconductor and equipment, and we have formed long-term and stable cooperative relations with customers in these fields;
- On July 22, 2019, worldia was officially listed on the STAR Market in Shanghai Stock Exchange.  
(Stock Code: 688028)

PCD MICRO DRILL



# PCD MICRO DRILL





SUPER-PRECISION  
 $\phi 0.2\text{-}\phi 2\text{ mm}$   
PCD MICRO DRILL

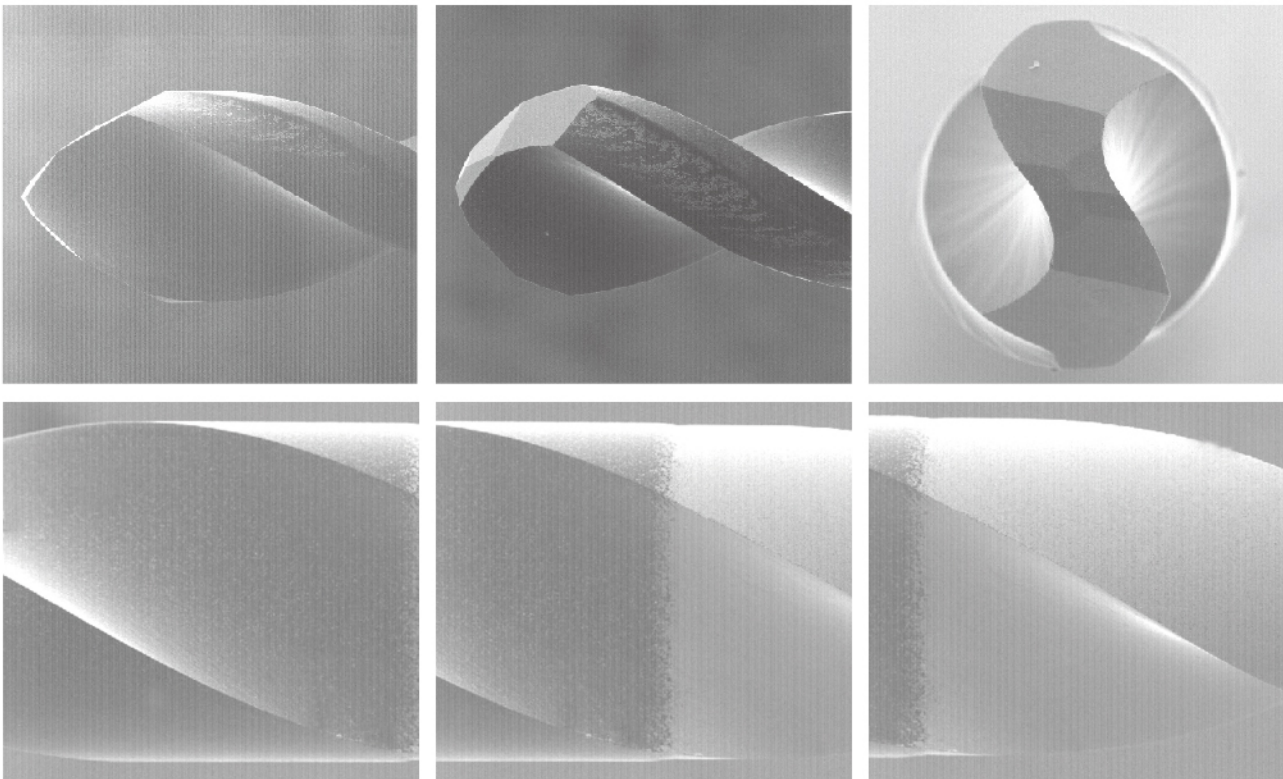
## CONTENTS

|                          |          |
|--------------------------|----------|
| PCD Micro-Drill Features | / Part 1 |
| Specification Selection  | /Part 2  |
| Processing Case          | /Part 3  |

# 01 FEATURES



PCD MICRO DRILL SLOT STRUCTURE AND DRILL TIP

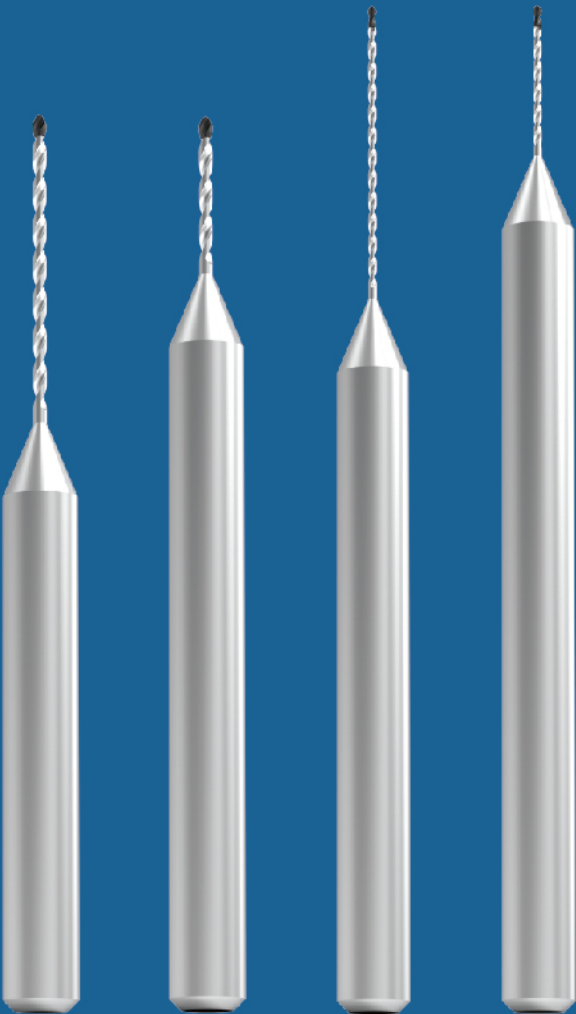


- 1. The grinding groove is smooth and the chip removal is excellent;
- 2. The edge surface is polished and the main edge is sharp;
- 3. The tip rotates stably and the hole position is accurate.

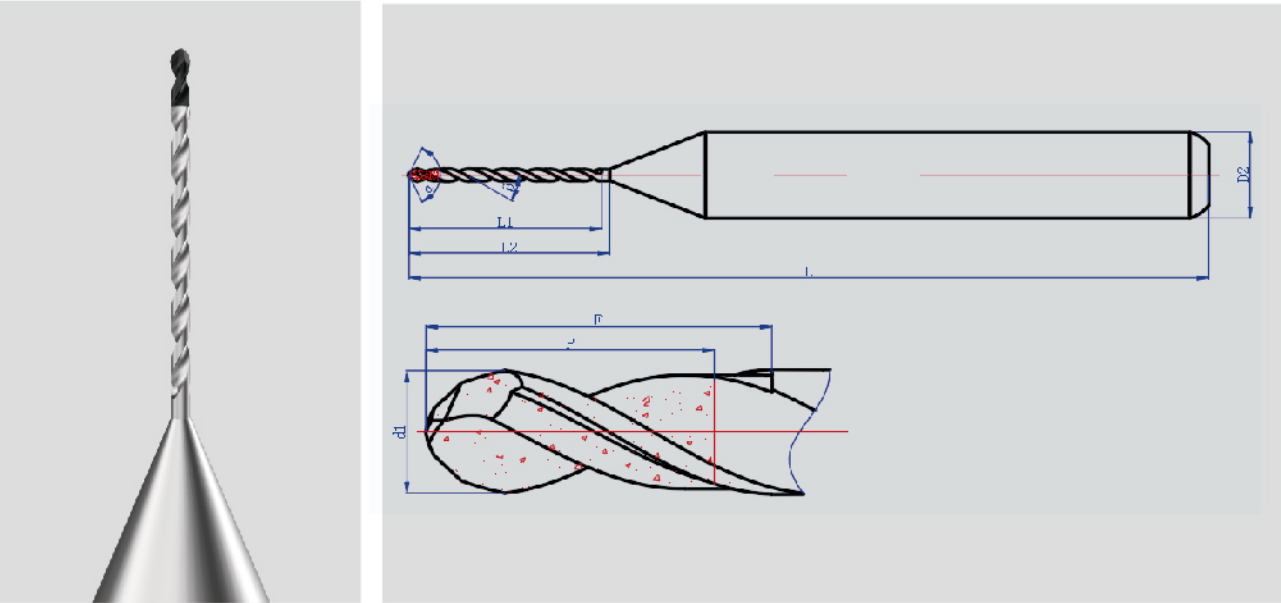
Product Features

- 1.PCD micro drill has characteristics of high hardness, wear resistance, and relatively long service life compared with traditional alloy microdrill;
- 2.PCD micro drill is widely used in addition to processing metal materials, can also be used for inorganic non-metallic material processing, with high processing precision;
- 3.PCD micro drill, compared with traditional alloy microdrill, can process hole wall with better quality.

02 SPECIFICATION



PRODUCT CATEGORY

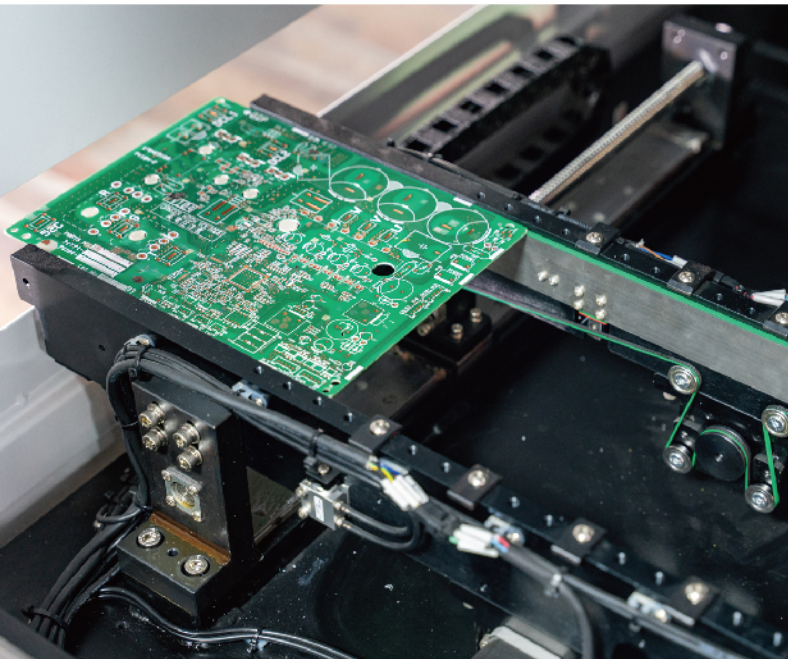


SPECIFICATION SELECTION TABLE

| Specification Table |                                          |           |        |      |       |       |           |                                                                                        |
|---------------------|------------------------------------------|-----------|--------|------|-------|-------|-----------|----------------------------------------------------------------------------------------|
| Series              | Specification                            | d1 (mm)   | L2(mm) | L2/D | D2    | L     | $\alpha$  | Application                                                                            |
| WZ1                 | d1*L2*SD3.175*L* $\alpha$                | 0.2≤0.4   | 2~6    | 32   | 3.175 | 38/45 | 110°-130° | Graphite, polymer wear-resisting material, aluminum alloy and other non-ferrous metals |
|                     |                                          | 0.4≤0.8   | 4~13.5 |      |       |       |           |                                                                                        |
|                     |                                          | 0.8≤2.0   |        |      |       |       |           |                                                                                        |
| WZ2                 | d1*L2*SD3.175*L* $\alpha$                | 0.4≤0.8   | 4~13.5 | 20   | 3.175 | 38/45 | 110°-130° | Composite ceramic wear resistant material                                              |
|                     |                                          | 0.8≤2.0   |        |      | 3.175 | 38/45 | 110°-130° |                                                                                        |
| WZ3                 | d1*L2*SD3.175*L* $\alpha$                | 0.2≤0.35  | 2-4    | 38   | 3.175 | 38/45 | 110°-130° | Monocrystalline silicon, polysilicon                                                   |
|                     |                                          | 0.35≤0.75 | 2-7    |      |       |       |           |                                                                                        |
|                     |                                          |           | 7-13.5 |      |       |       |           |                                                                                        |
| Remark              | Non-standard products can be customized! |           |        |      |       |       |           |                                                                                        |

PRODUCT APPLICATION FIELD

- Semiconductor industry
- National defense field
- Aerospace
- Chip&Communication electronics
- Automotive electronics
- High-end medical equipment field

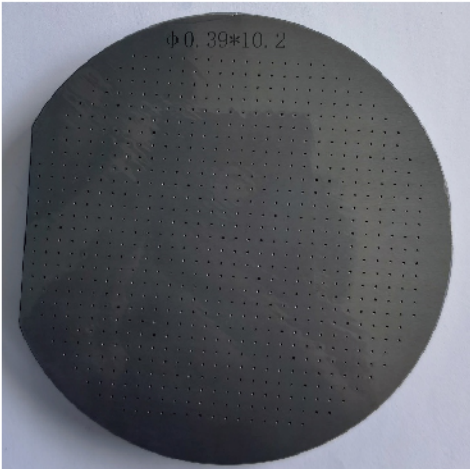
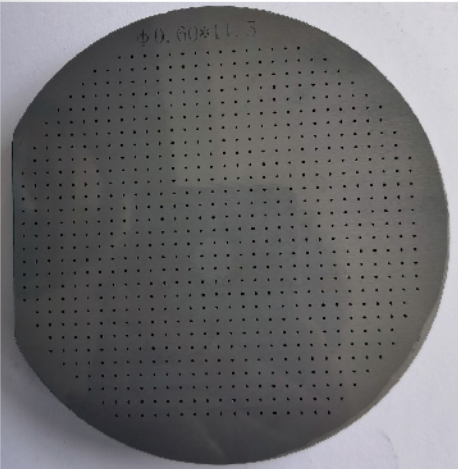
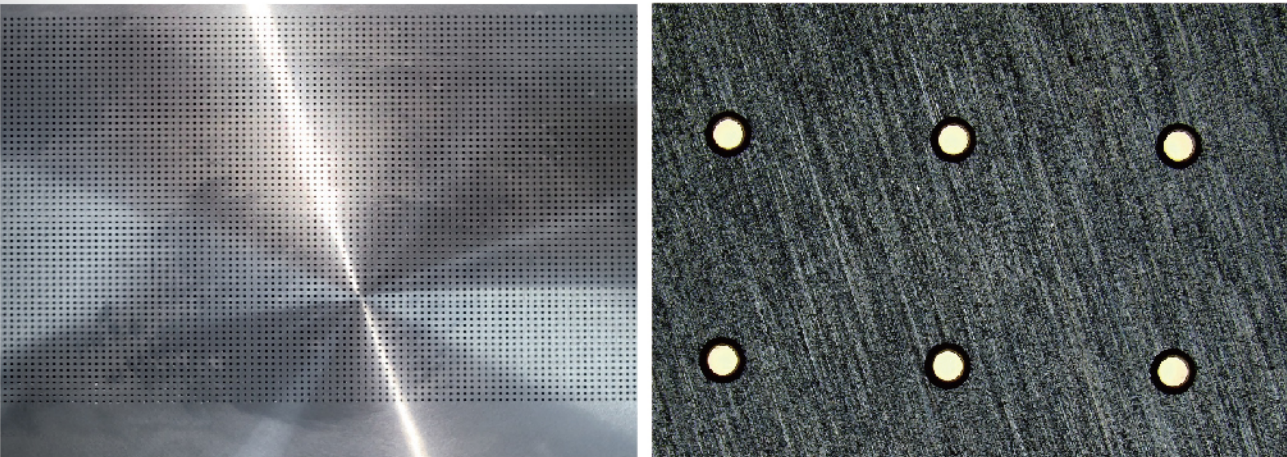




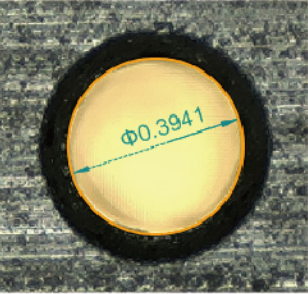
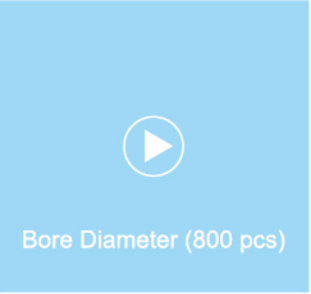
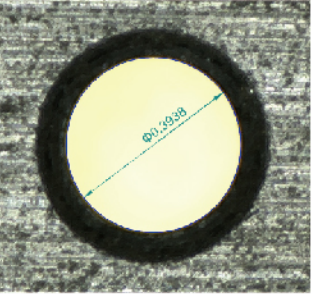
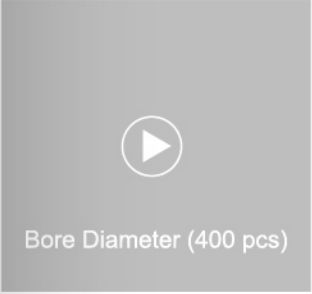
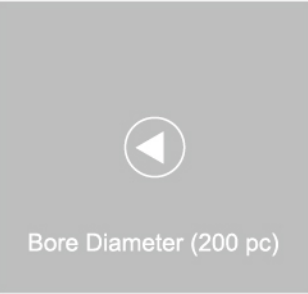
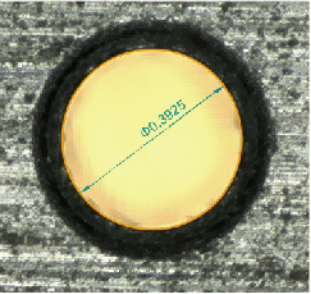
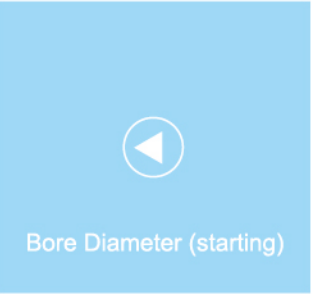
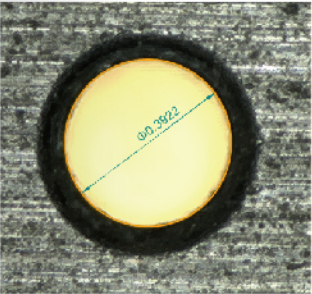
# 03 PROCESSING CASE



## MONOCRYSTALLINE SILICON PROCESSING CASE 1



Material: monocrystalline silicon  
Bore Diameter: 0.39  
Depth: 10.5  
Surface Hardness: 50Gpa  
Holes Qty.: 2000 pcs

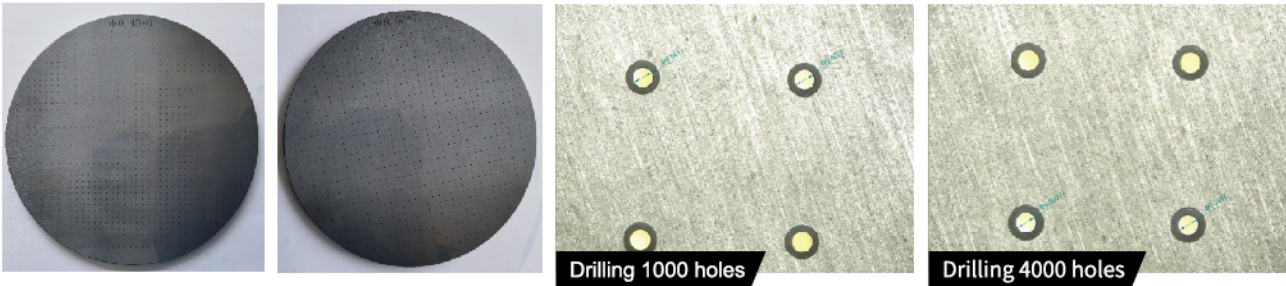


Remark: selection of WZ3 series PCD microdrill

MONOCRYSTALLINE SILICON PROCESSING CASE 2

| monocrystalline silicon(0.39*10.5)-driling parameter and quality |                   |                   |                       |                           |                           |              |
|------------------------------------------------------------------|-------------------|-------------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                                            | Spindle speed     | Feeding speed     | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                                             | 20000             | 10                | 0.1                   | 10.5                      | 167                       | G83          |
| Unit                                                             | r/min             | mm/min            | mm                    | mm                        | S                         |              |
| Index                                                            | Borehole diameter | Starting diameter | Ending diameter       | Stablty in 800 holes      | Hole roundness            | Chipping     |
| Data                                                             | 0.391             | 0.392             | 0.394                 | <0.01                     | <0.005                    | <0.01        |
| Unit                                                             | mm                | mm                | mm                    | mm                        | mm                        | mm           |

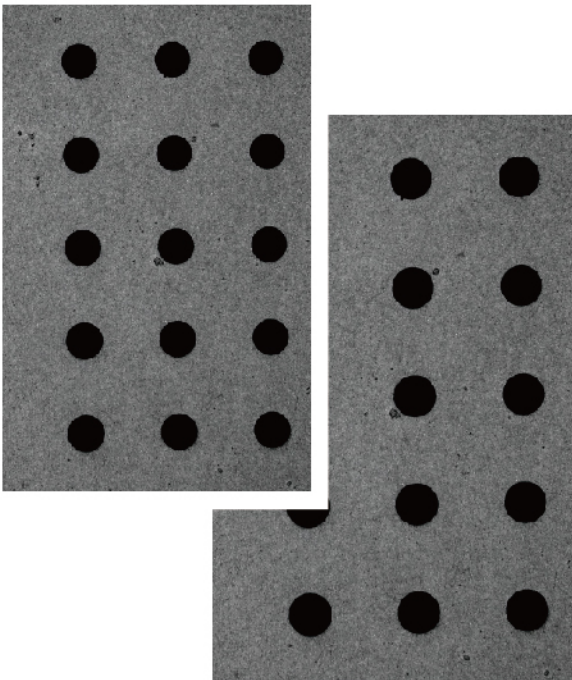
| monocrystalline silicon(0.5*7)-driling parameter and quality |                   |                   |                       |                           |                           |              |
|--------------------------------------------------------------|-------------------|-------------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                                        | Spindle speed     | Feeding speed     | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                                         | 20000             | 20                | 0.4                   | 6.5                       | 24                        | G83          |
| Unit                                                         | r/min             | mm/min            | mm                    | mm                        | S                         |              |
| Index                                                        | Borehole diameter | Starting diameter | Ending diameter       | Stablty in 50 holes       | Hole roundness            | Chipping     |
| Data                                                         | 0.497             | 0.501             | 0.503                 | <0.01                     | <0.005                    | <0.01        |
| Unit                                                         | mm                | mm                | mm                    | mm                        | mm                        | mm           |



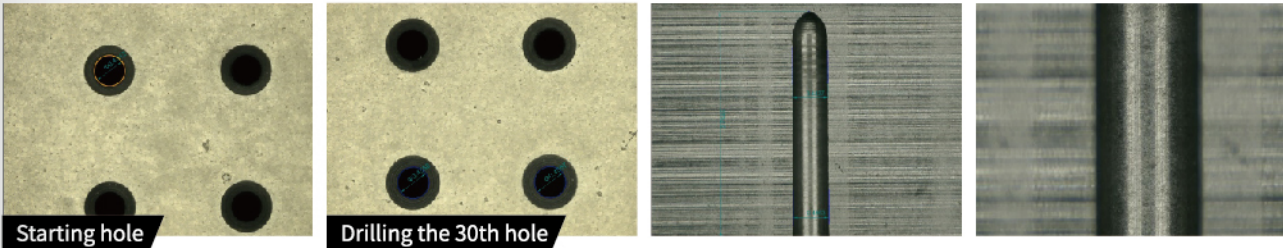
Remark: selection of WZ3 series PCD microdrill

SIC NON-PRESSURE SINTERING CERAMIC PROCESSING CASE - Φ0.45

| SIC non-pressure sintering ceramic parameter |                                                                     |          |
|----------------------------------------------|---------------------------------------------------------------------|----------|
| Index                                        | Performance                                                         | Unit     |
| Volume Density                               | >3.12                                                               | g/cm³    |
| Purity                                       | 98.50%                                                              | %        |
| Bending strength                             | >400                                                                | Mpa      |
| HRC                                          | >93                                                                 | HBA      |
| Thermal conductivity                         | 148                                                                 | W/m·k    |
| MOE                                          | 415                                                                 | GPa      |
| Fracture toughness                           | >4.5                                                                | Mpa.m1/2 |
| Application                                  | Cooling fin, bulletproof plate, mechanical seal sandblasting nozzle |          |



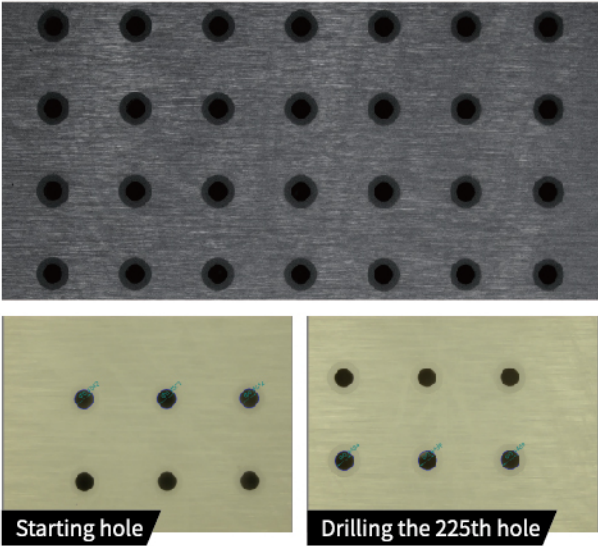
| SIC non-pressure sintering ceramic -driling parameter and quality |                   |                   |                       |                           |                           |              |
|-------------------------------------------------------------------|-------------------|-------------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                                             | Spindle speed     | Feeding speed     | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                                              | 20000             | 5                 | 0.1                   | 5                         | 145                       | G83          |
| Unit                                                              | r/min             | mm/min            | mm                    | mm                        | S                         |              |
| Index                                                             | Borehole diameter | Starting diameter | Ending diameter       | Stablty in 30 holes       | Hole roundness            | Chipping     |
| Data                                                              | 0.450             | 0.451             | 0.455                 | <0.01                     | <0.005                    | <0.01        |
| Unit                                                              | mm                | mm                | mm                    | mm                        | mm                        | mm           |



Remark: selection of WZ3 series PCD microdrill

ZIRCONIA PROCESSING CASE——Φ0.451

| Zirconia ceramic parameter |                                                                                           |          |
|----------------------------|-------------------------------------------------------------------------------------------|----------|
| Performance                | Unit                                                                                      | Data     |
| Density                    | g/cm³                                                                                     | 6        |
| Mohs hardness              | level                                                                                     | 8.5-9    |
| Bending strength           | Mpa                                                                                       | 1100     |
| Compressive strength       | Mpa                                                                                       | 2500     |
| Fracture toughness         | Mpa.M-3/2                                                                                 | 11       |
| Elastic modulus            | Gpa                                                                                       | 200      |
| Thermal expansion          | X10-6/°C                                                                                  | 10.5     |
| Thermal shock              | ΔT°C                                                                                      | 300      |
| Operating temperature      | °C                                                                                        | 500-1000 |
| Application                | Radiators, communication hardware, IC electronic devices, new energy electronic equipment |          |



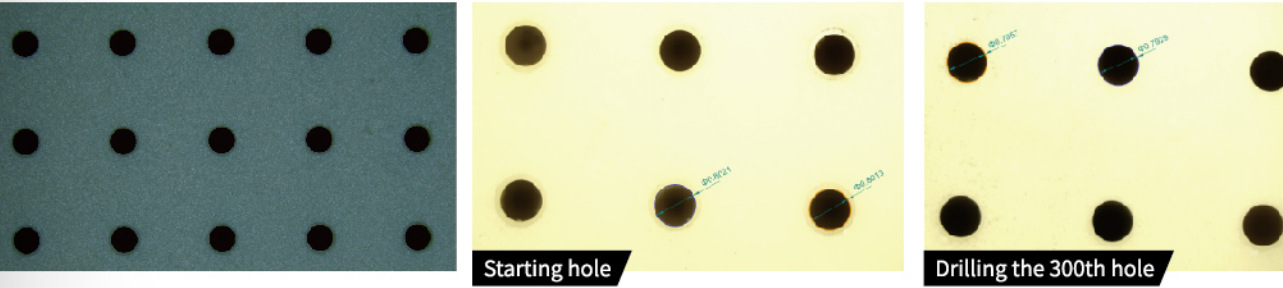
| Zirconia ceramic-drilling parameter and quality |                   |                   |                       |                           |                           |              |
|-------------------------------------------------|-------------------|-------------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                           | Spindle speed     | Feeding speed     | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                            | 20000             | 5                 | 0.1                   | 5                         | 145                       | G83          |
| Unit                                            | r/min             | mm/min            | mm                    | mm                        | S                         |              |
| Index                                           | Borehole diameter | Starting diameter | Ending diameter       | Stablity in 225 holes     | Hole roundness            | Chipping     |
| Data                                            | 0.451             | 0.452             | 0.449                 | <0.01                     | <0.005                    | <0.01        |
| Unit                                            | mm                | mm                | mm                    | mm                        | mm                        | mm           |

Remark: selection of WZ2 series PCD microdrill

CERAMIC PROCESSING CASE - Φ0.799

| Alumina ceramic parameter |                   |                 |                      |                   |                             |                                  |                      |
|---------------------------|-------------------|-----------------|----------------------|-------------------|-----------------------------|----------------------------------|----------------------|
| Performance               | Alumina content   | Volume density  | Hardness             | Bending strength  | Maximum service temperature | Continounous working temperature | Acid resistance      |
| Unit                      | wt%               | g/cm³           | HRA≥                 | MPA≥              | °C                          | °C                               | mg/cm²≤              |
| Data                      | ≥96%              | ≥3.7%           | 86                   | 300               | 1600                        | 1100                             | 7                    |
| Performance               | Alkali resistance | Wear resistance | Compressive strength | Flexural strength | MOE                         | Poisson's ratio                  | Thermal conductivity |
| Unit                      | mg/cm²≤           | g/cm²≤          | mpa≥                 | mpa≥              | G Pa                        |                                  | W/m.K(20°C)          |
| Data                      | 0.2               | 0.2             | 2000                 | 200               | 300                         | 0.2                              | 24                   |

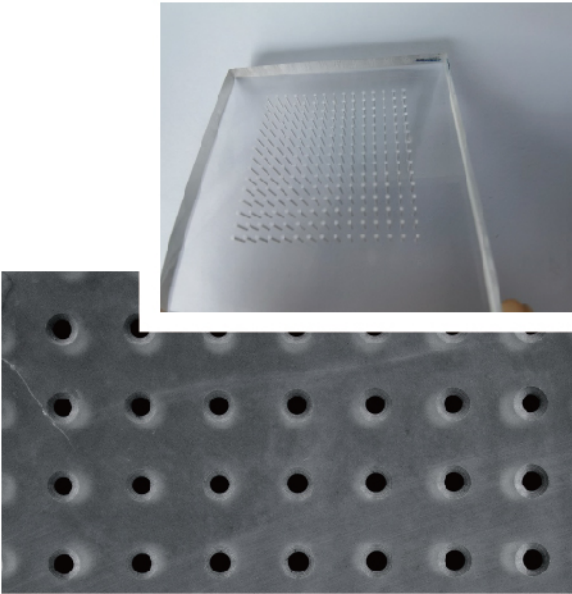
| Silicon carbide non-pressure ceramic-drilling parameter and quality |                   |                   |                       |                           |                           |              |
|---------------------------------------------------------------------|-------------------|-------------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                                               | Spindle speed     | Feeding speed     | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                                                | 20000             | 10                | 0.15                  | 12.5                      | 158                       | G83          |
| Unit                                                                | r/min             | mm/min            | mm                    | mm                        | S                         |              |
| Index                                                               | Borehole diameter | Starting diameter | Ending diameter       | Stablity in 300 holes     | Hole roundness            | Chipping     |
| Data                                                                | 0.799             | 0.802             | 0.793                 | <0.015                    | <0.005                    | <0.01        |
| Unit                                                                | mm                | mm                | mm                    | mm                        | mm                        | mm           |



Remark: selection of WZ2 series PCD microdrill

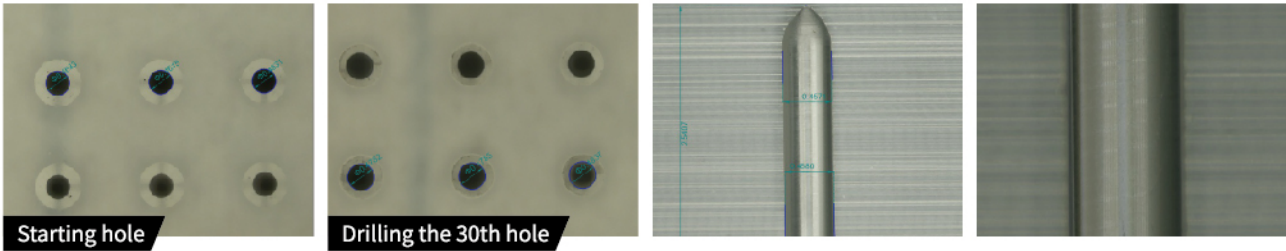
QUARTZ GLASS PROCESSING CASE——Φ0.455

| Quartz glass parameter |                                                     |             |
|------------------------|-----------------------------------------------------|-------------|
| Index                  | Unit                                                | Performance |
| softening temperature  | °C                                                  | 1730        |
| Purity                 | %                                                   | 99.98       |
| Mohs hardness          | level                                               | 7           |
| volume density         | g/cm³                                               | >2.23       |
| MOE                    | GPa                                                 | 80.9        |
| Bending strength       | Mpa                                                 | 785-1150    |
| Fracture toughness     | Mpa.m1/2                                            | 33.4        |
| Application            | Wear-resistant equipment, semiconductor, metallurgy |             |



| Quartz glass-drilling parameter and quality |               |               |                       |                           |                           |              |
|---------------------------------------------|---------------|---------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                                       | Spindle speed | Feeding speed | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                                        | 20000         | 20            | 0.4                   | 6                         | 24                        | G83          |
| Unit                                        | r/min         | mm/min        | mm                    | mm                        | S                         |              |

| Index | Borehole diameter | Starting diameter | Ending diameter | Stablity in 300 holes | Hole roundness | Chipping |
|-------|-------------------|-------------------|-----------------|-----------------------|----------------|----------|
| Data  | 0.455             | 0.463             | 0.48            | <0.02                 | <0.01          | <0.015   |
| Unit  | mm                | mm                | mm              | mm                    | mm             | mm       |



Remark: selection of WZ1 series PCD microdrill

GRAPHITE PROCESSING CASE - Φ0.798

| Isostatic pressing formed graphite |                                                                               |          |
|------------------------------------|-------------------------------------------------------------------------------|----------|
| P/N                                | LTD-8                                                                         |          |
| Volume density                     | G/cm³                                                                         | 1.9-1.93 |
| Electrical resistivity             | UΩM                                                                           | 11-13    |
| Thermal conductivity (100°C)       | W/M-K                                                                         | 85       |
| Thermal expansion                  | 10-6°C                                                                        | 5.85     |
| Shore hardness                     | HSD                                                                           | 70       |
| Flexural strength                  | MPA                                                                           | 60       |
| Compressive strength               | MPA                                                                           | 135      |
| MOE                                | GPA                                                                           | 12       |
| Air hole rate                      | %                                                                             | 11       |
| Particle size                      | μm                                                                            | 8-10     |
| Application                        | Metallurgy, chemical industry, electric power, light industry, abrasive tools |          |



| Graphite-drilling data and quality |               |               |                       |                           |                           |              |
|------------------------------------|---------------|---------------|-----------------------|---------------------------|---------------------------|--------------|
| Index                              | Spindle speed | Feeding speed | Each processing depth | Effective machining depth | Single hole drilling time | Drilling way |
| Data                               | 20000         | 40            | 0.4                   | 11                        | 47                        | G83          |
| Unit                               | r/min         | mm/min        | mm                    | mm                        | S                         |              |

| Index | Borehole diameter | Starting diameter | Diameter of the 2000th hole | Stablity in 2000 holes | Hole roundness | Chipping |
|-------|-------------------|-------------------|-----------------------------|------------------------|----------------|----------|
| Data  | 0.798             | 0.799             | 0.801                       | <0.005                 | <0.01          | <0.01    |
| Unit  | mm                | mm                | mm                          | mm                     | mm             | mm       |

Remark: selection of WZ1 series PCD microdrill