# Aluminium wheel machining

## Polishing

2018 EN

CERATIZIT is a high-tech engineering group specialising in tool and hard materials technologies.

**Tooling the Future**

www.ceratizit.com

CUTTING SOLUTIONS BY CERATIZIT

# Advantage through innovation: stable process means lustrous finish is more consistent

# CERATIZIT – With passion and a pioneering spirit for carbides

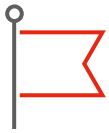
For more than 95 years, CERATIZIT has been a pioneer in the field of ambitious hard material solutions for machining and protection against wear.

The private company, with registered offices in Mamer, Luxembourg, develops and produces highly-specialised cutting tools, indexable inserts, rods made from hard materials and wearing parts. We are the global market leader in various application segments for wearing parts and are successfully developing new carbide, cermet and ceramic grades, for example in woodworking and stone working.

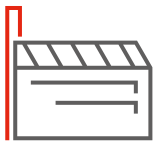
With more than 9,000 employees at 34 production facilities worldwide and a sales network with over 70 branches, the Group is a global player in the carbide sector. Our international network also includes subsidiaries KOMET, WNT and Becker Diamantwerkzeuge, as well as the CB-CERATIZIT joint venture. As a technology leader, we continuously invest in research and development and hold over 1,000 patents. Our innovative carbide solutions are used in the mechanical engineering and tool making sectors, in the automotive industry, the aviation and aerospace industry, and in the medical industry.

We are represented on the market by our seven flagship brands, Hard Material Solutions by CERATIZIT, Toolmaker Solutions by CERATIZIT, Tool Solutions by CERATIZIT, Cutting Solutions by CERATIZIT, KOMET, WNT and KLENK.

## Facts & figures



**1 headquarters**
Mamer / Luxembourg



**34**
Production facilities

**> 70**
Sales offices

**> 9,000**
Employees

**> 100,000**
Different products

**> 1,000**
Patents and utility models

**> 200**
Employees in R&D

**> 10**
Innovation prizes

**30%**
Products that are less than 5 years old

# Polishing aluminium wheels

Polishing is one of the most problematic aspects of aluminium wheel machining. There are eight challenges that come up in relation to polishing that need to be tackled with the ultimate in precision on a daily basis. That's why CERATIZIT has developed a specific product for each of these issues.

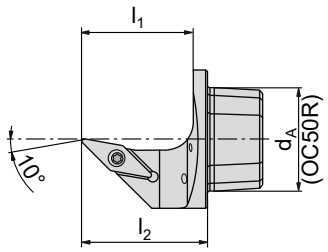
## Chip stroke

- Problem: Chips come into contact with the finished surface causing damage.
- Solution: This can be prevented by targeting the direction of chips. e.g. by changing the machining direction.

1

## Vibration

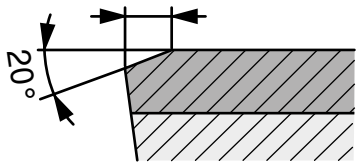
- Problem: Vibration that is either the direct result of the machine (spindle, engine, chuck, etc.) or unstable tools.
- Solution: Reduced vibration by using stable tools that are as short as possible.




2

## Shadows/clouding

- Problem: The surface appears blotchy (cloudy). This can lead to increased/reduced cutting pressure.
- Solution: A variety of different cutting edge finishes can be used to optimise the process.




3

## Scratches

- Problem: Chips get stuck between the cutting edge and the finished surface, causing scratches.
- Solution: Targeted chip control through the correct setting angle and targeted coolant supply are the key to success here.

4

## Uniform surface/finish

- Problem: The turning finish is not the one sought/ required.
- Solution: All CERATIZIT standard inserts are available with a 0.8/1.2/2 mm radius in all cutting edge finishes. This makes it possible to generate the required turning finish.

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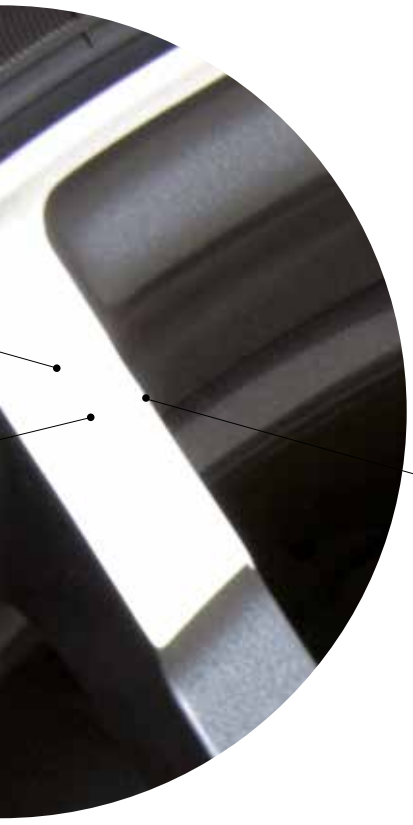
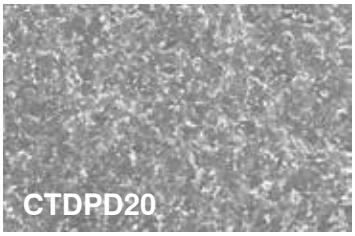


## Turning finish

- Problem: The finish differs depending on the inserts/ rims and/or if there are interruptions to the uniform cut.
- Solution: CTDPD20 grade combined with optimized production allows for uniform standardisation.




7

## Chipped paint

- Problem: Chipped paint at the edges despite optimally adjusted painting process.
- Solution: The huge range of standardised inserts offered by CERATIZIT means it is always possible to find the right one.

6

## Open pores

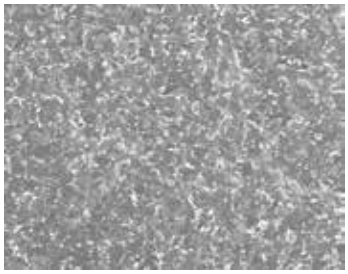
- Problem: The silicon pockets that are trapped during casting are opened by sharp inserts and create air bubbles after painting.
- Solution: Chamfer variants up to 0.4 mm, including rounding where necessary, close more or less all pores.

5

# Grades overview

## CTDPD20

DP-N20 ●



**Specifications:**
Composition: Polycrystalline diamond (PCD) | Grain size: ~ 3 µm

**Recommended use:**
Polycrystalline fine-grained diamond grade for machining of non-ferrous metals and non-metallic materials.

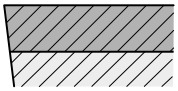
- ▲ Fine-grained sintered diamond
- ▲ Grain size 2 – -4 µm
- ▲ Grinding process for the cutting edge
- ▲ Diamond cutting materials with extremely high degree of toughness
- ▲ Machining is possible with heavily interrupted cuts (finish and superfinish machining)
- ▲ Finishing and premachining

- ▲ Machining of
  - – Hypoeutectic aluminium
  - – Non-metallic materials
  - – Plastics

# Cutting edge finishes for machining

## FN

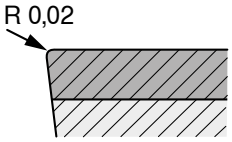
- Sharp cutting edge to minimise chipped paintwork
- Silicon pockets are opened
- Suitable for premium cast aluminium



| | |
|---|---|
| Edge breakage | + + |
| Pores | – – |
| Scratches | + + |
| Vibration | + + |

## EN

- Cutting edge with gentle rounding
- Rounded cutting edges “smear over” small pores
- Large silicon pockets are opened
- Suitable for good-quality cast aluminium

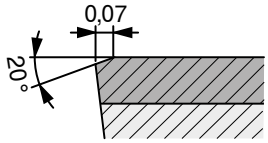



| | |
|---|---|
| Edge breakage | + |
| Pores | ○ |
| Scratches | – |
| Vibration | + |

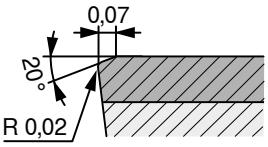
## TN/SN-007D

- Cutting edge with small 20-degree chamfer
- Chamfer blocks up small pores
- Suitable for good-quality cast aluminium
- As SN variant with rounding for additional “smearing”

TN




SN

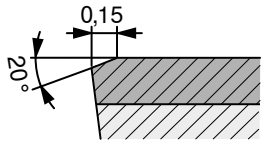



| | TN | SN |
|---|---|---|
| Edge breakage | + | + |
| Pores | + | + |
| Scratches | + | + |
| Vibration | + | + |

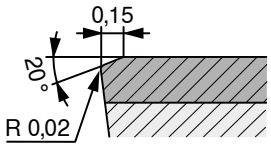
## TN/SN-015D

- Cutting edge with medium-sized 20° degree chamfer
- Chamfer blocks up medium-sized pores
- Suitable for cast aluminium of varying quality
- As SN variant with rounding for additional “smearing”

TN




SN

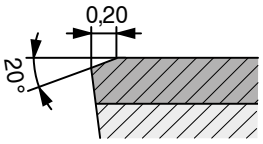



| | TN | SN |
|---|---|---|
| Edge breakage | + | ○ |
| Pores | + | + |
| Scratches | ++ | + |
| Vibration | + | + |

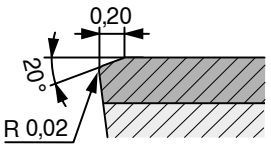
## TN/SN-020D

- Cutting edge with medium-sized 20° degree chamfer
- Chamfer blocks up medium-sized pores
- Suitable for cast aluminium of varying quality
- As SN variant with rounding for additional “smearing”

TN




SN

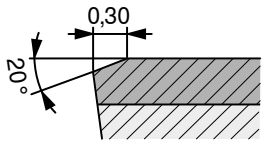



| | TN | SN |
|---|---|---|
| Edge breakage | ○ | – |
| Pores | + | ++ |
| Scratches | + | + |
| Vibration | + | ○ |

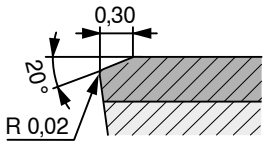
## TN/SN-030D

- Cutting edge with large 20-degree chamfer
- Chamfer blocks up large pores
- Suitable for poor quality cast aluminium and highly adhesive paint
- As SN variant with rounding for additional “smearing”

TN




SN

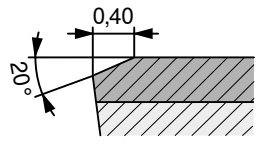



| | TN | SN |
|---|---|---|
| Edge breakage | – | – – |
| Pores | ++ | ++ |
| Scratches | + | ○ |
| Vibration | ○ | ○ |

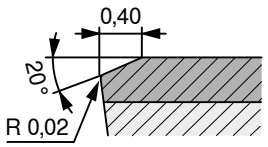
## TN/SN-040D

- Cutting edge with very large 20-degree chamfer
- Chamfer blocks up large pores
- Suitable for poor quality cast aluminium and highly adhesive paint
- As SN variant with rounding for additional “smearing”

TN




SN




| | TN | SN |
|---|---|---|
| Edge breakage | – – | – – |
| Pores | ++ | ++ |
| Scratches | ○ | – |
| Vibration | – | – – |

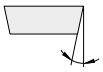
# Designation systems for indexable inserts

| V | C | U | W | 16 | 04 | 08 | S | N | - | 020D | _ | A5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | 10 | | 11 |

## 1 Insert shape

| | | |
|---|---|---|
| Rhombus | 35° | V |
| | 55° | D |
| | 75° | E |
| | 80° | C |
| | 86° | M |
| Rhomboid | 55° | K |
| | 82° | B |
| | 85° | A |
| Other shapes | 90° | L |
| | 108° | P |
| | 120° | H |
| | 135° | O |
| | – | R |
| | 90° | S |
| | 60° | T |
| | 80° | W |

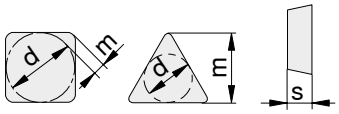
## 2 Clearance angle



| | | | |
|---|---|---|---|
| 3° | A | 25° | F |
| 5° | B | 30° | G |
| 7° | C | 0° | N |
| 15° | D | 11° | P |
| 20° | E | )* | O |

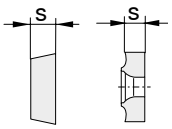
)* Clearance angles outside the standard, for which special information is required

## 3 Tolerances




| | d ± [mm] | m ± [mm] | s ± [mm] |
|---|---|---|---|
| A | 0,025 | 0,005 | 0,025 |
| F | 0,013 | 0,005 | 0,025 |
| C | 0,025 | 0,013 | 0,025 |
| H | 0,013 | 0,013 | 0,025 |
| E | 0,025 | 0,025 | 0,025 |
| G | 0,025 | 0,025 | 0,13 |
| J | 0,05-0,15* | 0,005 | 0,025 |
| K | 0,05-0,15* | 0,013 | 0,025 |
| L | 0,05-0,15* | 0,025 | 0,025 |
| M | 0,05-0,15* | 0,05-0,20 | 0,13 |
| N | 0,05-0,15* | 0,05-0,20 | 0,025 |
| U | 0,08-0,25* | 0,13-0,38 | 0,13 |

## 6 Insert thickness




| [mm] | Key figures [mm] |
|---|---|
| 1,59 | 01 |
| 2,38 | 02 |
| 3,18 | 03 |
| 3,97 | T3 |
| 4,76 | 04 |
| 5,56 | 05 |
| 6,35 | 06 |
| 7,94 | 07 |
| 9,52 | 09 |

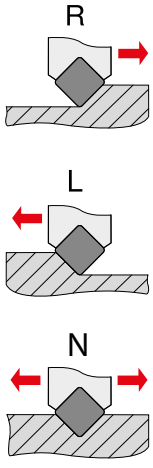
## 7 Corner radius


| [mm] | Key figures [mm] |
|---|---|
| ≤ 0,05 | 00 |
| 0,1 | 01 |
| 0,2 | 02 |
| 0,4 | 04 |
| 0,8 | 08 |
| 1,2 | 12 |
| 1,6 | 16 |
| 2,0 | 20 |
| 2,4 | 24 |
| 2,8 | 28 |
| 3,2 | 32 |

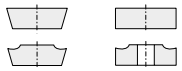
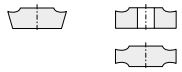
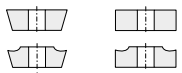
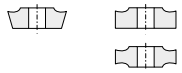
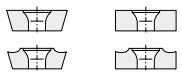
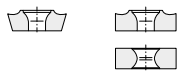
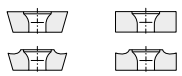
## 8 Cutting edge

| | |
|---|---|
| F | sharp |
| E | rounded |
| T | chamfered |
| S | chamfered and rounded |
| K | double-chamfered |
| P | double-chamfered and rounded |

## 9 Direction of cut



## 4 Characteristics

| | |
|---|---|
| **N** |  |
| **R** |  |
| **F** |  |
| **A** |  |
| **M, P** |  |
| **G, P** |  |
| **W** |  |
| **T** |  |
| **Q** |  |
| **U** |  |
| **B** |  |
| **H** |  |
| **C** |  |
| **J** |  |
| **X** | Special version |

## 5 Cutting length

| Type | ISO | ANSI | L [mm] | d [mm] |
|---|---|---|---|---|
| C | 06 | 2 | 6,4 | 6,35 |
| | 09 | 3 | 9,7 | 9,525 |
| | 12 | 4 | 12,9 | 12,70 |
| | 16 | 5 | 16,1 | 15,875 |
| | 19 | 6 | 19,3 | 19,05 |
| | 25 | 8 | 25,8 | 25,4 |
| | 32 | 12 | 32,24 | 31,75 |
| S | 06 | 2 | 6,35 | 6,35 |
| | 09 | 3 | 9,525 | 9,525 |
| | 12 | 4 | 12,7 | 12,7 |
| | 15 | 5 | 15,875 | 15,875 |
| | 19 | 6 | 19,05 | 19,05 |
| | 25 | 8 | 25,4 | 25,4 |
| | 31 | 10 | 31,75 | 31,75 |

| Type | ISO | ANSI | L [mm] | d [mm] |
|---|---|---|---|---|
| T | 06 | 1.2 | 6,9 | 3,97 |
| | 09 | 1.8 | 9,6 | 5,56 |
| | 11 | 2 | 11,0 | 6,35 |
| | 16 | 3 | 16,5 | 9,525 |
| | 22 | 4 | 22,0 | 12,70 |
| | 27 | 5 | 27,5 | 15,875 |
| | 33 | 6 | 33,0 | 19,05 |
| W | 06 | 3 | 6,5 | 9,525 |
| | 08 | 4 | 8,7 | 12,70 |
| | 10 | 5 | 10,9 | 15,875 |
| R | 12* | 4 | 12,7 | 12,70 |
| | 15 | 5 | 15,875 | 15,875 |

———*) inch version

## 10 Chamfer design


T / S K / P 1)

| [mm] | | | |
|---|---|---|---|
| 015 | 0,15 | **A** | 05° |
| 020 | 0,20 | **B** | 10° |
| 025 | 0,25 | **C** | 15° |
| 050 | 0,50 | **D** | 20° |
| 075 | 0,75 | **E** | 25° |
| 100 | 1,00 | **F** | 30° |

1) Two letters are assigned for double-chamfered cutting

**e.g.**
BE = Chamfer angle 1 = 10°
Chamfer angle 2 = 25°

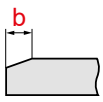
**Example 10:**

020 D

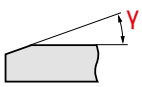
I II

| | | |
|---|---|---|
| **I** | Chamfer width mm | b = 0.20 |
| **II** | Chamfer angle | D = 20° |

**Code for angle Y**




Chamfer width

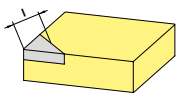



Chamfer angle

| | Chamfer width b [mm] | Angle Y |
|---|---|---|
| **A** | 0,20 | 5° |
| **B** | 0,20 | 10° |
| **C** | 0,20 | 15° |
| **D** | 0,20 | 20° |
| **E** | 0,20 | 25° |
| **F** | 0,20 | 30° |

## 11 Long cutting edge segment

single sided

**A** 

Example:

**A5** = single-sided cutting edge segment, l = 5 mm

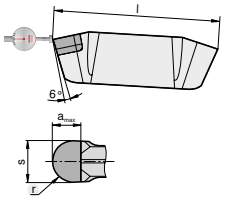
**A**... = single sided

...**3** = 3 mm
...**5** = 5 mm

# Indexable insert system

## GX16..

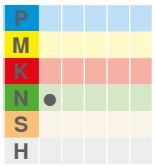
FN/EN/TN/SN

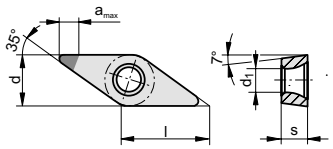



| | | P M K N S H | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | CTDPD20 | | | | l [mm] | $a_{max}$ [mm] | r [mm] |
| 2,00 | GX16-3R2.00FN_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00EN_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00TN-007D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00TN-015D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00TN-020D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00TN-030D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00TN-040D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00SN-007D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00SN-015D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00SN-020D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00SN-030D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |
| 2,00 | GX16-3R2.00SN-040D_A4 | ● | | | | 16,00 | 2,00 | 2,00 |

# VC..

FN/EN/TN/SN



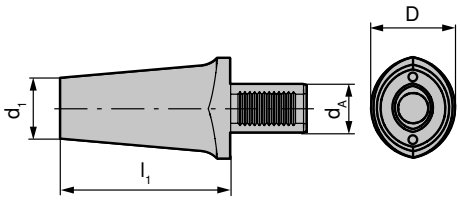




| | | CTDPD20 | l [mm] | d [mm] | s [mm] | $a_{max}$ [mm] |
|---|---|---|---|---|---|---|
| 0,80 | VCUW 160408FN_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408EN_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408TN-007D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408TN-015D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408TN-020D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408TN-030D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408TN-040D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408SN-007D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408SN-015D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408SN-020D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408SN-030D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 0,80 | VCUW 160408SN-040D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412FN_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412EN_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412TN-007D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412TN-015D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412TN-020D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412TN-030D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412TN-040D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412SN-007D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412SN-015D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412SN-020D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412SN-030D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |
| 1,20 | VCUW 160412SN-040D_A5 | ● | 16,60 | 9,52 | 4,76 | 5,00 |

# Base holders/Adapters

## OvalFlex

### Internal machining




| Type, designation | $d_A$ [mm] | $d_1$ [mm] | $l_1$ [mm] | D [mm] |
|---|---|---|---|---|
| OC50R-DIN69880-40IN60 | 40 | 50 | 60 | 83 |
| OC50R-DIN69880-50IN60 | 50 | 50 | 60 | 98 |
| OC50-DIN69880-40IN60 | 40 | 50 | 60 | 83 |
| OC50-DIN69880-50IN60 | 50 | 50 | 60 | 98 |

Spare part:
for power screw clamping – to be used for clamping from the rear

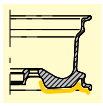
| $d_A$ [mm] | Length [mm] |  |
|---|---|---|
| 40 | 240 | OC50-KLINGE-SW8-240 |
| 50 | 360 | OC50-KLINGE-SW8-360 |

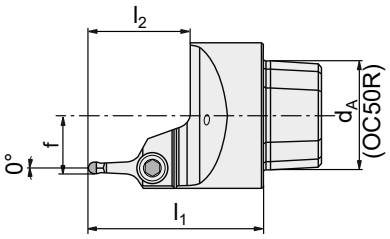
| $d_A$ [mm] |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
| 40 | 10002788/M16X1,5X6 SW8 | 10002105/M16X65 SW8 | WS-L-SW8-200 | 7730102/GREASE | O-Ring 4,3-2,40 | 10011426/TORX25T/SW5/OVAL |
| 50 | 10002788/M16X1,5X6 SW8 | 10002105/M16X65 SW8 | WS-L-SW8-200 | 7730102/GREASE | O-Ring 4,3-2,40 | 10011426/TORX25T/SW5/OVAL |

# Tool heads

## OvalFlex

### 0°



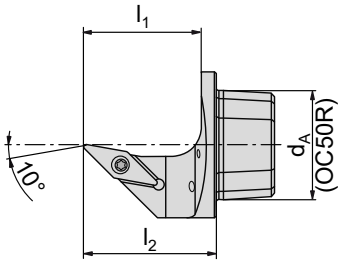



| Type, designation | L N R | $d_A$ [mm] | $l_1$ [mm] | $l_2$ [mm] | f [mm] | |
|---|---|---|---|---|---|---|
| OC50-GX16-3R2.00N00D | R | 50 | 60 | 13 | 0 | X16..R2 |
| OC50-GX16-3R2.00R00D | R | 50 | 60 | 35 | 20 | X16.. R2 |
| OC50-GX16-3R2.00L00D | R | 50 | 60 | 35 | 20 | X16.. R2 |
| OC50R-GX16-3R2.00N00D | R | 50 | 60 | 13 | 0 | X16.. R2.. |
| OC50R-GX16-3R2.00R00D | R | 50 | 60 | 35 | 20 | X16.. R2.. |
| OC50R-GX16-3R2.00L00D | R | 50 | 60 | 35 | 20 | X16.. R2.. |

| | $d_A$ [mm] | | | |
|---|---|---|---|---|
| X16.. | 50 | 354368/M6X16 | 10002788/M16X1,5X6 SW8 | |
| ...R-X16.. | 50 | 354368/M6X16 | | 11696356/OC50R-DEMOUNT SCREW |

# SV..

## 10°




| Type, designation | L N R | $d_A$ [mm] | $l_1$ [mm] | $l_2$ [mm] | f [mm] | |
|---|---|---|---|---|---|---|
| OC50-SVXCL 16 | L | 50 | 40 | 67 | 0 | VC..1604.. |
| OC50-SVXCR 16 | R | 50 | 40 | 67 | 0 | VC..1604.. |
| OC50-SVXCN 16 | N | 50 | 26 | 67 | 0 | VC..1604.. |
| OC50R-SVXCL 16 | L | 50 | 40 | 67 | 0 | VC..1604.. |
| OC50R-SVXCR 16 | R | 50 | 40 | 67 | 0 | VC..1604.. |
| OC50R-SVXCN 16 | N | 50 | 26 | 67 | 0 | VC..1604.. |

| | $d_A$ [mm] | | | |
|---|---|---|---|---|
| VC..1604.. | 50 | 7815102/M3,5X11,0/T15 | 7883301/KOMBI T15 | |
| ...R...VC..1604.. | 50 | 7815102/M3,5X11,0/T15 | 7883301/KOMBI T15 | 11696356/OC50R-DEMOUNT SCREW |

# Success story

## SITUATION

| | |
|---|---|
| **Application** | Turning |
| **Workpiece** | Aluminium wheel |
| **Material** | AlSi7 |
| **Properties/Hardness** | – |
| **Machine** | Doosan AW560 |

## COMPETITION

| | |
|---|---|
| **Tool** | SO turning tool |
| **Indexable insert** | VCUW 160408... |
| **Grade** | ? |

## PROBLEM/CRITERIA

- ▲ Varying finishes
- ▲ Poor service life
- ▲ Chipped paint

## CERATIZIT

| | |
|---|---|
| **Tool** | SO turning tool |
| **Indexable insert** | VCUW 160408TN007D_A5 |
| **Grade** | CTDPD20 |

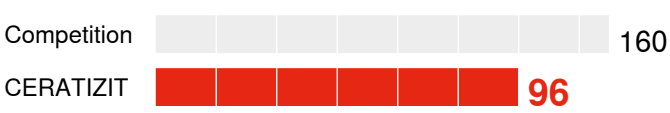
## RESULT

| | Competition | CERATIZIT |
|---|---|---|
| **n min$^{-1}$** | 1600 | 1600 |
| **$a_p$ [mm]** | 0.5 mm roughing, 0.04 mm finishing | 0.5 mm roughing, 0.04 mm finishing |
| **f [mm]** | 0.1 mm roughing, 0.2 mm finishing | 0.18 mm roughing, 0.2 mm finishing |
| **Cooling** | MMS | MMS |
| **Cuts** | 1 / 2 | **1 / 1** |

## RESULT / CUSTOMER BENEFIT

- ▲ Time saving approx. 30%
- ▲ Consistently better surface
- ▲ Reduced cuts

## CUTS/TIME

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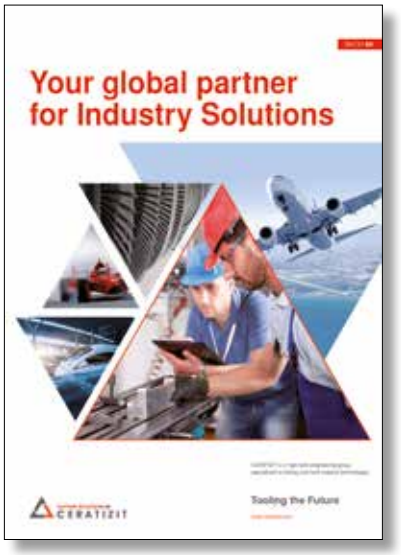


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# Notes

# Notes

# Notes

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