



# GENERAL CATALOGUE

SOLID CARBIDE CUTTING TOOLS | METRIC



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# A LEGACY OF **PRECISION**

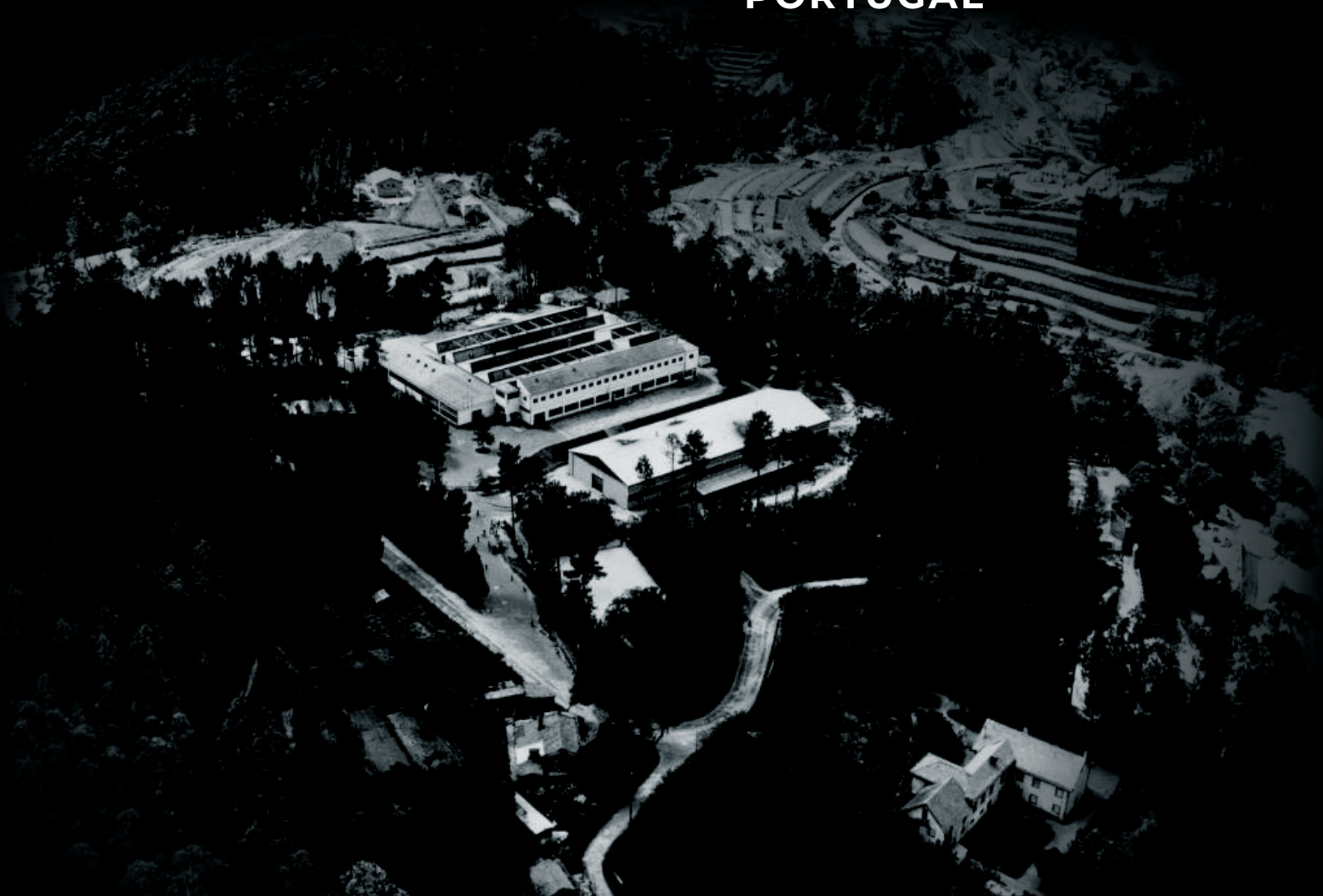
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METALWORKING.

Founded in 1916, Palbit began with deep roots in mining and evolved into a global manufacturer of carbide tooling solutions.

Driven by continuous innovation and a commitment to excellence, we transform industrial challenges into reliable solutions for customers across automotive, aerospace, mould & die, general engineering and many other sectors.

founded in  
**1916**

headquarters  
**Palhal,**  
**PORTUGAL**





# TODAY, WE ARE MORE THAN MANUFACTURERS

WE ARE ENGINEERS, INNOVATORS AND TRUSTED PARTNERS  
DEDICATED TO IMPROVING INDUSTRIAL PERFORMANCE WORLDWIDE.

100+

Years of  
Expertise

90%+

Production  
Exported

70+

Countries  
Worldwide

5

Continents  
Reached

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GLOBAL NETWORK.



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## MORE THAN TOOLS, A PARTNER IN PERFORMANCE.

We combine technical knowledge, manufacturing excellence and a customer-focused approach to help manufacturers achieve greater efficiency, reliability and long-term success.



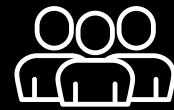
### 100+ YEARS OF EXPERTISE

More than a century of experience in carbide tool solutions and continuous evolution.



### VERTICAL INTEGRATION

Full control of the production chain ensures consistent quality and reliability.



### ENGINEERING PARTNERSHIP

We work alongside you to understand challenges and co-create solutions.



### CUSTOMIZED SOLUTIONS

Tailor-made products engineered to meet your specific applications.



### APPLICATION ENGINEERING

Technical expertise focused on optimizing machining processes and application performance.



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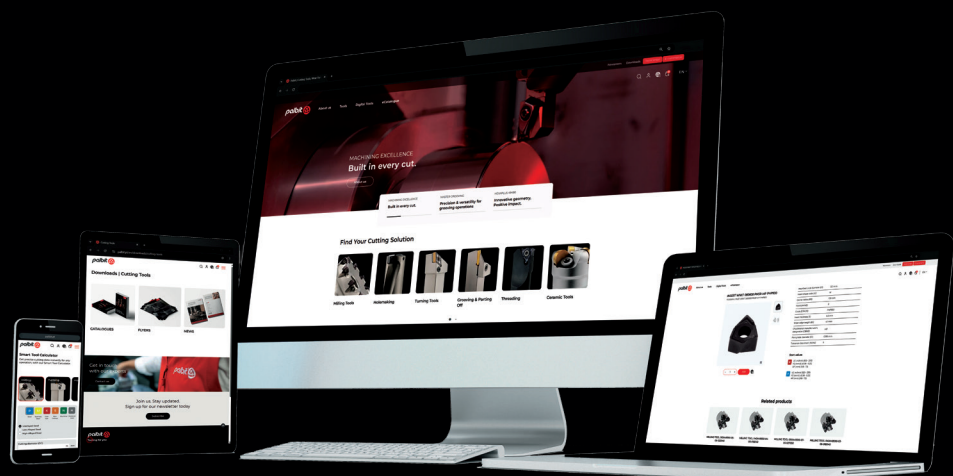
### WEBSITE

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### TECHCENTER

Application knowledge  
and machining expertise  
in one place.





# INDEX



CE

SCE

SCD



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**SOLID CARBIDE END MILLS**

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**SOLID CARBIDE DRILLS**

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# CERAMIC END MILLS



# CERAMIC END MILLS

## **1 CERABOOST CR42SS**

- > Suitable for machining **S**
- > See page 10





Short



6 - 8



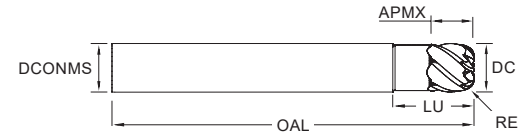
Helix 42°



Corner radius



< 45 HRC



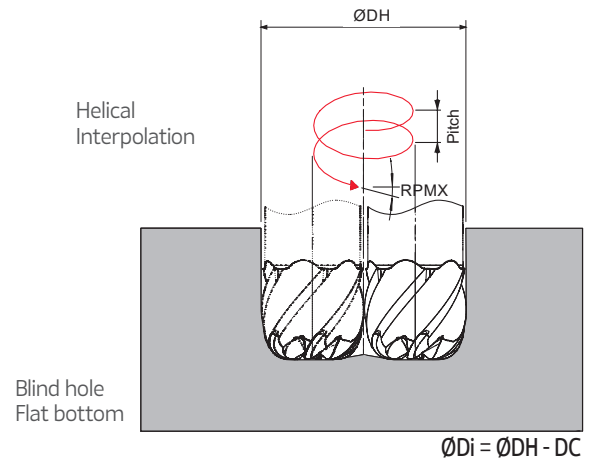
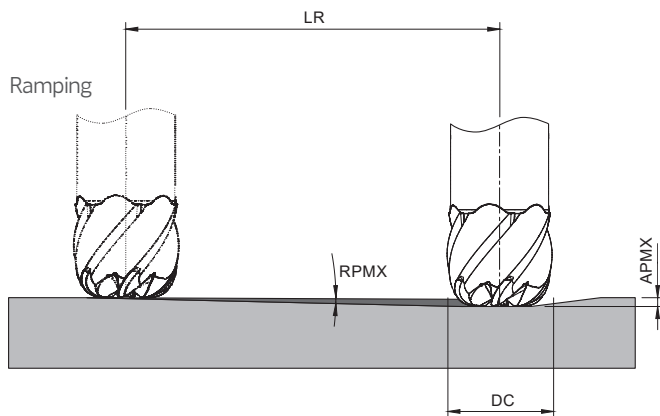
| (1) Order code   | (2) Grade code                        |     | 1J     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |      |     |
|------------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|------|-----|
|                  | Reference<br>Referência<br>Referencia | NOF |        | DC                                        | DCONMS | APMX | RE   | LU   | OAL |
| HA (Cylindrical) |                                       |     | PCN010 |                                           |        |      |      |      |     |
| 1182588          | CR42SS 6 060 045 R200                 | 6   | ⊗      | 6                                         | 6      | 4,5  | 2,00 | 10,5 | 60  |
| 1182589          | CR42SS 6 080 065 R200                 | 6   | ⊗      | 8                                         | 8      | 6,5  | 2,00 | 12,5 | 60  |
| 1182590          | CR42SS 6 100 065 R200                 | 6   | ⊗      | 10                                        | 10     | 6,5  | 2,00 | 12,5 | 65  |
| 1182591          | CR42SS 6 120 090 R200                 | 6   | ⊗      | 12                                        | 12     | 9,0  | 2,00 | 15,0 | 70  |
| 1182592          | CR42SS 8 160 140 R200                 | 8   | ⊗      | 16                                        | 16     | 14,0 | 2,00 | 20,0 | 90  |
| 1182748          | CR42SS 8 200 140 R200                 | 8   | ○      | 20                                        | 20     | 14,0 | 2,00 | 20,0 | 93  |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RAMPING AND HELICAL INTERPOLATION

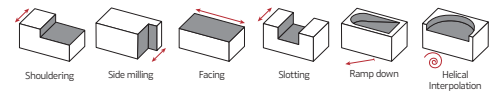
Descida em rampa e interpolação helicoidal | Bajada en rampa e interpolación circular



| DC | RPMX | Ramping |        | Helical Interpolation |        |                |               |
|----|------|---------|--------|-----------------------|--------|----------------|---------------|
|    |      | APMX    | Min LR | ØDHmin                | ØDHmax | Max Pitch/Rev. | Max Angle (°) |
| 6  | 1,5  | 0,9     | 34,4   | 8,0                   | -      | 0,1            | 0,9           |
| 8  | 1,5  | 1,2     | 45,8   | 10,7                  | 12,0   | 0,2            | 0,5           |
| 10 | 1,5  | 1,5     | 57,3   | 13,3                  | 16,0   | 0,2            | 1,0           |
| 12 | 1,5  | 1,8     | 68,7   | 16,0                  | 20,0   | 0,3            | 0,7           |
| 16 | 1,5  | 2,4     | 91,7   | 21,3                  | 24,0   | 0,2            | 1,1           |
| 20 | 1,5  | 3,0     | 114,6  | 26,7                  | 32,0   | 0,5            | 0,8           |
|    |      |         |        |                       | 40,0   | 1,0            | 1,1           |
|    |      |         |        |                       |        | 1,3            | 1,3           |
|    |      |         |        |                       |        |                | 1,2           |

Note: During helical interpolation do not exceed APMX.





## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

|     |     |                       |         |            | ae / DC = 10% |           |           |           |           |           |
|-----|-----|-----------------------|---------|------------|---------------|-----------|-----------|-----------|-----------|-----------|
| ISO | PSM | Material              | HB      | Vc (m/min) | fz (mm/t)     |           |           |           |           |           |
|     |     |                       |         |            | 6             | 8         | 10        | 12        | 16        | 20        |
| S   | 11  | Ni-based super alloys | 200-450 | 500-750    | 0,02-0,04     | 0,02-0,04 | 0,02-0,06 | 0,03-0,06 | 0,03-0,06 | 0,04-0,08 |

|     |     |                       |         | ae / DC = 100% |           |      |      |      |      |      |         |
|-----|-----|-----------------------|---------|----------------|-----------|------|------|------|------|------|---------|
| ISO | PSM | Material              | HB      | Vc (m/min)     | fz (mm/t) |      |      |      |      |      | APMX    |
|     |     |                       |         |                | 6         | 8    | 10   | 12   | 16   | 20   |         |
| S   | 11  | Ni-based super alloys | 200-450 | 350-525        | 0,02      | 0,02 | 0,03 | 0,03 | 0,03 | 0,04 | 0,15xDC |

| BEST PRACTICES   |                                                                                                                                                                                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cutting speed    | Maintaining a high cutting speed allows the cutting tool to minimize wear                                                                                                                                                 |
| Coolant          | It is recommended not to use coolant or air blowing to prevent thermal cracking. Air blowing should only be used when superior chip evacuation is necessary.                                                              |
| Toolholder       | A hydraulic chuck or precision milling chuck is highly recommended to ensure stable machining under the high temperatures generated during application. The heating chuck is disabled.                                    |
| Milling Strategy | Climb milling is highly recommended due to the characteristics of the application. Conventional milling can result in accelerated wear of the cutting edge and may affect the hardened surface of the workpiece material. |
| Finishing        | A finishing allowance of at least 0,3 mm is recommended.                                                                                                                                                                  |
| Built-up edge    | Do not manually remove any built-up edge, as this may damage the cutting edge.                                                                                                                                            |

## CERAMIC GRADES Graus cerâmicos | Calidades cerámicas



**NEW**  
**PCN010**  
S05-S20

A ceramic substrate with excellent wear resistance for machining superalloys with high cutting speeds and high material removal rates.





# SOLID CARBIDE END MILLS



# SOLID CARBIDE END MILLS

## 1 PCD TIPPED END MILLS

> See page 14

## 2 CHOOSE BY MATERIAL

> See page 20

## 3 CHOOSE BY APPLICATION

> See page 42

## 4 GENERAL END MILLS

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## 5 INTEG GRADES

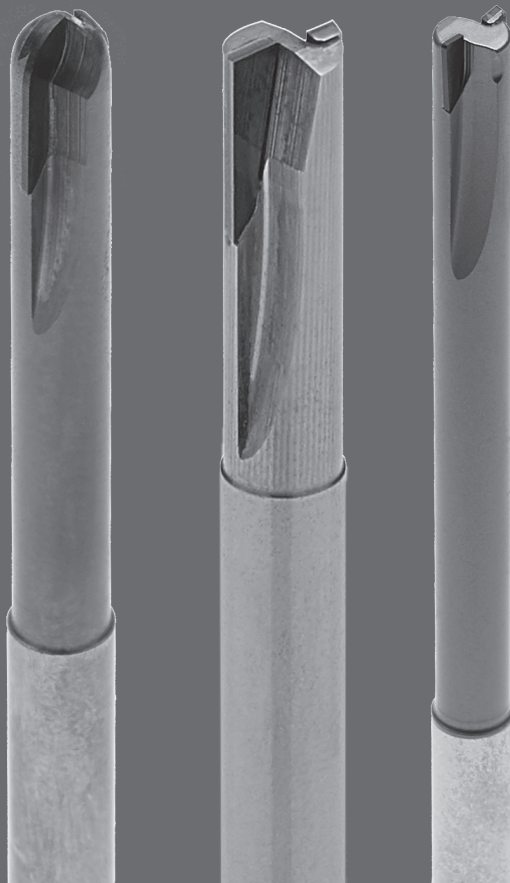
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## 6 TECHNICAL GUIDEBOOK

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END MILLS

# PCD TIPPED



PCD end mills are brazed-tipped tools specifically designed for non-ferrous applications. PCD withstands abrasion wear, significantly prolonging tool life. PCD end mills operate at higher speeds than traditional carbide end mills, resulting in improved surface finish and extended tool life.

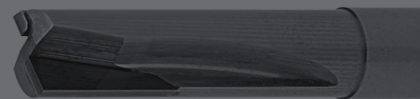
Fresas de topo PCD são ferramentas com ponta brasada especificamente projetadas para aplicações não ferrosas. O PCD suporta desgaste por abrasão, prolongando significativamente a vida útil da ferramenta. As fresas de topo PCD operam em velocidades mais altas do que as fresas de metal duro integral de topo tradicionais, resultando em melhor acabamento de superfície e vida útil estendida.

Las fresas de punta PCD son herramientas con punta soldada diseñadas especificamente para aplicaciones no ferrosas. El PCD soporta el desgaste por abrasión, prolongando significativamente la vida útil de la herramienta. Las fresas de punta PCD operan a velocidades más altas que las fresas de punta de carburo tradicionales, lo que resulta en un mejor acabado superficial y una vida útil prolongada.



## STRAIGHT EDGE > page 17

- > From DC 4mm to 16mm  
De DC 4mm a 16mm | Desde DC 4mm hasta 16mm
- > 2 or 3 cutting edges  
2 ou 3 arestas de corte | 2 o 3 filos de corte
- > Flat top geometry  
Disponível com geometria em topo raso | Disponible con geometría en topo plano



## BULL NOSE > page 18

- > From DC 3mm to 12mm  
De DC 3mm a 12mm | Desde DC 3mm hasta 12mm
- > 1 or 2 cutting edges  
1 ou 2 arestas de corte | 1 o 2 filos de corte
- > 5° dish angle  
Ângulo de topo de 5° | Ángulo de la punta de 5°



## BALL NOSE > page 19

- > From DC 3mm to 12mm  
De DC 3mm a 12mm | Desde DC 3mm hasta 12mm
- > 1 or 2 cutting edges  
1 ou 2 arestas de corte | 1 o 2 filos de corte
- > Spheric geometry  
Disponível com geometria esférica | Disponible con geometría esférica



# CODIFICATION SYSTEM FOR PCD TIPPED END MILLS

Sistema de codificação para fresas de metal duro com pontas de PCD | Sistema de codificación para fresas de carburo con puntas de PCD

Straight Flute example:

| D | S | N | S | 2 | 050 | 080 | 010 | 060 |
|---|---|---|---|---|-----|-----|-----|-----|
| 1 | 2 | 3 | 4 | 5 | 6   | 7   | 8   | 9   |

| 1 - Tool type            |
|--------------------------|
| D - Diamond (PCD tipped) |

| 2 - Design                    |
|-------------------------------|
| B - Ball nose<br>S - Straight |

| 3 - Application           |
|---------------------------|
| N - Non-ferrous materials |

| 4 - Length of Shank                                           |
|---------------------------------------------------------------|
| S - Short length<br>L - Long length<br>XL - Extra long length |

| 5 - Flutes number (NOF)              |
|--------------------------------------|
| Example: NOF = 1 ; NOF = 2 ; NOF = 3 |

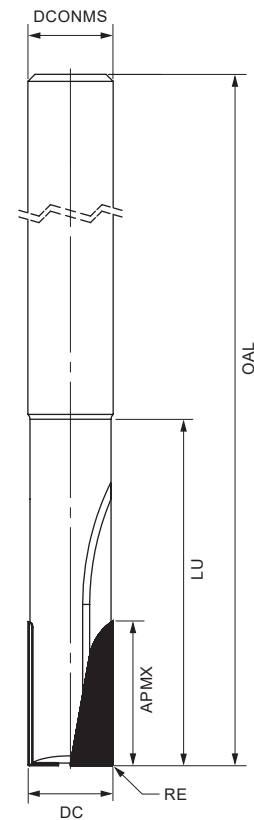
| 6 - Cutting diameter (DC)             |
|---------------------------------------|
| Example: 120 = 12,0 mm ; 008 = 0,8 mm |

| 7 - Max cutting depth<br>(APMX - on straight flute solid carbide) |
|-------------------------------------------------------------------|
| 060 = 6 mm ; 080 = 8 mm                                           |

| 8 - Corner radius (Suppressed when it doesn't exist) |
|------------------------------------------------------|
| R... Example: R150 = 1,5 mm ; R015 = 0,15 mm         |

| 9 - Shank diameter (only on straight flute solid carbide) |
|-----------------------------------------------------------|
| Example: 060 = 6 mm                                       |

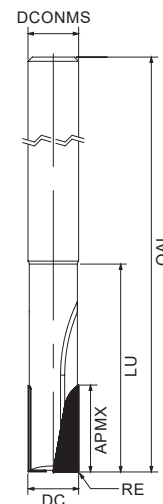
Straight Flute  
technical drawing example



|        |                                 |
|--------|---------------------------------|
| DC     | Tool diameter                   |
| DCONMS | Shank diameter                  |
| OAL    | Overall length                  |
| LU     | Neck length                     |
| APMX   | Tip length                      |
| RE     | Corner form (radius or chamfer) |



# HARDMILL STRAIGHT EDGE



|                              |                                       |     | N   | Dimensions   Dimensões   Dimensiones (mm) |        |     |      |      |      |
|------------------------------|---------------------------------------|-----|-----|-------------------------------------------|--------|-----|------|------|------|
|                              | <sup>(2)</sup> Grade code             |     | PCD |                                           |        |     |      |      |      |
| <sup>(1)</sup> Geometry code | Reference<br>Referência<br>Referencia | NOF | D6  |                                           |        |     |      |      |      |
|                              |                                       |     |     | DC                                        | DCONMS | OAL | LU   | APMX | RE   |
| 1180011                      | DSNS 2 040 060 010 060                | 2   | ⊗   | 4                                         | 6      | 51  | 14,3 | 6    | 0,10 |
| 1180012                      | DSNS 2 050 080 010 060                | 2   | ⊗   | 5                                         | 6      | 51  | 15   | 8    | 0,10 |
| 1180006                      | DSNS 2 060 080 010 060                | 2   | ⊗   | 6                                         | 6      | 57  | 26   | 8    | 0,10 |
| 1180013                      | DSNS 2 080 080 010 080                | 2   | ⊗   | 8                                         | 8      | 63  | 27   | 8    | 0,10 |
| 1180014                      | DSNS 2 080 120 010 080                | 2   | ⊗   | 8                                         | 8      | 63  | 28   | 12   | 0,10 |
| 1180015                      | DSNS 2 100 080 010 100                | 2   | ⊗   | 10                                        | 10     | 72  | 33   | 8    | 0,10 |
| 1180016                      | DSNS 2 100 160 010 100                | 2   | ⊗   | 10                                        | 10     | 72  | 33   | 16   | 0,10 |
| 1180017                      | DSNS 2 120 080 010 120                | 2   | ⊗   | 12                                        | 12     | 83  | 38   | 8    | 0,10 |
| 1180018                      | DSNS 2 120 160 010 120                | 2   | ⊗   | 12                                        | 12     | 83  | 38   | 16   | 0,10 |
| 1180019                      | DSNS 3 140 080 010 140                | 3   | ⊗   | 14                                        | 14     | 83  | 38   | 8    | 0,10 |
| 1180020                      | DSNS 3 140 160 010 140                | 3   | ⊗   | 14                                        | 14     | 83  | 38   | 16   | 0,10 |
| 1180021                      | DSNS 3 160 120 010 160                | 3   | ⊗   | 16                                        | 16     | 100 | 52   | 12   | 0,10 |
| 1180022                      | DSNS 3 160 200 010 160                | 3   | ⊗   | 16                                        | 16     | 100 | 52   | 20   | 0,10 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

order code = (1) Geometry code + (2) Grade Code

## NON-FERROUS MATERIALS Materials não ferrosos | Materiales no ferrosos

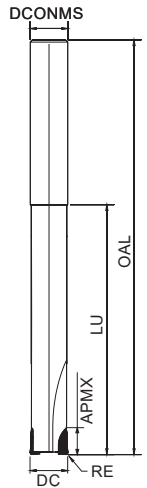
| ISO | Workpiece Material   | Vc (m/min) |      | fz (mm/t) |      | Coolant        |
|-----|----------------------|------------|------|-----------|------|----------------|
|     |                      | min        | max  | min       | max  |                |
| N   | Aluminium <6%Si      | 200        | 6000 | 0,05      | 0,30 | Emulsion / MQL |
|     | Aluminium <12%Si     | 200        | 4000 | 0,05      | 0,25 |                |
|     | Aluminium >12%Si     | 200        | 2000 | 0,05      | 0,20 |                |
|     | Cooper/Cooper Alloys | 250        | 3000 | 0,03      | 0,30 |                |

## SYNTHETICS MATERIALS Materials sintéticos | Materiales sintéticos

| ISO | Workpiece Material         | Vc (m/min) |      | fz (mm/t) |      | Coolant        |
|-----|----------------------------|------------|------|-----------|------|----------------|
|     |                            | min        | max  | min       | max  |                |
| N   | Graphit                    | 150        | 2500 | 0,05      | 0,40 | Dry / Air      |
|     | GFRP, CFRP                 | 200        | 3000 | 0,05      | 0,40 | Dry / Air      |
|     | Plastics (Termo/Duroplast) | 100        | 2500 | 0,05      | 0,30 | Emulsion / MQL |
|     | Acrylic (PMMA)             | 100        | 1200 | 0,01      | 0,25 | Emulsion / MQL |
|     | Laminate                   | 100        | 1200 | 0,02      | 0,50 | Dry / Air      |

These recommended parameters are only approximate values. It can be necessary to adjust them regarding to the specific machining operation.

## HARDMILL BULL NOSE



|                              |                                       |     | N      | Dimensions   Dimensões   Dimensiones (mm) |        |     |     |      |      |  |
|------------------------------|---------------------------------------|-----|--------|-------------------------------------------|--------|-----|-----|------|------|--|
|                              | <sup>(2)</sup> Grade code             |     | PCD    |                                           |        |     |     |      |      |  |
| <sup>(1)</sup> Geometry code | Reference<br>Referência<br>Referencia | NOF | PDP410 | DC                                        | DCONMS | OAL | LU  | APMX | RE   |  |
| 1180073                      | DSNS 1 030 050 030 040                | 1   |        | 3                                         | 4      | 60  | 30  | 5    | 0,30 |  |
| 1180075                      | DSNL 2 040 050 030 040                | 2   |        | 4                                         | 4      | 75  | 45  | 5    | 0,30 |  |
| 1180076                      | DSNL 2 060 060 030 060                | 2   |        | 6                                         | 6      | 100 | 60  | 6    | 0,30 |  |
| 1180077                      | DSNL 2 080 060 030 080                | 2   |        | 8                                         | 8      | 125 | 80  | 6    | 0,30 |  |
| 1180074                      | DSNL 2 100 060 050 100                | 2   |        | 10                                        | 10     | 150 | 100 | 6    | 0,30 |  |
| 1180078                      | DSNL 2 120 070 050 120                | 2   |        | 12                                        | 12     | 150 | 100 | 7    | 0,30 |  |

Stock item | Produto de stock | Itens de stock

Available under request | Disponível sobre consulta | Disponible bajo consulta

Order code = (1) Geometry Code + (2) Grade Code

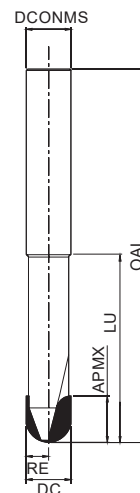
| Material Group                      | Correction factor | V <sub>C</sub> (m/min) |
|-------------------------------------|-------------------|------------------------|
| Aluminium cast alloys 5% < Si ≤ 12% | 1,6               | 790-1000               |
| Aluminium cast alloys 12% < Si      | 1,5               | 790-1000               |
| Fibre-reinforced synthetics         | 1,0               | 400-500                |
| Graphite                            | 1,0               | 700-850                |

| DC | <br>$a_e = 0,2 \times DC$<br>$APMX = 0,1 \times DC$ | <br>$APMX = 0,05 \times DC$ |
|----|-----------------------------------------------------|-----------------------------|
|    | f <sub>z</sub> (mm/t)                               | f <sub>z</sub> (mm/t)       |
| 3  | 0,020                                               | 0,022                       |
| 4  | 0,025                                               | 0,028                       |
| 6  | 0,035                                               | 0,040                       |
| 8  | 0,050                                               | 0,055                       |
| 10 | 0,060                                               | 0,070                       |
| 12 | 0,075                                               | 0,078                       |

Please note that the value f<sub>z</sub> from the table above must be multiplied with the corresponding correction factor.



# HARDMILL BALL NOSE



|                                       |                        |     | N      | Dimensions   Dimensões   Dimensiones (mm) |        |     |    |      |      |
|---------------------------------------|------------------------|-----|--------|-------------------------------------------|--------|-----|----|------|------|
|                                       |                        |     | PCD    |                                           |        |     |    |      |      |
| (1) Geometry code                     | (2) Grade code         | NOF | D6     |                                           |        |     |    |      |      |
| Reference<br>Referência<br>Referencia |                        |     | PDP410 | DC                                        | DCONMS | OAL | LU | APMX | RE   |
| 1180079                               | DBNS 1 030 050 150 060 | 1   | ⊗      | 3                                         | 3      | 60  | 30 | 5    | 1,50 |
| 1180080                               | DBNS 1 040 100 200 040 | 1   | ⊗      | 4                                         | 4      | 60  | 30 | 10   | 2,00 |
| 1180081                               | DBNS 2 060 100 300 060 | 2   | ⊗      | 6                                         | 6      | 80  | 40 | 10   | 3,00 |
| 1180082                               | DBNS 2 080 100 400 080 | 2   | ⊗      | 8                                         | 8      | 80  | 40 | 10   | 4,00 |
| 1180083                               | DBNS 2 100 100 500 100 | 2   | ⊗      | 10                                        | 10     | 80  | 40 | 10   | 5,00 |
| 1180084                               | DBNS 2 120 100 600 120 | 2   | ○      | 12                                        | 12     | 100 | 60 | 10   | 6,00 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Order code = (1) Geometry Code + (2) Grade Code

| Material Group                      | Correction factor | V <sub>C</sub> (m/min) |
|-------------------------------------|-------------------|------------------------|
| Aluminium cast alloys 5% < Si ≤ 12% | 1,6               | 790-1000               |
| Aluminium cast alloys 12% < Si      | 1,5               | 790-1000               |
| Fibre-reinforced synthetics         | 1,0               | 400-500                |
| Graphite                            | 1,0               | 700-850                |

| DC | <br>$a_e = 0,2 \times DC$<br>$APMX = 0,1 \times DC$ | <br>$APMX = 0,05 \times DC$ |
|----|-----------------------------------------------------|-----------------------------|
|    | f <sub>z</sub> (mm/t)                               | f <sub>z</sub> (mm/t)       |
| 3  | 0,020                                               | 0,022                       |
| 4  | 0,025                                               | 0,028                       |
| 6  | 0,035                                               | 0,040                       |
| 8  | 0,050                                               | 0,055                       |
| 10 | 0,060                                               | 0,070                       |
| 12 | 0,075                                               | 0,078                       |

Please note that the value f<sub>z</sub> from the table above must be multiplied with the corresponding correction factor.

# CHOOSE BY **MATERIAL**



A high-performance solid carbide end mills designed for specific workpiece materials, offering improved productivity, extended tool life, and providing high process security for demanding parts production in industries such as aerospace, automotive, mold and die, and power generation.

Fresas de metal duro integral de alto desempenho projetadas para materiais de peças específicas, oferecendo produtividade aprimorada, vida útil estendida e alta segurança de processo para produção de peças exigentes em indústrias como aeroespacial, automóvel, moldes e matrizes e geração de energia.

Fresas de carburo integral de alto rendimiento diseñadas para materiales específicos de piezas, ofreciendo productividad mejorada, vida útil prolongada y alta seguridad del proceso para la producción de piezas exigentes en industrias como aeroespacial, automotriz, moldes y matrices, y generación de energía.



## STEEL INTEG > page 26

- > Steel specialized end mills  
Fresas especiais para aço | Fresas especiales para acero
- > From DC 2mm to 25mm  
De DC 2mm a 25mm | Desde DC 2mm hasta 25mm
- > Chamfer or radius geometry  
Disponível com geometria em chanfro ou raio | Disponible con geometría en chaflán o radio



## INOX INTEG > page 29

- > Stainless steel specialized end mills  
Fresas especiais para aço inox | Fresas especiales para acero inoxidable
- > From DC 2mm to 20mm  
De DC 2mm a 20mm | Desde DC 2mm hasta 20mm
- > Chamfer or radius geometry  
Disponível com geometria em chanfro ou raio | Disponible con geometría en chaflán o radio



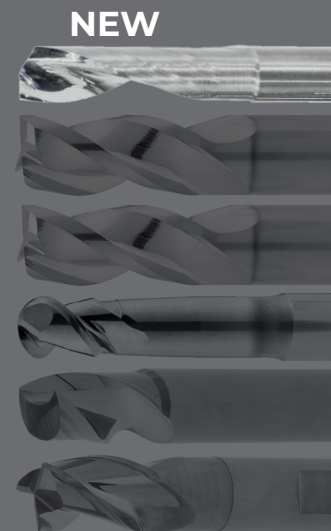
## NEW CFRP INTEG > page 32

- > Carbon fiber specialized end mills  
Fresas especiais para fibras de carbono | Fresas especiales para fibra de carbono
- > From DC 6mm to 12mm  
De DC 6mm a 12mm | Desde DC 6mm hasta 12mm
- > Flat top geometry geometry  
Disponível com geometria de topo raso | Disponible con geometría de superficie plana



## AL INTEG > page 33

- > Aluminium specialized end mills  
Fresas especiais para alumínio | Fresas especiales para aluminio
- > From DC 2mm to 20mm  
De DC 2mm a 20mm | Desde DC 2mm hasta 20mm
- > Chamfer, radius, ball nose or flat top geometry  
Disponível com geometria em chanfro, raio, topo redondo ou topo raso | Disponible con geometría en chaflán, radio, topo redondeado o plano



## HARD INTEG > page 39

- > Hardened steel specialized end mills  
Fresas especiais para aço | Fresas especiales para acero
- > From DC 0,2mm to 12mm  
De DC 0,2mm a 12mm | Desde DC 0,2mm hasta 12mm
- > Ball nose or flat top geometry  
Disponível com geometria redonda ou topo raso | Disponible con geometría redondeada o plano



# CODIFICATION SYSTEM FOR SOLID CARBIDE END MILLS

Sistema de codificação para fresas de metal duro para acabamento | Sistema de codificación para fresas de carburo para acabado

Integral Solid Carbide  
example:

|          |          |           |          |          |          |          |            |           |              |           |           |          |
|----------|----------|-----------|----------|----------|----------|----------|------------|-----------|--------------|-----------|-----------|----------|
| <b>H</b> | <b>C</b> | <b>35</b> | <b>-</b> | <b>P</b> | <b>S</b> | <b>4</b> | <b>090</b> | <b>22</b> | <b>XR100</b> | <b>90</b> | <b>-</b>  | <b>W</b> |
| <b>1</b> | <b>2</b> | <b>3</b>  | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b>   | <b>9</b>  | <b>10</b>    | <b>11</b> | <b>12</b> |          |

## 1 - Tool type

H - Solid carbide end mill (Hard metal)

## 2 - Design

F - Square form (Flat top)  
R - Square form with corner radius  
C - Square form with corner chamfer  
B - Ball nose  
CH - Conical Top  
XC - Conical Segment  
XT - Tangential Segment  
XR - Special Radius  
RO - Rougher

## 3 - Helix Angle (Suppressed when it is 90°)

... - Degree of helix rounded to nearest 5 degree

## 4 - Machining Method (Suppressed when it doesn't exist)

HF - High Feed                      HP - High Performance  
TS - Trochoidal milling

## 5 - Application

A - Aluminium                      S - Stainless steel  
G - General application              H - Hard materials  
F - Finishing                      MIN - Micro milling  
P - Steel

## 6 - Length of Shank

S - Short length  
L - Long length  
XL - Extra long length

## 7 - Flutes number (NOF)

Example: NOF = 1 ; NOF = 2 ; NOF = 3

## 8 - Cutting diameter (DC)

Example: 120 = 12,0 mm ; 008 = 0,8 mm

## 9 - Max cutting depth (APMX)

Example for  $APMX \geq 1$  mm: 04 = 4 mm ; 06 = 6 mm  
Example for  $APMX < 1$  mm: 002 = 0,2 mm ; 005 = 0,5 mm

## 10 - Shank diameter (only on straight flute solid carbide)

Example for corner radius: R150 = 1,5 mm ; R015 = 0,15 mm  
Example for special radius: XR100 = 1,0 mm  
Example for conical segment: 18RM120 -  $\alpha/2 = 18^\circ$ , RM = 1200 mm  
Example for tangential segment: RM090 - RM = 90 mm

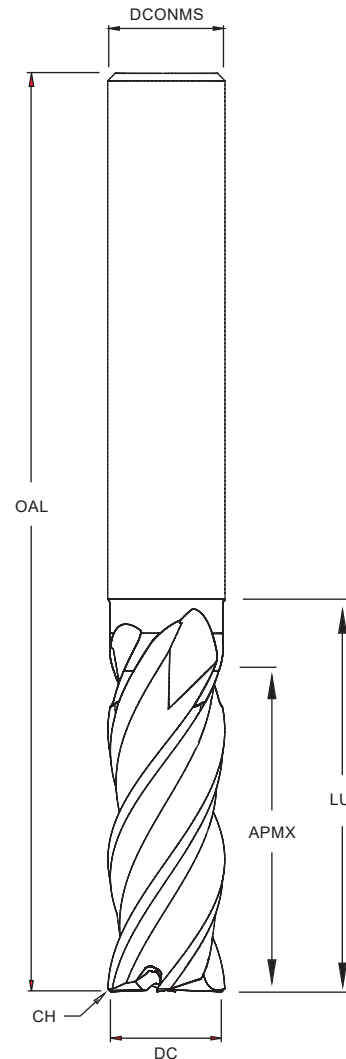
## 11 - Angle (Only for chamfering end mills)

Example: 90 = 90°

## 12 - Shank (Suppressed when cylindrical)

W - Weldon

Integral Solid Carbide  
technical drawing example





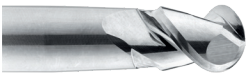
# SELECTION GUIDE FOR SOLID CARBIDE END MILLS

Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

|                                                                                                             | DC    | NOF | HELIX<br>ANGLE | GEOMETRY                                                                                                 | FINISHING                                                                                                                                                                                                                                                                                                                                                                                                                           | ROUGHING                                                                                                                                                                                                                                                                                                                                                                                                                                   | MATERIAL | DESCRIPTION                                 | PAGE |
|-------------------------------------------------------------------------------------------------------------|-------|-----|----------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------|------|
| <br>STEEL INTEG<br>HC35PS   | 2-25  | 4   | 35°<br>38°     | <br>Corner<br>chamfer   |                |                | PK       | Steel<br>Specialized<br>End mills           | 26   |
| <br>STEEL INTEG<br>HC35ML   | 1-20  | 4   | 35°<br>38°     | <br>Corner<br>chamfer   |                |                | PK       |                                             | 27   |
| <br>STEEL INTEG<br>HR35GL | 12-20 | 4   | 35°<br>38°     | <br>Corner<br>radius  |      |      | PMKS     |                                             | 28   |
| <br>INOX INTEG<br>HR37SS  | 2-20  | 4   | 38°<br>39°     | <br>Corner<br>radius  |      |      | M        | Stainless Steel<br>Specialized<br>End mills | 29   |
| <br>INOX INTEG<br>HC40SS  | 3-20  | 4   | 40°<br>41°     | <br>Corner<br>chamfer |      |      | M        |                                             | 30   |
| <br>INOX INTEG<br>HRO40SS | 3-20  | 4   | 39°<br>41°     | <br>Corner<br>chamfer |      |      | M        |                                             | 31   |

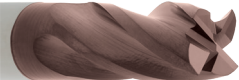
## SELECTION GUIDE FOR SOLID CARBIDE END MILLS

Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

|                                                                                                                   | DC   | NOF | HELIX<br>ANGLE | GEOMETRY                                                                                                 | FINISHING                                                                           | ROUGHING                                                                             | MATERIAL | DESCRIPTION                              | PAGE |
|-------------------------------------------------------------------------------------------------------------------|------|-----|----------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------|------------------------------------------|------|
| <br>CFRP INTEG<br>HF17TCFS<br>NEW | 6-12 | 10  | 17°            | <br>Square              |    |    | N        | Carbon Fiber<br>Specialized<br>End mills | 32   |
| <br>AL INTEG<br>HF30CA<br>NEW     | 3-10 | 1   | 30°            | <br>Square              |    |    | N        | Aluminium<br>Specialized<br>End mills    | 33   |
| <br>AL INTEG<br>HR35HPAS          | 2-20 | 3   | 35°            | <br>Corner<br>radius    |    |    | N        |                                          | 34   |
| <br>AL INTEG<br>HF45HPAS        | 2-20 | 3   | 45°            | <br>Square            |  |  | N        |                                          | 35   |
| <br>AL INTEG<br>HB50HPAS        | 2-20 | 2   | 50°            | <br>Ball nose         |  |  | N        |                                          | 36   |
| <br>AL INTEG<br>HC38AS          | 3-20 | 3   | 38°            | <br>Corner<br>chamfer |  |  | N        |                                          | 37   |
| <br>AL INTEG<br>HF30AS          | 2-12 | 1   | 30°            | <br>Square            |  |  | N        |                                          | 38   |

SELECTION GUIDE FOR SOLID CARBIDE END MILLS

Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

|                                                                                                                   | DC      | NOF | HELIX<br>ANGLE | GEOMETRY                                                                                       | FINISHING                                                                     | ROUGHING                                                                      | MATERIAL | DESCRIPTION                                       | PAGE |
|-------------------------------------------------------------------------------------------------------------------|---------|-----|----------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------|---------------------------------------------------|------|
| <br>HARD INTEG<br>HB05HMIN<br>NEW | 0,2-6,0 | 2   | 5°             | <br>Ball nose | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | H        | Hardened<br>Materials<br>Specialized<br>End mills | 39   |
| <br>HARD INTEG<br>HF30HL          | 4-12    | 4   | 30°            | <br>Square    | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | H        |                                                   | 40   |
| <br>HARD INTEG<br>HB30HL          | 2-12    | 2   | 30°            | <br>Ball nose | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div><div></div></div> | H        |                                                   | 41   |



## STEEL INTEG Steel Specialized End mills

## HC35PS Corner chamfer



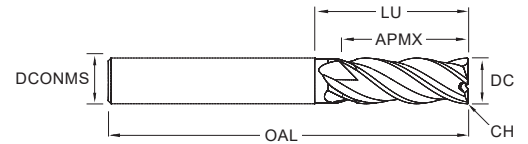
P K

45°  
Corner chamferVariable helix  
35° | 38°

Short

Reduced  
neckVariable Pitch  
4

&lt; 48 HRC



|                           |             | <sup>(2)</sup> Grade code             |     | 2A     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHU910 |                                           |        |      |      |     |    |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1182241                   | 1182240     | HC35PS 4 020 05                       | 4   | ⊗      | 2                                         | 6      | 5    | 0,08 | 45° | 8  | 57  |
| 1182242                   | 1181829     | HC35PS 4 030 08                       | 4   | ⊗      | 3                                         | 6      | 8    | 0,1  | 45° | 12 | 57  |
| 1182243                   | 1181749     | HC35PS 4 040 08                       | 4   | ⊗      | 4                                         | 6      | 8    | 0,1  | 45° | 12 | 57  |
| 1182244                   | 1181750     | HC35PS 4 050 10                       | 4   | ⊗      | 5                                         | 6      | 10   | 0,15 | 45° | 15 | 57  |
| 1182245                   | 1181751     | HC35PS 4 060 13                       | 4   | ⊗      | 6                                         | 6      | 13   | 0,2  | 45° | 21 | 57  |
| 1182246                   | 1181834     | HC35PS 4 070 19                       | 4   | ⊗      | 7                                         | 8      | 19   | 0,2  | 45° | 27 | 63  |
| 1182247                   | 1181752     | HC35PS 4 080 19                       | 4   | ⊗      | 8                                         | 8      | 19   | 0,2  | 45° | 27 | 63  |
| 1182248                   | 1181830     | HC35PS 4 090 22                       | 4   | ⊗      | 9                                         | 10     | 22   | 0,2  | 45° | 32 | 72  |
| 1182249                   | 1181753     | HC35PS 4 100 22                       | 4   | ⊗      | 10                                        | 10     | 22   | 0,2  | 45° | 32 | 72  |
| 1182250                   | 1181831     | HC35PS 4 110 26                       | 4   | ○      | 11                                        | 12     | 26   | 0,2  | 45° | 38 | 83  |
| 1182180                   | 1181828     | HC35PS 4 120 26                       | 4   | ⊗      | 12                                        | 12     | 26   | 0,2  | 45° | 38 | 83  |
| 1182251                   | 1181832     | HC35PS 4 130 26                       | 4   | ○      | 13                                        | 14     | 26   | 0,3  | 45° | 38 | 83  |
| 1182252                   | 1181754     | HC35PS 4 140 26                       | 4   | ⊗      | 14                                        | 14     | 26   | 0,3  | 45° | 38 | 83  |
| 1182253                   | 1181755     | HC35PS 4 160 32                       | 4   | ⊗      | 16                                        | 16     | 32   | 0,3  | 45° | 44 | 92  |
| 1182254                   | 1181756     | HC35PS 4 180 32                       | 4   | ⊗      | 18                                        | 18     | 32   | 0,3  | 45° | 44 | 92  |
| 1182255                   | 1181757     | HC35PS 4 200 38                       | 4   | ⊗      | 20                                        | 20     | 38   | 0,3  | 45° | 50 | 104 |
| 1182256                   | 1181833     | HC35PS 4 250 42                       | 4   | ○      | 25                                        | 25     | 42   | 0,3  | 45° | 56 | 121 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

Note: For HB (Weldon) end mills, the reference ends with "-W"

Example: "HC35PS 4 030 08-W"

## HC35ML Corner chamfer



P K



|                           |             | <sup>(2)</sup> Grade code             |     | T1     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHP920 |                                           |        |      |      |     |    |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180480                   | -           | HF35ML 4 010 03                       | 4   | ○      | 1                                         | 6      | 2,5  | -    |     | 5  | 57  |
| 1180482                   | 1180483     | HC35ML 4 020 05                       | 4   | ⊗      | 2                                         | 6      | 5    | 0,07 | 45° | 10 | 57  |
| 1180466                   | 1180467     | HC35ML 4 030 08                       | 4   | ⊗      | 3                                         | 6      | 8    | 0,15 | 45° | 15 | 57  |
| 1180137                   | 1180468     | HC35ML 4 040 11                       | 4   | ⊗      | 4                                         | 6      | 11   | 0,15 | 45° | 17 | 57  |
| 1180469                   | 1180521     | HC35ML 4 050 13                       | 4   | ⊗      | 5                                         | 6      | 13   | 0,15 | 45° | 19 | 57  |
| 1180138                   | 1180470     | HC35ML 4 060 13                       | 4   | ⊗      | 6                                         | 6      | 13   | 0,15 | 45° | 21 | 57  |
| 1180052                   | 1180471     | HC35ML 4 080 19                       | 4   | ⊗      | 8                                         | 8      | 19   | 0,15 | 45° | 27 | 63  |
| 1180053                   | 1180472     | HC35ML 4 100 22                       | 4   | ⊗      | 10                                        | 10     | 22   | 0,20 | 45° | 32 | 72  |
| 1180139                   | 1180473     | HC35ML 4 120 26                       | 4   | ⊗      | 12                                        | 12     | 26   | 0,20 | 45° | 38 | 83  |
| 1180474                   | 1180475     | HC35ML 4 140 26                       | 4   | ⊗      | 14                                        | 14     | 26   | 0,25 | 45° | 38 | 83  |
| 1180153                   | 1180476     | HC35ML 4 160 32                       | 4   | ⊗      | 16                                        | 16     | 32   | 0,35 | 45° | 44 | 92  |
| 1180477                   | 1180478     | HC35ML 4 180 32                       | 4   | ⊗      | 18                                        | 18     | 32   | 0,45 | 45° | 44 | 92  |
| 1180140                   | 1180479     | HC35ML 4 200 38                       | 4   | ⊗      | 20                                        | 20     | 38   | 0,60 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

Note: For HB (Weldon) end mills, the reference ends with "-W"  
Example: "HC35ML 4 030 08-W"

## STEEL INTEG Steel Specialized End mills

## HR35GL Corner radius



Corner radius

Variable helix  
35° | 38°

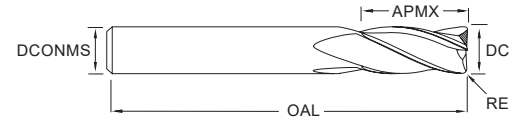
Long

Reduced  
neck

4



&lt; 52 HRC



All order codes are cylindrical shank,  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | T1<br>PHP920 | Dimensions   Dimensões   Dimensiones (mm) |        |      |    |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|----|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | RE | OAL |
| 1180042              | HR35GL 4 120 26 R100                  | 4   | ⊗            | 12                                        | 12     | 26   | 1  | 81  |
| 1180043              | HR35GL 4 120 26 R200                  | 4   | ⊗            | 12                                        | 12     | 26   | 2  | 81  |
| 1180044              | HR35GL 4 120 26 R300                  | 4   | ⊗            | 12                                        | 12     | 26   | 3  | 81  |
| 1180187              | HR35GL 4 160 24 R100                  | 4   | ⊗            | 16                                        | 16     | 24   | 1  | 100 |
| 1180188              | HR35GL 4 160 24 R200                  | 4   | ⊗            | 16                                        | 16     | 24   | 2  | 100 |
| 1180189              | HR35GL 4 200 40 R100                  | 4   | ⊗            | 20                                        | 20     | 40   | 1  | 100 |
| 1180190              | HR35GL 4 200 40 R200                  | 4   | ⊗            | 20                                        | 20     | 40   | 2  | 100 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material            | f <sub>z</sub> (mm/t) |                      |                       | V <sub>c</sub> (m/min) |                      |                       |
|-----|---------------------|-----------------------|----------------------|-----------------------|------------------------|----------------------|-----------------------|
|     |                     | a <sub>e</sub> = 25%  | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% | a <sub>e</sub> = 25%   | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% |
| P   | Unalloyed Steel     | 0,008 x DC            | 0,005 x DC           | 0,004 x DC            | 190                    | 180                  | 150                   |
|     | Low-Alloyed Steel   | 0,007 x DC            | 0,004 x DC           | 0,003 x DC            | 180                    | 160                  | 130                   |
|     | High-Alloyed Steel  | 0,006 x DC            | 0,004 x DC           | 0,003 x DC            | 160                    | 150                  | 120                   |
| K   | Malleable Cast Iron | 0,008 x DC            | 0,005 x DC           | 0,004 x DC            | 230                    | 210                  | 180                   |
|     | Grey Cast Iron      | 0,008 x DC            | 0,005 x DC           | 0,004 x DC            | 230                    | 210                  | 170                   |
|     | Nodular Cast Iron   | 0,008 x DC            | 0,004 x DC           | 0,004 x DC            | 210                    | 190                  | 160                   |

Note<sup>1</sup>: Recommended feed values for maximum a<sub>p</sub>. For reduced a<sub>p</sub>, consider increasing F<sub>z</sub> up to 25%.

Note<sup>2</sup>: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.



# INOX INTEG Stainless Steel Specialized End mills

## HR37SS Corner radius



Corner radius



Variable Helix  
38° | 39°



Short



Reduced neck

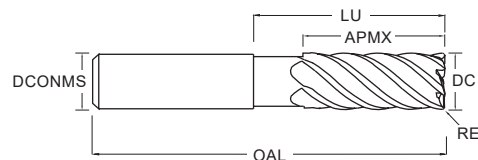


Variable Pitch  
4

M



< 42 HRC



|                  |             | (2) Grade code                        |     | 1F     | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |    |     |
|------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|-----|----|-----|
| (1) Order code   |             | Reference<br>Referência<br>Referencia | NOF | PHF920 |                                           |        |      |     |    |     |
| HA (Cylindrical) | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | RE  | LU | OAL |
| -                | 1182351     | HR37SS 4 020 05 R020-W                | 4   | ⊗      | 2                                         | 6      | 5    | 0,2 | 11 | 57  |
| -                | 1182352     | HR37SS 4 030 08 R020-W                | 4   | ⊗      | 3                                         | 6      | 8    | 0,2 | 16 | 57  |
| -                | 1182353     | HR37SS 4 040 08 R020-W                | 4   | ⊗      | 4                                         | 6      | 8    | 0,2 | 19 | 57  |
| -                | 1182354     | HR37SS 4 050 10 R020-W                | 4   | ⊗      | 5                                         | 6      | 10   | 0,2 | 21 | 57  |
| -                | 1182355     | HR37SS 4 060 13 R030-W                | 4   | ⊗      | 6                                         | 6      | 13   | 0,3 | 23 | 57  |
| -                | 1182356     | HR37SS 4 080 19 R050-W                | 4   | ⊗      | 8                                         | 8      | 19   | 0,5 | 31 | 63  |
| -                | 1181510     | HR37SS 4 100 22 R050-W                | 4   | ⊗      | 10                                        | 10     | 22   | 0,5 | 33 | 72  |
| -                | 1182357     | HR37SS 4 120 26 R100-W                | 4   | ⊗      | 12                                        | 12     | 26   | 1,0 | 37 | 83  |
| -                | 1182358     | HR37SS 4 160 32 R100-W                | 4   | ⊗      | 16                                        | 16     | 32   | 1,0 | 44 | 92  |
| -                | 1182359     | HR37SS 4 200 38 R100-W                | 4   | ⊗      | 20                                        | 20     | 38   | 1,0 | 55 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## INOX INTEG Stainless Steel Specialized End mills

## HC40SS Corner chamfer

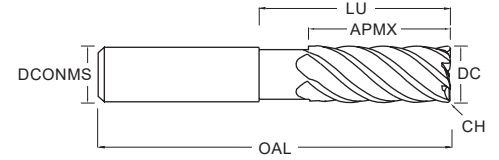
45°  
Corner chamferVariable helix  
40° | 41°

Short

Reduced  
neckVariable Pitch  
4

&lt; 42 HRC

M



|                           |             | <sup>(2)</sup> Grade code             |     | Z9     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHU920 |                                           |        |      |      |     |    |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180484                   | 1180485     | HF40SS 4 010 03                       | 4   | ⊗      | 1                                         | 6      | 2,5  | -    | -   | 5  | 57  |
| 1180380                   | 1180487     | HF40SS 4 020 05                       | 4   | ⊗      | 2                                         | 6      | 5    | -    | -   | 10 | 57  |
| 1180381                   | 1180488     | HC40SS 4 030 08                       | 4   | ⊗      | 3                                         | 6      | 8    | 0,15 | 45° | 15 | 57  |
| 1180382                   | 1180489     | HC40SS 4 040 11                       | 4   | ⊗      | 4                                         | 6      | 11   | 0,15 | 45° | 17 | 57  |
| 1180383                   | 1180490     | HC40SS 4 050 13                       | 4   | ⊗      | 5                                         | 6      | 13   | 0,15 | 45° | 19 | 57  |
| 1180384                   | 1180389     | HC40SS 4 060 13                       | 4   | ⊗      | 6                                         | 6      | 13   | 0,15 | 45° | 21 | 57  |
| 1180329                   | 1180491     | HC40SS 4 080 19                       | 4   | ⊗      | 8                                         | 8      | 19   | 0,15 | 45° | 27 | 63  |
| 1180385                   | 1180492     | HC40SS 4 100 22                       | 4   | ⊗      | 10                                        | 10     | 22   | 0,20 | 45° | 32 | 72  |
| 1180386                   | 1180493     | HC40SS 4 120 26                       | 4   | ⊗      | 12                                        | 12     | 26   | 0,20 | 45° | 38 | 83  |
| 1180436                   | 1180494     | HC40SS 4 140 26                       | 4   | ⊗      | 14                                        | 14     | 26   | 0,25 | 45° | 38 | 83  |
| 1180387                   | 1180390     | HC40SS 4 160 32                       | 4   | ⊗      | 16                                        | 16     | 32   | 0,35 | 45° | 44 | 92  |
| 1180555                   | 1180556     | HC40SS 4 180 32                       | 4   | ⊗      | 18                                        | 18     | 32   | 0,45 | 45° | 44 | 92  |
| 1180388                   | 1180455     | HC40SS 4 200 38                       | 4   | ⊗      | 20                                        | 20     | 38   | 0,60 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

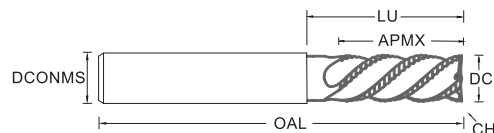
End mill order code = (1) Geometry Code + (2) Grade Code

# INOX INTEG Stainless Steel Specialized End mills

## HRO40SS Rougher



M



|                           |             | <sup>(2)</sup> Grade code             |     | Z9     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHU920 |                                           |        |      |      |     |    |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180701                   | 1180702     | HRO40SS 4 030 08                      | 4   | ⊗      | 3                                         | 6      | 8    | 0,15 | 45° | 24 | 57  |
| 1180445                   | 1180392     | HRO40SS 4 040 11                      | 4   | ⊗      | 4                                         | 6      | 11   | 0,15 | 45° | 17 | 57  |
| 1180446                   | 1180393     | HRO40SS 4 050 13                      | 4   | ⊗      | 5                                         | 6      | 13   | 0,15 | 45° | 19 | 57  |
| 1180447                   | 1180394     | HRO40SS 4 060 13                      | 4   | ⊗      | 6                                         | 6      | 13   | 0,15 | 45° | 21 | 57  |
| 1180448                   | 1180395     | HRO40SS 4 080 19                      | 4   | ⊗      | 8                                         | 8      | 19   | 0,15 | 45° | 27 | 63  |
| 1180391                   | 1180396     | HRO40SS 4 100 22                      | 4   | ⊗      | 10                                        | 10     | 22   | 0,20 | 45° | 32 | 72  |
| 1180449                   | 1180397     | HRO40SS 4 120 26                      | 4   | ⊗      | 12                                        | 12     | 26   | 0,20 | 45° | 38 | 83  |
| 1180450                   | 1180398     | HRO40SS 4 140 26                      | 4   | ⊗      | 14                                        | 14     | 26   | 0,25 | 45° | 38 | 83  |
| 1180451                   | 1180399     | HRO40SS 4 160 32                      | 4   | ⊗      | 16                                        | 16     | 32   | 0,35 | 45° | 44 | 92  |
| 1180452                   | 1180400     | HRO40SS 4 180 32                      | 4   | ⊗      | 18                                        | 18     | 32   | 0,45 | 45° | 44 | 92  |
| 1180453                   | 1180454     | HRO40SS 4 200 38                      | 4   | ⊗      | 20                                        | 20     | 38   | 0,60 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material                          | f <sub>z</sub> (mm/t) |                      |                       | V <sub>c</sub> (m/min) |                      |                       |
|-----|-----------------------------------|-----------------------|----------------------|-----------------------|------------------------|----------------------|-----------------------|
|     |                                   | a <sub>e</sub> = 25%  | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% | a <sub>e</sub> = 25%   | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% |
| M   | SS - Ferritic / Martensitic       | 0,006 x DC            | 0,005 x DC           | 0,004 x DC            | 140                    | 130                  | 110                   |
|     | SS - Austenitic                   | 0,006 x DC            | 0,005 x DC           | 0,003 x DC            | 130                    | 120                  | 110                   |
|     | SS - Austenitic-ferritic (Duplex) | 0,005 x DC            | 0,004 x DC           | 0,003 x DC            | 120                    | 110                  | 100                   |

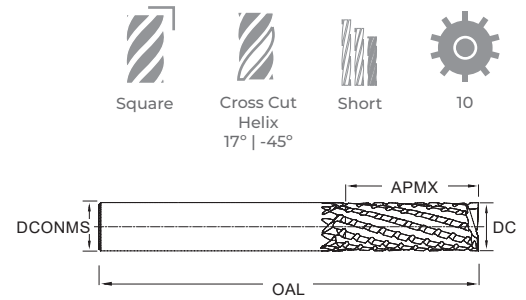
Note<sup>1</sup>: Feed valid for when the end mill works with its whole ap, for when the end mill is working with lower depths of cut consider increasing the feed up to 25%.

Note<sup>2</sup>: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.



**NEW CFRP INTEG** Carbon Fiber Specialized End mills**HF17TCF** Flat Top End Mill

All order codes are cylindrical shank,  
Weldon shank available under request.



| <sup>(1)</sup> Order code | <sup>(2)</sup> Grade code             |     | 1N     | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|---------------------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|-----|
| HA (Cylindrical)          | Reference<br>Referência<br>Referencia | NOF | PH0920 | DC                                        | DCONMS | APMX | OAL |
| 1182705                   | HF17TCFS 10 060 15                    | 10  | ○      | 6                                         | 6      | 15   | 57  |
| 1182632                   | HF17TCFS 10 080 20                    | 10  | ⊗      | 8                                         | 8      | 20   | 63  |
| 1182675                   | HF17TCFS 10 100 25                    | 10  | ⊗      | 10                                        | 10     | 25   | 72  |
| 1182706                   | HF17TCFS 10 120 30                    | 10  | ○      | 12                                        | 12     | 30   | 83  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

**RECOMMENDED CUTTING CONDITIONS** Condições de corte recomendadas | Condiciones de corte recomendables

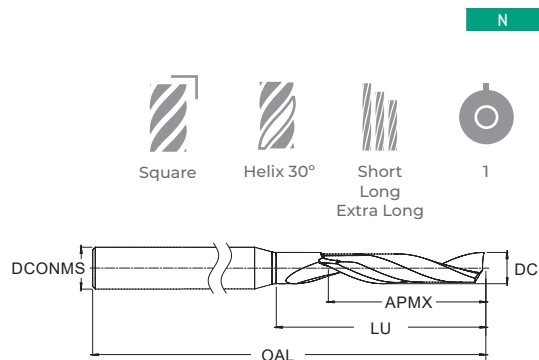
| ISO | Material            | fz (mm/t)            |                      |                       | Vc (m/min)           |                      |                       |
|-----|---------------------|----------------------|----------------------|-----------------------|----------------------|----------------------|-----------------------|
|     |                     | a <sub>e</sub> = 15% | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% | a <sub>e</sub> = 15% | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% |
| N   | Composite Materials | 0,004 x DC           | 0,004 x DC           | 0,003 x DC            | 240                  | 180                  | 120                   |

Note: For slotting, use a depth of cut of <1D. For side milling/trimming, use a depth of cut of <1.5D.

## NEW HF30CA Flat Top End Mill



All order codes are cylindrical shank,  
Weldon shank available under request.



| (1) Order code | (2) Grade code                        |     | 12     | Dimensions   Dimensões   Dimensiones (mm) |        |      |    |     |
|----------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|----|-----|
|                | Reference<br>Referência<br>Referencia | NOF | PH0920 | DC                                        | DCONMS | APMX | LU | OAL |
| HF30CAS        |                                       |     |        |                                           |        |      |    |     |
| 1182641        | HF30CAS 1 050 30                      | 1   | ⊗      | 5                                         | 8      | 30   | 40 | 80  |
| 1182350        | HF30CAS 1 060 30                      | 1   | ⊗      | 6                                         | 8      | 30   | 40 | 80  |
| 1182644        | HF30CAS 1 070 30                      | 1   | ⊗      | 7                                         | 10     | 30   | 40 | 80  |
| 1182563        | HF30CAS 1 080 30                      | 1   | ⊗      | 8                                         | 10     | 30   | 40 | 80  |
| 1182566        | HF30CAS 1 100 30                      | 1   | ⊗      | 10                                        | 12     | 30   | 40 | 80  |
| HF30CAL        |                                       |     |        |                                           |        |      |    |     |
| 1182666        | HF30CAL 1 030 30                      | 1   | ⊗      | 3                                         | 8      | 30   | 60 | 100 |
| 1182667        | HF30CAL 1 040 30                      | 1   | ⊗      | 4                                         | 8      | 30   | 60 | 100 |
| 1182642        | HF30CAL 1 050 30                      | 1   | ⊗      | 5                                         | 8      | 30   | 60 | 100 |
| 1182561        | HF30CAL 1 060 30                      | 1   | ⊗      | 6                                         | 8      | 30   | 60 | 100 |
| 1182645        | HF30CAL 1 070 30                      | 1   | ⊗      | 7                                         | 10     | 30   | 60 | 100 |
| 1182564        | HF30CAL 1 080 30                      | 1   | ⊗      | 8                                         | 10     | 30   | 60 | 100 |
| 1182567        | HF30CAL 1 100 30                      | 1   | ⊗      | 10                                        | 12     | 30   | 60 | 100 |
| HF30CAXL       |                                       |     |        |                                           |        |      |    |     |
| 1182643        | HF30CAXL 1 050 30                     | 1   | ⊗      | 5                                         | 8      | 30   | 80 | 120 |
| 1182562        | HF30CAXL 1 060 30                     | 1   | ⊗      | 6                                         | 8      | 30   | 80 | 120 |
| 1182646        | HF30CAXL 1 070 30                     | 1   | ⊗      | 7                                         | 10     | 30   | 80 | 120 |
| 1182565        | HF30CAXL 1 080 30                     | 1   | ⊗      | 8                                         | 10     | 30   | 80 | 120 |
| 1182568        | HF30CAXL 1 100 30                     | 1   | ⊗      | 10                                        | 12     | 30   | 80 | 120 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

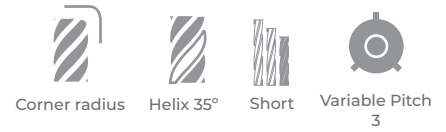
End mill order code = (1) Geometry Code + (2) Grade Code

## AL INTEG Aluminium Specialized End mills

## HR35HPAS Corner radius



N



|                           |             | <sup>(2)</sup> Grade code             |     | H3     | Dimensions   Dimensões   Dimensiones (mm) |      |     |        |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|------|-----|--------|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHT910 |                                           |      |     |        |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | APMX | RE  | DCONMS | OAL |
| 1182443                   | -           | HR35HPAS 3 020 04 R050                | 3   | ○      | 2                                         | 4    | 0,5 | 6      | 57  |
| 1182444                   | -           | HR35HPAS 3 030 06 R050                | 3   | ⊗      | 3                                         | 6    | 0,5 | 6      | 57  |
| 1182445                   | -           | HR35HPAS 3 040 08 R050                | 3   | ⊗      | 4                                         | 8    | 0,5 | 6      | 57  |
| 1182446                   | -           | HR35HPAS 3 050 10 R050                | 3   | ○      | 5                                         | 10   | 0,5 | 6      | 57  |
| 1182182                   | -           | HR35HPAS 3 060 13 R050                | 3   | ⊗      | 6                                         | 13   | 0,5 | 6      | 57  |
| 1181710                   | -           | HR35HPAS 3 080 19 R050                | 3   | ⊗      | 8                                         | 19   | 0,5 | 8      | 63  |
| 1182183                   | -           | HR35HPAS 3 100 22 R050                | 3   | ⊗      | 10                                        | 22   | 0,5 | 10     | 72  |
| 1182184                   | -           | HR35HPAS 3 120 26 R050                | 3   | ⊗      | 12                                        | 26   | 0,5 | 12     | 83  |
| 1182447                   | -           | HR35HPAS 3 140 28 R050                | 3   | ○      | 14                                        | 28   | 0,5 | 14     | 83  |
| 1182292                   | -           | HR35HPAS 3 160 32 R050                | 3   | ⊗      | 16                                        | 32   | 0,5 | 16     | 92  |
| 1182448                   | -           | HR35HPAS 3 180 36 R050                | 3   | ○      | 18                                        | 36   | 0,5 | 18     | 92  |
| 1182449                   | -           | HR35HPAS 3 200 40 R050                | 3   | ⊗      | 20                                        | 40   | 0,5 | 20     | 104 |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code



# AL INTEG Aluminium Specialized End mills

## HF45HPAS Flat top



|                           |             | <sup>(2)</sup> Grade code             |     | H3     | Dimensions   Dimensões   Dimensiones (mm) |      |        |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|------|--------|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHT910 |                                           |      |        |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | APMX | DCONMS | OAL |
| 1182450                   | -           | HF45HPAS 3 020 04                     | 3   | ⊗      | 2                                         | 4    | 6      | 57  |
| 1182451                   | -           | HF45HPAS 3 030 06                     | 3   | ⊗      | 3                                         | 6    | 6      | 57  |
| 1182333                   | -           | HF45HPAS 3 040 08                     | 3   | ⊗      | 4                                         | 8    | 6      | 57  |
| 1182452                   | -           | HF45HPAS 3 050 08                     | 3   | ⊗      | 5                                         | 10   | 6      | 57  |
| 1182334                   | -           | HF45HPAS 3 060 13                     | 3   | ⊗      | 6                                         | 13   | 6      | 57  |
| 1182335                   | -           | HF45HPAS 3 080 19                     | 3   | ⊗      | 8                                         | 19   | 8      | 63  |
| 1182336                   | -           | HF45HPAS 3 100 22                     | 3   | ⊗      | 10                                        | 22   | 10     | 72  |
| 1182337                   | -           | HF45HPAS 3 120 26                     | 3   | ⊗      | 12                                        | 26   | 12     | 83  |
| 1182453                   | -           | HF45HPAS 3 140 28                     | 3   | ○      | 14                                        | 28   | 14     | 83  |
| 1182338                   | -           | HF45HPAS 3 160 32                     | 3   | ⊗      | 16                                        | 32   | 16     | 92  |
| 1182454                   | -           | HF45HPAS 3 180 36                     | 3   | ○      | 18                                        | 36   | 18     | 92  |
| 1182455                   | -           | HF45HPAS 3 200 40                     | 3   | ⊗      | 20                                        | 40   | 20     | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

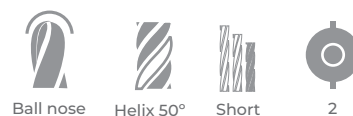
End mill order code = (1) Geometry Code + (2) Grade Code

## AL INTEG Aluminium Specialized End mills

## HB50HPAS Ball nose



N



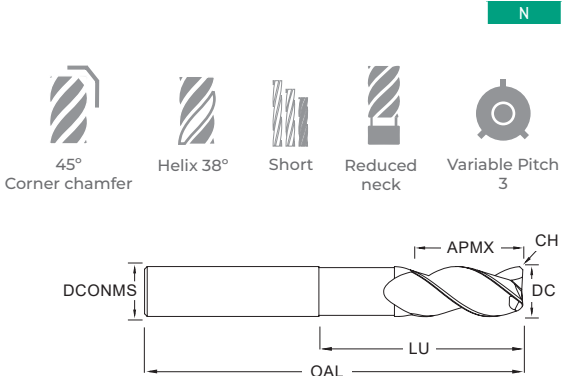
|                  |             | (2) Grade code                        |     | H3     | Dimensions   Dimensões   Dimensiones (mm) |      |        |    |     |
|------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|------|--------|----|-----|
| (1) Order code   |             | Reference<br>Referência<br>Referencia | NOF | PHT910 |                                           |      |        |    |     |
| HA (Cylindrical) | HB (Weldon) |                                       |     |        | DC                                        | APMX | DCONMS | LU | OAL |
| 1182456          | -           | HB50HPAS 2 020 02                     | 2   | ⊗      | 2                                         | 2    | 6      | 10 | 57  |
| 1182457          | -           | HB50HPAS 2 030 03                     | 2   | ○      | 3                                         | 3    | 6      | 12 | 57  |
| 1182339          | -           | HB50HPAS 2 040 04                     | 2   | ⊗      | 4                                         | 4    | 6      | 20 | 57  |
| 1182458          | -           | HB50HPAS 2 050 05                     | 2   | ○      | 5                                         | 5    | 6      | 25 | 57  |
| 1182340          | -           | HB50HPAS 2 060 06                     | 2   | ⊗      | 6                                         | 6    | 6      | 25 | 57  |
| 1182341          | -           | HB50HPAS 2 080 08                     | 2   | ⊗      | 8                                         | 8    | 8      | 30 | 63  |
| 1182342          | -           | HB50HPAS 2 100 10                     | 2   | ⊗      | 10                                        | 10   | 10     | 35 | 72  |
| 1182343          | -           | HB50HPAS 2 120 12                     | 2   | ⊗      | 12                                        | 12   | 12     | 40 | 83  |
| 1182459          | -           | HB50HPAS 2 140 14                     | 2   | ○      | 14                                        | 14   | 14     | 40 | 83  |
| 1182460          | -           | HB50HPAS 2 160 16                     | 2   | ○      | 16                                        | 16   | 16     | 50 | 92  |
| 1182461          | -           | HB50HPAS 2 180 18                     | 2   | ○      | 18                                        | 18   | 18     | 50 | 92  |
| 1182462          | -           | HB50HPAS 2 200 20                     | 2   | ○      | 20                                        | 20   | 20     | 50 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

HC38AS Corner chamfer



|                           |             | <sup>(2)</sup> Grade code             |     | 12     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PH0920 |                                           |        |      |      |     |    |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180401                   | 1180410     | HC38AS 3 030 07                       | 3   | ⊗      | 3                                         | 6      | 7    | 0,15 | 45° | 15 | 57  |
| 1180402                   | 1180411     | HC38AS 3 040 08                       | 3   | ⊗      | 4                                         | 6      | 8    | 0,15 | 45° | 17 | 57  |
| 1180403                   | 1180412     | HC38AS 3 050 10                       | 3   | ⊗      | 5                                         | 6      | 10   | 0,15 | 45° | 19 | 57  |
| 1180404                   | 1180413     | HC38AS 3 060 10                       | 3   | ⊗      | 6                                         | 6      | 10   | 0,15 | 45° | 21 | 57  |
| 1180405                   | 1180414     | HC38AS 3 080 16                       | 3   | ⊗      | 8                                         | 8      | 16   | 0,15 | 45° | 27 | 63  |
| 1180406                   | 1180415     | HC38AS 3 100 19                       | 3   | ⊗      | 10                                        | 10     | 19   | 0,20 | 45° | 32 | 72  |
| 1180407                   | 1180416     | HC38AS 3 120 22                       | 3   | ⊗      | 12                                        | 12     | 22   | 0,20 | 45° | 38 | 83  |
| 1180408                   | 1180417     | HC38AS 3 160 26                       | 3   | ⊗      | 16                                        | 16     | 26   | 0,35 | 45° | 44 | 92  |
| 1180409                   | 1180418     | HC38AS 3 200 32                       | 3   | ⊗      | 20                                        | 20     | 32   | 0,35 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

Note: For HB (Weldon) end mills, the reference ends with "-W"  
Example: "HC38AS 3 030 07-W PH0920"

## AL INTEG Aluminium Specialized End mills

## HF30AS Single flute



All order codes are cylindrical shank.  
Weldon shank available under request.



Square



Helix 30°



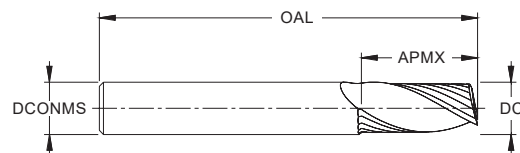
Short



Reduced neck



1



| (1)<br>Geometry code | (2) Grade code                        |     | 12<br>PH0920 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | OAL |
| 1180751              | HF30AS 1 020 05                       | 1   | ⊗            | 2                                         | 6      | 5    | 57  |
| 1180752              | HF30AS 1 030 08                       | 1   | ⊗            | 3                                         | 6      | 8    | 57  |
| 1180753              | HF30AS 1 040 11                       | 1   | ⊗            | 4                                         | 6      | 11   | 57  |
| 1180754              | HF30AS 1 050 13                       | 1   | ⊗            | 5                                         | 6      | 13   | 57  |
| 1180755              | HF30AS 1 060 13                       | 1   | ⊗            | 6                                         | 6      | 13   | 57  |
| 1180756              | HF30AS 1 080 19                       | 1   | ⊗            | 8                                         | 8      | 19   | 63  |
| 1180757              | HF30AS 1 100 25                       | 1   | ⊗            | 10                                        | 10     | 25   | 72  |
| 1180758              | HF30AS 1 120 26                       | 1   | ⊗            | 12                                        | 12     | 26   | 83  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material         | fz (mm/t)  |            |            | Vc (m/min) |          |           |
|-----|------------------|------------|------------|------------|------------|----------|-----------|
|     |                  | ae = 25%   | ae = 40%   | ae = 100%  | ae = 25%   | ae = 40% | ae = 100% |
| N   | Aluminium <6%Si  | 0,011 x DC | 0,009 x DC | 0,006 x DC | 230        | 220      | 190       |
|     | Aluminium <12%Si | 0,009 x DC | 0,008 x DC | 0,005 x DC | 210        | 200      | 180       |
|     | Aluminium >12%Si | 0,008 x DC | 0,007 x DC | 0,005 x DC | 200        | 190      | 170       |

Note<sup>1</sup>: Recommended feed values for maximum ap. For reduced ap, consider increasing fz up to 25%.

Note<sup>2</sup>: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.



# HARD INTEG Hardened Materials Specialized End mills

## NEW HB05HMIN Ball nose



Ball nose



Helix 5°



Short

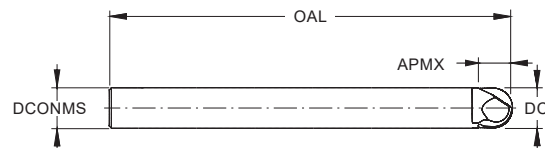


2

H



< 70 HRC



All order codes are cylindrical shank.  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | 7D<br>PHD705 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | OAL |
| 1181689              | HB05HMIN 2 002 001                    | 2   | ○            | 0,2                                       | 4      | 0,12 | 50  |
| 1181835              | HB05HMIN 2 003 002                    | 2   | ○            | 0,3                                       | 4      | 0,18 | 50  |
| 1181690              | HB05HMIN 2 004 002                    | 2   | ○            | 0,4                                       | 4      | 0,24 | 50  |
| 1181746              | HB05HMIN 2 005 003                    | 2   | ⊗            | 0,5                                       | 4      | 0,30 | 50  |
| 1181691              | HB05HMIN 2 006 004                    | 2   | ⊗            | 0,6                                       | 4      | 0,42 | 50  |
| 1181692              | HB05HMIN 2 008 006                    | 2   | ⊗            | 0,8                                       | 4      | 0,56 | 50  |
| 1181693              | HB05HMIN 2 010 007                    | 2   | ⊗            | 1,0                                       | 4      | 0,70 | 50  |
| 1181694              | HB05HMIN 2 015 010                    | 2   | ⊗            | 1,5                                       | 4      | 1,00 | 50  |
| 1181695              | HB05HMIN 2 020 014                    | 2   | ⊗            | 2,0                                       | 4      | 1,40 | 50  |
| 1181696              | HB05HMIN 2 030 021                    | 2   | ⊗            | 3,0                                       | 6      | 2,10 | 60  |
| 1181697              | HB05HMIN 2 040 028                    | 2   | ⊗            | 4,0                                       | 6      | 2,80 | 60  |
| 1181698              | HB05HMIN 2 050 035                    | 2   | ⊗            | 5,0                                       | 6      | 3,50 | 60  |
| 1181699              | HB05HMIN 2 060 042                    | 2   | ⊗            | 6,0                                       | 6      | 4,20 | 60  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material        | fz (mm/t)  | RPM       |           |
|-----|-----------------|------------|-----------|-----------|
|     |                 | ae < 10%   | DC < 2,00 | DC > 2,00 |
| H   | Hardened Steels | 0,004 x DC | 30 000    | 20 000    |

# HARD INTEG Hardened Materials Specialized End mills

## HF30HL Flat top



All order codes are cylindrical shank,  
Weldon shank available under request.



Square



Helix 30°



Long

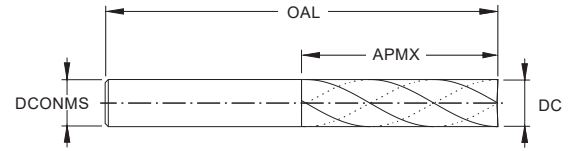


4

H



< 70 HRC



| (1)<br>Geometry code | (2) Grade code                        |     | X4<br>PHH603 | Dimensions   Dimensões   Dimensiones (mm) |         |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|---------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONSMS | APMX | OAL |
| 1180112              | HF30HL 4 040 20                       | 4   | ⊗            | 4                                         | 6       | 20   | 75  |
| 1180358              | HF30HL 4 050 20                       | 4   | ⊗            | 5                                         | 6       | 20   | 75  |
| 1180196              | HF30HL 4 060 30                       | 4   | ⊗            | 6                                         | 6       | 30   | 75  |
| 1180113              | HF30HL 4 080 35                       | 4   | ⊗            | 8                                         | 8       | 35   | 100 |
| 1180359              | HF30HL 4 100 40                       | 4   | ⊗            | 10                                        | 10      | 40   | 100 |
| 1180111              | HF30HL 4 120 50                       | 4   | ⊗            | 12                                        | 12      | 50   | 100 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

# HARD INTEG Hardened Materials Specialized End mills

## HB30HL Ball nose



Ball nose



Helix 30°



Long

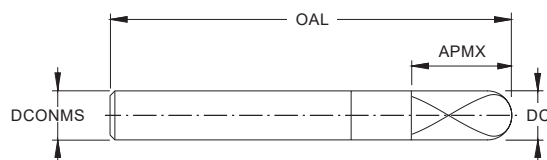


2

H



< 70 HRC



All order codes are cylindrical shank.  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | X4<br>PHH603 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | OAL |
| 1180356              | HB30HL 2 020 04                       | 2   | ⊗            | 2                                         | 6      | 4    | 75  |
| 1180357              | HB30HL 2 030 06                       | 2   | ⊗            | 3                                         | 6      | 6    | 75  |
| 1180093              | HB30HL 2 040 08                       | 2   | ⊗            | 4                                         | 6      | 8    | 75  |
| 1180109              | HB30HL 2 050 10                       | 2   | ⊗            | 5                                         | 6      | 10   | 75  |
| 1180130              | HB30HL 2 060 12                       | 2   | ⊗            | 6                                         | 6      | 12   | 75  |
| 1180131              | HB30HL 2 080 16                       | 2   | ⊗            | 8                                         | 8      | 16   | 75  |
| 1180132              | HB30HL 2 100 20                       | 2   | ⊗            | 10                                        | 10     | 20   | 100 |
| 1180141              | HB30HL 2 120 24                       | 2   | ⊗            | 12                                        | 12     | 24   | 100 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material        | fz (mm/t)  |            | Vc (m/min) |          |
|-----|-----------------|------------|------------|------------|----------|
|     |                 | ae = 10%   | ae = 30%   | ae = 10%   | ae = 30% |
| H   | Hardened Steels | 0,006 x DC | 0,005 x DC | 120        | 110      |

# CHOOSE BY **APPLICATION**



Exceptional performance solid carbide end mills designed for specific applications. The high quality is a direct outcome of specialized end mill geometry for each type of application, including optimized flute design, specialized edge honing, and wear-resistant coatings.

Fresas de metal duro integral de alto desempenho projetadas para aplicações específicas. A alta qualidade é resultado direto da geometria especializada da fresa para cada tipo de aplicação, incluindo design de flutes otimizado, afiação de aresta especializada e revestimentos resistentes ao desgaste.

Fresas de carburo integral de alto rendimiento diseñadas para aplicaciones específicas. La alta calidad es el resultado directo de la geometría especializada de la fresa para cada tipo de aplicación, incluido el diseño optimizado de las ranuras, el afilado especializado de los bordes y los recubrimientos resistentes al desgaste.



## HIFEED INTEG > page 46

- > High feed milling

Fresagem de alto avanço | Fresado de alta avance

- > Special radius roughing end mills

Fresas especiais de raio para desbaste | Fresas especiales de radio para desbaste



## DYN INTEG > page 48

- > Trochoidal milling

Fresagem trocoidal | Fresado trocoidal

- > For steel, stainless steel and superalloys applications

Para aço, aço inoxidável e aplicações em superligas | Para acero, acero inoxidable y aplicaciones en superaleaciones

NEW



## RAD INTEG > page 50

- > 5-Axis milling

Fresagem a 5 eixos | Fresado de 5 ejes

- > Conical or tangential end mills

Fresas cónicas e tangenciais | Fresas cónicas ou tangenciais



## FIN INTEG > page 52

- > Finishing milling

Dresagem de acabamento | Fresado de acabado

- > Long end mill with corner chamfer

Fresas longas com chanfro nos cantos | Fresa larga con chaflán en las esquinas



## MIN INTEG > page 54

- > Micro milling

Microfresagem | Microfresado

- > Ball nose end mills

Fresas de topo redondo | Fresas de topo redondeado



## CHAMF INTEG > page 57

- > Chamfer Milling

Fresagem de chanfro | Fresado de chaflán

- > 45° chamfers

Chanfros a 45° | Chaflanes a 45°



# CODIFICATION SYSTEM FOR SOLID CARBIDE END MILLS

Sistema de codificação para fresas de metal duro para acabamento | Sistema de codificación para fresas de carburo para acabado

Integral Solid Carbide  
example:

| H | C | 40 | TS | P | L | 5 | 120 | 41 | XR100 | 90 | - | W  |
|---|---|----|----|---|---|---|-----|----|-------|----|---|----|
| 1 | 2 | 3  | 4  | 5 | 6 | 7 | 8   | 9  | 10    | 11 |   | 12 |

## 1 - Tool type

H - Solid carbide end mill (Hard metal)

## 2 - Design

F - Square form (Flat top)  
R - Square form with corner radius  
C - Square form with corner chamfer  
B - Ball nose  
CH - Conical Top  
XC - Conical Segment  
XT - Tangential Segment  
XR - Special Radius  
RO - Rougher

## 3 - Helix Angle (Suppressed when it is 90°)

... - Degree of helix rounded to nearest 5 degree

## 4 - Machining Method (Suppressed when it doesn't exist)

HF - High Feed                      HP - High Performance  
TS - Trochoidal milling

## 5 - Application

A - Aluminium                      S - Stainless steel  
G - General application              H - Hard materials  
F - Finishing                          MIN - Micro milling  
P - Steel

## 6 - Length of Shank

S - Short length  
L - Long length  
XL - Extra long length

## 7 - Flutes number (NOF)

Example: NOF = 1 ; NOF = 2 ; NOF = 3

## 8 - Cutting diameter (DC)

Example: 120 = 12,0 mm ; 008 = 0,8 mm

## 9 - Max cutting depth (APMX)

Example for  $APMX \geq 1$  mm: 04 = 4 mm ; 06 = 6 mm  
Example for  $APMX < 1$  mm: 002 = 0,2 mm ; 005 = 0,5 mm

## 10 - Shank diameter (only on straight flute solid carbide)

Example for corner radius: R150 = 1,5 mm ; R015 = 0,15 mm  
Example for special radius: XR100 = 1,0 mm  
Example for conical segment: 18RM120 -  $\alpha/2 = 18^\circ$ , RM = 1200 mm  
Example for tangential segment: RM090 - RM = 90 mm

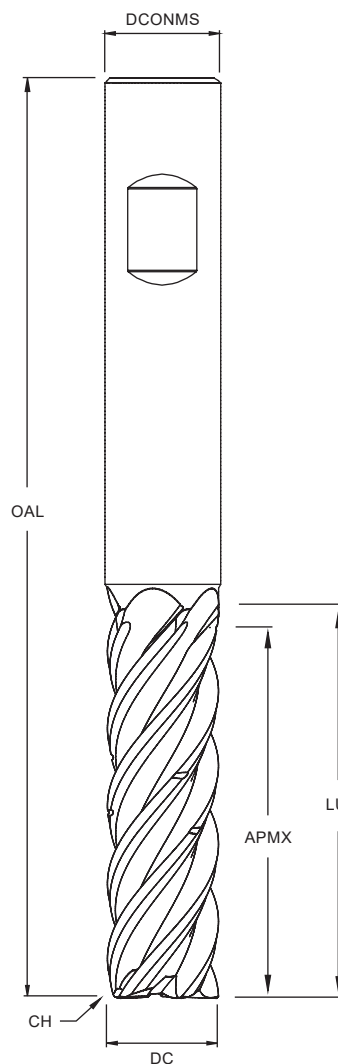
## 11 - Angle (Only for chamfering end mills)

Example: 90 = 90°

## 12 - Shank (Suppressed when cylindrical)

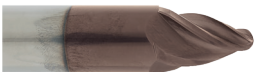
W - Weldon

Integral Solid Carbide  
technical drawing example



# SELECTION GUIDE FOR SOLID CARBIDE END MILLS

Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

|                                                                                                                                | DC      | NOF | HELIX<br>ANGLE    | GEOMETRY                                                                                                 | FINISHING                                                                                                                                                                                                                                                                                                                                       | ROUGHING                                                                                                                                                                                                                                                                                                                                             | MATERIAL     | DESCRIPTION                             | PAGE |
|--------------------------------------------------------------------------------------------------------------------------------|---------|-----|-------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------|------|
| <br><b>HIFEED INTEG</b><br>HXR30HFGS           | 3-12    | 4-5 | -                 | <br>Special<br>radius   |             |             | <b>PMKSH</b> | Special radius<br>Roughing<br>End mills | 46   |
| <br><b>DYN INTEG</b><br>HR38TSM                | 6-20    | 5   | 38°               | <br>Corner<br>radius    |             |             | <b>MS</b>    | Trochoidal<br>Milling                   | 48   |
| <br><b>DYN INTEG</b><br>HC40TSP2<br><b>NEW</b> | 6-16    | 5   | 40°<br>41°<br>42° | <br>Corner<br>chamfer   |             |             | <b>PK</b>    |                                         | 49   |
| <br><b>RAD INTEG</b><br>HXC30GL              | 8-16    | 4   | 30°               | <br>Radial<br>segment |     |     | <b>PMKS</b>  | Radial<br>Segment<br>End mills          | 50   |
| <br><b>RAD INTEG</b><br>HXT30GL              | 6-16    | 4   | 30°               | <br>Radial<br>segment |     |     | <b>PMKS</b>  |                                         | 50   |
| <br><b>FIN INTEG</b><br>HC45FL               | 3-20    | 6   | 43°<br>45°        | <br>Corner<br>chamfer |     |     | <b>PMKH</b>  | Finishing<br>End mills                  | 52   |
| <br><b>MIN INTEG</b><br>HB30MINS             | 0,4-3,0 | 2   | 30°               | <br>Ball nose         |     |     | <b>PMKSH</b> | Micro<br>Machining<br>End mills         | 54   |
| <br><b>CHAMF INTEG</b><br>HCHGS              | 3-20    | 4   | 0°                | <br>Conical<br>Top    |     |     | <b>PMK</b>   | Chamferings<br>End mills                | 57   |

## HIFEED INTEG High Feed End mills

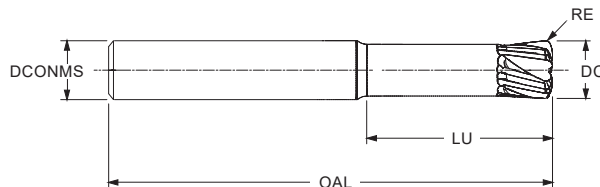
## HXR30HFGS Special radius roughing



P M K S H



All order codes are cylindrical shank,  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | 2A<br>PHU910 | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |      |    |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|------|------|----|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | RE   | PR*  | LU | OAL |
| 1181449              | HXR30HFGS 4 030 002 XR020             | 4   | ⊗            | 3                                         | 6      | 0,20 | 0,20 | 0,40 | 9  | 63  |
| 1181450              | HXR30HFGS 4 040 003 XR030             | 4   | ⊗            | 4                                         | 6      | 0,30 | 0,30 | 0,50 | 12 | 63  |
| 1181451              | HXR30HFGS 4 050 003 XR040             | 4   | ⊗            | 5                                         | 6      | 0,30 | 0,40 | 0,60 | 15 | 63  |
| 1181452              | HXR30HFGS 4 060 004 XR050             | 4   | ⊗            | 6                                         | 6      | 0,40 | 0,50 | 0,80 | 24 | 63  |
| 1181453              | HXR30HFGS 5 080 004 XR060             | 5   | ⊗            | 8                                         | 8      | 0,40 | 0,60 | 0,90 | 32 | 75  |
| 1181430              | HXR30HFGS 5 100 005 XR080             | 5   | ⊗            | 10                                        | 10     | 0,50 | 0,80 | 1,20 | 32 | 75  |
| 1181454              | HXR30HFGS 5 120 005 XR100             | 5   | ⊗            | 12                                        | 12     | 0,50 | 1,00 | 1,40 | 36 | 83  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

\*Programming radius

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

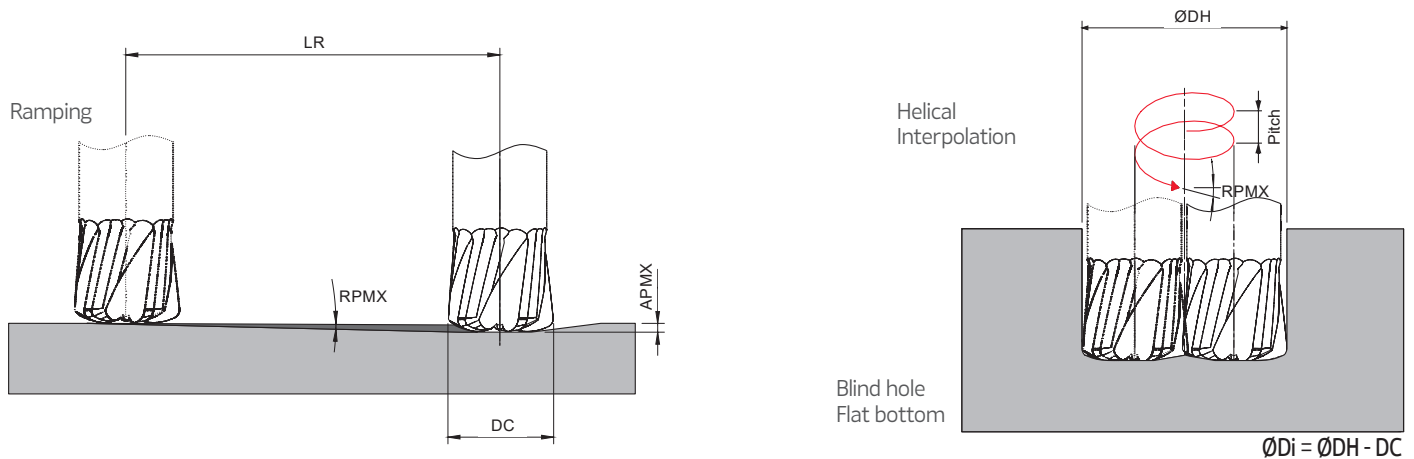
| ISO | Workpiece Material                           | f <sub>z</sub> (mm/t) |                      |                       | v <sub>c</sub> (m/min) |                      |                       | Plunging              |                        |
|-----|----------------------------------------------|-----------------------|----------------------|-----------------------|------------------------|----------------------|-----------------------|-----------------------|------------------------|
|     |                                              | a <sub>e</sub> = 25%  | a <sub>e</sub> = 50% | a <sub>e</sub> = 100% | a <sub>e</sub> = 25%   | a <sub>e</sub> = 50% | a <sub>e</sub> = 100% | f <sub>z</sub> (mm/t) | v <sub>c</sub> (m/min) |
| P   | Unalloyed Steel                              | 0,044 x DC            | 0,038 x DC           | 0,023 x DC            | 300                    | 280                  | 270                   | 0,004 x DC            | 160                    |
|     | Low-Alloyed Steel                            | 0,044 x DC            | 0,038 x DC           | 0,023 x DC            | 280                    | 250                  | 230                   | 0,004 x DC            | 140                    |
|     | High-Alloyed Steel                           | 0,040 x DC            | 0,036 x DC           | 0,020 x DC            | 200                    | 180                  | 150                   | 0,004 x DC            | 120                    |
| M   | Stainless Steel (Ferritic / Martensitic)     | 0,035 x DC            | 0,035 x DC           | 0,018 x DC            | 180                    | 160                  | 150                   | 0,003 x DC            | 110                    |
|     | Stainless Steel (Austenitic)                 | 0,035 x DC            | 0,033 x DC           | 0,018 x DC            | 120                    | 110                  | 100                   | 0,003 x DC            | 100                    |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 0,033 x DC            | 0,031 x DC           | 0,018 x DC            | 80                     | 70                   | 60                    | 0,003 x DC            | 60                     |
| K   | Malleable Cast Iron                          | 0,034 x DC            | 0,032 x DC           | 0,021 x DC            | 170                    | 150                  | 130                   | 0,003 x DC            | 110                    |
|     | Grey Cast Iron                               | 0,035 x DC            | 0,035 x DC           | 0,021 x DC            | 220                    | 200                  | 180                   | 0,003 x DC            | 120                    |
|     | Nodular Cast Iron                            | 0,034 x DC            | 0,032 x DC           | 0,021 x DC            | 160                    | 140                  | 120                   | 0,003 x DC            | 110                    |
| S   | Heat Resistant Super Alloys                  | 0,022 x DC            | 0,017 x DC           | 0,014 x DC            | 40                     | 35                   | 30                    | 0,002 x DC            | 30                     |
| H   | Hardened Steels                              | 0,026 x DC            | 0,021 x DC           | 0,014 x DC            | 90                     | 85                   | 70                    | 0,002 x DC            | 70                     |

Note: Plunge Depth = 2 x DC  
Ae Stepover = 0,2 x DC



## RAMPING AND HELICAL INTERPOLATION

Descida em rampa e interpolação helicoidal | Bajada en rampa e interpolación circular

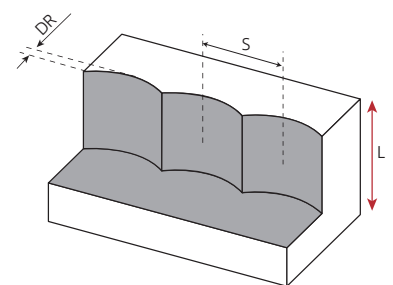


| DC | Ramping |      |        | Helical Interpolation |        |                | Max Angle (°) |
|----|---------|------|--------|-----------------------|--------|----------------|---------------|
|    | RPMX    | APMX | Min LR | ØDHmin                | ØDHmax | Max Pitch/Rev. |               |
| 3  | 1,5     | 0,2  | 7,6    | 4,0                   | -      | 0,07           | 1,5           |
|    |         |      |        | -                     | 6,0    | 0,20           | 1,5           |
| 4  | 1,5     | 0,3  | 11,5   | 5,3                   | -      | 0,10           | 1,5           |
|    |         |      |        | -                     | 8,0    | 0,30           | 1,3           |
| 5  | 1,5     | 0,3  | 11,5   | 6,7                   | -      | 0,10           | 1,5           |
|    |         |      |        | -                     | 10,0   | 0,30           | 1,0           |
| 6  | 1,5     | 0,4  | 15,3   | 8,0                   | -      | 0,15           | 1,5           |
|    |         |      |        | -                     | 12,0   | 0,40           | 1,2           |
| 8  | 1,5     | 0,4  | 15,3   | 10,7                  | -      | 0,20           | 1,5           |
|    |         |      |        | -                     | 16,0   | 0,40           | 0,9           |
| 10 | 1,5     | 0,5  | 19,1   | 13,3                  | -      | 0,25           | 1,5           |
|    |         |      |        | -                     | 20,0   | 0,50           | 0,9           |
| 12 | 1,5     | 0,5  | 19,1   | 16,0                  | -      | 0,30           | 1,5           |
|    |         |      |        | -                     | 24,0   | 0,50           | 0,7           |

Note: During helical interpolation do not exceed APMX.

## PLUNGING Mergulho | Plunge

| Cutting Conditions |           |
|--------------------|-----------|
| Vc (m/min)         | fz (mm/t) |
| 70%                | 35%       |



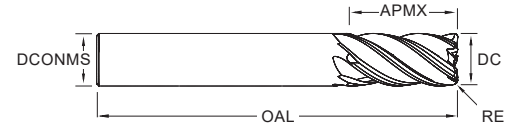
| S max and DR corresponding cutting diameter DC (mm) |         |     |     |     |     |     |     |
|-----------------------------------------------------|---------|-----|-----|-----|-----|-----|-----|
| DR (mm)                                             | DC (mm) |     |     |     |     |     |     |
|                                                     | 3       | 4   | 5   | 6   | 8   | 10  | 12  |
| 0,5                                                 | 1,1     | 1,3 | 1,5 | 1,7 | 1,9 | 2,2 | 2,4 |
| 1,0                                                 | 1,4     | 1,7 | 2,0 | 2,2 | 2,6 | 3,0 | 3,3 |
| 1,5                                                 | -       | -   | 2,3 | 2,6 | 3,1 | 3,6 | 4,0 |
| 2,0                                                 | -       | -   | -   | -   | 3,5 | 4,0 | 4,5 |
| 3,0                                                 | -       | -   | -   | -   | -   | 4,6 | 5,2 |

## DYN INTEG Trochoidal Milling

## HR38TSM Corner radius



M S



|                  |             | (2) Grade code                        |     | 4F     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |
|------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|
| (1) Order code   |             | Reference<br>Referência<br>Referencia | NOF | PHF910 |                                           |        |      |      |     |
| HA (Cylindrical) | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | RE   | OAL |
| HR38TSMS         |             |                                       |     |        |                                           |        |      |      |     |
| 1182476          | 1182501     | HR38TSMS 5 060 12 R100                | 5   | ○      | 6                                         | 6      | 12   | 1,00 | 57  |
| 1182477          | 1182502     | HR38TSMS 5 060 12 R050                | 5   | ⊗      | 6                                         | 6      | 12   | 0,50 | 57  |
| 1182478          | 1182503     | HR38TSMS 5 080 16 R100                | 5   | ○      | 8                                         | 8      | 16   | 1,00 | 63  |
| 1182479          | 1182504     | HR38TSMS 5 080 16 R050                | 5   | ⊗      | 8                                         | 8      | 16   | 0,50 | 63  |
| 1182480          | 1182505     | HR38TSMS 5 100 20 R100                | 5   | ⊗      | 10                                        | 10     | 20   | 1,00 | 72  |
| 1182481          | 1182506     | HR38TSMS 5 100 20 R050                | 5   | ○      | 10                                        | 10     | 20   | 0,50 | 72  |
| 1182332          | 1182507     | HR38TSMS 5 120 24 R100                | 5   | ⊗      | 12                                        | 12     | 24   | 1,00 | 83  |
| 1182482          | 1182508     | HR38TSMS 5 120 24 R050                | 5   | ○      | 12                                        | 12     | 24   | 0,50 | 83  |
| 1182331          | 1182509     | HR38TSMS 5 160 32 R100                | 5   | ⊗      | 16                                        | 16     | 32   | 1,00 | 92  |
| 1182483          | 1182510     | HR38TSMS 5 160 32 R200                | 5   | ○      | 16                                        | 16     | 32   | 2,00 | 92  |
| 1182484          | 1182511     | HR38TSMS 5 180 36 R100                | 5   | ○      | 18                                        | 18     | 36   | 1,00 | 92  |
| 1182485          | 1182512     | HR38TSMS 5 180 36 R200                | 5   | ○      | 18                                        | 18     | 36   | 2,00 | 92  |
| 1182486          | 1182513     | HR38TSMS 5 200 40 R100                | 5   | ○      | 20                                        | 20     | 40   | 1,00 | 104 |
| 1182487          | 1182514     | HR38TSMS 5 200 40 R200                | 5   | ○      | 20                                        | 20     | 40   | 2,00 | 104 |
| HR38TSMML        |             |                                       |     |        |                                           |        |      |      |     |
| 1182488          | 1182515     | HR38TSMML 5 060 18 R100               | 5   | ○      | 6                                         | 6      | 18   | 1,00 | 57  |
| 1182489          | 1182516     | HR38TSMML 5 060 18 R050               | 5   | ⊗      | 6                                         | 6      | 18   | 0,50 | 57  |
| 1182490          | 1182517     | HR38TSMML 5 080 24 R100               | 5   | ○      | 8                                         | 8      | 24   | 1,00 | 63  |
| 1182491          | 1182518     | HR38TSMML 5 080 24 R050               | 5   | ⊗      | 8                                         | 8      | 24   | 0,50 | 63  |
| 1182492          | 1182519     | HR38TSMML 5 100 30 R100               | 5   | ⊗      | 10                                        | 10     | 30   | 1,00 | 72  |
| 1182493          | 1182520     | HR38TSMML 5 100 30 R050               | 5   | ⊗      | 10                                        | 10     | 30   | 0,50 | 72  |
| 1182494          | 1182521     | HR38TSMML 5 120 36 R100               | 5   | ⊗      | 12                                        | 12     | 36   | 1,00 | 83  |
| 1182495          | 1182522     | HR38TSMML 5 120 36 R050               | 5   | ⊗      | 12                                        | 12     | 36   | 0,50 | 83  |
| 1182390          | 1182523     | HR38TSMML 5 160 48 R100               | 5   | ⊗      | 16                                        | 16     | 48   | 1,00 | 100 |
| 1182496          | 1182524     | HR38TSMML 5 160 48 R200               | 5   | ○      | 16                                        | 16     | 48   | 2,00 | 100 |
| 1182497          | 1182525     | HR38TSMML 5 180 54 R100               | 5   | ○      | 18                                        | 18     | 54   | 1,00 | 104 |
| 1182498          | 1182526     | HR38TSMML 5 180 54 R200               | 5   | ○      | 18                                        | 18     | 54   | 2,00 | 104 |
| 1182499          | 1182527     | HR38TSMML 5 200 60 R100               | 5   | ○      | 20                                        | 20     | 60   | 1,00 | 110 |
| 1182500          | 1182528     | HR38TSMML 5 200 60 R200               | 5   | ○      | 20                                        | 20     | 60   | 2,00 | 110 |

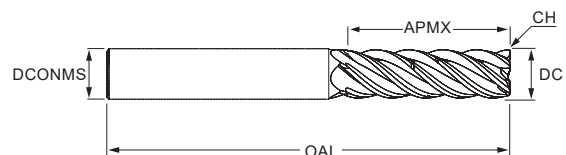
⊗ Stock item | Produto de stock | Itens de stock    ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Note: For HB (Weldon) end mills, the reference ends with "-W"

Example: "HR38TSMS 5 080 16 R100-W"

End mill order code = (1) Geometry Code + (2) Grade Code

## NEW HC40TSP2 Corner chamfer



|                           |             | <sup>(2)</sup> Grade code             |     | TZ9    | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHU920 | DC                                        | DCONMS | APMX | CHW  | KCH | OAL |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        |                                           |        |      |      |     |     |
| HC40TSP2L                 |             |                                       |     |        |                                           |        |      |      |     |     |
| 1182635                   | 1182688     | HC40TSP2L 5 060 18                    | 5   | ⊗      | 6                                         | 6      | 18   | 0,15 | 45° | 57  |
| 1182685                   | 1182689     | HC40TSP2L 5 080 24                    | 5   | ⊗      | 8                                         | 8      | 24   | 0,15 | 45° | 63  |
| 1182584                   | 1182583     | HC40TSP2L 5 100 30                    | 5   | ⊗      | 10                                        | 10     | 30   | 0,20 | 45° | 72  |
| 1182686                   | 1182690     | HC40TSP2L 5 120 36                    | 5   | ⊗      | 12                                        | 12     | 36   | 0,20 | 45° | 83  |
| 1182687                   | 1182670     | HC40TSP2L 5 160 48                    | 5   | ⊗      | 16                                        | 16     | 48   | 0,25 | 45° | 100 |
| HC40TSP2XL                |             |                                       |     |        |                                           |        |      |      |     |     |
| -                         | 1182691Z9   | HC40TSP2XL 5 060 30-W                 | 5   | ⊗      | 6                                         | 6      | 30   | 0,15 | 45° | 75  |
| -                         | 1182671Z9   | HC40TSP2XL 5 080 40-W                 | 5   | ⊗      | 8                                         | 8      | 40   | 0,15 | 45° | 87  |
| -                         | 1182636Z9   | HC40TSP2XL 5 100 50-W                 | 5   | ⊗      | 10                                        | 10     | 50   | 0,20 | 45° | 100 |
| -                         | 1182672Z9   | HC40TSP2XL 5 120 60-W                 | 5   | ⊗      | 12                                        | 12     | 60   | 0,20 | 45° | 125 |
| -                         | 1182673Z9   | HC40TSP2XL 5 160 80-W                 | 5   | ⊗      | 16                                        | 16     | 80   | 0,25 | 45° | 141 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

Note: For HB (weldon) end mills, the reference ends with "-W"

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Workpiece Material                | fz (mm/t)  |            |            | Vc (m/min) |          |          |
|-----|-----------------------------------|------------|------------|------------|------------|----------|----------|
|     |                                   | ae = 5,0%  | ae = 15%   | ae = 30%   | ae = 5,0%  | ae = 15% | ae = 30% |
| P   | Unalloyed Steel                   | 0,009 x DC | 0,009 x DC | 0,008 x DC | 180        | 170      | 170      |
|     | Low-Alloyed Steel                 | 0,008 x DC | 0,007 x DC | 0,007 x DC | 160        | 160      | 150      |
|     | High-Alloyed Steel                | 0,007 x DC | 0,007 x DC | 0,006 x DC | 140        | 140      | 140      |
| M   | SS - Ferritic / Martensitic       | 0,010xDC   | 0,008xDC   | 0,006xDC   | 160        | 150      | 120      |
|     | SS - Austenitic                   | 0,009xDC   | 0,007xDC   | 0,005xDC   | 150        | 140      | 110      |
|     | SS - Austenitic-ferritic (Duplex) | 0,008xDC   | 0,005xDC   | 0,004xDC   | 130        | 120      | 100      |
| K   | Malleable Cast Iron               | 0,009 x DC | 0,009 x DC | 0,008 x DC | 210        | 210      | 200      |
|     | Grey Cast Iron                    | 0,009 x DC | 0,009 x DC | 0,008 x DC | 210        | 200      | 200      |
|     | Nodular Cast Iron                 | 0,009 x DC | 0,008 x DC | 0,007 x DC | 190        | 190      | 180      |
| S   | Heat Resistant Super Alloys       | 0,005xDC   | 0,004xDC   | 0,003xDC   | 80         | 60       | 40       |

Note<sup>1</sup>: Feed valid for when the end mill works with its whole ap, for when the end mill is working with lower depths of cut consider increasing the feed up to 25%.

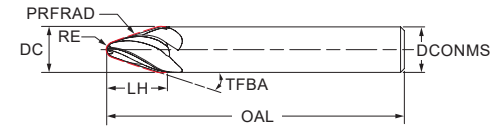
Note<sup>2</sup>: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

# RAD INTEG Conical and Tangential Segment End mills

## HXC30GL Conical



P M K S



All order codes are cylindrical shank.  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | T1     |        | Dimensions   Dimensões   Dimensiones (mm) |        |      |        |    |    |     |
|----------------------|---------------------------------------|-----|--------|--------|-------------------------------------------|--------|------|--------|----|----|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 | PHH920 | DC                                        | DCONMS | TFBA | PRFRAD | RE | LH | OAL |
|                      |                                       |     |        |        |                                           |        |      |        |    |    |     |
| 1180046              | HXC30GL 4 080 10 18RM030              | 4   | ⊗      | ⊗      | 8                                         | 8      | 18   | 300    | 1  | 10 | 75  |
| 1180047              | HXC30GL 4 120 14 18RM045              | 4   | ⊗      | ⊗      | 12                                        | 12     | 18   | 450    | 2  | 14 | 83  |
| 1180048              | HXC30GL 4 160 18 18RM120              | 4   | ⊗      | ⊗      | 16                                        | 16     | 18   | 1200   | 3  | 18 | 95  |
| 1180049              | HXC30GL 4 160 12 28RM080              | 4   | ⊗      | ⊗      | 16                                        | 16     | 28   | 800    | 3  | 12 | 95  |
| 1180050              | HXC30GL 4 160 16 18RM120              | 4   | ⊗      | ⊗      | 16                                        | 16     | 18   | 1200   | 4  | 16 | 110 |
| 1180051              | HXC30GL 4 160 11 28RM080              | 4   | ⊗      | ⊗      | 16                                        | 16     | 28   | 800    | 4  | 11 | 110 |

⊗ Stock item | Produto de stock | Itens de stock

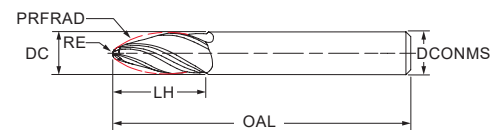
○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## HXT30GL Tangential



P M K S



All order codes are cylindrical shank.  
Weldon shank available under request.

|                                 | <sup>(2)</sup> Grade code             |     | T1     | Y3     | Dimensions   Dimensões   Dimensiones (mm) |        |        |    |    |     |
|---------------------------------|---------------------------------------|-----|--------|--------|-------------------------------------------|--------|--------|----|----|-----|
| <sup>(1)</sup><br>Geometry code | Reference<br>Referência<br>Referencia | NOF | PHP920 | PHH920 |                                           |        |        |    |    |     |
|                                 |                                       |     |        |        | DC                                        | DCONMS | PRFRAD | RE | LH | OAL |
| 1180045                         | HXT30GL 4 060 22 RM095                | 4   | ⊗      | ⊗      | 6                                         | 6      | 95     | 1  | 22 | 63  |
| 1180037                         | HXT30GL 4 080 24 RM095                | 4   | ⊗      | ⊗      | 8                                         | 8      | 95     | 1  | 24 | 70  |
| 1180038                         | HXT30GL 4 100 28 RM085                | 4   | ⊗      | ⊗      | 10                                        | 10     | 85     | 2  | 28 | 72  |
| 1180039                         | HXT30GL 4 120 28 RM090                | 4   | ⊗      | ⊗      | 12                                        | 12     | 90     | 2  | 28 | 83  |
| 1180691                         | HXT30GL 4 160 30 RM080                | 4   | ⊗      | ⊗      | 16                                        | 16     | 80     | 3  | 30 | 110 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

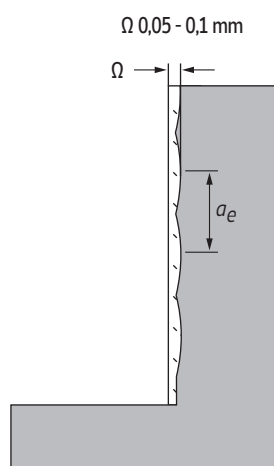


## GRADES SELECTION GUIDE Guia para selecção de graus | Tabla para selección de calidades

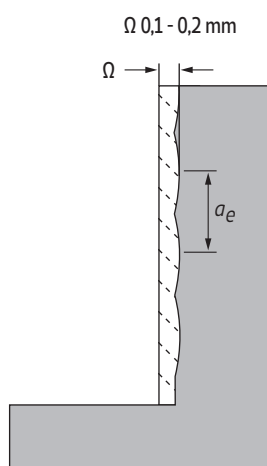
| ISO | Material                                     | Grades |        |
|-----|----------------------------------------------|--------|--------|
|     |                                              | PHP920 | PHH920 |
| P   | Unalloyed Steel                              | ✓      |        |
|     | Low-Alloyed Steel                            | ✓      |        |
|     | High-Alloyed Steel                           | ✓      |        |
| M   | Stainless Steel (Ferritic / Martensitic)     |        | ✓      |
|     | Stainless Steel (Austenitic)                 |        | ✓      |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) |        | ✓      |
| K   | Malleable Cast Iron                          | ✓      |        |
|     | Grey Cast Iron                               | ✓      |        |
|     | Nodular Cast Iron                            | ✓      |        |
| S   | Heat Resistant Super Alloys                  |        | ✓      |

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

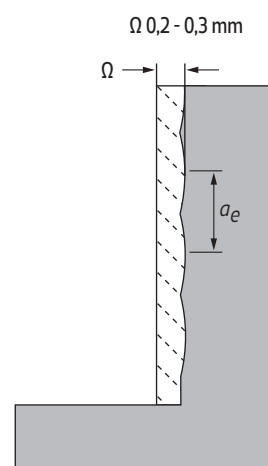
$\Omega$  - Allowance  
 $a_e$  - Stepmover



Fine Finishing



Finishing



Semi-Finishing

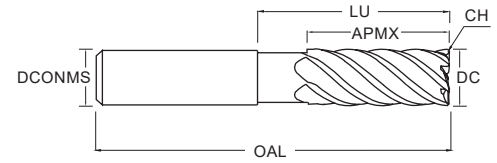
| ISO | Workpiece Material                           | Vc<br>(m/min) | fz (mm/t)         |                |                      |                |                |
|-----|----------------------------------------------|---------------|-------------------|----------------|----------------------|----------------|----------------|
|     |                                              |               | HXC30GL - Conical |                | HXT30GL - Tangential |                |                |
|     |                                              |               | Ω 0,05 - 0,1 mm   | Ω 0,1 - 0,2 mm | Ω 0,05 - 0,1 mm      | Ω 0,1 - 0,2 mm | Ω 0,2 - 0,3 mm |
| P   | Unalloyed Steel                              | 180           | 0,007 x DC        | 0,006 x DC     | 0,007 x DC           | 0,006 x DC     | 0,005 x DC     |
|     | Low-Alloyed Steel                            | 160           | 0,006 x DC        | 0,005 x DC     | 0,006 x DC           | 0,005 x DC     | 0,004 x DC     |
|     | High-Alloyed Steel                           | 150           | 0,005 x DC        | 0,004 x DC     | 0,005 x DC           | 0,004 x DC     | 0,004 x DC     |
| M   | Stainless Steel (Ferritic / Martensitic)     | 120           | 0,005 x DC        | 0,004 x DC     | 0,005 x DC           | 0,004 x DC     | 0,004 x DC     |
|     | Stainless Steel (Austenitic)                 | 120           | 0,004 x DC        | 0,003 x DC     | 0,004 x DC           | 0,003 x DC     | 0,003 x DC     |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 110           | 0,003 x DC        | 0,003 x DC     | 0,003 x DC           | 0,003 x DC     | 0,002 x DC     |
| K   | Malleable Cast Iron                          | 220           | 0,007 x DC        | 0,006 x DC     | 0,007 x DC           | 0,006 x DC     | 0,005 x DC     |
|     | Grey Cast Iron                               | 210           | 0,007 x DC        | 0,006 x DC     | 0,007 x DC           | 0,006 x DC     | 0,005 x DC     |
|     | Nodular Cast Iron                            | 190           | 0,006 x DC        | 0,005 x DC     | 0,006 x DC           | 0,005 x DC     | 0,005 x DC     |
| S   | Heat Resistant Super Alloys                  | 60            | 0,003 x DC        | 0,003 x DC     | 0,003 x DC           | 0,003 x DC     | 0,002 x DC     |

## FIN INTEG Finishing End mills

## HC45FL Corner chamfer



P M K H



All order codes are cylindrical shank.  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | T1     |        | X7                                        |        |      |      |     |    |     |
|----------------------|---------------------------------------|-----|--------|--------|-------------------------------------------|--------|------|------|-----|----|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 | PHP603 | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|                      |                                       |     |        |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180845              | HC45FL 6 030 08                       | 6   | ○      | ⊗      | 3                                         | 6      | 8    | 0,15 | 45° | 15 | 57  |
| 1180846              | HC45FL 6 040 11                       | 6   | ○      | ⊗      | 4                                         | 6      | 11   | 0,15 | 45° | 17 | 57  |
| 1180847              | HC45FL 6 050 13                       | 6   | ○      | ⊗      | 5                                         | 6      | 13   | 0,15 | 45° | 19 | 57  |
| 1180342              | HC45FL 6 060 13                       | 6   | ⊗      | ⊗      | 6                                         | 6      | 13   | 0,15 | 45° | 21 | 57  |
| 1180062              | HC45FL 6 080 19                       | 6   | ⊗      | ⊗      | 8                                         | 8      | 19   | 0,15 | 45° | 28 | 63  |
| 1180344              | HC45FL 6 100 22                       | 6   | ⊗      | ⊗      | 10                                        | 10     | 22   | 0,20 | 45° | 30 | 72  |
| 1180343              | HC45FL 6 120 26                       | 6   | ⊗      | ⊗      | 12                                        | 12     | 26   | 0,20 | 45° | 34 | 83  |
| 1180848              | HC45FL 6 160 32                       | 6   | ○      | ○      | 16                                        | 16     | 32   | 0,35 | 45° | 44 | 92  |
| 1180849              | HC45FL 6 200 38                       | 6   | ○      | ○      | 20                                        | 20     | 38   | 0,60 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## GRADES SELECTION GUIDE Guia para selecção de graus | Tabla para selección de calidades

| ISO | Material                                     | Grades |        |
|-----|----------------------------------------------|--------|--------|
|     |                                              | PHP603 | PHP920 |
| P   | Unalloyed Steel                              | ⚠      | ⚠      |
|     | Low-Alloyed Steel                            | ⚠      | ⚠      |
|     | High-Alloyed Steel                           | ⚠      | ⚠      |
| M   | Stainless Steel (Ferritic / Martensitic)     | ⚠      | ⚠      |
|     | Stainless Steel (Austenitic)                 | ⚠      | ⚠      |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | ⚠      | ⚠      |
| K   | Malleable Cast Iron                          | ⚠      | ⚠      |
|     | Grey Cast Iron                               | ⚠      | ⚠      |
|     | Nodular Cast Iron                            | ⚠      | ⚠      |
| H   | Hardened Steels                              | ⚠      | -      |

⚠ First choice | 1ª Escolha | 1ª Opción

⚠ Suitable | Adequado | Adecuado

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material                                     | Vc (m/min) |        | fz (mm/t)  |
|-----|----------------------------------------------|------------|--------|------------|
|     |                                              | PHP603     | PHP920 |            |
| P   | Unalloyed Steel                              | 200        | 190    | 0,009 x DC |
|     | Low-Alloyed Steel                            | 170        | 160    | 0,007 x DC |
|     | High-Alloyed Steel                           | 140        | 130    | 0,005 x DC |
| M   | Stainless Steel (Ferritic / Martensitic)     | 130        | 120    | 0,006 x DC |
|     | Stainless Steel (Austenitic)                 | 120        | 110    | 0,005 x DC |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 90         | 90     | 0,004 x DC |
| K   | Malleable Cast Iron                          | 240        | 230    | 0,009 x DC |
|     | Grey Cast Iron                               | 240        | 230    | 0,009 x DC |
|     | Nodular Cast Iron                            | 200        | 190    | 0,008 x DC |
| H   | Hardened Steels                              | 80         | -      | 0,004 x DC |

Note<sup>1</sup>: Feed valid for when the end mill works with its whole ap, for when the end mill is working with lower depths of cut consider increasing the feed up to 25%.

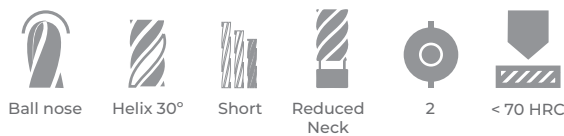
Note<sup>2</sup>: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

# MIN INTEG Micro Machining End mills

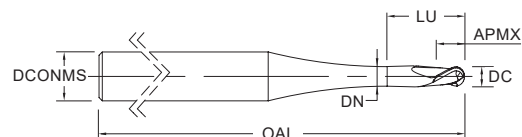
## HB30MINS Short neck



P M K S H



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | X4<br>PHH603 | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|------|-----|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | DN   | APMX | LU  | OAL |
| 1180769              | HB30MINS 2 004 01 010                 | 2   | ○            | 0,4                                       | 4      | 0,37 | 0,4  | 1,0 | 50  |
| 1180297              | HB30MINS 2 005 01 015                 | 2   | ⊗            | 0,5                                       | 4      | 0,45 | 0,6  | 1,5 | 50  |
| 1180288              | HB30MINS 2 006 01 020                 | 2   | ⊗            | 0,6                                       | 4      | 0,58 | 0,6  | 2,0 | 50  |
| 1180289              | HB30MINS 2 008 01 020                 | 2   | ⊗            | 0,8                                       | 4      | 0,78 | 0,8  | 2,0 | 50  |
| 1180298              | HB30MINS 2 010 02 025                 | 2   | ⊗            | 1,0                                       | 4      | 0,95 | 1,3  | 2,5 | 50  |
| 1180290              | HB30MINS 2 010 01 030                 | 2   | ⊗            | 1,0                                       | 4      | 0,95 | 1,0  | 3,0 | 50  |
| 1180291              | HB30MINS 2 012 02 030                 | 2   | ⊗            | 1,2                                       | 4      | 1,15 | 1,2  | 3,0 | 50  |
| 1180292              | HB30MINS 2 016 02 040                 | 2   | ⊗            | 1,6                                       | 4      | 1,55 | 1,6  | 4,0 | 50  |
| 1180293              | HB30MINS 2 020 02 040                 | 2   | ⊗            | 2,0                                       | 4      | 1,94 | 2,0  | 4,0 | 50  |
| 1180307              | HB30MINS 2 020 03 050                 | 2   | ⊗            | 2,0                                       | 4      | 1,95 | 2,5  | 5,0 | 50  |
| 1180299              | HB30MINS 2 025 03 060                 | 2   | ⊗            | 2,5                                       | 6      | 2,45 | 3,0  | 6,0 | 60  |
| 1180309              | HB30MINS 2 030 04 075                 | 2   | ⊗            | 3,0                                       | 6      | 2,95 | 4,0  | 7,5 | 60  |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

MIN INTEG Micro Machining End mills

HB30MINS Medium neck



P M K S H

Ball nose

Helix 30°

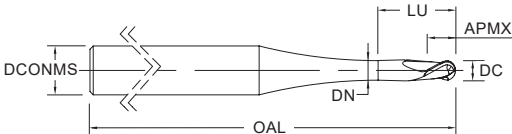
Short

Reduced Neck

2

< 70 HRC

All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2)Grade code                         |     | X4<br>PHH603 | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | DN   | APMX | LU   | OAL |
| 1180305              | HB30MINS 2 005 01 025                 | 2   | ⊗            | 0,5                                       | 4      | 0,45 | 0,4  | 2,5  | 50  |
| 1180308              | HB30MINS 2 010 02 050                 | 2   | ⊗            | 1,0                                       | 4      | 0,95 | 1,3  | 5,0  | 50  |
| 1180336              | HB30MINS 2 016 02 080                 | 2   | ⊗            | 1,6                                       | 4      | 1,55 | 1,6  | 8,0  | 50  |
| 1180310              | HB30MINS 2 020 03 100                 | 2   | ⊗            | 2,0                                       | 4      | 1,95 | 2,5  | 10,0 | 50  |
| 1180311              | HB30MINS 2 025 03 125                 | 2   | ⊗            | 2,5                                       | 6      | 2,45 | 3,0  | 12,5 | 60  |
| 1180301              | HB30MINS 2 030 04 150                 | 2   | ⊗            | 3,0                                       | 6      | 2,95 | 4,0  | 15,0 | 60  |

Stock item | Produto de stock | Itens de stock

Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code



# MIN INTEG Micro Machining End mills

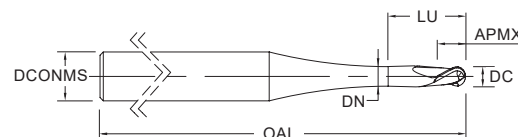
## HB30MINS Long neck



P M K S H



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | X4<br>PHH603 | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | DN   | APMX | LU   | OAL |
| 1180306              | HB30MINS 2 005 01 040                 | 2   | ⊗            | 0,5                                       | 4      | 0,45 | 0,6  | 4,0  | 50  |
| 1180300              | HB30MINS 2 010 02 080                 | 2   | ⊗            | 1,0                                       | 4      | 0,95 | 1,3  | 8,0  | 50  |
| 1180337              | HB30MINS 2 016 02 128                 | 2   | ⊗            | 1,6                                       | 4      | 1,55 | 1,6  | 12,8 | 50  |
| 1180302              | HB30MINS 2 020 03 160                 | 2   | ⊗            | 2,0                                       | 4      | 1,95 | 2,5  | 16,0 | 50  |
| 1180312              | HB30MINS 2 025 03 200                 | 2   | ⊗            | 2,5                                       | 6      | 2,45 | 3,0  | 20,0 | 60  |
| 1180313              | HB30MINS 2 030 04 240                 | 2   | ⊗            | 3,0                                       | 6      | 2,95 | 4,0  | 24,0 | 60  |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material                                     | Copying             |                     |                                     |                                     |                                     |                                     |
|-----|----------------------------------------------|---------------------|---------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|     |                                              | fz (mm/t)           |                     | Vc (m/min)                          |                                     |                                     |                                     |
|     |                                              | $\alpha < 15^\circ$ | $\alpha > 15^\circ$ | AP = 0,05 DC<br>$\alpha < 15^\circ$ | AP = 0,25 DC<br>$\alpha < 15^\circ$ | AP = 0,05 DC<br>$\alpha > 15^\circ$ | AP = 0,25 DC<br>$\alpha > 15^\circ$ |
| P   | Unalloyed Steel                              | 0,010 x DC          | 0,003 x DC          | 700                                 | 340                                 | 460                                 | 220                                 |
|     | Low-Alloyed Steel                            | 0,009 x DC          | 0,003 x DC          | 650                                 | 320                                 | 430                                 | 210                                 |
|     | High-Alloyed Steel                           | 0,008 x DC          | 0,003 x DC          | 590                                 | 290                                 | 390                                 | 190                                 |
| M   | Stainless Steel (Ferritic / Martensitic)     | 0,009 x DC          | 0,003 x DC          | 600                                 | 300                                 | 400                                 | 200                                 |
|     | Stainless Steel (Austenitic)                 | 0,008 x DC          | 0,003 x DC          | 560                                 | 280                                 | 370                                 | 190                                 |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 0,007 x DC          | 0,002 x DC          | 540                                 | 270                                 | 360                                 | 180                                 |
| K   | Malleable Cast Iron                          | 0,008 x DC          | 0,003 x DC          | 650                                 | 320                                 | 430                                 | 210                                 |
|     | Grey Cast Iron                               | 0,008 x DC          | 0,003 x DC          | 640                                 | 310                                 | 420                                 | 200                                 |
|     | Nodular Cast Iron                            | 0,007 x DC          | 0,002 x DC          | 600                                 | 300                                 | 400                                 | 190                                 |
| S   | Heat Resistant Super Alloys                  | 0,007 x DC          | 0,002 x DC          | 230                                 | 110                                 | 150                                 | 80                                  |
| H   | Hardened Steels                              | 0,008 x DC          | 0,003 x DC          | 460                                 | 230                                 | 310                                 | 150                                 |

Note: Since some of the end mills have low DC the above Vc cannot be achieved by any conventional machining center. The end mills still work at much lower Vc.

# CHAMF INTEG Chamfering End mills

## HCHGS



P M K



|                           |             | <sup>(2)</sup> Grade code             |     | Z9     | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHU920 |                                           |        |      |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | PRFA | OAL |
| 1180366                   | -           | HCHGS 4 030 02 90                     | 4   | ⊗      | 3                                         | 3      | 90°  | 38  |
| 1180367                   | -           | HCHGS 4 040 02 90                     | 4   | ⊗      | 4                                         | 4      | 90°  | 50  |
| 1180368                   | 1180496     | HCHGS 4 060 03 90                     | 4   | ⊗      | 6                                         | 6      | 90°  | 57  |
| 1180369                   | 1180497     | HCHGS 4 080 04 90                     | 4   | ⊗      | 8                                         | 8      | 90°  | 63  |
| 1180370                   | 1180498     | HCHGS 4 100 05 90                     | 4   | ⊗      | 10                                        | 10     | 90°  | 72  |
| 1180371                   | 1180499     | HCHGS 4 120 06 90                     | 4   | ⊗      | 12                                        | 12     | 90°  | 83  |
| 1180372                   | 1180500     | HCHGS 4 160 08 90                     | 4   | ⊗      | 16                                        | 16     | 90°  | 92  |
| 1180373                   | 1180553     | HCHGS 4 200 10 90                     | 4   | ⊗      | 20                                        | 20     | 90°  | 104 |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

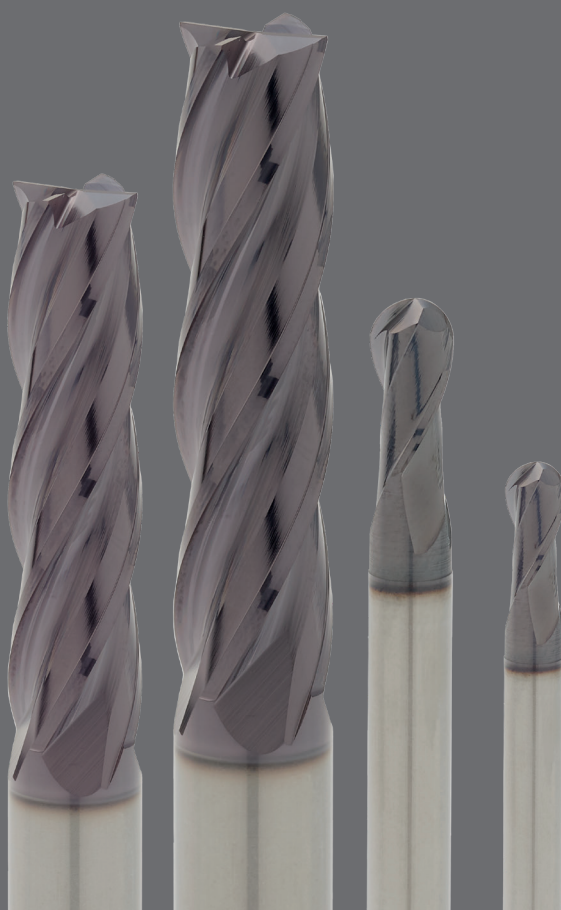
End mill order code = (1) Geometry Code + (2) Grade Code

Note: For HB (weldon) end mills, the reference ends with "-W"

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material                                     | Chamfering |            |
|-----|----------------------------------------------|------------|------------|
|     |                                              | fz (mm/t)  | Vc (m/min) |
| P   | Unalloyed Steel                              | 0,008 x DC | 180        |
|     | Low-Alloyed Steel                            | 0,007 x DC | 160        |
|     | High-Alloyed Steel                           | 0,006 x DC | 140        |
| M   | Stainless Steel (Ferritic / Martensitic)     | 0,007 x DC | 150        |
|     | Stainless Steel (Austenitic)                 | 0,006 x DC | 130        |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 0,004 x DC | 110        |
| K   | Malleable Cast Iron                          | 0,008 x DC | 210        |
|     | Grey Cast Iron                               | 0,008 x DC | 210        |
|     | Nodular Cast Iron                            | 0,008 x DC | 190        |

# GENERAL **END MILLS**



Solid carbide end mills for a general industrial applications, from roughing to finishing operations.

Fresas de metal duro integral para aplicações industriais gerais, desde operações de desbaste até acabamento.

Fresas de carburo integral para aplicaciones industriales generales, desde operaciones de desbaste hasta acabado.

## HF30G > page 62

- > Flat top end mills

Fresas de topo raso | Fresas de topo plano

- > 2 or 4 flutes

2 ou 4 flutes | 2 o 4 ranuras

- > Short and extra long version

Disponível em versão curta e extra longa | Disponible en versión corta y extra larga



## HR30G > page 65

- > Corner radius end mills

Fresas de raio de canto | Fresas de radio de esquina

- > 4 flutes

4 flutes | 4 ranuras

- > Short version

Disponível em versão curta | Disponible en versión corta



## HB30G > page 66

- > Ball nose end mills

Fresas de topo redondo | Fresas de topo redondeado

- > 2 or 4 flutes

2 ou 4 flutes | 2 o 4 ranuras

- > Short and long version

Disponível em versão curta e longa | Disponible en versión corta y larga



## HRO45G > page 68

- > Rougher end mills

Fresas para desbaste | Fresas para desbaste

- > From 3 to 6 flutes

De 3 a 6 flutes | De 3 a 6 ranuras

- > Short version

Disponível em versão curta | Disponible en versión corta



# CODIFICATION SYSTEM FOR SOLID CARBIDE END MILLS

Sistema de codificação para fresas de metal duro para acabamento | Sistema de codificación para fresas de carburo para acabado

Integral Solid Carbide  
example:

|          |          |           |          |          |          |          |            |           |              |           |          |           |
|----------|----------|-----------|----------|----------|----------|----------|------------|-----------|--------------|-----------|----------|-----------|
| <b>H</b> | <b>F</b> | <b>30</b> | <b>-</b> | <b>G</b> | <b>S</b> | <b>2</b> | <b>080</b> | <b>19</b> | <b>XR100</b> | <b>90</b> | <b>-</b> | <b>W</b>  |
| <b>1</b> | <b>2</b> | <b>3</b>  | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b>   | <b>9</b>  | <b>10</b>    | <b>11</b> |          | <b>12</b> |

## 1 - Tool type

H - Solid carbide end mill (Hard metal)

## 2 - Design

F - Square form (Flat top)  
R - Square form with corner radius  
C - Square form with corner chamfer  
B - Ball nose  
CH - Conical Top  
XC - Conical Segment  
XT - Tangential Segment  
XR - Special Radius  
RO - Rougher

## 3 - Helix Angle (Suppressed when it is 90°)

... - Degree of helix rounded to nearest 5 degree

## 4 - Machining Method (Suppressed when it doesn't exist)

HF - High Feed                      HP - High Performance  
TS - Trochoidal milling

## 5 - Application

A - Aluminium                      S - Stainless steel  
G - General application              H - Hard materials  
F - Finishing                      MIN - Micro milling  
P - Steel

## 6 - Length of Shank

S - Short length  
L - Long length  
XL - Extra long length

## 7 - Flutes number (NOF)

Example: NOF = 1 ; NOF = 2 ; NOF = 3

## 8 - Cutting diameter (DC)

Example: 120 = 12,0 mm ; 008 = 0,8 mm

## 9 - Max cutting depth (APMX)

Example for APMX ≥ 1 mm: 04 = 4 mm ; 06 = 6 mm  
Example for APMX < 1 mm: 002 = 0,2 mm ; 005 = 0,5 mm

## 10 - Shank diameter (only on straight flute solid carbide)

Example for corner radius: R150 = 1,5 mm ; R015 = 0,15 mm  
Example for special radius: XR100 = 1,0 mm  
Example for conical segment: 18RM120 -  $\alpha/2 = 18^\circ$ , RM = 1200 mm  
Example for tangential segment: RM090 - RM = 90 mm

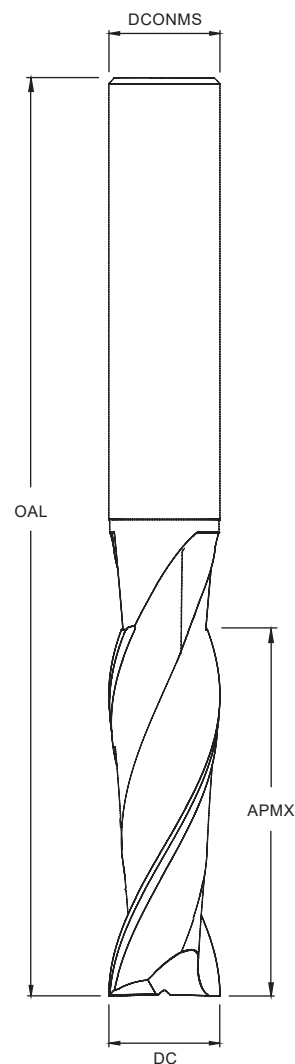
## 11 - Angle (Only for chamfering end mills)

Example: 90 = 90°

## 12 - Shank (Suppressed when cylindrical)

W - Weldon

Integral Solid Carbide  
technical drawing example





# SELECTION GUIDE FOR SOLID CARBIDE END MILLS

Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

|                                                                                                                | DC   |  | HELIX ANGLE | GEOMETRY                                                                                              | FINISHING                                                                           | ROUGHING                                                                             | MATERIAL | DESCRIPTION            | PAGE |
|----------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------|------------------------|------|
| <br><b>INTEG</b><br>HF30GS 2   | 2-20 | 2                                                                                 | 30°         | <br>Square           |    |    | PMK      | Flat Top End mills     | 62   |
| <br><b>INTEG</b><br>HF30GS 4   | 2-20 | 4                                                                                 | 30°         | <br>Square           |    |    | PMK      |                        | 63   |
| <br><b>INTEG</b><br>HF30GXL 4  | 2-12 | 4                                                                                 | 30°         | <br>Square           |    |    | PMK      |                        | 64   |
| <br><b>INTEG</b><br>HR30GS 4  | 3-20 | 4                                                                                 | 30°         | <br>Corner radius   |  |  | PMK      | Round Corner End mills | 65   |
| <br><b>INTEG</b><br>HB30GS 2 | 2-12 | 2                                                                                 | 30°         | <br>Ball nose      |  |  | PMK      | Ball Nose End mills    | 66   |
| <br><b>INTEG</b><br>HB30GL 2 | 4-12 | 2                                                                                 | 30°         | <br>Ball nose      |  |  | PMK      |                        | 66   |
| <br><b>INTEG</b><br>HB30GS 4 | 2-12 | 4                                                                                 | 30°         | <br>Ball nose      |  |  | PMK      |                        | 67   |
| <br><b>INTEG</b><br>HB30GL 4 | 2-20 | 4                                                                                 | 30°         | <br>Ball nose      |  |  | PMK      |                        | 67   |
| <br><b>INTEG</b><br>HRO45GS  | 3-20 | 4   6                                                                             | 45°         | <br>Corner chamfer |  |  | PMK      | Rougher End mills      | 68   |

# INTEG General Purpose End mills

## HF30GS 2 Flat top



P M K



Square



Helix 30°



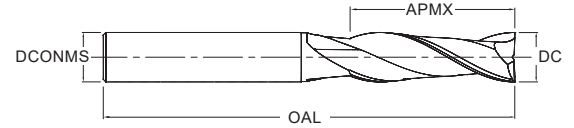
Short



2



< 45 HRC



|                           |             | <sup>(2)</sup> Grade code             |     | T1     | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHP920 |                                           |        |      |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | OAL |
| 1180587                   | -           | HF30GS 2 020 06                       | 2   | ⊗      | 2                                         | 4      | 6    | 38  |
| 1180588                   | -           | HF30GS 2 030 12                       | 2   | ⊗      | 3                                         | 4      | 12   | 38  |
| 1180589                   | -           | HF30GS 2 040 14                       | 2   | ⊗      | 4                                         | 4      | 14   | 50  |
| 1180590                   | -           | HF30GS 2 050 16                       | 2   | ⊗      | 5                                         | 6      | 16   | 50  |
| 1180591                   | -           | HF30GS 2 060 19                       | 2   | ⊗      | 6                                         | 6      | 19   | 50  |
| 1180592                   | 1180532     | HF30GS 2 080 20                       | 2   | ⊗      | 8                                         | 8      | 20   | 63  |
| 1180593                   | 1180533     | HF30GS 2 100 22                       | 2   | ⊗      | 10                                        | 10     | 22   | 75  |
| 1180594                   | 1180534     | HF30GS 2 120 25                       | 2   | ⊗      | 12                                        | 12     | 25   | 75  |
| 1180595                   | 1180535     | HF30GS 2 140 26                       | 2   | ⊗      | 14                                        | 14     | 26   | 83  |
| 1180596                   | 1180536     | HF30GS 2 160 32                       | 2   | ⊗      | 16                                        | 16     | 32   | 89  |
| 1180597                   | 1180537     | HF30GS 2 180 32                       | 2   | ⊗      | 18                                        | 18     | 32   | 92  |
| 1180598                   | 1180538     | HF30GS 2 200 38                       | 2   | ⊗      | 20                                        | 20     | 38   | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## HF30GS 4 Flat top



P M K



Square



Helix 30°



Short



4



< 45 HRC



|                           |             | <sup>(2)</sup> Grade code             |     | T1     | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|---------------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|-----|
| <sup>(1)</sup> Order code |             | Reference<br>Referência<br>Referencia | NOF | PHP920 |                                           |        |      |     |
| HA (Cylindrical)          | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | OAL |
| 1180262                   | -           | HF30GS 4 020 06                       | 4   | ⊗      | 2                                         | 4      | 6    | 38  |
| 1180219                   | -           | HF30GS 4 030 12                       | 4   | ⊗      | 3                                         | 4      | 12   | 38  |
| 1180215                   | -           | HF30GS 4 040 14                       | 4   | ⊗      | 4                                         | 4      | 14   | 50  |
| 1180195                   | -           | HF30GS 4 050 16                       | 4   | ⊗      | 5                                         | 6      | 16   | 50  |
| 1180263                   | -           | HF30GS 4 060 19                       | 4   | ⊗      | 6                                         | 6      | 19   | 50  |
| 1180223                   | 1180605     | HF30GS 4 070 19                       | 4   | ⊗      | 7                                         | 8      | 19   | 63  |
| 1180202                   | 1180544     | HF30GS 4 080 20                       | 4   | ⊗      | 8                                         | 8      | 20   | 63  |
| 1180224                   | 1180606     | HF30GS 4 090 22                       | 4   | ⊗      | 9                                         | 10     | 22   | 75  |
| 1180216                   | 1180545     | HF30GS 4 100 22                       | 4   | ⊗      | 10                                        | 10     | 22   | 75  |
| 1180264                   | 1180546     | HF30GS 4 120 25                       | 4   | ⊗      | 12                                        | 12     | 25   | 75  |
| 1180220                   | 1180547     | HF30GS 4 140 26                       | 4   | ⊗      | 14                                        | 14     | 26   | 83  |
| 1180129                   | 1180548     | HF30GS 4 160 32                       | 4   | ⊗      | 16                                        | 16     | 32   | 89  |
| 1180221                   | 1180549     | HF30GS 4 180 32                       | 4   | ⊗      | 18                                        | 18     | 32   | 92  |
| 1180222                   | 1180550     | HF30GS 4 200 38                       | 4   | ⊗      | 20                                        | 20     | 38   | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

# INTEG General Purpose End mills

## HF30GXL 4 Flat top



P M K



Square



Helix 30°



Extra long



4



< 45 HRC



All order codes are cylindrical shank.  
Weldon shank available under request.

| (1)<br>Geometry code | (2) Grade code                        |     | T1     |        | G4                                        |        |      |     |
|----------------------|---------------------------------------|-----|--------|--------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 | PH7920 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|                      |                                       |     |        |        | DC                                        | DCONMS | APMX | OAL |
| 1180708              | HF30GXL 4 020 09                      | 4   | ○      |        | 2                                         | 4      | 9    | 100 |
| 1180265              | HF30GXL 4 030 12                      | 4   | ○      |        | 3                                         | 6      | 12   | 100 |
| 1180266              | HF30GXL 4 040 16                      | 4   | ○      | △      | 4                                         | 6      | 16   | 100 |
| 1180267              | HF30GXL 4 050 20                      | 4   | ⊗      |        | 5                                         | 6      | 20   | 100 |
| 1180268              | HF30GXL 4 060 20                      | 4   | ⊗      |        | 6                                         | 6      | 20   | 100 |
| 1180269              | HF30GXL 4 080 20                      | 4   | ⊗      |        | 8                                         | 8      | 20   | 120 |
| 1180270              | HF30GXL 4 100 25                      | 4   | ⊗      |        | 10                                        | 10     | 25   | 120 |
| 1180057              | HF30GXL 4 120 30                      | 4   | ⊗      |        | 12                                        | 12     | 30   | 120 |

⊗ Stock item | Produto de stock  
Itens de stock

△ Stock available until sold out | Stock disponível até acabar o stock  
Stock disponible hasta acabar el stock

○ Available under request | Disponível sobre consulta  
Disponível bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

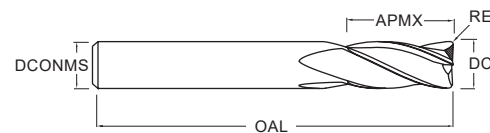
## HR30GS 4 Corner radius



P M K



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | T1     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |
|----------------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 | DC                                        | DCONMS | APMX | RE   | OAL |
| 1180231              | HR30GS 4 030 12 R025                  | 4   | ○      | 3                                         | 4      | 12   | 0,25 | 50  |
| 1180232              | HR30GS 4 030 12 R050                  | 4   | ○      | 3                                         | 4      | 12   | 0,50 | 50  |
| 1180233              | HR30GS 4 040 14 R025                  | 4   | ○      | 4                                         | 4      | 14   | 0,25 | 50  |
| 1180234              | HR30GS 4 040 14 R050                  | 4   | ○      | 4                                         | 4      | 14   | 0,50 | 50  |
| 1180235              | HR30GS 4 050 16 R025                  | 4   | ○      | 5                                         | 6      | 16   | 0,25 | 50  |
| 1180236              | HR30GS 4 050 16 R050                  | 4   | ○      | 5                                         | 6      | 16   | 0,50 | 50  |
| 1180237              | HR30GS 4 060 19 R050                  | 4   | ⊗      | 6                                         | 6      | 19   | 0,50 | 50  |
| 1180238              | HR30GS 4 060 19 R100                  | 4   | ⊗      | 6                                         | 6      | 19   | 1,00 | 50  |
| 1180239              | HR30GS 4 070 19 R050                  | 4   | ○      | 7                                         | 8      | 19   | 0,50 | 63  |
| 1180240              | HR30GS 4 070 19 R100                  | 4   | ○      | 7                                         | 8      | 19   | 1,00 | 63  |
| 1180241              | HR30GS 4 080 20 R050                  | 4   | ⊗      | 8                                         | 8      | 20   | 0,50 | 63  |
| 1180242              | HR30GS 4 080 20 R100                  | 4   | ⊗      | 8                                         | 8      | 20   | 1,00 | 63  |
| 1180243              | HR30GS 4 090 22 R050                  | 4   | ○      | 9                                         | 10     | 22   | 0,50 | 75  |
| 1180244              | HR30GS 4 090 22 R100                  | 4   | ○      | 9                                         | 10     | 22   | 1,00 | 75  |
| 1180245              | HR30GS 4 100 22 R100                  | 4   | ⊗      | 10                                        | 10     | 22   | 1,00 | 75  |
| 1180246              | HR30GS 4 100 22 R200                  | 4   | ⊗      | 10                                        | 10     | 22   | 2,00 | 75  |
| 1180247              | HR30GS 4 120 25 R100                  | 4   | ⊗      | 12                                        | 12     | 25   | 1,00 | 75  |
| 1180248              | HR30GS 4 120 25 R200                  | 4   | ⊗      | 12                                        | 12     | 25   | 2,00 | 75  |
| 1180249              | HR30GS 4 140 26 R100                  | 4   | ○      | 14                                        | 14     | 26   | 1,00 | 83  |
| 1180250              | HR30GS 4 140 26 R200                  | 4   | ○      | 14                                        | 14     | 26   | 2,00 | 83  |
| 1180251              | HR30GS 4 160 32 R100                  | 4   | ⊗      | 16                                        | 16     | 32   | 1,00 | 89  |
| 1180252              | HR30GS 4 160 32 R200                  | 4   | ⊗      | 16                                        | 16     | 32   | 2,00 | 89  |
| 1180253              | HR30GS 4 180 32 R100                  | 4   | ○      | 18                                        | 18     | 32   | 1,00 | 92  |
| 1180254              | HR30GS 4 180 32 R200                  | 4   | ○      | 18                                        | 18     | 32   | 2,00 | 92  |
| 1180255              | HR30GS 4 200 38 R100                  | 4   | ⊗      | 20                                        | 20     | 38   | 1,00 | 104 |
| 1180256              | HR30GS 4 200 38 R200                  | 4   | ⊗      | 20                                        | 20     | 38   | 2,00 | 104 |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code



# INTEG General Purpose End mills

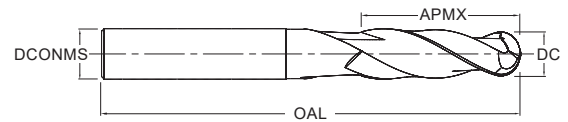
## HB30GS 2 Ball nose



P M K



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | T1     |        | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------|--------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 | PH7920 | DC                                        | DCONMS | APMX | OAL |
| 1180278              | HB30GS 2 020 06                       | 2   | ○      | ⊗      | 2                                         | 3      | 6    | 38  |
| 1180279              | HB30GS 2 030 12                       | 2   | ⊗      |        | 3                                         | 3      | 12   | 38  |
| 1180280              | HB30GS 2 040 14                       | 2   | ○      |        | 4                                         | 4      | 14   | 50  |
| 1180281              | HB30GS 2 050 16                       | 2   | ⊗      |        | 5                                         | 6      | 16   | 50  |
| 1180282              | HB30GS 2 060 19                       | 2   | ○      |        | 6                                         | 6      | 19   | 50  |
| 1180283              | HB30GS 2 080 20                       | 2   | ⊗      |        | 8                                         | 8      | 20   | 63  |
| 1180284              | HB30GS 2 100 22                       | 2   | ⊗      |        | 10                                        | 10     | 22   | 75  |
| 1180285              | HB30GS 2 120 25                       | 2   | ⊗      |        | 12                                        | 12     | 25   | 75  |

⊗ Stock item | Produto de stock  
Itens de stock

⊗ Stock available until sold out | Stock disponível até acabar o stock  
Stock disponible hasta acabar el stock

○ Available under request | Disponível sobre consulta  
Disponível bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

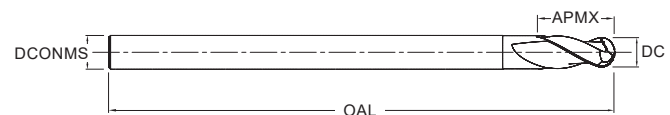
## HB30GL 2 Ball nose



P M K



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | T1     |  | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------|--|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF | PHP920 |  | DC                                        | DCONMS | APMX | OAL |
| 1180688              | HB30GL 2 040 08                       | 2   | ⊗      |  | 4                                         | 6      | 8    | 75  |
| 1180128              | HB30GL 2 060 12                       | 2   | ⊗      |  | 6                                         | 6      | 12   | 75  |
| 1180029              | HB30GL 2 080 14                       | 2   | ⊗      |  | 8                                         | 8      | 14   | 100 |
| 1180030              | HB30GL 2 100 18                       | 2   | ⊗      |  | 10                                        | 10     | 18   | 100 |
| 1180031              | HB30GL 2 120 22                       | 2   | ⊗      |  | 12                                        | 12     | 22   | 100 |

⊗ Stock item | Produto de stock  
Itens de stock

⊗ Stock available until sold out | Stock disponível até acabar o stock  
Stock disponible hasta acabar el stock

○ Available under request | Disponível sobre consulta  
Disponível bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

# INTEG General Purpose End mills

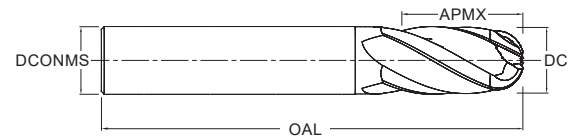
## HB30GS 4 Ball nose



P M K



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | T1<br>PHP920 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | OAL |
| 1180156              | HB30GS 4 020 03                       | 4   | ⊗            | 2                                         | 4      | 3    | 50  |
| 1180157              | HB30GS 4 030 05                       | 4   | ⊗            | 3                                         | 4      | 5    | 50  |
| 1180068              | HB30GS 4 040 06                       | 4   | ⊗            | 4                                         | 6      | 6    | 60  |
| 1181837              | HB30GS 4 050 08                       | 4   | ⊗            | 5                                         | 6      | 8    | 60  |
| 1180272              | HB30GS 4 060 09                       | 4   | ⊗            | 6                                         | 6      | 9    | 60  |
| 1180066              | HB30GS 4 080 16                       | 4   | ⊗            | 8                                         | 8      | 16   | 63  |
| 1180432              | HB30GS 4 100 20                       | 4   | ⊗            | 10                                        | 10     | 20   | 75  |
| 1180287              | HB30GS 4 120 25                       | 4   | ⊗            | 12                                        | 12     | 25   | 75  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

End mill order code = (1) Geometry Code + (2) Grade Code

## HB30GL 4 Ball nose



P M K



All order codes are cylindrical shank.  
Weldon shank available under request.



| (1)<br>Geometry code | (2) Grade code                        |     | T1<br>PHP920 | Dimensions   Dimensões   Dimensiones (mm) |        |      |     |
|----------------------|---------------------------------------|-----|--------------|-------------------------------------------|--------|------|-----|
|                      | Reference<br>Referência<br>Referencia | NOF |              | DC                                        | DCONMS | APMX | OAL |
| 1180273              | HB30GL 4 020 04                       | 4   | ⊗            | 2                                         | 4      | 4    | 75  |
| 1180274              | HB30GL 4 030 08                       | 4   | ⊗            | 3                                         | 4      | 8    | 75  |
| 1180275              | HB30GL 4 040 11                       | 4   | ○            | 4                                         | 4      | 11   | 75  |
| 1180150              | HB30GL 4 050 13                       | 4   | ⊗            | 5                                         | 6      | 13   | 75  |
| 1180032              | HB30GL 4 060 13                       | 4   | ⊗            | 6                                         | 6      | 13   | 75  |
| 1180064              | HB30GL 4 080 16                       | 4   | ⊗            | 8                                         | 8      | 16   | 100 |
| 1180065              | HB30GL 4 100 16                       | 4   | ⊗            | 10                                        | 10     | 16   | 100 |
| 1180071              | HB30GL 4 120 25                       | 4   | ⊗            | 12                                        | 12     | 25   | 100 |
| 1180276              | HB30GL 4 160 32                       | 4   | ⊗            | 16                                        | 16     | 32   | 120 |
| 1180277              | HB30GL 4 200 38                       | 4   | ⊗            | 20                                        | 20     | 38   | 120 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

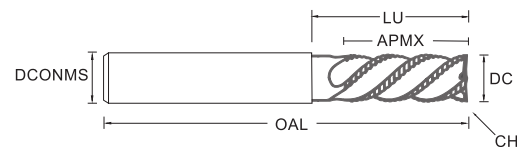
End mill order code = (1) Geometry Code + (2) Grade Code

# INTEG General Purpose End mills

## HRO45GS Rougher



P M K



|                  |             | (2) Grade code                        |     | Z9     | Dimensions   Dimensões   Dimensiones (mm) |        |      |      |     |    |     |
|------------------|-------------|---------------------------------------|-----|--------|-------------------------------------------|--------|------|------|-----|----|-----|
| (1) Order code   |             | Reference<br>Referência<br>Referencia | NOF | PHU920 |                                           |        |      |      |     |    |     |
| HA (Cylindrical) | HB (Weldon) |                                       |     |        | DC                                        | DCONMS | APMX | CHW  | KCH | LU | OAL |
| 1180557          | 1180558     | HRO45GS 3 030 08                      | 3   | ○      | 3                                         | 6      | 8    | 0,15 | 45° | 15 | 57  |
| 1180559          | 1180560     | HRO45GS 4 040 11                      | 4   | ○      | 4                                         | 6      | 11   | 0,15 | 45° | 17 | 57  |
| 1180561          | 1180562     | HRO45GS 4 050 13                      | 4   | ○      | 5                                         | 6      | 13   | 0,15 | 45° | 19 | 57  |
| 1180439          | 1180563     | HRO45GS 4 060 13                      | 4   | ⊗      | 6                                         | 6      | 13   | 0,15 | 45° | 21 | 57  |
| 1180440          | 1180564     | HRO45GS 4 080 19                      | 4   | ⊗      | 8                                         | 8      | 19   | 0,15 | 45° | 27 | 63  |
| 1180441          | 1180565     | HRO45GS 4 100 22                      | 4   | ⊗      | 10                                        | 10     | 22   | 0,20 | 45° | 32 | 72  |
| 1180374          | 1180465     | HRO45GS 4 120 26                      | 4   | ⊗      | 12                                        | 12     | 26   | 0,20 | 45° | 38 | 83  |
| 1180566          | 1180567     | HRO45GS 5 160 32                      | 5   | ⊗      | 16                                        | 16     | 32   | 0,35 | 45° | 44 | 92  |
| 1180568          | 1180569     | HRO45GS 6 200 38                      | 6   | ⊗      | 20                                        | 20     | 38   | 0,60 | 45° | 54 | 104 |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

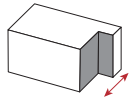
End mill order code = (1) Geometry Code + (2) Grade Code

## RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

| ISO | Material                                     | f <sub>z</sub> (mm/t) |                      |                       | V <sub>c</sub> (m/min) |                      |                       |
|-----|----------------------------------------------|-----------------------|----------------------|-----------------------|------------------------|----------------------|-----------------------|
|     |                                              | a <sub>e</sub> = 25%  | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% | a <sub>e</sub> = 25%   | a <sub>e</sub> = 40% | a <sub>e</sub> = 100% |
| P   | Unalloyed Steel                              | 0,008 x DC            | 0,007 x DC           | 0,005 x DC            | 170                    | 160                  | 140                   |
|     | Low-Alloyed Steel                            | 0,007 x DC            | 0,006 x DC           | 0,004 x DC            | 150                    | 140                  | 120                   |
|     | High-Alloyed Steel                           | 0,006 x DC            | 0,005 x DC           | 0,004 x DC            | 130                    | 120                  | 100                   |
| M   | Stainless Steel (Ferritic / Martensitic)     | 0,006 x DC            | 0,005 x DC           | 0,004 x DC            | 110                    | 110                  | 90                    |
|     | Stainless Steel (Austenitic)                 | 0,005 x DC            | 0,004 x DC           | 0,003 x DC            | 100                    | 90                   | 80                    |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 0,004 x DC            | 0,003 x DC           | 0,002 x DC            | 80                     | 80                   | 70                    |
| K   | Malleable Cast Iron                          | 0,008 x DC            | 0,007 x DC           | 0,005 x DC            | 200                    | 190                  | 170                   |
|     | Grey Cast Iron                               | 0,008 x DC            | 0,007 x DC           | 0,005 x DC            | 200                    | 190                  | 160                   |
|     | Nodular Cast Iron                            | 0,008 x DC            | 0,007 x DC           | 0,004 x DC            | 180                    | 170                  | 150                   |

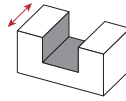
## CUTTING PARAMETERS Parâmetros de corte | Parámetros de corte

### Side milling



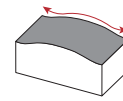
Finishing:  $a_e < 0,15 \times Dc$   
 Semi-finishing:  $0,15 \times Dc < a_e < 0,3 \times Dc$   
 Roughing:  $a_e > 0,3 \times Dc$

### Slotting



$a_e = 100\% \times Dc$

### Copying



Finishing:  $a_e < 0,20 \times Dc$   
 $a_p < 0,03 \times Dc$   
 Semi-finishing:  $0,20 \times Dc < a_e < 0,40 \times Dc$   
 $0,03 \times Dc < a_p < 0,10 \times Dc$   
 Roughing:  $a_e > 0,40 \times Dc$   
 $a_p > 0,10 \times Dc$

$\alpha$ : Surface inclination angle.

| ISO | Material                                     | fz (mm/t)         |                   |                   |                   |                     |                     |
|-----|----------------------------------------------|-------------------|-------------------|-------------------|-------------------|---------------------|---------------------|
|     |                                              | Side Milling      |                   |                   | Slotting          | Copying             |                     |
|     |                                              | $a_e = 12,5\%$    | $a_e = 25\%$      | $a_e = 40\%$      | $a_e = 100\%$     | $\alpha < 15^\circ$ | $\alpha > 15^\circ$ |
| P   | Unalloyed Steel                              | $0,009 \times Dc$ | $0,008 \times Dc$ | $0,005 \times Dc$ | $0,004 \times Dc$ | $0,012 \times Dc$   | $0,004 \times Dc$   |
|     | Low-Alloyed Steel                            | $0,008 \times Dc$ | $0,007 \times Dc$ | $0,004 \times Dc$ | $0,003 \times Dc$ | $0,010 \times Dc$   | $0,003 \times Dc$   |
|     | High-Alloyed Steel                           | $0,007 \times Dc$ | $0,006 \times Dc$ | $0,004 \times Dc$ | $0,003 \times Dc$ | $0,009 \times Dc$   | $0,003 \times Dc$   |
| M   | Stainless Steel (Ferritic / Martensitic)     | $0,007 \times Dc$ | $0,006 \times Dc$ | $0,004 \times Dc$ | $0,003 \times Dc$ | $0,009 \times Dc$   | $0,003 \times Dc$   |
|     | Stainless Steel (Austenitic)                 | $0,005 \times Dc$ | $0,005 \times Dc$ | $0,003 \times Dc$ | $0,002 \times Dc$ | $0,007 \times Dc$   | $0,002 \times Dc$   |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | $0,004 \times Dc$ | $0,004 \times Dc$ | $0,002 \times Dc$ | $0,002 \times Dc$ | $0,006 \times Dc$   | $0,002 \times Dc$   |
| K   | Malleable Cast Iron                          | $0,009 \times Dc$ | $0,008 \times Dc$ | $0,005 \times Dc$ | $0,004 \times Dc$ | $0,012 \times Dc$   | $0,004 \times Dc$   |
|     | Grey Cast Iron                               | $0,009 \times Dc$ | $0,008 \times Dc$ | $0,005 \times Dc$ | $0,004 \times Dc$ | $0,012 \times Dc$   | $0,004 \times Dc$   |
|     | Nodular Cast Iron                            | $0,008 \times Dc$ | $0,008 \times Dc$ | $0,004 \times Dc$ | $0,004 \times Dc$ | $0,011 \times Dc$   | $0,004 \times Dc$   |

(Note 1) Side milling and slotting feed valid for when the end mill works with its whole  $a_p$ , for when the end mill is working with lower depths of cut consider increasing the feed up to 25%.

(Note 2) Copying feed valid for low  $a_p$  ( $a_p / D < 0,1$ ), for higher  $a_p$  consider decreasing the feed by 50%.

| ISO | Material                                     | Vc (m/min)     |              |              |               |                                     |                                     |                                     |                                     |
|-----|----------------------------------------------|----------------|--------------|--------------|---------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|     |                                              | Side Milling   |              |              | Slotting      | Copying                             |                                     |                                     |                                     |
|     |                                              | $a_e = 12,5\%$ | $a_e = 25\%$ | $a_e = 40\%$ | $a_e = 100\%$ | AP = 0,05 DC<br>$\alpha < 15^\circ$ | AP = 0,25 DC<br>$\alpha < 15^\circ$ | AP = 0,05 DC<br>$\alpha > 15^\circ$ | AP = 0,25 DC<br>$\alpha > 15^\circ$ |
| P   | Unalloyed Steel                              | 200            | 190          | 180          | 150           | 480                                 | 240                                 | 320                                 | 160                                 |
|     | Low-Alloyed Steel                            | 190            | 180          | 160          | 130           | 440                                 | 220                                 | 290                                 | 150                                 |
|     | High-Alloyed Steel                           | 170            | 160          | 150          | 120           | 400                                 | 200                                 | 260                                 | 130                                 |
| M   | Stainless Steel (Ferritic / Martensitic)     | 150            | 140          | 130          | 110           | 360                                 | 180                                 | 240                                 | 120                                 |
|     | Stainless Steel (Austenitic)                 | 120            | 110          | 100          | 80            | 290                                 | 140                                 | 190                                 | 100                                 |
|     | Stainless Steel (Austenitic/Ferritic/Duplex) | 100            | 100          | 80           | 70            | 250                                 | 120                                 | 160                                 | 80                                  |
| K   | Malleable Cast Iron                          | 240            | 230          | 220          | 170           | 580                                 | 290                                 | 380                                 | 190                                 |
|     | Grey Cast Iron                               | 230            | 230          | 210          | 170           | 560                                 | 280                                 | 380                                 | 190                                 |
|     | Nodular Cast Iron                            | 220            | 210          | 190          | 160           | 520                                 | 260                                 | 350                                 | 170                                 |

(Note 3) Table valid for PHP920 grade, for PH7920 consider reducing the cutting velocity by 10 m/min.

(Note 4) Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

(Note 5) For copying, spindle speed is calculated as follows:  $n = \frac{Vc \times 1000}{\pi \times 2 \sqrt{a_p(Dc - a_p)}}$

# INTEG GRADES

## COATINGS

### PHP

- Perfect coating adhesion;
- Smoothest surface;
- Suitable for dry and wet machining;
- Color: Black;



The PHP is the recommended coating for general machining on steel and cast iron.

Because of its smoothness at medium temperatures, the chips are able to flow effortlessly, maintaining the flutes clean and a long tool life even in dry conditions.

### PHH

- Highest thermal stability;
- Smooth surface;
- High performance in dry machining;
- Color: Light brown;



The PHH is the recommended coating for Hardened steels, as well as stainless steels and HRSA.

Because of its high performance at high temperatures the coating successfully protect the cutting edges allowing the tool to work for long periods of time.

### PHU

- High thermal shock resistance;
- Carefully engineered surface quality;
- Suitable for dry and wet machining;
- Color: Grey;



Combining both excellent thermal resistance and excellent surface quality, the PHU coating is recommended for stainless steels, while also being suitable for steels and cast iron.

Because of its surface quality and thermal resistance it is able to prevent built-up-edge in both low-alloy steels and stainless steels, making it a very versatile coating.

### PHF

- High resistance wear and thermal stability;
- Superior surface quality;
- Suitable for dry and wet machining;
- Color: Red gold;



PHF boasts high resistance to wear, combining this with exceptional adhesion and very homogeneous wear behavior. Additionally, its dense layer structure and high silicon doping contribute to its superior thermal stability, facilitating heat dissipation in the chip and consequently increasing process stability.

### PHT

- Optimum chip removal;
- Excellent protection against built-up edges;
- Top performance on aluminum applications;
- Color: Silver;



PHT is a unique nanocrystalline coating, exceptionally dense yet smooth, with maximum adhesion even on sharp cutting edges. It effectively prevents the formation of built-up edges and ensures excellent machining results in non-ferrous metals, even at high operating temperatures.



## COATINGS

### PHD

- Superior finish on composite fiber materials;
- Excellent adhesion and multi-layer structure;
- Suitable for higher-cobalt carbide grades;
- Color: Silver-Grey



PHD is the recommended coating for solid carbide tools machining composite materials and carbon fiber, also suitable for carbide grades with increased cobalt content. Its multi-layer structure combines high hardness with excellent adhesion, keeping the cutting edge sharp for superior surface finishes and consistent tool performance.

### PCD GRADE

#### PDP410

Highest hardness and wear resistance.

High thermal conductivity dissipates heat rapidly from the cutting edge.

Recommended for general applications in aluminum and hardened materials.

## HARDMETAL SUBSTRATE

#### PH0910

A micrograin substrate that combines wear resistance and toughness.

Higher rigidity contributes to a longer tool life.

Recommended for semi-finishing to roughing on stable to slightly unstable conditions.

#### PH0920

Universal substrate with great balance between toughness and wear resistance.

Outstanding heat dissipation properties.

Recommended for semi-finishing to roughing on most materials.

#### PH0603

Harder grade with extreme wear resistance.

Excellent thermal stability.

Recommended for finishing applications and hardened steels.

#### PH0705

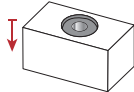
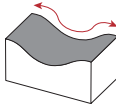
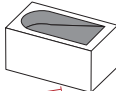
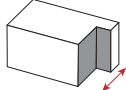
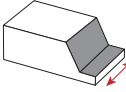
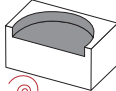
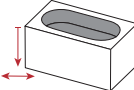
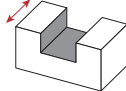
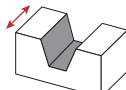
A fine grain size that increases hardness and fracture toughness.

High resistance to abrasion and edge chipping.

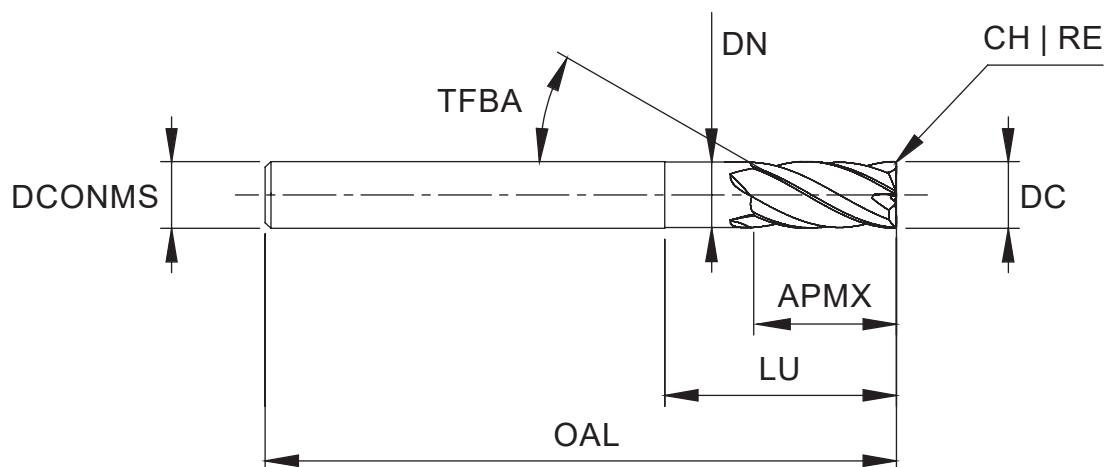
Suitable for abrasive materials.

# TECHNICAL GUIDEBOOK

## CUTTING PROCESS

|              |                                                                                                                                                                                                                                                                                |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FACE SIDE    |  <p>Spot Facing</p> <p>Uses the face of the Mill to normally cut a small blind hole.</p> <ul style="list-style-type: none"> <li>■ Smaller Helix angles</li> </ul>                             |
|              |  <p>Profiling</p> <p>Used for slanted surfaces or irregular profiles.</p> <ul style="list-style-type: none"> <li>■ Radial Segment or Ball Nose</li> </ul>                                     |
|              |  <p>Ramp down</p> <p>Uses the face of the Mill and cuts the surface with an angle producing a "ramp" like path.</p> <ul style="list-style-type: none"> <li>■ Cylindrical End Mills</li> </ul> |
| ONE SURFACE  |  <p>Side milling</p> <p>Grind a surface at a time, normally perpendicular to the tool path.</p> <ul style="list-style-type: none"> <li>■ Cylindrical End Mills</li> </ul>                     |
|              |  <p>Tapering</p> <p>Grind a surface at a time, normally the surface has an angle with the tool path.</p> <ul style="list-style-type: none"> <li>■ Radial Segmented</li> </ul>               |
|              |  <p>Helical Interpolation</p> <p>Grind the surface in a continuous curve.</p> <ul style="list-style-type: none"> <li>■ Choose according to geometry</li> </ul>                              |
|              |  <p>Plunging and recessing</p> <p>Grind in a closed boundary.</p> <ul style="list-style-type: none"> <li>■ Choose according to geometry</li> </ul>                                          |
| TWO SURFACES |  <p>Slotting</p> <p>Grind between two surfaces, normally perpendicular to the tool path.</p> <ul style="list-style-type: none"> <li>■ Cylindrical End Mills</li> </ul>                      |
|              |  <p>Ribbing</p> <p>Grind between two surfaces, normally with an angle between them.</p> <ul style="list-style-type: none"> <li>■ Radial Segmented</li> </ul>                                |

## END MILL ELEMENTS



DCONMS - Shank diameter

DC - Cutting diameter

DN - Neck diameter

CH - Chamfer

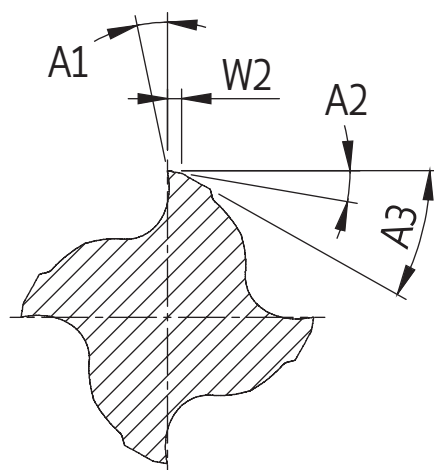
RE - Corner radius

OAL - Total length

LU - Useful length

APMX - Max cutting depth

TFBA - Helix angle



A1 - Rake angle;

A2 - Relief angle 1;

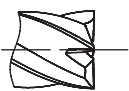
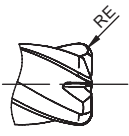
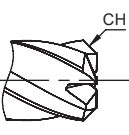
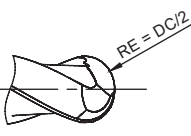
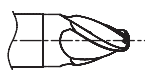
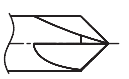
A3 - Relief angle 2;

W1 - Relief width 1;

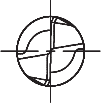
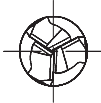
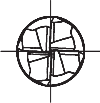
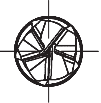
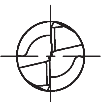
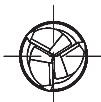
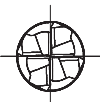
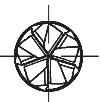
W2 - Relief width 2;

## SHAPE OF CORNER

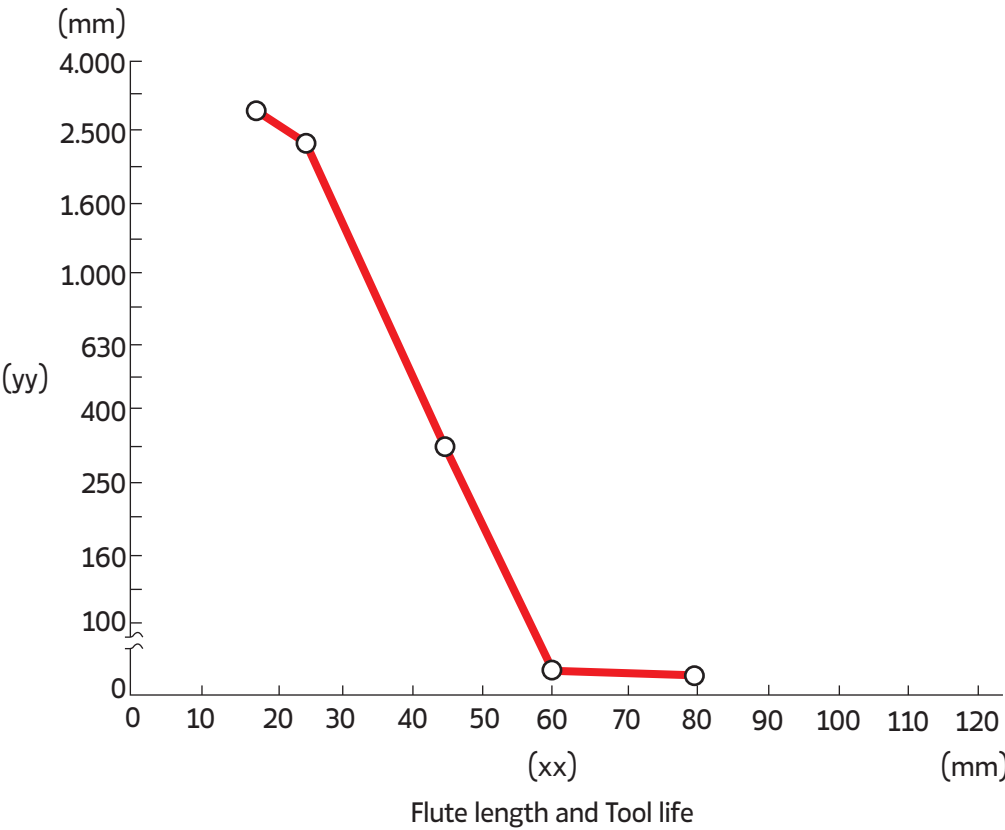
The Shape of Corner directly affect the distribution of cutting forces thus influence life span, productivity and functionality.

|                |                                                                                                       |                                                                                                                                                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Square         | <br>Square           |  <ul style="list-style-type: none"> <li>■ Recommended for side milling;</li> <li>■ When sharp corners are required;</li> </ul>                                                           |
| Corner Radius  | <br>Corner radius    |  <ul style="list-style-type: none"> <li>■ Commonly used for profiling and irregular surface machining;</li> </ul>                                                                        |
| Corner Chamfer | <br>Corner chamfer  |  <ul style="list-style-type: none"> <li>■ Protected edge geometry;</li> <li>■ Recommended for Shouldering;</li> </ul>                                                                   |
| Ball Nose      | <br>Ball nose      |  <ul style="list-style-type: none"> <li>■ Recommended for profiling and irregular surface machining;</li> </ul>                                                                        |
| Radial Segment | <br>Radial Segment |  <ul style="list-style-type: none"> <li>■ For higher productivity in hard to read surfaces;</li> <li>■ Balance between ball nose accessibility and straight tool finishing;</li> </ul> |
| Conical Top    | <br>Conical Top    |  <ul style="list-style-type: none"> <li>■ For Chamfering;</li> </ul>                                                                                                                   |

TYPES OF END-CUTTING EDGE SHAPES

|             | 2 - Flutes                                                                        | 3 - Flutes                                                                        | 4 - Flutes                                                                         | 6 - Flutes                                                                          |
|-------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Center cut  |  |  |  |  |
| Center eyed |  |  |  |  |

In brief, deflection increases twice if the flute length increases by 25%, or it decreases one-half if the mill diameter increases by 20%. The following shows the effect of flute length on cutting life of tools, indicating that it is recommended to use a tool with as high stiffness as possible to obtain high efficiency cutting. The long shank type end mill has short flute length and long shank with high stiffness compared with the long flute length type, and is suited to deep contouring.





# TECHNICAL GUIDEBOOK

## BALLNOSED END MILLS

End mills that are largely used for what's called "2 1/2D" machining, sometimes called "Prismatic" machining. This is machining where the Z or height of the surface doesn't change in smoothly flowing contours. It may drop down for a pocket or two, but the floors of the pockets and the top of the part are generally smooth planes punctuated by holes and more pockets. The vast majority of parts have this characteristic, but for those that don't, you'll be doing true "3D" machining, and to do that, you'll want to use a Ballnosed End mill.

Ballnoses create scallops whose size depends on the diameter of the ballnose, the depth of cut, and the stepover between successive passes:



NUMBER OF FLUTES

The flute number count is of great importance to the operation at hand. The ideal number of flutes varies greatly depending on the material and application.

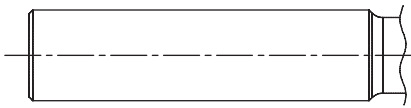
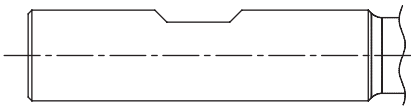
End mills with a higher number of flutes tend to have a larger core which make the tool stronger. Tool strength is an important parameter specially for machining ferrous materials. On the other hand, by increasing the core diameter, the flute depth decreases. This lack of space on the flute prevents the tool from removing large quantities of material per flute, as it would risk the chips jamming the flute and breaking the tool. Of course, this decrease in material removal per flute is compensated to some degree by the increase in number of flutes and therefore increase in feed (feed = #flutes x fz). End mills with a high flute count are better for finishing operations. This is because the tool is stronger and vibrates less and more cutting edges are in contact with the material at the same time. At finishing operations there is usually no problem related to chip evacuation.

Typically, End mills with a low number of flutes (1-3) are used for machining aluminium and NFM where tool strength is not a concern and for roughing with more traditional milling strategies.

|                 | <br>1 | <br>2 | <br>3 | <br>4 | <br>5 | <br>6 + |
|-----------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Chip evacuation |      |      |      |      |      |        |
| Feed rate       |     |     |     |     |     |       |
| Flute Capacity  |     |     |     |     |     |       |
| Surface Quality |     |     |     |     |     |       |
| Tool Strength   |     |     |     |     |     |       |

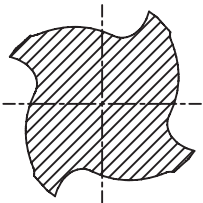
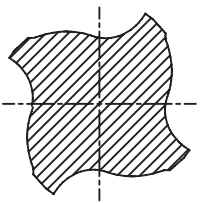
|         |           | 2 - Flutes                                                                           | 3 - Flutes                                                | 4 - Flutes                                 | 6 - Flutes                                              |
|---------|-----------|--------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------|---------------------------------------------------------|
| Feature | Advantage | Chip disposability is excellent.<br>Suitable for sinking.<br>Low cutting resistance. | Chip disposability is excellent.<br>Suitable for sinking. | High rigidity.                             | High rigidity.<br>Superior cutting edge durability.     |
|         | Fault     | Low rigidity.                                                                        | Diameter is not easily measured.                          | Chip disposability is poor.                | Chip disposability is poor.                             |
| Usage   |           | Slotting, side milling, sinking, etc.<br>Wide range of use.                          | Slotting, side milling, heavy cutting, finishing.         | Shallow slotting, side milling, finishing. | High hardness material, Shallow slotting, side milling. |

## SHANK TYPES - DIN 6535

| Flat Shank                                                                                                                                                                                                                                                   | Weldon Shank                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                             |                                                                                                                                                  |
| <p>Cylindrical Shank provides:</p> <ul style="list-style-type: none"> <li>■ Lower runout;</li> <li>■ Versatility choosing the holder;</li> <li>■ Higher tool life than weldon flat;</li> <li>■ Pullout may occur;</li> <li>■ Better tool balance;</li> </ul> | <p>Weldon Flat provides:</p> <ul style="list-style-type: none"> <li>■ Strong clamp;</li> <li>■ Pullout revention;</li> <li>■ Higher runout;</li> <li>■ Reduce tool Life;</li> <li>■ Cannot be used in thermic clamping;</li> </ul> |

## RAKE ANGLE

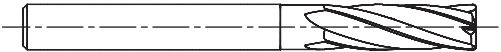
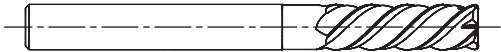
Rake angle is the angle that the End mill cutting face have regarding the work face material. That angle can be positive, neutral or negative, depending of the functionality and needs:

| Positive Rake Angle                                                                                                                                                                                                                                                                             | Negative Rake Angle                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>■ Good for soft / ductile work material;</li> <li>■ Lower cutting forces;</li> <li>■ Chip continuous and less deformed;</li> <li>■ Tool life reduces due to sharper helix;</li> <li>■ Worse defects may occur due to impact during machining;</li> </ul> | <ul style="list-style-type: none"> <li>■ Good for Hard/Brittle work material;</li> <li>■ Stronger tool thus a harder to worn out and a higher tool life;</li> <li>■ Sustains higher vibrations than a tool with positive rake angle;</li> <li>■ Higher feed and depth of cut but worse finished surface;</li> </ul> |
|                                                                                                                                                                                                              |                                                                                                                                                                                                                                |

HELIX ANGLE

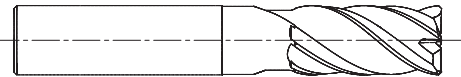
While working, End mill are being exposed to axial and radial forces, depending of cutting process and orientation. Axial force tends to press the end mill against the holder or pull it out of the holder, while the radial forces cause tools to bend thus creating cyclical vibrations.

Low helix angle implies higher radial forces, radial tool vibration and in extreme cases may even damage the machine spindle.

| Up to 30°                                                                                                                                                    | From 30° to 60°                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|                                                                             |                                                  |
| <ul style="list-style-type: none"><li>■ Lower pullout risk;</li><li>■ High vibrations;</li><li>■ Stronger tools;</li><li>■ Larger chip evacuation;</li></ul> | <ul style="list-style-type: none"><li>■ Lower radial force;</li><li>■ Better surface finish;</li><li>■ Faster feed rate;</li></ul> |

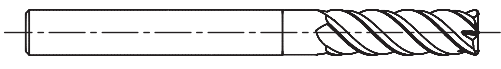
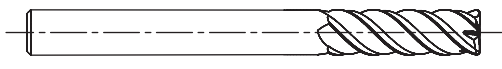
Irregular Pitch and Variable Helix Angle

Due to constant angles between helix, harmonic vibrations are formed. Those vibrations might bruise the tool, reducing tool life. For that reason, a simple way to prevent those harmonics is to put helix out of phase, thus inducing a lag between max values of forces.

|                                                                                     |                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>■ Reduced chatter due to reduced vibrations;</li><li>■ More stability;</li><li>■ Enhanced tool Life;</li><li>■ High speeds due to reduce in chatter;</li></ul> |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

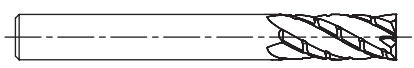
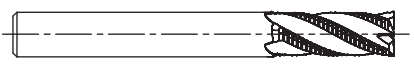
# TECHNICAL GUIDEBOOK

## REDUCED NECK

| With Reduced Neck                                                                                          | Without Reduced Neck                                                               |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                           |  |
| <ul style="list-style-type: none"> <li>■ More Reach and Stability;</li> <li>■ Prevents Rubbing;</li> </ul> |                                                                                    |

## CHIPBREAKER AND KNUCKLE ROUGHER

Both have similar geometries, but have completely different functionalities.

| Chip Divider End Mill                                                                                                                                                                                                                                                | Rougher End Mill                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                   |                                                                                                                             |
| <ul style="list-style-type: none"> <li>■ Better chip evacuation;</li> <li>■ Good surface finish;</li> <li>■ Enhance cutting performance;</li> <li>■ Prevents the formation of long chips;</li> <li>■ Common for aluminium and end mills with long flutes;</li> </ul> | <ul style="list-style-type: none"> <li>■ Smaller chip;</li> <li>■ High metal removal efficient;</li> <li>■ Bad surface finish;</li> <li>■ Allow higher feed at high stepover (&gt;40%) and slotting;</li> </ul> |

Roughing end mills like the one pictured have little serrations in the teeth. These serrations do a couple of useful things. First, they break up the chips making it easier to clear them out of the cavity during cutting in. Second, they are less prone to chatter. All those serrations produce a variety of vibrations that interfere with one another instead of creating a single ringing tone.

Roughing end mills are not very expensive and can provide a nice step up in productivity.

## TOOLHOLDER

Depending of the toolholder, you can obtain different runout, cutting speed, rigidity, versatility and tool switching/setting. There are some variant, but the basic clamping types are Collet, Side Lock, Hydraulic and Heat Shrink.

|             | Collet Chuck<br> | Weldon Chuck<br> | Hydraulic Expansion Chuck<br> | Shrink Chuck<br>                                                                 |
|-------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setting     |                  |                  |                               |                                                                                  |
| Rigidity    |                  |                  |                               |                                                                                  |
| Versatility |                  |                  |                               |                                                                                  |
| Runout      |                |                |                             |                                                                                |
| Pullout     |                |                |                             |                                                                                |
|             | <ul style="list-style-type: none"> <li>■ Versatile;</li> <li>■ Low Cutting Speed;</li> </ul>      | <ul style="list-style-type: none"> <li>■ Weldon Clamper;</li> <li>■ Prevent Pullout;</li> </ul>   | <ul style="list-style-type: none"> <li>■ High Speed;</li> <li>■ Bulky by design;</li> </ul>                     | <ul style="list-style-type: none"> <li>■ Requires a Heat Shrink Machine;</li> <li>■ Slow Tool Switching;</li> <li>■ Metal's Thermal expansion dependent;</li> </ul> |



# TECHNICAL GUIDEBOOK

## DRY AND WET MILLING

The main difference between dry and wet milling is the presence of a cold fluid, usually a cooling lubricant, that, as the name suggest, help cooling and lubricating the End mill while machining, providing a better material removal rate.

In other hand, the misuse of coolant can induce a cyclical thermal shock along the mill, resulting in fatigue decreasing the normal tool life span.

For that reason, coolant should only be used for Aluminium, titanium and heat resistant alloys.

As a half measure approach, minimum quantity lubrication using air can be used as a coolant, providing a better chip removal while increasing tool life span.



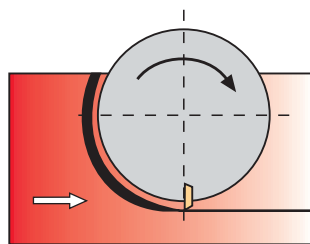
Wet Milling

## CLIMB MILLING

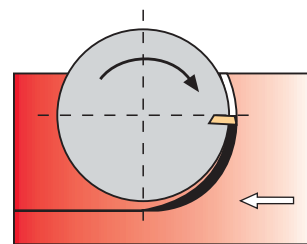
Unlike Conventional Milling, the mill rotation of Climb Milling has the same direction as the feed rate, providing a deflection direction away from the cutting surface and a better surface quality.

Furthermore, Chip thickness starts at the maximum, that way, the heat generated from grinding is directed to the chip, providing a tool life increase.

However, in some cases, Conventional Milling is still preferable due to the chip thickness start at zero and increases to the maximum at the end of cut, for example in harder metals is easier to machine using this technique.



Conventional Milling

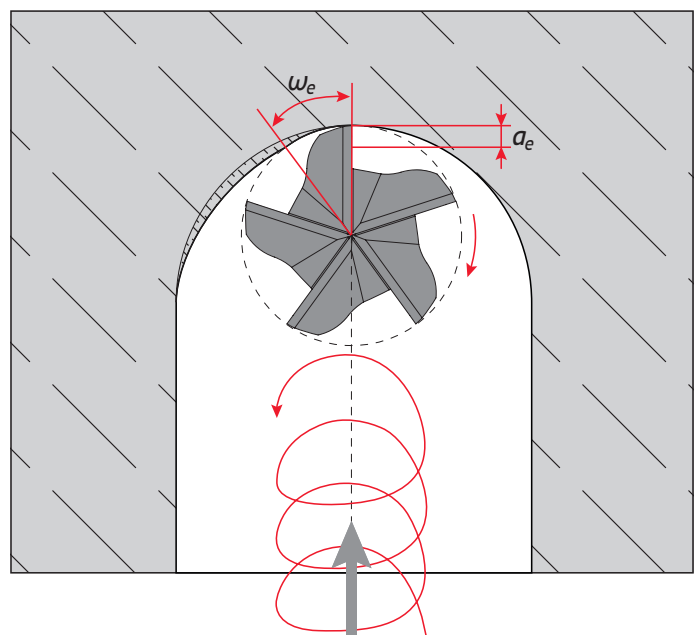
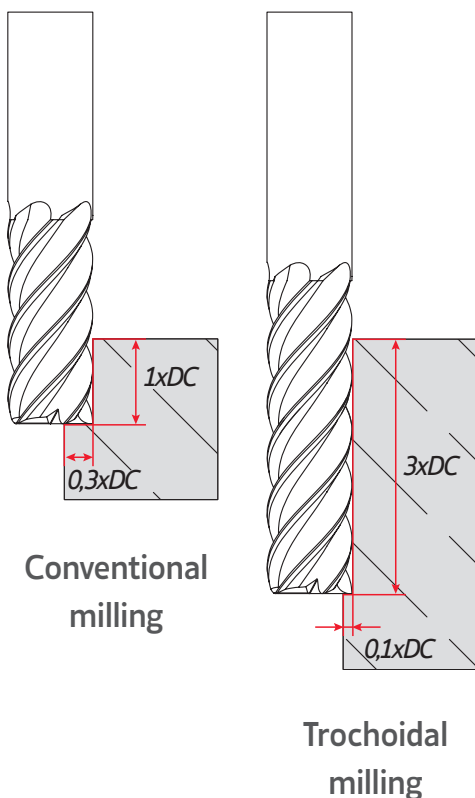


Climb Milling

## TROCHOIDAL MILLING



Instead of using a normal tool path, the trochoidal milling uses a spiral like path reducing the tool contact angle. With the reduced contact engagement, there is also a reduction in the load and wear on the tool and spindle, that decrease the amount of heat produced that is distributed across the tool's cutting edge. The reduced radial force also induces greater accuracy resulting in more precise and refined details in the machined section. All those facts can be summarized in lower cutting forces that reduce and redistribute heat along the tool, thus improving tool life, and faster cycle times while improving machining accuracy. The same tool can also be used across multiple slot sizes provided that the cutter diameter stays from 50% to 70% of the final slot width and the radial depth between 10% and 35% of the cutting tool diameter.

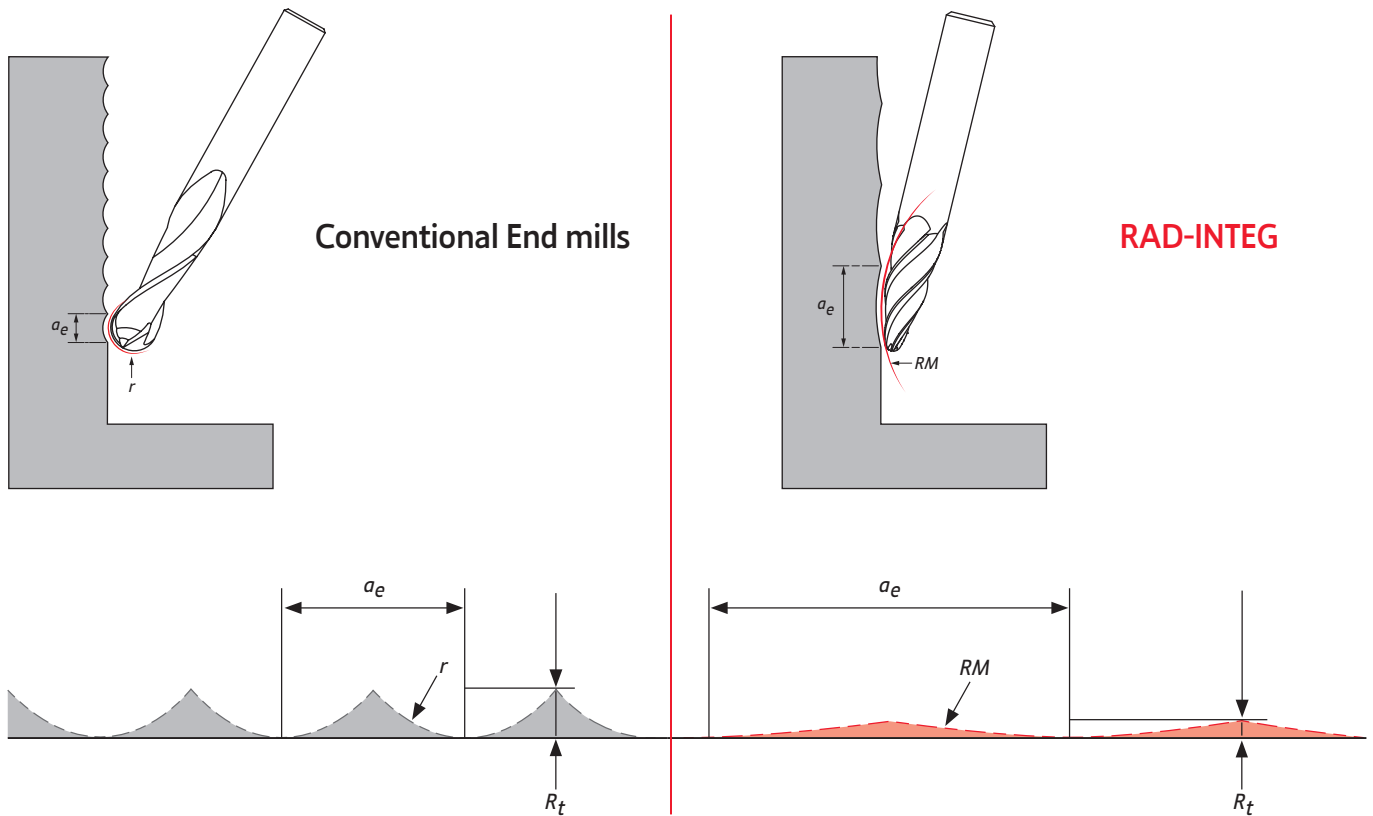


## RADIAL SEGMENT END MILL

A solution between regular End mill and ball nose are the radial segment. Instead of having a normal cylindrical form, they have a conical shape that provides a better surface and faster machining compared to regular and ball nose end mills. To put it in context, a normal radial segment with a diameter of 8mm can machine a radius of 300mm.

Some advantage of radial segment End mill are an up to 80% time saving compared to normal ball nose End mill, a better surface quality due to a large side cutting radius, a longer tool life due to lower cutting forces and a better accessibility for difficult areas.

Provides higher productivity and better finishing even at higher stepover and while maintaining the same allowance.



## ALUMINIUM MACHINING APPLICATION

Aluminium is a highly formable, workable, lightweight material. Parts made from this material can be found in nearly every industry. Additionally, Aluminium has become a popular choice for prototypes due to its low-cost and flexibility.

Aluminium is available in two basic forms: Cast and Wrought. Wrought Aluminium is typically stronger, more expensive, and contains a lower percentage of outside elements in its alloys. Wrought Aluminium is also more heat-resistant than Cast and has a higher level of machinability.

Cast Aluminium has less tensile strength but with a higher flexibility. It costs less, and has higher percentages of outside elements (silicon, magnesium, etc.) in its alloys, making it more abrasive than Wrought

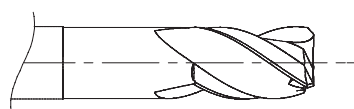
The real key to high performance machining in Aluminium is knowing the proper flute count and helix angle required for your operation.

## FLUTE COUNT

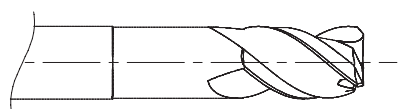
End mills for Aluminium are often available in either 2 flute or 3 flute styles. With higher flute counts, it would become difficult to evacuate chips effectively at the high speeds at which you can run in Aluminium. This is because Aluminium alloys leave a large chip, and chip valleys become smaller with each additional flute on an end mill.

The helix angle of a tool is measured by the angle formed between the centerline of the tool and a straight line tangent along the cutting edge. Cutting tools for Aluminium typically feature higher helix angles than standard end mills.

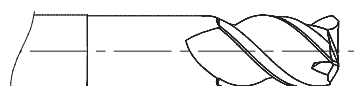
Specialized helix angles for Aluminium are typically either 35°, 40°, or 45°. Variable helix tools are also available and make a great choice for reducing chatter and harmonics while also increasing material removal rates.



35° Helix



40° Helix



45° Helix

A helix angle of 35° or 40° is a good choice for traditional roughing and slotting applications. A 45° helix angle is the preferred choice for finishing, but also for High Efficiency Milling toolpaths as the high helix angle wraps around the tool faster and makes for a more aggressive cut.

# TECHNICAL GUIDEBOOK

## TROUBLE SHOOTING FOR END MILLING

| Symptoms of Troubles                              | Probable Causes                                                                                                                                                                                                                         | Remedies                                                                                                                                                                                                                                                                           |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chatter during cutting</b>                     | <p>Low-angled cutting edge due to too high peripheral flank angle and rake angle;</p> <p>The work piece is not attached securely;</p> <p>Insufficient stiffness of machine and chuck;</p> <p>Too high cutting speed and feed speed;</p> | <p>Mend the flank angle and rake angle properly;</p> <p>Fix the work piece firmly;</p> <p>Replace the machine and chuck with proper ones;</p> <p>Change cutting conditions;</p>                                                                                                    |
| <b>Breakage during cutting</b>                    | <p>The end mill lacks firmness;</p> <p>Too high feed speed;</p> <p>Too large depth of cut;</p> <p>Excessively long protrusion;</p> <p>Worn-out cutting edge;</p> <p>The flute is longer than it need to be;</p>                         | <p>Use a tool designed to have high stiffness;</p> <p>Decrease the feed rate;</p> <p>Make small depth of cut;</p> <p>Shorten the protrusion length;</p> <p>Perform re-grinding in early stage of wear;</p> <p>Replace the end mill with a new one having shorter flute length;</p> |
| <b>Broken cutting edge during cutting</b>         | <p>The work piece is not fixed firmly;</p> <p>Too high feed speed;</p> <p>Low-angled cutting edge;</p> <p>Lack in tightening of chuck;</p> <p>Too large depth of cut;</p> <p>Insufficient stiffness of machine;</p>                     | <p>Fix a work piece firmly;</p> <p>Decrease the feed rate;</p> <p>Grind the angle properly;</p> <p>Perform chucking of a tool reliably;</p> <p>Make small depth of cut;</p> <p>Replace the machine with a proper one;</p>                                                          |
| <b>Serious wear and burning</b>                   | <p>Too high cutting speed;</p> <p>Excessively small peripheral flank angle;</p> <p>Hardness of the work material is too high;</p>                                                                                                       | <p>Slow down the revolution number;</p> <p>Modify the flank angle properly;</p> <p>Apply surface treatment to a tool to be used;</p>                                                                                                                                               |
| <b>Poor cutting quality</b>                       | <p>Excessively worn-out cutting edge;</p> <p>A tool to be used is not suited to the work material;</p> <p>Too small rake angle;</p>                                                                                                     | <p>Perform re-grinding;</p> <p>Use a tool specially designed for the work;</p> <p>Modify the rake angle properly;</p>                                                                                                                                                              |
| <b>Chip clogging</b>                              | <p>Too large amount of chips are produced;</p> <p>Small chip pocket;</p> <p>Insufficient application of cutting fluid;</p> <p>Improper shape of chip pocket;</p>                                                                        | <p>Adjust the feed speed and depth of cut;</p> <p>Use an end mill having less number of flutes;</p> <p>Apply a large amount of cutting fluid to work material;</p> <p>Modify the chip pocket to have a proper shape;</p>                                                           |
| <b>Burr on the finished surface</b>               | <p>Seriously worn-out peripheral flank;</p> <p>Mistake in selection of cutting conditions;</p> <p>Improper peripheral flank angle and rake angle;</p>                                                                                   | <p>Perform re-grinding in early stage of wear;</p> <p>Re-examine cutting conditions;</p> <p>Modify the angle properly;</p>                                                                                                                                                         |
| <b>Insufficient roughness of finished surface</b> | <p>Too high feed speed;</p> <p>Too slow cutting speed;</p> <p>Excessively worn-out cutting edge;</p> <p>Chips bite the work material;</p> <p>Too small medium to low gradient of end cutting edges;</p>                                 | <p>Decrease the feed rate;</p> <p>Use an end mill with smaller helix angle;</p> <p>Shorten the protrusion length;</p> <p>Make small depth of cut;</p>                                                                                                                              |
| <b>Inclination of slot</b>                        | <p>Too high feed speed;</p> <p>Too large helix angle;</p> <p>Too long overhang;</p> <p>Too large depth of cut;</p>                                                                                                                      | <p>Decrease the feed rate;</p> <p>Use an end mill with smaller helix angle;</p> <p>Shorten the protrusion length;</p> <p>Make small depth of cut;</p>                                                                                                                              |

## TROUBLE SHOOTING FOR END MILLING

| Symptoms of Troubles               | Probable Causes                                                                                                                                                                         | Remedies                                                                                                                                                                                                                                                |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Poor dimensional precision         | Insufficient precision of machine and chuck;<br>Too long flute length;<br>Insufficient stiffness of machine and chuck;                                                                  | Repair the machine and chuck;<br>Use an end mill with proper flute length;<br>Change the machine and chuck;                                                                                                                                             |
| Chatter during cutting             | The end mill lacks firmness;<br>Too high feed speed;<br>Too large depth of cut;<br>Excessively long protrusion;<br>Worn-out cutting edge;<br>The flute is longer than it need to be;    | Use a tool designed to have high stiffness;<br>Decrease the feed rate;<br>Make small depth of cut;<br>Shorten the protrusion length;<br>Perform re-grinding in early stage of wear;<br>Replace the end mill with a new one having shorter flute length; |
| Broken cutting edge during cutting | The work piece is not fixed firmly;<br>Too high feed speed;<br>Low-angle cutting edge;<br>Lack in tightening of chuck;<br>Too large depth of cut;<br>Insufficient stiffness of machine; | Fix a work piece firmly;<br>Decrease the feed rate;<br>Grind the angle properly;<br>Perform chucking of a tool reliably;<br>Make small depth of cut;<br>Replace the machine with a proper one;                                                          |
| Serious wear and burning           | Too high cutting speed;<br>Excessively small peripheral flank angle;<br>Hardness of the work material is too high;                                                                      | Slow down the revolution number;<br>Modify the flank angle properly;<br>Apply surface treatment to a tool to be used;                                                                                                                                   |
| Poor cutting quality               | Excessively worn-out cutting edge;<br>A tool to be used is not suited to the work material;<br>Too small rake angle;                                                                    | Perform re-grinding;<br>Use a tool specially designed for the work;<br>Modify the rake angle properly;                                                                                                                                                  |





# SOLID CARBIDE DRILLS



# SOLID CARBIDE DRILLS

## 1 MICRO DRILLS

> See page 90

## 2 GENERAL DRILLS

> See page 94

# SOLID CARBIDE

## MICRO DRILLS



Solid carbide micro drills are engineered for precision drilling of small diameters where accuracy and process stability are essential. Their optimized geometry ensures excellent hole quality, reliable chip evacuation and consistent performance.

As microbrocas de metal duro integral foram desenvolvidas para a furação de pequenos diâmetros, onde a precisão e a estabilidade do processo são essenciais. A sua geometria otimizada assegura elevada qualidade dos furos, evacuação eficiente da apar e desempenho consistente.

Las microbrocas de carburo sólido están diseñadas para el taladrado de pequeños diámetros, donde la precisión y la estabilidad del proceso son esenciales. Su geometría optimizada garantiza una alta calidad del orificio, una evacuación eficiente de la viruta y un rendimiento constante.

## HMDUUE > page 92

- > From DC 1,0mm to 2,9mm  
De DC 1,0mm a 2,9mm | Desde DC 1,0mm hasta 2,9mm
- > Available in 3D  
Disponível em 3D | Disponible en 3D
- > Without coolant  
Sem refrigeração | Sin refrigeración



## HMDUCE > page 93

- > From DC 1,0mm to 2,9mm  
De DC 1,0mm a 2,9mm | Desde DC 1,0mm hasta 2,9mm
- > Available in 5D  
Disponível em 5D | Disponible en 5D
- > With coolant  
Com refrigeração | Con refrigeración

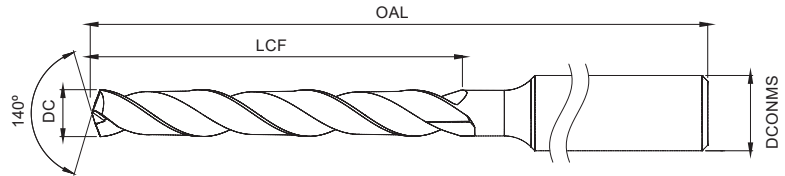


# HMDUUE 2 03D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro



|                |                   |
|----------------|-------------------|
| P              | K                 |
| HRC<br>≤<br>60 | IT8-9<br>IT class |

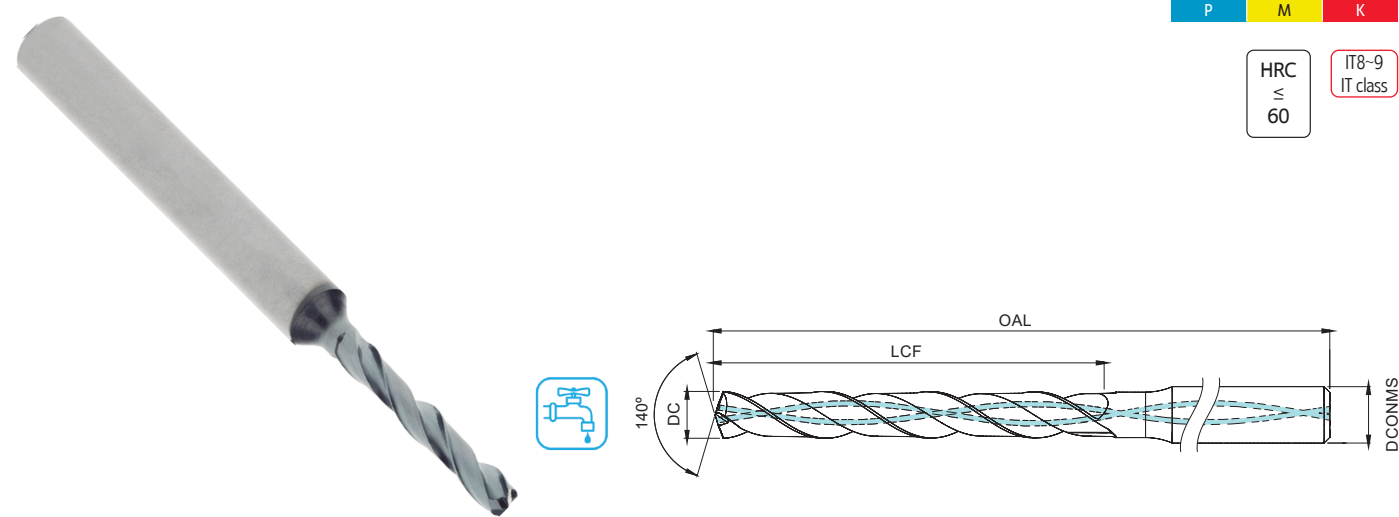


| Order code       | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920  |
|------------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|------------------|
| HA (Cylindrical) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA (Cylindrical) |
| 1182306Z9        | HMDUUE 2 03D 0100-045005              | 1,00                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181797Z9        | HMDUUE 2 03D 0110-045007              | 1,10                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181798Z9        | HMDUUE 2 03D 0120-045007              | 1,20                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181799Z9        | HMDUUE 2 03D 0130-045007              | 1,30                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181800Z9        | HMDUUE 2 03D 0140-045007              | 1,40                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181801Z9        | HMDUUE 2 03D 0150-045007              | 1,50                                      | 4      | 7   | 45  | 2   | ⊗                |
| 1181802Z9        | HMDUUE 2 03D 0160-055014              | 1,60                                      | 4      | 14  | 55  | 2   | ⊗                |
| 1181803Z9        | HMDUUE 2 03D 0170-055014              | 1,70                                      | 4      | 14  | 55  | 2   | ⊗                |
| 1181804Z9        | HMDUUE 2 03D 0180-055014              | 1,80                                      | 4      | 14  | 55  | 2   | ⊗                |
| 1181814Z9        | HMDUUE 2 03D 0190-055014              | 1,90                                      | 4      | 14  | 55  | 2   | ⊗                |
| 1181501Z9        | HMDUUE 2 03D 0200-055020              | 2,00                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1182307Z9        | HMDUUE 2 03D 0210-055020              | 2,10                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1181817Z9        | HMDUUE 2 03D 0220-055020              | 2,20                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1181818Z9        | HMDUUE 2 03D 0230-055020              | 2,30                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1181819Z9        | HMDUUE 2 03D 0240-055020              | 2,40                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1182308Z9        | HMDUUE 2 03D 0250-055020              | 2,50                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1181821Z9        | HMDUUE 2 03D 0260-055020              | 2,60                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1181822Z9        | HMDUUE 2 03D 0270-055020              | 2,70                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1182309Z9        | HMDUUE 2 03D 0280-055020              | 2,80                                      | 4      | 20  | 55  | 2   | ⊗                |
| 1182310Z9        | HMDUUE 2 03D 0290-055020              | 2,90                                      | 4      | 20  | 55  | 2   | ⊗                |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

HMDUCE 2 05D Solid carbide drills | Brocas de metal duro | Brocas en metal duro



| Order code       | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920  |
|------------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|------------------|
| HA (Cylindrical) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA (Cylindrical) |
| 1181838Z9        | HMDUCE 2 05D 0100-055010              | 1,00                                      | 3      | 10  | 55  | 2   | ⊗                |
| 1181839Z9        | HMDUCE 2 05D 0110-055012              | 1,10                                      | 3      | 12  | 55  | 2   | ⊗                |
| 1181840Z9        | HMDUCE 2 05D 0120-055012              | 1,20                                      | 3      | 12  | 55  | 2   | ⊗                |
| 1181841Z9        | HMDUCE 2 05D 0130-055012              | 1,30                                      | 3      | 12  | 55  | 2   | ⊗                |
| 1181842Z9        | HMDUCE 2 05D 0140-055012              | 1,40                                      | 3      | 12  | 55  | 2   | ⊗                |
| 1181843Z9        | HMDUCE 2 05D 0150-055012              | 1,50                                      | 3      | 12  | 55  | 2   | ⊗                |
| 1181844Z9        | HMDUCE 2 05D 0160-055016              | 1,60                                      | 3      | 16  | 55  | 2   | ⊗                |
| 1181845Z9        | HMDUCE 2 05D 0170-055016              | 1,70                                      | 3      | 16  | 55  | 2   | ⊗                |
| 1181846Z9        | HMDUCE 2 05D 0180-055016              | 1,80                                      | 3      | 16  | 55  | 2   | ⊗                |
| 1181847Z9        | HMDUCE 2 05D 0190-055016              | 1,90                                      | 3      | 16  | 55  | 2   | ⊗                |
| 1181848Z9        | HMDUCE 2 05D 0200-055016              | 2,00                                      | 3      | 16  | 55  | 2   | ⊗                |
| 1181849Z9        | HMDUCE 2 05D 0210-055021              | 2,10                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1181850Z9        | HMDUCE 2 05D 0220-055021              | 2,20                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182311Z9        | HMDUCE 2 05D 0230-055021              | 2,30                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182312Z9        | HMDUCE 2 05D 0240-055021              | 2,40                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182313Z9        | HMDUCE 2 05D 0250-055021              | 2,50                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182314Z9        | HMDUCE 2 05D 0260-055021              | 2,60                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1181855Z9        | HMDUCE 2 05D 0270-055021              | 2,70                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182315Z9        | HMDUCE 2 05D 0280-055021              | 2,80                                      | 3      | 21  | 55  | 2   | ⊗                |
| 1182316Z9        | HMDUCE 2 05D 0290-055021              | 2,90                                      | 3      | 21  | 55  | 2   | ⊗                |

⊗ Stock item | Produto de stock | Itens de stock      ○ Available under request | Disponível sobre consulta | Disponible bajo consulta



# SOLID CARBIDE

GENERAL DRILLS



Solid carbide general drills are designed to deliver reliable holemaking across a wide range of materials and applications. They combine high productivity, process reliability and dimensional accuracy for everyday drilling operations.

As brocas gerais de metal duro integral foram concebidas para proporcionar furação fiável numa ampla gama de materiais e aplicações. Combinam elevada produtividade, fiabilidade do processo e precisão dimensional nas operações de furação do dia a dia.

Las brocas generales de carburo sólido están diseñadas para ofrecer un taladrado fiable en una amplia variedad de materiales y aplicaciones. Combinan alta productividad, fiabilidad del proceso y precisión dimensional en las operaciones de taladrado diarias.

## **HBDPCE/W** > page 96

- > From DC 3,0mm to 20,0mm  
De DC 3,0mm a 20,0mm | Desde DC 3,0mm hasta 20,0mm
- > Available in 3D, 5D and 8D  
Disponível em 3D, 5D e 8D | Disponible en 3D, 5D y 8D
- > With coolant  
Com refrigeração | Con refrigeración

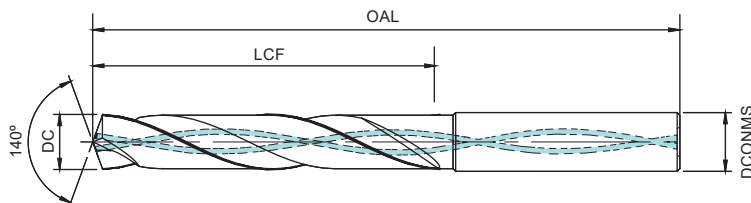


## **HBDPUE/W** > page 105

- > From DC 3,0mm to 20,0mm  
De DC 3,0mm a 20,0mm | Desde DC 3,0mm hasta 20,0mm
- > Available in 3D and 5D  
Disponível em 3D e 5D | Disponible en 3D y 5D
- > Without coolant  
Sem refrigeração | Sin refrigeración



# HBDPCE/W 2 03D Solid carbide drills | Brocas de metal duro | Brocas en metal duro



|                   |   |   |
|-------------------|---|---|
| P                 | M | K |
| HRC ≤ 60          |   |   |
| IT8-9<br>IT class |   |   |

| Drill Dia. DC   | DC3,0            | 3,0<DC≤6,0       | 6,0<DC≤10,0      | 10,0<DC≤18,0     | 18,0<DC≤20,0     |
|-----------------|------------------|------------------|------------------|------------------|------------------|
| Hole Tolerances | +0,002<br>+0,012 | +0,004<br>+0,016 | +0,006<br>+0,021 | +0,007<br>+0,025 | +0,008<br>+0,028 |

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180956Z9        | 1181963Z9   | HBDPCE/W 2 03D 0300-062020            | 3,00                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180957Z9        | 1181964Z9   | HBDPCE/W 2 03D 0310-062020            | 3,10                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180958Z9        | 1181965Z9   | HBDPCE/W 2 03D 0320-062020            | 3,20                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1181791Z9        | 1181966Z9   | HBDPCE/W 2 03D 0325-062020            | 3,25                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180959Z9        | 1181967Z9   | HBDPCE/W 2 03D 0330-062020            | 3,30                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180960Z9        | 1181968Z9   | HBDPCE/W 2 03D 0340-062020            | 3,40                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180961Z9        | 1181969Z9   | HBDPCE/W 2 03D 0350-062020            | 3,50                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180962Z9        | 1181970Z9   | HBDPCE/W 2 03D 0360-062020            | 3,60                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180963Z9        | 1181971Z9   | HBDPCE/W 2 03D 0370-062020            | 3,70                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180964Z9        | 1181972Z9   | HBDPCE/W 2 03D 0380-066024            | 3,80                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180965Z9        | 1181973Z9   | HBDPCE/W 2 03D 0390-066024            | 3,90                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180966Z9        | 1181974Z9   | HBDPCE/W 2 03D 0400-066024            | 4,00                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180967Z9        | 1181975Z9   | HBDPCE/W 2 03D 0410-066024            | 4,10                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180968Z9        | 1181976Z9   | HBDPCE/W 2 03D 0420-066024            | 4,20                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180969Z9        | 1181977Z9   | HBDPCE/W 2 03D 0430-066024            | 4,30                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180970Z9        | 1181978Z9   | HBDPCE/W 2 03D 0440-066024            | 4,40                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180971Z9        | 1181979Z9   | HBDPCE/W 2 03D 0450-066024            | 4,50                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180972Z9        | 1181980Z9   | HBDPCE/W 2 03D 0460-066024            | 4,60                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1181793Z9        | 1181981Z9   | HBDPCE/W 2 03D 0465-066024            | 4,65                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180973Z9        | 1181982Z9   | HBDPCE/W 2 03D 0470-066024            | 4,70                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180974Z9        | 1181983Z9   | HBDPCE/W 2 03D 0480-066028            | 4,80                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180975Z9        | 1181984Z9   | HBDPCE/W 2 03D 0490-066028            | 4,90                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180976Z9        | 1181985Z9   | HBDPCE/W 2 03D 0500-066028            | 5,00                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180977Z9        | 1181986Z9   | HBDPCE/W 2 03D 0510-066028            | 5,10                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180978Z9        | 1181987Z9   | HBDPCE/W 2 03D 0520-066028            | 5,20                                      | 6      | 28  | 66  | 2   | ○               | ○  |
| 1180979Z9        | 1181988Z9   | HBDPCE/W 2 03D 0530-066028            | 5,30                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Continue next page

## HBDPCE/W 2 03D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180980Z9        | 1181989Z9   | HBDPCE/W 2 03D 0540-066028            | 5,40                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180981Z9        | 1181990Z9   | HBDPCE/W 2 03D 0550-066028            | 5,50                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1181795Z9        | 1181991Z9   | HBDPCE/W 2 03D 0555-066028            | 5,55                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180982Z9        | 1181992Z9   | HBDPCE/W 2 03D 0560-066028            | 5,60                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180983Z9        | 1181993Z9   | HBDPCE/W 2 03D 0570-066028            | 5,70                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180984Z9        | 1181994Z9   | HBDPCE/W 2 03D 0580-066028            | 5,80                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180985Z9        | 1181995Z9   | HBDPCE/W 2 03D 0590-066028            | 5,90                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180986Z9        | 1181996Z9   | HBDPCE/W 2 03D 0600-066028            | 6,00                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180987Z9        | 1181997Z9   | HBDPCE/W 2 03D 0610-079034            | 6,10                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180988Z9        | 1181998Z9   | HBDPCE/W 2 03D 0620-079034            | 6,20                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180989Z9        | 1181999Z9   | HBDPCE/W 2 03D 0630-079034            | 6,30                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180990Z9        | 1182000Z9   | HBDPCE/W 2 03D 0640-079034            | 6,40                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180991Z9        | 1182001Z9   | HBDPCE/W 2 03D 0650-079034            | 6,50                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180792Z9        | 1182002Z9   | HBDPCE/W 2 03D 0660-079034            | 6,60                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180992Z9        | 1182003Z9   | HBDPCE/W 2 03D 0670-079034            | 6,70                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180993Z9        | 1182004Z9   | HBDPCE/W 2 03D 0680-079034            | 6,80                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180994Z9        | 1182005Z9   | HBDPCE/W 2 03D 0690-079034            | 6,90                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180995Z9        | 1182006Z9   | HBDPCE/W 2 03D 0700-079034            | 7,00                                      | 8      | 34  | 79  | 2   | ○               | ⊗  |
| 1180996Z9        | 1182007Z9   | HBDPCE/W 2 03D 0710-079041            | 7,10                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180997Z9        | 1182008Z9   | HBDPCE/W 2 03D 0720-079041            | 7,20                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180998Z9        | 1182009Z9   | HBDPCE/W 2 03D 0730-079041            | 7,30                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180999Z9        | 1182010Z9   | HBDPCE/W 2 03D 0740-079041            | 7,40                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1181000Z9        | 1182011Z9   | HBDPCE/W 2 03D 0750-079041            | 7,50                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1181001Z9        | 1182012Z9   | HBDPCE/W 2 03D 0760-079041            | 7,60                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1181002Z9        | 1182013Z9   | HBDPCE/W 2 03D 0770-079041            | 7,70                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1181003Z9        | 1182014Z9   | HBDPCE/W 2 03D 0780-079041            | 7,80                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1181004Z9        | 1182015Z9   | HBDPCE/W 2 03D 0790-079041            | 7,90                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1181005Z9        | 1182016Z9   | HBDPCE/W 2 03D 0800-079041            | 8,00                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1181006Z9        | 1182017Z9   | HBDPCE/W 2 03D 0810-089047            | 8,10                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181007Z9        | 1182018Z9   | HBDPCE/W 2 03D 0820-089047            | 8,20                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181008Z9        | 1182019Z9   | HBDPCE/W 2 03D 0830-089047            | 8,30                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181009Z9        | 1182020Z9   | HBDPCE/W 2 03D 0840-089047            | 8,40                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181010Z9        | 1182021Z9   | HBDPCE/W 2 03D 0850-089047            | 8,50                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181011Z9        | 1182022Z9   | HBDPCE/W 2 03D 0860-089047            | 8,60                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181012Z9        | 1182023Z9   | HBDPCE/W 2 03D 0870-089047            | 8,70                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181013Z9        | 1182024Z9   | HBDPCE/W 2 03D 0880-089047            | 8,80                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181014Z9        | 1182025Z9   | HBDPCE/W 2 03D 0890-089047            | 8,90                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181015Z9        | 1182026Z9   | HBDPCE/W 2 03D 0900-089047            | 9,00                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181016Z9        | 1182027Z9   | HBDPCE/W 2 03D 0910-089047            | 9,10                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181017Z9        | 1182028Z9   | HBDPCE/W 2 03D 0920-089047            | 9,20                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181018Z9        | 1182029Z9   | HBDPCE/W 2 03D 0930-089047            | 9,30                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181019Z9        | 1182030Z9   | HBDPCE/W 2 03D 0940-089047            | 9,40                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181020Z9        | 1182031Z9   | HBDPCE/W 2 03D 0950-089047            | 9,50                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181021Z9        | 1182032Z9   | HBDPCE/W 2 03D 0960-089047            | 9,60                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181022Z9        | 1182033Z9   | HBDPCE/W 2 03D 0970-089047            | 9,70                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181023Z9        | 1182034Z9   | HBDPCE/W 2 03D 0980-089047            | 9,80                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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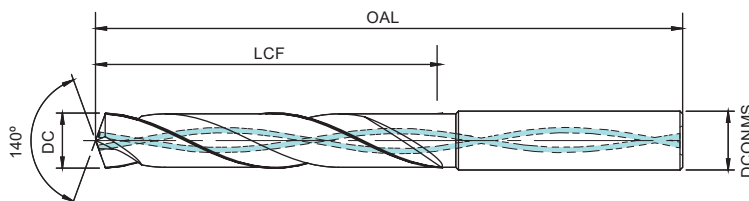
**HBDPCE/W 2 03D**

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181024Z9        | 1182035Z9   | HBDPCE/W 2 03D 0990-089047            | 9,90                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1181025Z9        | 1182036Z9   | HBDPCE/W 2 03D 1000-089047            | 10,00                                     | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1181026Z9        | -           | HBDPCE/W 2 03D 1010-102055            | 10,10                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181027Z9        | 1182037Z9   | HBDPCE/W 2 03D 1020-102055            | 10,20                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1181028Z9        | 1182038Z9   | HBDPCE/W 2 03D 1030-102055            | 10,30                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1181029Z9        | -           | HBDPCE/W 2 03D 1040-102055            | 10,40                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181030Z9        | 1182039Z9   | HBDPCE/W 2 03D 1050-102055            | 10,50                                     | 12     | 55  | 102 | 2   | ○               | ○  |
| 1181031Z9        | -           | HBDPCE/W 2 03D 1060-102055            | 10,60                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181032Z9        | -           | HBDPCE/W 2 03D 1070-102055            | 10,70                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1181033Z9        | 1182040Z9   | HBDPCE/W 2 03D 1080-102055            | 10,80                                     | 12     | 55  | 102 | 2   | ○               | ⊗  |
| 1181034Z9        | -           | HBDPCE/W 2 03D 1090-102055            | 10,90                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181035Z9        | 1182041Z9   | HBDPCE/W 2 03D 1100-102055            | 11,00                                     | 12     | 55  | 102 | 2   | ○               | ○  |
| 1181036Z9        | -           | HBDPCE/W 2 03D 1110-102055            | 11,10                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181037Z9        | 1182042Z9   | HBDPCE/W 2 03D 1120-102055            | 11,20                                     | 12     | 55  | 102 | 2   | ○               | ⊗  |
| 1181038Z9        | -           | HBDPCE/W 2 03D 1130-102055            | 11,30                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1181039Z9        | -           | HBDPCE/W 2 03D 1140-102055            | 11,40                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1181040Z9        | 1182043Z9   | HBDPCE/W 2 03D 1150-102055            | 11,50                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1181041Z9        | -           | HBDPCE/W 2 03D 1160-102055            | 11,60                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1181042Z9        | -           | HBDPCE/W 2 03D 1170-102055            | 11,70                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1181043Z9        | 1182044Z9   | HBDPCE/W 2 03D 1180-102055            | 11,80                                     | 12     | 55  | 102 | 2   | ⊗               | ○  |
| 1181044Z9        | -           | HBDPCE/W 2 03D 1190-102055            | 11,90                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1181045Z9        | 1182045Z9   | HBDPCE/W 2 03D 1200-102055            | 12,00                                     | 12     | 55  | 102 | 2   | ⊗               | ○  |
| 1181046Z9        | 1182046Z9   | HBDPCE/W 2 03D 1250-107060            | 12,50                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181770Z9        | 1182047Z9   | HBDPCE/W 2 03D 1280-107060            | 12,80                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181047Z9        | 1182048Z9   | HBDPCE/W 2 03D 1300-107060            | 13,00                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1182399Z9        | 1182402Z9   | HBDPCE/W 2 03D 1320-107060            | 13,20                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181048Z9        | 1182049Z9   | HBDPCE/W 2 03D 1350-107060            | 13,50                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181772Z9        | 1182050Z9   | HBDPCE/W 2 03D 1380-107060            | 13,80                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1181049Z9        | 1182051Z9   | HBDPCE/W 2 03D 1400-107060            | 14,00                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1181774Z9        | 1182052Z9   | HBDPCE/W 2 03D 1420-115065            | 14,20                                     | 16     | 65  | 115 | 2   | ⊗               | ○  |
| 1181050Z9        | 1182053Z9   | HBDPCE/W 2 03D 1450-115065            | 14,50                                     | 16     | 65  | 115 | 2   | ⊗               | ○  |
| 1181776Z9        | 1182054Z9   | HBDPCE/W 2 03D 1480-115065            | 14,80                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1181051Z9        | 1182055Z9   | HBDPCE/W 2 03D 1500-115065            | 15,00                                     | 16     | 65  | 115 | 2   | ○               | ⊗  |
| 1181052Z9        | 1182056Z9   | HBDPCE/W 2 03D 1550-115065            | 15,50                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1181778Z9        | 1182057Z9   | HBDPCE/W 2 03D 1580-115065            | 15,80                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1181053Z9        | 1182058Z9   | HBDPCE/W 2 03D 1600-115065            | 16,00                                     | 16     | 65  | 115 | 2   | ⊗               | ○  |
| 1181054Z9        | 1182059Z9   | HBDPCE/W 2 03D 1650-123073            | 16,50                                     | 18     | 73  | 123 | 2   | ⊗               | ⊗  |
| 1181055Z9        | 1182060Z9   | HBDPCE/W 2 03D 1700-123073            | 17,00                                     | 18     | 73  | 123 | 2   | ⊗               | ○  |
| 1181056Z9        | 1182061Z9   | HBDPCE/W 2 03D 1750-123073            | 17,50                                     | 18     | 73  | 123 | 2   | ⊗               | ○  |
| 1181057Z9        | 1182062Z9   | HBDPCE/W 2 03D 1800-123073            | 18,00                                     | 18     | 73  | 123 | 2   | ⊗               | ○  |
| 1181058Z9        | 1182063Z9   | HBDPCE/W 2 03D 1850-131079            | 18,50                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1181059Z9        | 1182064Z9   | HBDPCE/W 2 03D 1900-131079            | 19,00                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1181060Z9        | 1182065Z9   | HBDPCE/W 2 03D 1950-131079            | 19,50                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1181061Z9        | 1182066Z9   | HBDPCE/W 2 03D 2000-131079            | 20,00                                     | 20     | 79  | 131 | 2   | ⊗               | ○  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta



| Drill Dia. DC   | DC3,0  | 3,0<DC≤6,0 | 6,0<DC≤10,0 | 10,0<DC≤18,0 | 18,0<DC≤20,0 |
|-----------------|--------|------------|-------------|--------------|--------------|
| Hole Tolerances | +0,002 | +0,004     | +0,006      | +0,007       | +0,008       |
|                 | +0,012 | +0,016     | +0,021      | +0,025       | +0,028       |

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180788Z9        | 1182067Z9   | HBDPCE/W 2 05D 0300-066028            | 3,00                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1181160Z9        | 1182068Z9   | HBDPCE/W 2 05D 0310-066028            | 3,10                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1181161Z9        | 1182069Z9   | HBDPCE/W 2 05D 0320-066028            | 3,20                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1181825Z9        | 1182070Z9   | HBDPCE/W 2 05D 0325-066028            | 3,25                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1181162Z9        | 1182071Z9   | HBDPCE/W 2 05D 0330-066028            | 3,30                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180797Z9        | 1182072Z9   | HBDPCE/W 2 05D 0340-066028            | 3,40                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1181163Z9        | 1182073Z9   | HBDPCE/W 2 05D 0350-066028            | 3,50                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1181164Z9        | 1182074Z9   | HBDPCE/W 2 05D 0360-066028            | 3,60                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180798Z9        | 1182075Z9   | HBDPCE/W 2 05D 0370-066028            | 3,70                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1181165Z9        | 1182076Z9   | HBDPCE/W 2 05D 0380-074036            | 3,80                                      | 6      | 36  | 74  | 2   | ⊗               | ○  |
| 1181166Z9        | 1182077Z9   | HBDPCE/W 2 05D 0390-074036            | 3,90                                      | 6      | 36  | 74  | 2   | ⊗               | ○  |
| 1181167Z9        | 1182078Z9   | HBDPCE/W 2 05D 0400-074036            | 4,00                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181168Z9        | 1182079Z9   | HBDPCE/W 2 05D 0410-074036            | 4,10                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1180799Z9        | 1182080Z9   | HBDPCE/W 2 05D 0420-074036            | 4,20                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1180800Z9        | 1182081Z9   | HBDPCE/W 2 05D 0430-074036            | 4,30                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181169Z9        | 1182082Z9   | HBDPCE/W 2 05D 0440-074036            | 4,40                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181170Z9        | 1182083Z9   | HBDPCE/W 2 05D 0450-074036            | 4,50                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181171Z9        | 1182084Z9   | HBDPCE/W 2 05D 0460-074036            | 4,60                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181535Z9        | 1182085Z9   | HBDPCE/W 2 05D 0465-074036            | 4,65                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181172Z9        | 1182086Z9   | HBDPCE/W 2 05D 0470-074036            | 4,70                                      | 6      | 36  | 74  | 2   | ⊗               | ⊗  |
| 1181173Z9        | 1182087Z9   | HBDPCE/W 2 05D 0480-082044            | 4,80                                      | 6      | 44  | 82  | 2   | ⊗               | ○  |
| 1181174Z9        | 1182088Z9   | HBDPCE/W 2 05D 0490-082044            | 4,90                                      | 6      | 44  | 82  | 2   | ⊗               | ⊗  |
| 1180801Z9        | 1182089Z9   | HBDPCE/W 2 05D 0500-082044            | 5,00                                      | 6      | 44  | 82  | 2   | ⊗               | ⊗  |
| 1181175Z9        | 1182090Z9   | HBDPCE/W 2 05D 0510-082044            | 5,10                                      | 6      | 44  | 82  | 2   | ⊗               | ⊗  |
| 1181176Z9        | 1182091Z9   | HBDPCE/W 2 05D 0520-082044            | 5,20                                      | 6      | 44  | 82  | 2   | ⊗               | ⊗  |
| 1181177Z9        | 1182092Z9   | HBDPCE/W 2 05D 0530-082044            | 5,30                                      | 6      | 44  | 82  | 2   | ⊗               | ⊗  |



## HBDPCE/W 2 05D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181178Z9        | 1182093Z9   | HBDPCE/W 2 05D 0540-082044            | 5,40                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181179Z9        | 1182094Z9   | HBDPCE/W 2 05D 0550-082044            | 5,50                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181536Z9        | 1182095Z9   | HBDPCE/W 2 05D 0555-082044            | 5,55                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181180Z9        | 1182096Z9   | HBDPCE/W 2 05D 0560-082044            | 5,60                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181181Z9        | 1182097Z9   | HBDPCE/W 2 05D 0570-082044            | 5,70                                      | 6      | 44  | 82  | 2   | 🔍               | ○  |
| 1180802Z9        | 1182098Z9   | HBDPCE/W 2 05D 0580-082044            | 5,80                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181182Z9        | 1182099Z9   | HBDPCE/W 2 05D 0590-082044            | 5,90                                      | 6      | 44  | 82  | 2   | 🔍               | ○  |
| 1181183Z9        | 1182100Z9   | HBDPCE/W 2 05D 0600-082044            | 6,00                                      | 6      | 44  | 82  | 2   | 🔍               | 🔍  |
| 1181184Z9        | 1182101Z9   | HBDPCE/W 2 05D 0610-091053            | 6,10                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181185Z9        | 1182102Z9   | HBDPCE/W 2 05D 0620-091053            | 6,20                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181186Z9        | 1182103Z9   | HBDPCE/W 2 05D 0630-091053            | 6,30                                      | 8      | 53  | 91  | 2   | 🔍               | ○  |
| 1181187Z9        | 1182104Z9   | HBDPCE/W 2 05D 0640-091053            | 6,40                                      | 8      | 53  | 91  | 2   | 🔍               | ○  |
| 1180787Z9        | 1182105Z9   | HBDPCE/W 2 05D 0650-091053            | 6,50                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181188Z9        | 1182106Z9   | HBDPCE/W 2 05D 0660-091053            | 6,60                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181189Z9        | 1182107Z9   | HBDPCE/W 2 05D 0670-091053            | 6,70                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1180803Z9        | 1182108Z9   | HBDPCE/W 2 05D 0680-091053            | 6,80                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181190Z9        | 1182109Z9   | HBDPCE/W 2 05D 0690-091053            | 6,90                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1180804Z9        | 1182110Z9   | HBDPCE/W 2 05D 0700-091053            | 7,00                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181191Z9        | 1182111Z9   | HBDPCE/W 2 05D 0710-091053            | 7,10                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181192Z9        | 1182112Z9   | HBDPCE/W 2 05D 0720-091053            | 7,20                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181193Z9        | 1182113Z9   | HBDPCE/W 2 05D 0730-091053            | 7,30                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1180805Z9        | 1182114Z9   | HBDPCE/W 2 05D 0740-091053            | 7,40                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181194Z9        | 1182115Z9   | HBDPCE/W 2 05D 0750-091053            | 7,50                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181195Z9        | 1182116Z9   | HBDPCE/W 2 05D 0760-091053            | 7,60                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181196Z9        | 1182117Z9   | HBDPCE/W 2 05D 0770-091053            | 7,70                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181197Z9        | 1182118Z9   | HBDPCE/W 2 05D 0780-091053            | 7,80                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181198Z9        | 1182119Z9   | HBDPCE/W 2 05D 0790-091053            | 7,90                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181199Z9        | 1182120Z9   | HBDPCE/W 2 05D 0800-091053            | 8,00                                      | 8      | 53  | 91  | 2   | 🔍               | 🔍  |
| 1181200Z9        | 1182121Z9   | HBDPCE/W 2 05D 0810-103061            | 8,10                                      | 10     | 61  | 103 | 2   | 🔍               | ○  |
| 1181201Z9        | 1182122Z9   | HBDPCE/W 2 05D 0820-103061            | 8,20                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181202Z9        | 1182123Z9   | HBDPCE/W 2 05D 0830-103061            | 8,30                                      | 10     | 61  | 103 | 2   | 🔍               | ○  |
| 1181203Z9        | 1182124Z9   | HBDPCE/W 2 05D 0840-103061            | 8,40                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1180806Z9        | 1182125Z9   | HBDPCE/W 2 05D 0850-103061            | 8,50                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181204Z9        | 1182126Z9   | HBDPCE/W 2 05D 0860-103061            | 8,60                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181205Z9        | 1182127Z9   | HBDPCE/W 2 05D 0870-103061            | 8,70                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181206Z9        | 1182128Z9   | HBDPCE/W 2 05D 0880-103061            | 8,80                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181207Z9        | 1182129Z9   | HBDPCE/W 2 05D 0890-103061            | 8,90                                      | 10     | 61  | 103 | 2   | 🔍               | ○  |
| 1180807Z9        | 1182130Z9   | HBDPCE/W 2 05D 0900-103061            | 9,00                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181208Z9        | 1182131Z9   | HBDPCE/W 2 05D 0910-103061            | 9,10                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181209Z9        | 1182132Z9   | HBDPCE/W 2 05D 0920-103061            | 9,20                                      | 10     | 61  | 103 | 2   | 🔍               | ○  |
| 1181210Z9        | 1182133Z9   | HBDPCE/W 2 05D 0930-103061            | 9,30                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181211Z9        | 1182134Z9   | HBDPCE/W 2 05D 0940-103061            | 9,40                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181212Z9        | 1182135Z9   | HBDPCE/W 2 05D 0950-103061            | 9,50                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181213Z9        | 1182136Z9   | HBDPCE/W 2 05D 0960-103061            | 9,60                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |
| 1181214Z9        | 1182137Z9   | HBDPCE/W 2 05D 0970-103061            | 9,70                                      | 10     | 61  | 103 | 2   | ○               | 🔍  |
| 1181215Z9        | 1182138Z9   | HBDPCE/W 2 05D 0980-103061            | 9,80                                      | 10     | 61  | 103 | 2   | 🔍               | 🔍  |

🔍 Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Continue next page

## HBDPCE/W 2 05D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

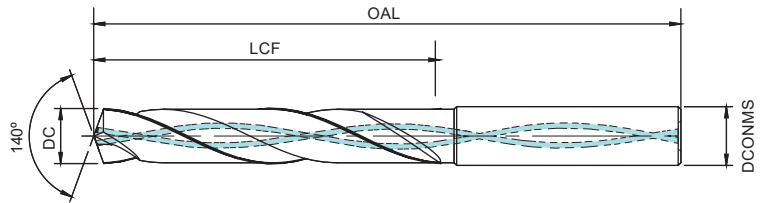
| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181216Z9        | 1182139Z9   | HBDPCE/W 2 05D 0990-103061            | 9,90                                      | 10     | 61  | 103 | 2   | ⊗               | ○  |
| 1181217Z9        | 1182140Z9   | HBDPCE/W 2 05D 1000-103061            | 10,00                                     | 10     | 61  | 103 | 2   | ⊗               | ⊗  |
| 1181218Z9        | 1182141Z9   | HBDPCE/W 2 05D 1010-118071            | 10,10                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1180808Z9        | 1182142Z9   | HBDPCE/W 2 05D 1020-118071            | 10,20                                     | 12     | 71  | 118 | 2   | ⊗               | ○  |
| 1181219Z9        | 1182143Z9   | HBDPCE/W 2 05D 1030-118071            | 10,30                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181220Z9        | 1182144Z9   | HBDPCE/W 2 05D 1040-118071            | 10,40                                     | 12     | 71  | 118 | 2   | ⊗               | ○  |
| 1180809Z9        | 1182145Z9   | HBDPCE/W 2 05D 1050-118071            | 10,50                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1180810Z9        | -           | HBDPCE/W 2 05D 1060-118071            | 10,60                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181221Z9        | -           | HBDPCE/W 2 05D 1070-118071            | 10,70                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181222Z9        | 1182146Z9   | HBDPCE/W 2 05D 1080-118071            | 10,80                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181223Z9        | -           | HBDPCE/W 2 05D 1090-118071            | 10,90                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1180811Z9        | 1182147Z9   | HBDPCE/W 2 05D 1100-118071            | 11,00                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181224Z9        | 1182148Z9   | HBDPCE/W 2 05D 1110-118071            | 11,10                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181225Z9        | 1182149Z9   | HBDPCE/W 2 05D 1120-118071            | 11,20                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181226Z9        | 1182150Z9   | HBDPCE/W 2 05D 1130-118071            | 11,30                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181227Z9        | -           | HBDPCE/W 2 05D 1140-118071            | 11,40                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1180812Z9        | 1182151Z9   | HBDPCE/W 2 05D 1150-118071            | 11,50                                     | 12     | 71  | 118 | 2   | ⊗               | ○  |
| 1181228Z9        | -           | HBDPCE/W 2 05D 1160-118071            | 11,60                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181229Z9        | -           | HBDPCE/W 2 05D 1170-118071            | 11,70                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181230Z9        | 1182152Z9   | HBDPCE/W 2 05D 1180-118071            | 11,80                                     | 12     | 71  | 118 | 2   | ⊗               | ⊗  |
| 1181231Z9        | -           | HBDPCE/W 2 05D 1190-118071            | 11,90                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1180813Z9        | 1182153Z9   | HBDPCE/W 2 05D 1200-118071            | 12,00                                     | 12     | 71  | 118 | 2   | ⊗               | ○  |
| 1181805Z9        | 1182154Z9   | HBDPCE/W 2 05D 1220-124077            | 12,20                                     | 14     | 77  | 124 | 2   | ⊗               | ○  |
| 1181232Z9        | 1182155Z9   | HBDPCE/W 2 05D 1250-124077            | 12,50                                     | 14     | 77  | 124 | 2   | ⊗               | ○  |
| 1181806Z9        | 1182156Z9   | HBDPCE/W 2 05D 1280-124077            | 12,80                                     | 14     | 77  | 124 | 2   | ⊗               | ○  |
| 1180814Z9        | 1182157Z9   | HBDPCE/W 2 05D 1300-124077            | 13,00                                     | 14     | 77  | 124 | 2   | ⊗               | ⊗  |
| 1182267Z9        | -           | HBDPCE/W 2 05D 1320-124077            | 13,20                                     | 14     | 77  | 124 | 2   | ⊗               | -  |
| 1181233Z9        | 1182158Z9   | HBDPCE/W 2 05D 1350-124077            | 13,50                                     | 14     | 77  | 124 | 2   | ⊗               | ⊗  |
| 1181807Z9        | 1182159Z9   | HBDPCE/W 2 05D 1380-124077            | 13,80                                     | 14     | 77  | 124 | 2   | ⊗               | ⊗  |
| 1181808Z9        | 1182160Z9   | HBDPCE/W 2 05D 1390-124077            | 13,90                                     | 14     | 77  | 124 | 2   | ⊗               | ⊗  |
| 1181234Z9        | 1182161Z9   | HBDPCE/W 2 05D 1400-124077            | 14,00                                     | 14     | 77  | 124 | 2   | ⊗               | ⊗  |
| 1181809Z9        | 1182162Z9   | HBDPCE/W 2 05D 1420-133083            | 14,20                                     | 16     | 83  | 133 | 2   | ⊗               | ○  |
| 1181235Z9        | 1182163Z9   | HBDPCE/W 2 05D 1450-133083            | 14,50                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181810Z9        | 1182164Z9   | HBDPCE/W 2 05D 1480-133083            | 14,80                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181236Z9        | 1182165Z9   | HBDPCE/W 2 05D 1500-133083            | 15,00                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181811Z9        | 1182166Z9   | HBDPCE/W 2 05D 1520-133083            | 15,20                                     | 16     | 83  | 133 | 2   | ○               | ○  |
| 1181237Z9        | 1182167Z9   | HBDPCE/W 2 05D 1550-133083            | 15,50                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181812Z9        | 1182168Z9   | HBDPCE/W 2 05D 1570-133083            | 15,70                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1180815Z9        | 1182169Z9   | HBDPCE/W 2 05D 1580-133083            | 15,80                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181238Z9        | 1182170Z9   | HBDPCE/W 2 05D 1600-133083            | 16,00                                     | 16     | 83  | 133 | 2   | ⊗               | ⊗  |
| 1181239Z9        | 1182171Z9   | HBDPCE/W 2 05D 1650-143093            | 16,50                                     | 18     | 93  | 143 | 2   | ⊗               | ⊗  |
| 1181240Z9        | 1182172Z9   | HBDPCE/W 2 05D 1700-143093            | 17,00                                     | 18     | 93  | 143 | 2   | ⊗               | ⊗  |
| 1180816Z9        | 1182173Z9   | HBDPCE/W 2 05D 1750-143093            | 17,50                                     | 18     | 93  | 143 | 2   | ⊗               | ○  |
| 1181241Z9        | 1182174Z9   | HBDPCE/W 2 05D 1800-143093            | 18,00                                     | 18     | 93  | 143 | 2   | ⊗               | ○  |
| 1181242Z9        | 1182175Z9   | HBDPCE/W 2 05D 1850-153101            | 18,50                                     | 20     | 101 | 153 | 2   | ⊗               | ○  |
| 1181243Z9        | 1182176Z9   | HBDPCE/W 2 05D 1900-153101            | 19,00                                     | 20     | 101 | 153 | 2   | ⊗               | ⊗  |
| 1181244Z9        | 1182177Z9   | HBDPCE/W 2 05D 1950-153101            | 19,50                                     | 20     | 101 | 153 | 2   | ⊗               | ⊗  |
| 1181245Z9        | 1182178Z9   | HBDPCE/W 2 05D 2000-153101            | 20,00                                     | 20     | 101 | 153 | 2   | ⊗               | ⊗  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

# HBDPCE/W 2 08D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro



| P              | M | K |
|----------------|---|---|
|                |   |   |
| HRC ≤ 48       |   |   |
| IT8-9 IT class |   |   |

| Drill Dia. DC   | 3,0<DC≤5,0 | 5,0<DC≤6,0 | 6,0<DC≤10,0 | 10,0<DC≤12,0 |
|-----------------|------------|------------|-------------|--------------|
| Hole Tolerances | +0,002     | +0,004     | +0,006      | +0,007       |
|                 | +0,012     | +0,016     | +0,021      | +0,025       |

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181246Z9        | -           | HBDPCE/W 2 08D 0300-072034            | 3,00                                      | 6      | 34  | 72  | 2   | ⊗               | -  |
| 1181247Z9        | -           | HBDPCE/W 2 08D 0310-072034            | 3,10                                      | 6      | 34  | 72  | 2   | ○               | -  |
| 1181248Z9        | -           | HBDPCE/W 2 08D 0320-072034            | 3,20                                      | 6      | 34  | 72  | 2   | ○               | -  |
| 1181249Z9        | -           | HBDPCE/W 2 08D 0330-072034            | 3,30                                      | 6      | 34  | 72  | 2   | ⊗               | -  |
| 1181250Z9        | -           | HBDPCE/W 2 08D 0340-072034            | 3,40                                      | 6      | 34  | 72  | 2   | ⊗               | -  |
| 1181251Z9        | -           | HBDPCE/W 2 08D 0350-072034            | 3,50                                      | 6      | 34  | 72  | 2   | ○               | -  |
| 1181252Z9        | -           | HBDPCE/W 2 08D 0360-072034            | 3,60                                      | 6      | 34  | 72  | 2   | ○               | -  |
| 1181253Z9        | -           | HBDPCE/W 2 08D 0370-072034            | 3,70                                      | 6      | 34  | 72  | 2   | ⊗               | -  |
| 1181254Z9        | -           | HBDPCE/W 2 08D 0380-081043            | 3,80                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181255Z9        | -           | HBDPCE/W 2 08D 0390-081043            | 3,90                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181256Z9        | -           | HBDPCE/W 2 08D 0400-081043            | 4,00                                      | 6      | 43  | 81  | 2   | ⊗               | -  |
| 1181257Z9        | -           | HBDPCE/W 2 08D 0410-081043            | 4,10                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181258Z9        | -           | HBDPCE/W 2 08D 0420-081043            | 4,20                                      | 6      | 43  | 81  | 2   | ⊗               | -  |
| 1181259Z9        | -           | HBDPCE/W 2 08D 0430-081043            | 4,30                                      | 6      | 43  | 81  | 2   | ⊗               | -  |
| 1181260Z9        | -           | HBDPCE/W 2 08D 0440-081043            | 4,40                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181261Z9        | -           | HBDPCE/W 2 08D 0450-081043            | 4,50                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181262Z9        | -           | HBDPCE/W 2 08D 0460-081043            | 4,60                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181263Z9        | -           | HBDPCE/W 2 08D 0470-081043            | 4,70                                      | 6      | 43  | 81  | 2   | ○               | -  |
| 1181264Z9        | -           | HBDPCE/W 2 08D 0480-095057            | 4,80                                      | 6      | 57  | 95  | 2   | ⊗               | -  |
| 1181265Z9        | -           | HBDPCE/W 2 08D 0490-095057            | 4,90                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181266Z9        | -           | HBDPCE/W 2 08D 0500-095057            | 5,00                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181267Z9        | -           | HBDPCE/W 2 08D 0510-095057            | 5,10                                      | 6      | 57  | 95  | 2   | ⊗               | -  |
| 1181268Z9        | -           | HBDPCE/W 2 08D 0520-095057            | 5,20                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181269Z9        | -           | HBDPCE/W 2 08D 0530-095057            | 5,30                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181270Z9        | -           | HBDPCE/W 2 08D 0540-095057            | 5,40                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181271Z9        | -           | HBDPCE/W 2 08D 0550-095057            | 5,50                                      | 6      | 57  | 95  | 2   | ⊗               | -  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Continue next page

## HBDPCE/W 2 08D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181272Z9        | -           | HBDPCE/W 2 08D 0560-095057            | 5,60                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181273Z9        | -           | HBDPCE/W 2 08D 0570-095057            | 5,70                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181274Z9        | -           | HBDPCE/W 2 08D 0580-095057            | 5,80                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181275Z9        | -           | HBDPCE/W 2 08D 0590-095057            | 5,90                                      | 6      | 57  | 95  | 2   | ○               | -  |
| 1181276Z9        | -           | HBDPCE/W 2 08D 0600-095057            | 6,00                                      | 6      | 57  | 95  | 2   | ⊗               | -  |
| 1181277Z9        | -           | HBDPCE/W 2 08D 0610-114076            | 6,10                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181278Z9        | -           | HBDPCE/W 2 08D 0620-114076            | 6,20                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181279Z9        | -           | HBDPCE/W 2 08D 0630-114076            | 6,30                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181280Z9        | -           | HBDPCE/W 2 08D 0640-114076            | 6,40                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181281Z9        | -           | HBDPCE/W 2 08D 0650-114076            | 6,50                                      | 8      | 76  | 114 | 2   | ⊗               | -  |
| 1181282Z9        | -           | HBDPCE/W 2 08D 0660-114076            | 6,60                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181283Z9        | -           | HBDPCE/W 2 08D 0670-114076            | 6,70                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181284Z9        | -           | HBDPCE/W 2 08D 0680-114076            | 6,80                                      | 8      | 76  | 114 | 2   | ⊗               | -  |
| 1181285Z9        | -           | HBDPCE/W 2 08D 0690-114076            | 6,90                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181286Z9        | -           | HBDPCE/W 2 08D 0700-114076            | 7,00                                      | 8      | 76  | 114 | 2   | ⊗               | -  |
| 1181287Z9        | -           | HBDPCE/W 2 08D 0710-114076            | 7,10                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181288Z9        | -           | HBDPCE/W 2 08D 0720-114076            | 7,20                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181289Z9        | -           | HBDPCE/W 2 08D 0730-114076            | 7,30                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181290Z9        | -           | HBDPCE/W 2 08D 0740-114076            | 7,40                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181291Z9        | -           | HBDPCE/W 2 08D 0750-114076            | 7,50                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181292Z9        | -           | HBDPCE/W 2 08D 0760-114076            | 7,60                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181293Z9        | -           | HBDPCE/W 2 08D 0770-114076            | 7,70                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181294Z9        | -           | HBDPCE/W 2 08D 0780-114076            | 7,80                                      | 8      | 76  | 114 | 2   | ⊗               | -  |
| 1181295Z9        | -           | HBDPCE/W 2 08D 0790-114076            | 7,90                                      | 8      | 76  | 114 | 2   | ○               | -  |
| 1181296Z9        | -           | HBDPCE/W 2 08D 0800-114076            | 8,00                                      | 8      | 76  | 114 | 2   | ⊗               | -  |
| 1181297Z9        | -           | HBDPCE/W 2 08D 0810-142095            | 8,10                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181298Z9        | -           | HBDPCE/W 2 08D 0820-142095            | 8,20                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181299Z9        | -           | HBDPCE/W 2 08D 0830-142095            | 8,30                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181300Z9        | -           | HBDPCE/W 2 08D 0840-142095            | 8,40                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181301Z9        | -           | HBDPCE/W 2 08D 0850-142095            | 8,50                                      | 10     | 95  | 142 | 2   | ⊗               | -  |
| 1181302Z9        | -           | HBDPCE/W 2 08D 0860-142095            | 8,60                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181303Z9        | -           | HBDPCE/W 2 08D 0870-142095            | 8,70                                      | 10     | 95  | 142 | 2   | ⊗               | -  |
| 1181304Z9        | -           | HBDPCE/W 2 08D 0880-142095            | 8,80                                      | 10     | 95  | 142 | 2   | ⊗               | -  |
| 1181305Z9        | -           | HBDPCE/W 2 08D 0890-142095            | 8,90                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181306Z9        | -           | HBDPCE/W 2 08D 0900-142095            | 9,00                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181307Z9        | -           | HBDPCE/W 2 08D 0910-142095            | 9,10                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181308Z9        | -           | HBDPCE/W 2 08D 0920-142095            | 9,20                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181309Z9        | -           | HBDPCE/W 2 08D 0930-142095            | 9,30                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181310Z9        | -           | HBDPCE/W 2 08D 0940-142095            | 9,40                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181311Z9        | -           | HBDPCE/W 2 08D 0950-142095            | 9,50                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181312Z9        | -           | HBDPCE/W 2 08D 0960-142095            | 9,60                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181313Z9        | -           | HBDPCE/W 2 08D 0970-142095            | 9,70                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181314Z9        | -           | HBDPCE/W 2 08D 0980-142095            | 9,80                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181315Z9        | -           | HBDPCE/W 2 08D 0990-142095            | 9,90                                      | 10     | 95  | 142 | 2   | ○               | -  |
| 1181316Z9        | -           | HBDPCE/W 2 08D 1000-142095            | 10,00                                     | 10     | 95  | 142 | 2   | ○               | -  |
| 1181317Z9        | -           | HBDPCE/W 2 08D 1010-162114            | 10,10                                     | 12     | 114 | 162 | 2   | ○               | -  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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**HBDPCE/W 2 08D**

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181318Z9        | -           | HBDPCE/W 2 08D 1020-162114            | 10,20                                     | 12     | 114 | 162 | 2   | ⊗               | -  |
| 1181319Z9        | -           | HBDPCE/W 2 08D 1030-162114            | 10,30                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181320Z9        | -           | HBDPCE/W 2 08D 1040-162114            | 10,40                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181321Z9        | -           | HBDPCE/W 2 08D 1050-162114            | 10,50                                     | 12     | 114 | 162 | 2   | ⊗               | -  |
| 1181322Z9        | -           | HBDPCE/W 2 08D 1060-162114            | 10,60                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181323Z9        | -           | HBDPCE/W 2 08D 1070-162114            | 10,70                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181324Z9        | -           | HBDPCE/W 2 08D 1080-162114            | 10,80                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181325Z9        | -           | HBDPCE/W 2 08D 1090-162114            | 10,90                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181326Z9        | -           | HBDPCE/W 2 08D 1100-162114            | 11,00                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181327Z9        | -           | HBDPCE/W 2 08D 1110-162114            | 11,10                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181328Z9        | -           | HBDPCE/W 2 08D 1120-162114            | 11,20                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181329Z9        | -           | HBDPCE/W 2 08D 1130-162114            | 11,30                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181330Z9        | -           | HBDPCE/W 2 08D 1140-162114            | 11,40                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181331Z9        | -           | HBDPCE/W 2 08D 1150-162114            | 11,50                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181332Z9        | -           | HBDPCE/W 2 08D 1160-162114            | 11,60                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181333Z9        | -           | HBDPCE/W 2 08D 1170-162114            | 11,70                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181334Z9        | -           | HBDPCE/W 2 08D 1180-162114            | 11,80                                     | 12     | 114 | 162 | 2   | ⊗               | -  |
| 1181335Z9        | -           | HBDPCE/W 2 08D 1190-162114            | 11,90                                     | 12     | 114 | 162 | 2   | ○               | -  |
| 1181336Z9        | -           | HBDPCE/W 2 08D 1200-162114            | 12,00                                     | 12     | 114 | 162 | 2   | ○               | -  |

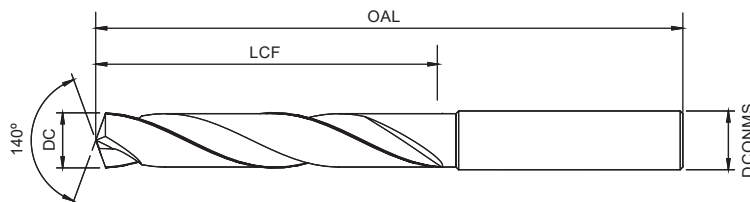
⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

# HBDPUE/W 2 03D Solid carbide drills | Brocas de metal duro | Brocas en metal duro



| P        | K                 |
|----------|-------------------|
| HRC ≤ 60 | IT8-9<br>IT class |



| Drill Dia. DC   | DC3,0            | 3,0<DC≤6,0       | 6,0<DC≤10,0      | 10,0<DC≤18,0     | 18,0<DC≤20,0     |
|-----------------|------------------|------------------|------------------|------------------|------------------|
| Hole Tolerances | +0,002<br>+0,012 | +0,004<br>+0,016 | +0,006<br>+0,021 | +0,007<br>+0,025 | +0,008<br>+0,028 |

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180784Z9        | 1181859Z9   | HBDPUE/W 2 03D 0300-062020            | 3,00                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180852Z9        | 1181860Z9   | HBDPUE/W 2 03D 0310-062020            | 3,10                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180853Z9        | 1181861Z9   | HBDPUE/W 2 03D 0320-062020            | 3,20                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1181790Z9        | 1181862Z9   | HBDPUE/W 2 03D 0325-062020            | 3,25                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180854Z9        | 1181863Z9   | HBDPUE/W 2 03D 0330-062020            | 3,30                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180790Z9        | 1181864Z9   | HBDPUE/W 2 03D 0340-062020            | 3,40                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180855Z9        | 1181865Z9   | HBDPUE/W 2 03D 0350-062020            | 3,50                                      | 6      | 20  | 62  | 2   | ⊗               | ○  |
| 1180856Z9        | 1181866Z9   | HBDPUE/W 2 03D 0360-062020            | 3,60                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180857Z9        | 1181867Z9   | HBDPUE/W 2 03D 0370-062020            | 3,70                                      | 6      | 20  | 62  | 2   | ⊗               | ⊗  |
| 1180858Z9        | 1181868Z9   | HBDPUE/W 2 03D 0380-066024            | 3,80                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180859Z9        | 1181869Z9   | HBDPUE/W 2 03D 0390-066024            | 3,90                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180860Z9        | 1181870Z9   | HBDPUE/W 2 03D 0400-066024            | 4,00                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180861Z9        | 1181871Z9   | HBDPUE/W 2 03D 0410-066024            | 4,10                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180862Z9        | 1181872Z9   | HBDPUE/W 2 03D 0420-066024            | 4,20                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180863Z9        | 1181873Z9   | HBDPUE/W 2 03D 0430-066024            | 4,30                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180864Z9        | 1181874Z9   | HBDPUE/W 2 03D 0440-066024            | 4,40                                      | 6      | 24  | 66  | 2   | ⊗               | ⊗  |
| 1180865Z9        | 1181875Z9   | HBDPUE/W 2 03D 0450-066024            | 4,50                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180866Z9        | 1181876Z9   | HBDPUE/W 2 03D 0460-066024            | 4,60                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1181792Z9        | 1181877Z9   | HBDPUE/W 2 03D 0465-066024            | 4,65                                      | 6      | 24  | 66  | 2   | ○               | ⊗  |
| 1180867Z9        | 1181878Z9   | HBDPUE/W 2 03D 0470-066024            | 4,70                                      | 6      | 24  | 66  | 2   | ⊗               | ○  |
| 1180868Z9        | 1181879Z9   | HBDPUE/W 2 03D 0480-066028            | 4,80                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180869Z9        | 1181880Z9   | HBDPUE/W 2 03D 0490-066028            | 4,90                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180870Z9        | 1181881Z9   | HBDPUE/W 2 03D 0500-066028            | 5,00                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180871Z9        | 1181882Z9   | HBDPUE/W 2 03D 0510-066028            | 5,10                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180872Z9        | 1181883Z9   | HBDPUE/W 2 03D 0520-066028            | 5,20                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180873Z9        | 1181884Z9   | HBDPUE/W 2 03D 0530-066028            | 5,30                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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**HBDPUE/W 2 03D**

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180874Z9        | 1181885Z9   | HBDPUE/W 2 03D 0540-066028            | 5,40                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180875Z9        | 1181886Z9   | HBDPUE/W 2 03D 0550-066028            | 5,50                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1181794Z9        | 1181887Z9   | HBDPUE/W 2 03D 0555-066028            | 5,55                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180791Z9        | 1181888Z9   | HBDPUE/W 2 03D 0560-066028            | 5,60                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180876Z9        | 1181889Z9   | HBDPUE/W 2 03D 0570-066028            | 5,70                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180877Z9        | 1181890Z9   | HBDPUE/W 2 03D 0580-066028            | 5,80                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180878Z9        | 1181891Z9   | HBDPUE/W 2 03D 0590-066028            | 5,90                                      | 6      | 28  | 66  | 2   | ⊗               | ○  |
| 1180879Z9        | 1181892Z9   | HBDPUE/W 2 03D 0600-066028            | 6,00                                      | 6      | 28  | 66  | 2   | ⊗               | ⊗  |
| 1180880Z9        | 1181893Z9   | HBDPUE/W 2 03D 0610-079034            | 6,10                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180881Z9        | 1181894Z9   | HBDPUE/W 2 03D 0620-079034            | 6,20                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180882Z9        | 1181895Z9   | HBDPUE/W 2 03D 0630-079034            | 6,30                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180883Z9        | 1181896Z9   | HBDPUE/W 2 03D 0640-079034            | 6,40                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180884Z9        | 1181897Z9   | HBDPUE/W 2 03D 0650-079034            | 6,50                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180885Z9        | 1181898Z9   | HBDPUE/W 2 03D 0660-079034            | 6,60                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180886Z9        | 1181899Z9   | HBDPUE/W 2 03D 0670-079034            | 6,70                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180887Z9        | 1181900Z9   | HBDPUE/W 2 03D 0680-079034            | 6,80                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180888Z9        | 1181901Z9   | HBDPUE/W 2 03D 0690-079034            | 6,90                                      | 8      | 34  | 79  | 2   | ⊗               | ○  |
| 1180889Z9        | 1181902Z9   | HBDPUE/W 2 03D 0700-079034            | 7,00                                      | 8      | 34  | 79  | 2   | ⊗               | ⊗  |
| 1180890Z9        | 1181903Z9   | HBDPUE/W 2 03D 0710-079041            | 7,10                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1180891Z9        | 1181904Z9   | HBDPUE/W 2 03D 0720-079041            | 7,20                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180892Z9        | 1181905Z9   | HBDPUE/W 2 03D 0730-079041            | 7,30                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180893Z9        | 1181906Z9   | HBDPUE/W 2 03D 0740-079041            | 7,40                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1180894Z9        | 1181907Z9   | HBDPUE/W 2 03D 0750-079041            | 7,50                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1180895Z9        | 1181908Z9   | HBDPUE/W 2 03D 0760-079041            | 7,60                                      | 8      | 41  | 79  | 2   | ⊗               | ○  |
| 1180896Z9        | 1181909Z9   | HBDPUE/W 2 03D 0770-079041            | 7,70                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180897Z9        | 1181910Z9   | HBDPUE/W 2 03D 0780-079041            | 7,80                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180898Z9        | 1181911Z9   | HBDPUE/W 2 03D 0790-079041            | 7,90                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180899Z9        | 1181912Z9   | HBDPUE/W 2 03D 0800-079041            | 8,00                                      | 8      | 41  | 79  | 2   | ⊗               | ⊗  |
| 1180900Z9        | 1181913Z9   | HBDPUE/W 2 03D 0810-089047            | 8,10                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180901Z9        | 1181914Z9   | HBDPUE/W 2 03D 0820-089047            | 8,20                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180902Z9        | 1181915Z9   | HBDPUE/W 2 03D 0830-089047            | 8,30                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180903Z9        | 1181916Z9   | HBDPUE/W 2 03D 0840-089047            | 8,40                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180904Z9        | 1181917Z9   | HBDPUE/W 2 03D 0850-089047            | 8,50                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180905Z9        | 1181918Z9   | HBDPUE/W 2 03D 0860-089047            | 8,60                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180906Z9        | 1181919Z9   | HBDPUE/W 2 03D 0870-089047            | 8,70                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180907Z9        | 1181920Z9   | HBDPUE/W 2 03D 0880-089047            | 8,80                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180908Z9        | 1181921Z9   | HBDPUE/W 2 03D 0890-089047            | 8,90                                      | 10     | 47  | 89  | 2   | ○               | ⊗  |
| 1180909Z9        | 1181922Z9   | HBDPUE/W 2 03D 0900-089047            | 9,00                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180910Z9        | 1181923Z9   | HBDPUE/W 2 03D 0910-089047            | 9,10                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180911Z9        | 1181924Z9   | HBDPUE/W 2 03D 0920-089047            | 9,20                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180912Z9        | 1181925Z9   | HBDPUE/W 2 03D 0930-089047            | 9,30                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180913Z9        | 1181926Z9   | HBDPUE/W 2 03D 0940-089047            | 9,40                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180914Z9        | 1181927Z9   | HBDPUE/W 2 03D 0950-089047            | 9,50                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180915Z9        | 1181928Z9   | HBDPUE/W 2 03D 0960-089047            | 9,60                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180916Z9        | 1181929Z9   | HBDPUE/W 2 03D 0970-089047            | 9,70                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180917Z9        | 1181930Z9   | HBDPUE/W 2 03D 0980-089047            | 9,80                                      | 10     | 47  | 89  | 2   | ⊗               | ⊗  |
| 1180918Z9        | 1181931Z9   | HBDPUE/W 2 03D 0990-089047            | 9,90                                      | 10     | 47  | 89  | 2   | ⊗               | ○  |
| 1180919Z9        | 1181932Z9   | HBDPUE/W 2 03D 1000-089047            | 10,00                                     | 10     | 47  | 89  | 2   | ⊗               | ⊗  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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## HBDPUE/W 2 03D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180920Z9        | -           | HBDPUE/W 2 03D 1010-102055            | 10,10                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1180921Z9        | 1181933Z9   | HBDPUE/W 2 03D 1020-102055            | 10,20                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180922Z9        | 1181934Z9   | HBDPUE/W 2 03D 1030-102055            | 10,30                                     | 12     | 55  | 102 | 2   | ⊗               | ○  |
| 1180923Z9        | -           | HBDPUE/W 2 03D 1040-102055            | 10,40                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1180924Z9        | 1181935Z9   | HBDPUE/W 2 03D 1050-102055            | 10,50                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180925Z9        | -           | HBDPUE/W 2 03D 1060-102055            | 10,60                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180926Z9        | -           | HBDPUE/W 2 03D 1070-102055            | 10,70                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180927Z9        | 1181936Z9   | HBDPUE/W 2 03D 1080-102055            | 10,80                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180928Z9        | -           | HBDPUE/W 2 03D 1090-102055            | 10,90                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180929Z9        | 1181937Z9   | HBDPUE/W 2 03D 1100-102055            | 11,00                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180930Z9        | -           | HBDPUE/W 2 03D 1110-102055            | 11,10                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1180931Z9        | 1181938Z9   | HBDPUE/W 2 03D 1120-102055            | 11,20                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180932Z9        | -           | HBDPUE/W 2 03D 1130-102055            | 11,30                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180933Z9        | -           | HBDPUE/W 2 03D 1140-102055            | 11,40                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180934Z9        | 1181939Z9   | HBDPUE/W 2 03D 1150-102055            | 11,50                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180935Z9        | -           | HBDPUE/W 2 03D 1160-102055            | 11,60                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180936Z9        | -           | HBDPUE/W 2 03D 1170-102055            | 11,70                                     | 12     | 55  | 102 | 2   | ○               | -  |
| 1180937Z9        | 1181940Z9   | HBDPUE/W 2 03D 1180-102055            | 11,80                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180938Z9        | -           | HBDPUE/W 2 03D 1190-102055            | 11,90                                     | 12     | 55  | 102 | 2   | ⊗               | -  |
| 1180939Z9        | 1181941Z9   | HBDPUE/W 2 03D 1200-102055            | 12,00                                     | 12     | 55  | 102 | 2   | ⊗               | ⊗  |
| 1180940Z9        | 1181942Z9   | HBDPUE/W 2 03D 1250-107060            | 12,50                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181769Z9        | 1181943Z9   | HBDPUE/W 2 03D 1280-107060            | 12,80                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1180941Z9        | 1181944Z9   | HBDPUE/W 2 03D 1300-107060            | 13,00                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1182437Z9        | -           | HBDPUE/W 2 03D 1310-107060            | 13,10                                     | 14     | 60  | 107 | 2   | ○               | -  |
| 1182400Z9        | 1182401Z9   | HBDPUE/W 2 03D 1320-107060            | 13,20                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1180942Z9        | 1181945Z9   | HBDPUE/W 2 03D 1350-107060            | 13,50                                     | 14     | 60  | 107 | 2   | ⊗               | ○  |
| 1181771Z9        | 1181946Z9   | HBDPUE/W 2 03D 1380-107060            | 13,80                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1180943Z9        | 1181947Z9   | HBDPUE/W 2 03D 1400-107060            | 14,00                                     | 14     | 60  | 107 | 2   | ⊗               | ⊗  |
| 1181773Z9        | 1181948Z9   | HBDPUE/W 2 03D 1420-115065            | 14,20                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1180944Z9        | 1181949Z9   | HBDPUE/W 2 03D 1450-115065            | 14,50                                     | 16     | 65  | 115 | 2   | ⊗               | ○  |
| 1181775Z9        | 1181950Z9   | HBDPUE/W 2 03D 1480-115065            | 14,80                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1180945Z9        | 1181951Z9   | HBDPUE/W 2 03D 1500-115065            | 15,00                                     | 16     | 65  | 115 | 2   | ⊗               | ○  |
| 1180946Z9        | 1181952Z9   | HBDPUE/W 2 03D 1550-115065            | 15,50                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1181777Z9        | 1181953Z9   | HBDPUE/W 2 03D 1580-115065            | 15,80                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1180947Z9        | 1181954Z9   | HBDPUE/W 2 03D 1600-115065            | 16,00                                     | 16     | 65  | 115 | 2   | ⊗               | ⊗  |
| 1180948Z9        | 1181955Z9   | HBDPUE/W 2 03D 1650-123073            | 16,50                                     | 18     | 73  | 123 | 2   | ⊗               | ○  |
| 1180949Z9        | 1181956Z9   | HBDPUE/W 2 03D 1700-123073            | 17,00                                     | 18     | 73  | 123 | 2   | ⊗               | ⊗  |
| 1180950Z9        | 1181957Z9   | HBDPUE/W 2 03D 1750-123073            | 17,50                                     | 18     | 73  | 123 | 2   | ⊗               | ○  |
| 1180951Z9        | 1181958Z9   | HBDPUE/W 2 03D 1800-123073            | 18,00                                     | 18     | 73  | 123 | 2   | ⊗               | ⊗  |
| 1180952Z9        | 1181959Z9   | HBDPUE/W 2 03D 1850-131079            | 18,50                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1180953Z9        | 1181960Z9   | HBDPUE/W 2 03D 1900-131079            | 19,00                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1180954Z9        | 1181961Z9   | HBDPUE/W 2 03D 1950-131079            | 19,50                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |
| 1180955Z9        | 1181962Z9   | HBDPUE/W 2 03D 2000-131079            | 20,00                                     | 20     | 79  | 131 | 2   | ⊗               | ⊗  |

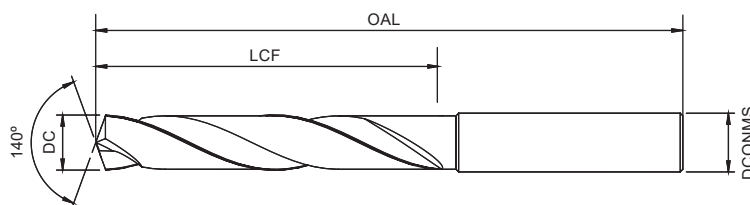
⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

# HBDPUE/W 2 05D Solid carbide drills | Brocas de metal duro | Brocas en metal duro



| P              | K                 |
|----------------|-------------------|
| HRC<br>≤<br>60 | IT8-9<br>IT class |



| Drill Dia. DC   | DC3,0            | 3,0<DC≤6,0       | 6,0<DC≤10,0      | 10,0<DC≤18,0     | 18,0<DC≤20,0     |
|-----------------|------------------|------------------|------------------|------------------|------------------|
| Hole Tolerances | +0,002<br>+0,012 | +0,004<br>+0,016 | +0,006<br>+0,021 | +0,007<br>+0,025 | +0,008<br>+0,028 |

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1180793Z9        | -           | HBDPUE/W 2 05D 0300-066028            | 3,00                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1180794Z9        | -           | HBDPUE/W 2 05D 0310-066028            | 3,10                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1181062Z9        | -           | HBDPUE/W 2 05D 0320-066028            | 3,20                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1181063Z9        | -           | HBDPUE/W 2 05D 0330-066028            | 3,30                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1180789Z9        | -           | HBDPUE/W 2 05D 0340-066028            | 3,40                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1181064Z9        | -           | HBDPUE/W 2 05D 0350-066028            | 3,50                                      | 6      | 28  | 66  | 2   | ⊗               | -  |
| 1181065Z9        | -           | HBDPUE/W 2 05D 0360-066028            | 3,60                                      | 6      | 28  | 66  | 2   | ○               | -  |
| 1181066Z9        | -           | HBDPUE/W 2 05D 0370-066028            | 3,70                                      | 6      | 28  | 66  | 2   | ○               | -  |
| 1181067Z9        | -           | HBDPUE/W 2 05D 0380-074036            | 3,80                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1180795Z9        | -           | HBDPUE/W 2 05D 0390-074036            | 3,90                                      | 6      | 36  | 74  | 2   | ○               | -  |
| 1181068Z9        | -           | HBDPUE/W 2 05D 0400-074036            | 4,00                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1181069Z9        | -           | HBDPUE/W 2 05D 0410-074036            | 4,10                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1180785Z9        | -           | HBDPUE/W 2 05D 0420-074036            | 4,20                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1181070Z9        | -           | HBDPUE/W 2 05D 0430-074036            | 4,30                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1181071Z9        | -           | HBDPUE/W 2 05D 0440-074036            | 4,40                                      | 6      | 36  | 74  | 2   | ○               | -  |
| 1181072Z9        | -           | HBDPUE/W 2 05D 0450-074036            | 4,50                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1181073Z9        | -           | HBDPUE/W 2 05D 0460-074036            | 4,60                                      | 6      | 36  | 74  | 2   | ○               | -  |
| 1181534Z9        | -           | HBDPUE/W 2 05D 0465-074036            | 4,65                                      | 6      | 36  | 74  | 2   | ○               | -  |
| 1180786Z9        | -           | HBDPUE/W 2 05D 0470-074036            | 4,70                                      | 6      | 36  | 74  | 2   | ⊗               | -  |
| 1181074Z9        | -           | HBDPUE/W 2 05D 0480-082044            | 4,80                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181075Z9        | -           | HBDPUE/W 2 05D 0490-082044            | 4,90                                      | 6      | 44  | 82  | 2   | ○               | -  |
| 1180782Z9        | -           | HBDPUE/W 2 05D 0500-082044            | 5,00                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181076Z9        | -           | HBDPUE/W 2 05D 0510-082044            | 5,10                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181077Z9        | -           | HBDPUE/W 2 05D 0520-082044            | 5,20                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181078Z9        | -           | HBDPUE/W 2 05D 0530-082044            | 5,30                                      | 6      | 44  | 82  | 2   | ○               | -  |
| 1181079Z9        | -           | HBDPUE/W 2 05D 0540-082044            | 5,40                                      | 6      | 44  | 82  | 2   | ○               | -  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

Continue next page

## HBDPUE/W 2 05D

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181080Z9        | -           | HBDPUE/W 2 05D 0550-082044            | 5,50                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181081Z9        | -           | HBDPUE/W 2 05D 0560-082044            | 5,60                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181082Z9        | -           | HBDPUE/W 2 05D 0570-082044            | 5,70                                      | 6      | 44  | 82  | 2   | ○               | -  |
| 1181083Z9        | -           | HBDPUE/W 2 05D 0580-082044            | 5,80                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181084Z9        | -           | HBDPUE/W 2 05D 0590-082044            | 5,90                                      | 6      | 44  | 82  | 2   | ○               | -  |
| 1181085Z9        | -           | HBDPUE/W 2 05D 0600-082044            | 6,00                                      | 6      | 44  | 82  | 2   | ⊗               | -  |
| 1181086Z9        | -           | HBDPUE/W 2 05D 0610-091053            | 6,10                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181087Z9        | -           | HBDPUE/W 2 05D 0620-091053            | 6,20                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181088Z9        | -           | HBDPUE/W 2 05D 0630-091053            | 6,30                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181089Z9        | -           | HBDPUE/W 2 05D 0640-091053            | 6,40                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181090Z9        | -           | HBDPUE/W 2 05D 0650-091053            | 6,50                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181091Z9        | -           | HBDPUE/W 2 05D 0660-091053            | 6,60                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181092Z9        | -           | HBDPUE/W 2 05D 0670-091053            | 6,70                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1180781Z9        | -           | HBDPUE/W 2 05D 0680-091053            | 6,80                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181093Z9        | -           | HBDPUE/W 2 05D 0690-091053            | 6,90                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181094Z9        | -           | HBDPUE/W 2 05D 0700-091053            | 7,00                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181095Z9        | -           | HBDPUE/W 2 05D 0710-091053            | 7,10                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181096Z9        | -           | HBDPUE/W 2 05D 0720-091053            | 7,20                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181097Z9        | -           | HBDPUE/W 2 05D 0730-091053            | 7,30                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181098Z9        | -           | HBDPUE/W 2 05D 0740-091053            | 7,40                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181099Z9        | -           | HBDPUE/W 2 05D 0750-091053            | 7,50                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181100Z9        | -           | HBDPUE/W 2 05D 0760-091053            | 7,60                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181101Z9        | -           | HBDPUE/W 2 05D 0770-091053            | 7,70                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181102Z9        | -           | HBDPUE/W 2 05D 0780-091053            | 7,80                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181103Z9        | -           | HBDPUE/W 2 05D 0790-091053            | 7,90                                      | 8      | 53  | 91  | 2   | ○               | -  |
| 1181104Z9        | -           | HBDPUE/W 2 05D 0800-091053            | 8,00                                      | 8      | 53  | 91  | 2   | ⊗               | -  |
| 1181105Z9        | -           | HBDPUE/W 2 05D 0810-103061            | 8,10                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181106Z9        | -           | HBDPUE/W 2 05D 0820-103061            | 8,20                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181107Z9        | -           | HBDPUE/W 2 05D 0830-103061            | 8,30                                      | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181108Z9        | -           | HBDPUE/W 2 05D 0840-103061            | 8,40                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181109Z9        | -           | HBDPUE/W 2 05D 0850-103061            | 8,50                                      | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181110Z9        | -           | HBDPUE/W 2 05D 0860-103061            | 8,60                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181111Z9        | -           | HBDPUE/W 2 05D 0870-103061            | 8,70                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181112Z9        | -           | HBDPUE/W 2 05D 0880-103061            | 8,80                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181113Z9        | -           | HBDPUE/W 2 05D 0890-103061            | 8,90                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181114Z9        | -           | HBDPUE/W 2 05D 0900-103061            | 9,00                                      | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181115Z9        | -           | HBDPUE/W 2 05D 0910-103061            | 9,10                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181116Z9        | -           | HBDPUE/W 2 05D 0920-103061            | 9,20                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181117Z9        | -           | HBDPUE/W 2 05D 0930-103061            | 9,30                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181118Z9        | -           | HBDPUE/W 2 05D 0940-103061            | 9,40                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181119Z9        | -           | HBDPUE/W 2 05D 0950-103061            | 9,50                                      | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181120Z9        | -           | HBDPUE/W 2 05D 0960-103061            | 9,60                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181121Z9        | -           | HBDPUE/W 2 05D 0970-103061            | 9,70                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181122Z9        | -           | HBDPUE/W 2 05D 0980-103061            | 9,80                                      | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181123Z9        | -           | HBDPUE/W 2 05D 0990-103061            | 9,90                                      | 10     | 61  | 103 | 2   | ○               | -  |
| 1181124Z9        | -           | HBDPUE/W 2 05D 1000-103061            | 10,00                                     | 10     | 61  | 103 | 2   | ⊗               | -  |
| 1181125Z9        | -           | HBDPUE/W 2 05D 1010-118071            | 10,10                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181126Z9        | -           | HBDPUE/W 2 05D 1020-118071            | 10,20                                     | 12     | 71  | 118 | 2   | ⊗               | -  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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**HBDPUE/W 2 05D**

Solid carbide drills | Brocas de metal duro | Brocas en metal duro

| Order code       |             | Reference<br>Referência<br>Referencia | Dimensions   Dimensões   Dimensiones (mm) |        |     |     | NOF | Stock<br>PHU920 |    |
|------------------|-------------|---------------------------------------|-------------------------------------------|--------|-----|-----|-----|-----------------|----|
| HA (Cylindrical) | HB (Weldon) |                                       | DC                                        | DCONMS | LCF | OAL |     | HA              | HB |
| 1181127Z9        | -           | HBDPUE/W 2 05D 1030-118071            | 10,30                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181128Z9        | -           | HBDPUE/W 2 05D 1040-118071            | 10,40                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1180796Z9        | -           | HBDPUE/W 2 05D 1050-118071            | 10,50                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181129Z9        | -           | HBDPUE/W 2 05D 1060-118071            | 10,60                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181130Z9        | -           | HBDPUE/W 2 05D 1070-118071            | 10,70                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181131Z9        | -           | HBDPUE/W 2 05D 1080-118071            | 10,80                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181132Z9        | -           | HBDPUE/W 2 05D 1090-118071            | 10,90                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181133Z9        | -           | HBDPUE/W 2 05D 1100-118071            | 11,00                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181134Z9        | -           | HBDPUE/W 2 05D 1110-118071            | 11,10                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181135Z9        | -           | HBDPUE/W 2 05D 1120-118071            | 11,20                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181136Z9        | -           | HBDPUE/W 2 05D 1130-118071            | 11,30                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181137Z9        | -           | HBDPUE/W 2 05D 1140-118071            | 11,40                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181138Z9        | -           | HBDPUE/W 2 05D 1150-118071            | 11,50                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181139Z9        | -           | HBDPUE/W 2 05D 1160-118071            | 11,60                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181140Z9        | -           | HBDPUE/W 2 05D 1170-118071            | 11,70                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181141Z9        | -           | HBDPUE/W 2 05D 1180-118071            | 11,80                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181142Z9        | -           | HBDPUE/W 2 05D 1190-118071            | 11,90                                     | 12     | 71  | 118 | 2   | ○               | -  |
| 1181143Z9        | -           | HBDPUE/W 2 05D 1200-118071            | 12,00                                     | 12     | 71  | 118 | 2   | ⊗               | -  |
| 1181144Z9        | -           | HBDPUE/W 2 05D 1250-124077            | 12,50                                     | 14     | 77  | 124 | 2   | ⊗               | -  |
| 1181145Z9        | -           | HBDPUE/W 2 05D 1300-124077            | 13,00                                     | 14     | 77  | 124 | 2   | ⊗               | -  |
| 1181146Z9        | -           | HBDPUE/W 2 05D 1350-124077            | 13,50                                     | 14     | 77  | 124 | 2   | ⊗               | -  |
| 1181147Z9        | -           | HBDPUE/W 2 05D 1400-124077            | 14,00                                     | 14     | 77  | 124 | 2   | ⊗               | -  |
| 1181148Z9        | -           | HBDPUE/W 2 05D 1450-133083            | 14,50                                     | 16     | 83  | 133 | 2   | ⊗               | -  |
| 1181149Z9        | -           | HBDPUE/W 2 05D 1500-133083            | 15,00                                     | 16     | 83  | 133 | 2   | ⊗               | -  |
| 1181150Z9        | -           | HBDPUE/W 2 05D 1550-133083            | 15,50                                     | 16     | 83  | 133 | 2   | ⊗               | -  |
| 1181151Z9        | -           | HBDPUE/W 2 05D 1600-133083            | 16,00                                     | 16     | 83  | 133 | 2   | ⊗               | -  |
| 1181152Z9        | -           | HBDPUE/W 2 05D 1650-143093            | 16,50                                     | 18     | 93  | 143 | 2   | ⊗               | -  |
| 1181153Z9        | -           | HBDPUE/W 2 05D 1700-143093            | 17,00                                     | 18     | 93  | 143 | 2   | ⊗               | -  |
| 1181154Z9        | -           | HBDPUE/W 2 05D 1750-143093            | 17,50                                     | 18     | 93  | 143 | 2   | ⊗               | -  |
| 1181155Z9        | -           | HBDPUE/W 2 05D 1800-143093            | 18,00                                     | 18     | 93  | 143 | 2   | ⊗               | -  |
| 1181156Z9        | -           | HBDPUE/W 2 05D 1850-153101            | 18,50                                     | 20     | 101 | 153 | 2   | ○               | -  |
| 1181157Z9        | -           | HBDPUE/W 2 05D 1900-153101            | 19,00                                     | 20     | 101 | 153 | 2   | ○               | -  |
| 1181158Z9        | -           | HBDPUE/W 2 05D 1950-153101            | 19,50                                     | 20     | 101 | 153 | 2   | ○               | -  |
| 1181159Z9        | -           | HBDPUE/W 2 05D 2000-153101            | 20,00                                     | 20     | 101 | 153 | 2   | ○               | -  |

⊗ Stock item | Produto de stock | Itens de stock

○ Available under request | Disponível sobre consulta | Disponible bajo consulta

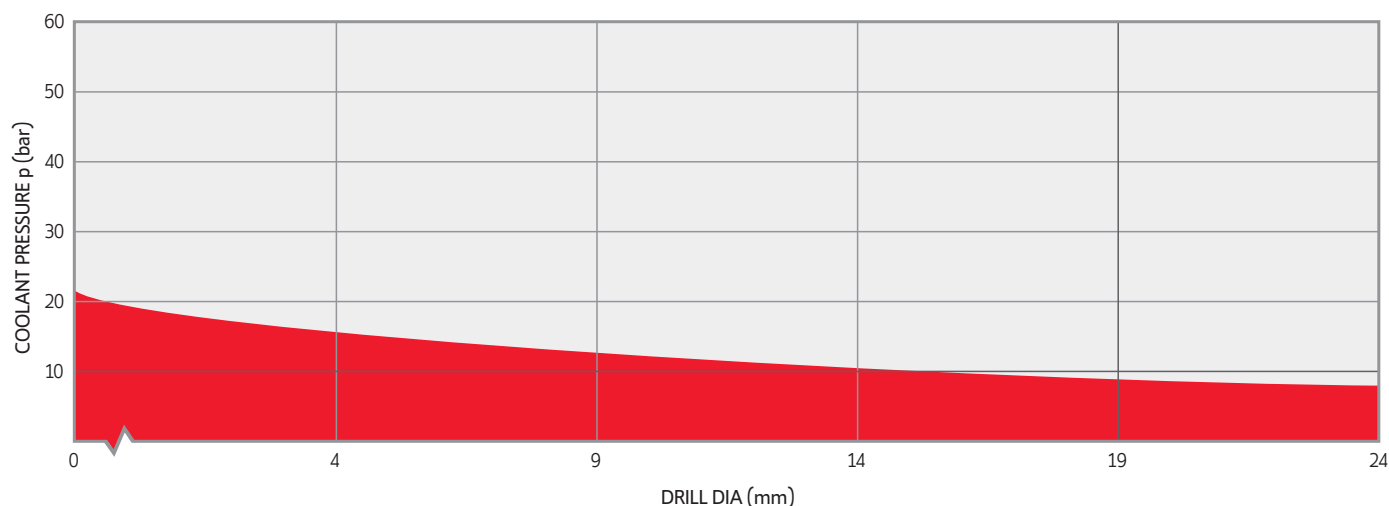
# SOLID CARBIDE DRILLS CUTTING PARAMETERS AND ADJUSTMENTS

Parâmetros de corte e ajustes | Condiciones de corte y ajustes

## RECOMMENDED SPEEDS AND FEEDS

| ISO | Material Group<br>Grupo Materiais<br>Grupo Materiales | Vc (m/min) | f (mm/rev) |           |           |           |
|-----|-------------------------------------------------------|------------|------------|-----------|-----------|-----------|
|     |                                                       |            | Ø3-8mm     | Ø8-12mm   | Ø12-16mm  | Ø16-20mm  |
| P   | Unalloyed steel (-0,25%)                              | 80-100     | 0,10-0,20  | 0,15-0,25 | 0,20-0,40 | 0,25-0,50 |
|     | Low-alloy steel (0,25%-)                              | 70-100     | 0,10-0,20  | 0,20-0,30 | 0,20-0,35 | 0,25-0,40 |
|     | High-alloy steel                                      | 40-70      | 0,08-0,15  | 0,12-0,22 | 0,20-0,40 | 0,25-0,40 |
| M   | Stainless steel                                       | 35-50      | 0,08-0,15  | 0,12-0,25 | 0,15-0,30 | 0,20-0,35 |
| K   | Maleable cast iron                                    | 70-100     | 0,10-0,30  | 0,20-0,40 | 0,25-0,40 | 0,25-0,50 |
|     | Grey cast iron                                        | 70-100     | 0,10-0,25  | 0,20-0,35 | 0,30-0,45 | 0,35-0,55 |

## COOLANT APPLICATION CHART





Excellence is not about meeting standards  
**it's about setting new ones.**





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