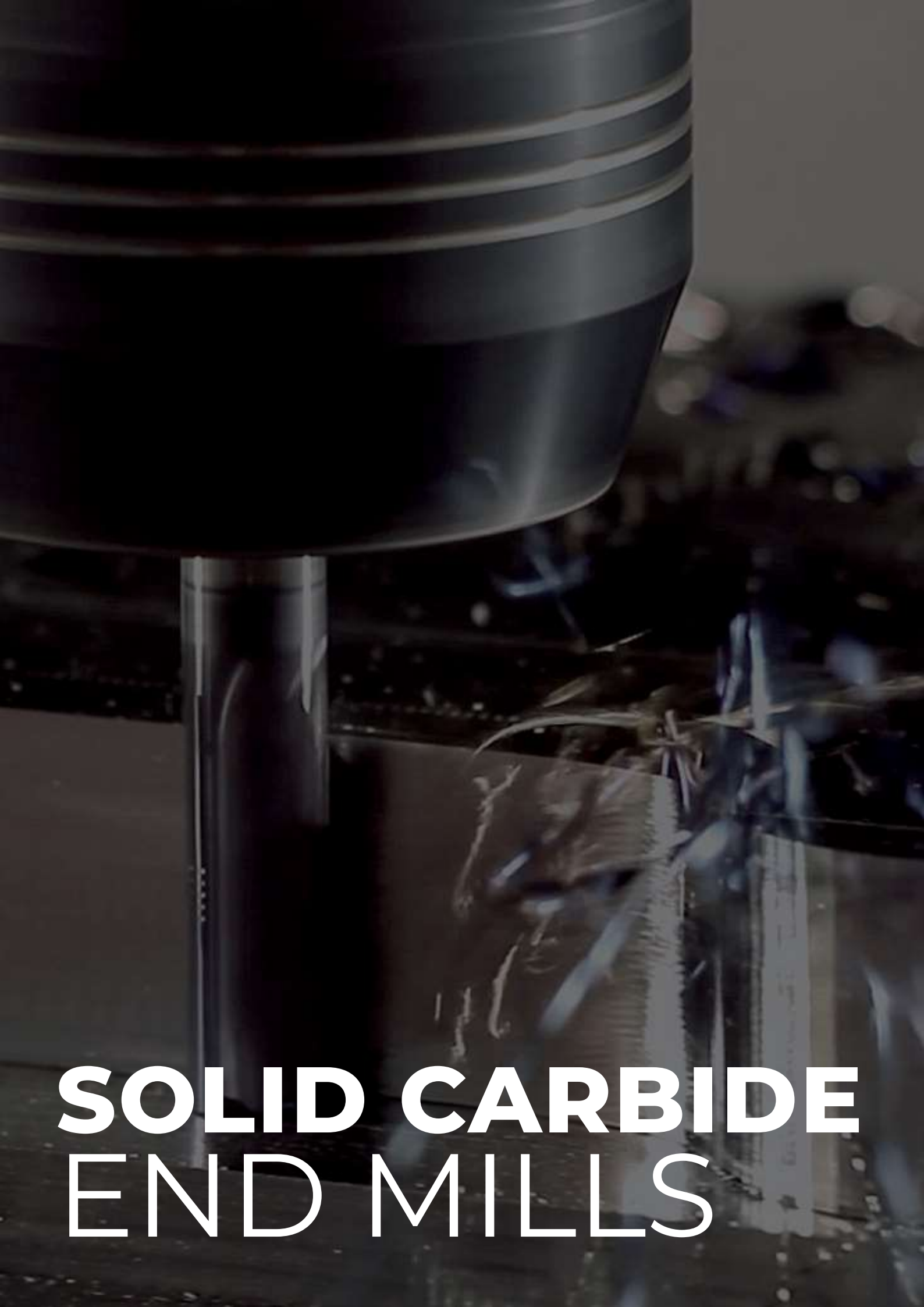




SOLID CARBIDE END MILLS

1 PCD TIPPED END MILLS

> See page A - 312

2 CHOOSE BY MATERIAL

> See page A - 318

3 CHOOSE BY APPLICATION

> See page A - 336

4 GENERAL INTEG

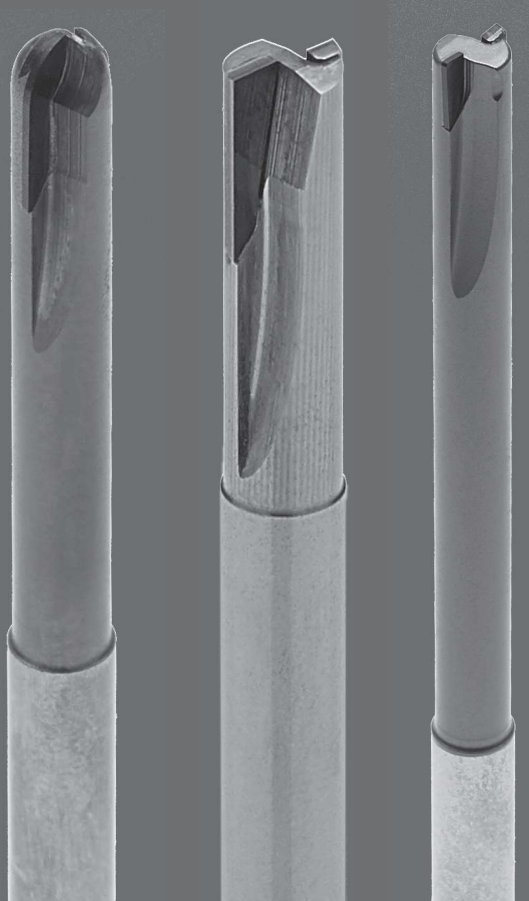
> See page A - 352

5 INTEG GRADES

> See page A - 364

END MILLS

PCD TIPPED



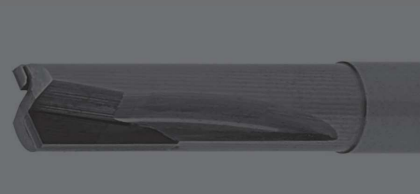
PCD end mills are brazed-tipped tools specifically designed for non-ferrous applications. PCD withstands abrasion wear, significantly prolonging tool life. PCD end mills operate at higher speeds than traditional carbide end mills, resulting in improved surface finish and extended tool life.

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 específicamente 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.

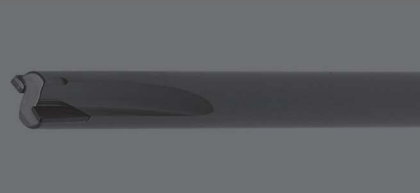
STRAIGHT EDGE > page 315

- > 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 aristas de corte
- > Flat top geometry
Disponível com geometria em topo raso | Disponible con geometría en topo plano
- > Short version
Disponível em versão curta | Disponible en versión corta



BULL NOSE > page 316

- > From DC 3mm to 12mm
De DC 4mm a 16mm | Desde DC 4mm hasta 16mm
- > 1 or 2 cutting edges
1 ou 2 arestas de corte | 1 o 2 aristas de corte
- > 5° dish angle
Ângulo de topo de 5° | Ángulo de la punta de 5°
- > Short and long version
Disponível em versão curta e longa | Disponible en versión corta y larga



BALL NOSE > page 317

- > 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 aristas de corte
- > Spheric geometry
Disponível com geometria esférica | Disponible con geometría esférica
- > Short version
Disponível em versão curta | Disponible en versión corta



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 S - Straight

3 - Application
N - Non-ferrous materials

4 - Length of Shank
S - Short length L - Long length XL - Extra long length

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

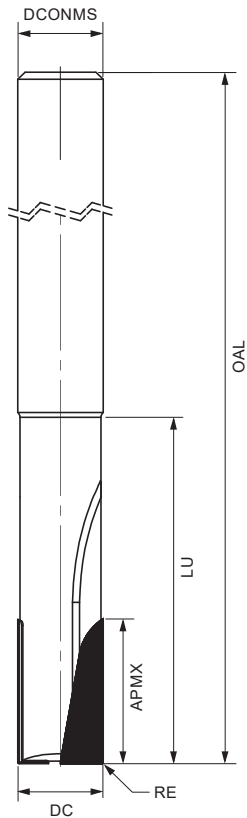
6 - Cutting diameter (DC)
Example: 120 = 12,0 mm ; 008 = 0,8 mm

7 - Max cutting depth (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

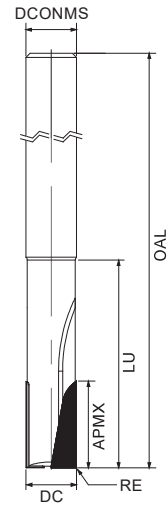
9 - Shank diameter (only on straight flute solid carbide)
Example: 060 = 6 mm

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



(1) Geometry code	(2) Grade code Referência Referencia		NOF	N PCD D6 PDP410	Dimensions Dimensões Dimensiones (mm)					
					DC	DCONMS	OAL	LU	APMX	RE
1180011	DSNS 2 040 060 010 060	2	⊗	⊗	4	6	51	6,40	6	0,10
1180012	DSNS 2 050 080 010 060	2	⊗	⊗	5	6	51	8,40	8	0,10
1180006	DSNS 2 060 080 010 060	2	⊗	⊗	6	6	63	21	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	27	12	0,10
1180015	DSNS 2 100 080 010 100	2	⊗	⊗	10	10	72	32	8	0,10
1180016	DSNS 2 100 160 010 100	2	⊗	⊗	10	10	72	32	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

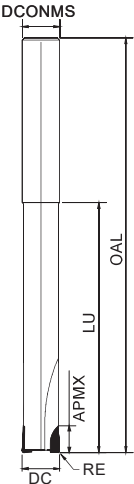
NON-FERROUS MATERIALS Materiais não ferrosos | Materiales no ferrosos

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 Materiais 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.



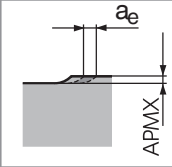
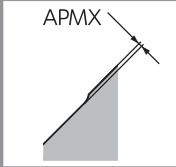
			N	Dimensions Dimensões Dimensiones (mm)						
			PCD							
(2) Grade code		NOF	D6							
(1) Geometry code	Reference Referência Referencia		PDP410	DC	DCONMS	OAL	LU	APMX	RE	
1180073	DSNS 1 030 050 030 040	1		3	4	60	30	5	0,30	
1180075	DSNL 2 040 050 030 040	2		4	4	75	45	5	0,30	
1180076	DSNL 2 060 060 030 060	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

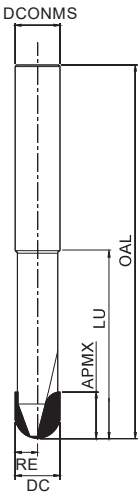
Order code = (1) Geometry Code + (2) Grade Code

Material Group	Correction factor	V _C (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	 a _e = 0,2 x DC APMX = 0,1 x DC	 APMX = 0,05 x DC
	f _z (mm/t)	f _z (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 fz from the table above must be multiplied with the corresponding correction factor.

HARDMILL BALL NOSE



			N	Dimensions Dimensões Dimensiones (mm)					
			PCD						
(2) Grade code			D6						
(1) Geometry code	Reference Referência Referencia	NOF	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 _C (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	 $a_e = 0,2 \times DC$ $APMX = 0,1 \times DC$	 $APMX = 0,05 \times DC$
	f _Z (mm/t)	f _Z (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 fz from the table above must be multiplied with the corresponding correction factor.

CHOOSE BY **MATERIAL**



A high-performance solid carbide endmills 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.

NEW

STEEL INTEG > page 323

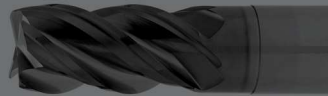
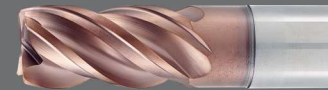
- > Steel specialized end mills
Fresas especiais para aço | Fresas especiales para acero
- > From DC 2mm to 25mm
De DC 2mm a 25mm | Desde DC 2mm hasta 25mm
- > Chamfer or radius geometry
Disponível com geometria em chanfro ou raio | Disponible con geometría en chaflán o radio
- > Short and long version
Disponível em versão curta e longa | Disponible en versión corta y larga



NEW

INOX INTEG > page 326

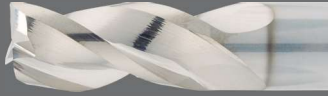
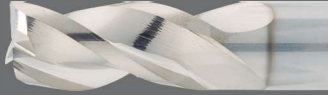
- > Stainless steel specialized end mills
Fresas especiais para aço inox | Fresas especiales para acero inoxidable
- > From DC 2mm to 20mm
De DC 2mm a 20mm | Desde DC 2mm hasta 20mm
- > Chamfer or radius geometry
Disponível com geometria em chanfro ou raio | Disponible con geometría en chaflán o radio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



NEW

AL INTEG > page 329

- > 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
- > Short version
Disponível em versão curta | Disponible en versión corta



HARD INTEG > page 334

- > Hardened steel specialized end mills
Fresas especiais para aço | Fresas especiales para acero
- > From DC 2mm to 12mm
De DC 2mm a 12mm | Desde DC 2mm hasta 12mm
- > Ball nose or flat top geometry
Disponível com geometria redonda ou topo raso | Disponible con geometría redondeada o plano
- > Short and long version
Disponível em versão curta e longa | Disponible en versión corta y larga



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	35	-	P	S	4	090	22	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 TS - Trochoidal milling	HP - High Performance

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

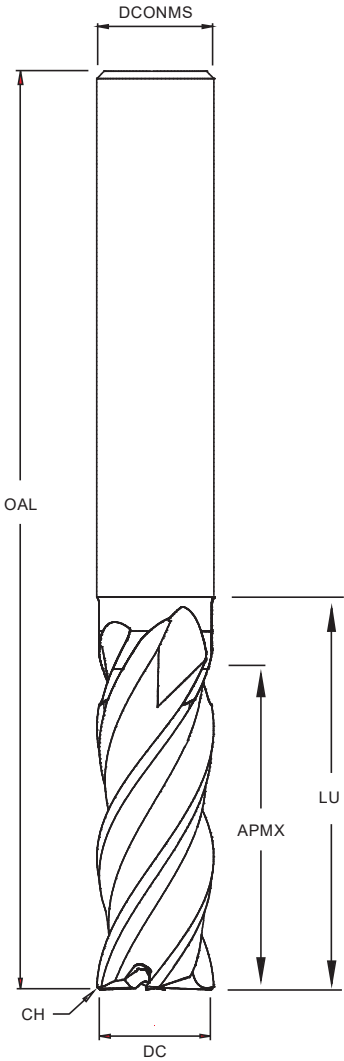
9 - Max cutting depth (APMX)
Example for APMX ≥ 1 mm: 04 = 4 mm ; 06 = 6 mm Example for APMX < 1 mm: 002 = 0,2 mm ; 005 = 0,5 mm

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 - α/2 = 18° , 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 ANGLE	GEOMETRY	FINISHING	ROUGHING	MATERIAL	DESCRIPTION	PAGE
 STEEL INTEG HC35PS NEW	2-25	4	35° 38°	 Corner chamfer	    	    	PK	Steel Specialized End mills	A-323
 STEEL INTEG HC35ML	1-20	4	35° 38°	 Corner chamfer	    	    	PK		A-324
 STEEL INTEG HR35GL	12-20	4	35° 38°	 Corner radius	    	    	PMKS		A-325
 INOX INTEG HR37SS NEW	2-20	4	38° 39°	 Corner radius	    	    	M	Stainless Steel Specialized End mills	A-326
 INOX INTEG HC40SS	3-20	4	40° 41°	 Corner chamfer	    	    	M		A-327
 INOX INTEG HRO40SS	3-20	4	39° 41°	 Corner chamfer	    	    	M		A-328

SELECTION GUIDE FOR SOLID CARBIDE END MILLS

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

MILLING

Face milling

High feed milling

Shoulder milling

Profile milling

Specialty

Spare Parts

Technical Data

End Mills

	DC	NOF	HELIX ANGLE	GEOMETRY	FINISHING	ROUGHING	MATERIAL	DESCRIPTION	PAGE
 AL INTEG HR35HPAS NEW	2-20	3	35°	 Corner radius			N	Aluminium Specialized End mills	A-329
 AL INTEG HF45HPAS NEW	2-20	3	45°	 Square			N		A-330
 AL INTEG HB50HPAS NEW	2-20	2	50°	 Ball nose			N		A-331
 AL INTEG HC38AS	2-12	3	38°	 Corner chamfer			N		A-332
 AL INTEG HF30AS	2-12	1	30°	 Square			N		A-333
 HARD INTEG HF30HL	4-12	4	30°	 Square			H	Hardened Materials Specialized End mills	A-334
 HARD INTEG HB30HL	2-12	2	30°	 Ball nose			H		A-335

NEW HC35PS Corner chamfer

P K



Short

Variable Pitch
4Variable helix
35° | 38°Reduced
neck45°
Corner chamfer

< 48 HRC



		⁽²⁾ Grade code		2A	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHU910							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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	0,10	45°	12	57
1182243	1181749	HC35PS 4 040 08	4	⊗	4	6	8	0,10	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	0,20	45°	21	57
1182246	1181834	HC35PS 4 070 19	4	⊗	7	8	19	0,20	45°	27	63
1182247	1181752	HC35PS 4 080 19	4	⊗	8	8	19	0,20	45°	27	63
1182248	1181830	HC35PS 4 090 22	4	⊗	9	10	22	0,20	45°	32	72
1182249	1181753	HC35PS 4 100 22	4	⊗	10	10	22	0,20	45°	32	72
1182250	1181831	HC35PS 4 110 26	4	○	11	12	26	0,20	45°	32	83
1182180	1181828	HC35PS 4 120 26	4	⊗	12	12	26	0,20	45°	38	83
1182251	1181832	HC35PS 4 130 26	4	○	13	14	26	0,20	45°	38	83
1182252	1181754	HC35PS 4 140 26	4	○	14	14	26	0,30	45°	38	83
1182253	1181755	HC35PS 4 160 32	4	⊗	16	16	32	0,30	45°	44	92
1182254	1181756	HC35PS 4 180 32	4	⊗	18	18	32	0,30	45°	44	92
1182255	1181757	HC35PS 4 200 38	4	⊗	20	20	38	0,30	45°	50	104
1182256	1181833	HC35PS 4 250 42	4	○	25	25	42	0,30	45°	58	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



Short



Variable Pitch
4



Variable helix
35° | 38°



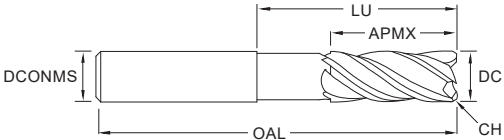
Reduced
neck



45°
Corner chamfer



< 42 HRC



		⁽²⁾ Grade code		T1	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHP920							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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"

HR35GL Corner radius



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

P

K

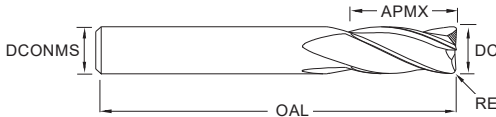
Long

4

Variable helix
35° | 38°

Corner radius

< 52 HRC



(1) Geometry code	(2) Grade code		T1	Dimensions Dimensões Dimensiones (mm)				
	Reference Referência Referencia	NOF	PHP920					
				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	fz (mm/t)			Vc (m/min)		
		ae = 25%	ae = 40%	ae = 100%	ae = 25%	ae = 40%	ae = 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

Note1: Recommended feed values for maximum ap. For reduced ap, consider increasing Fz up to 25%.
Note2: 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

NEW HR37SS Corner radius



Short



Variable Pitch
4



Variable Helix
38° | 39°



Reduced
Neck

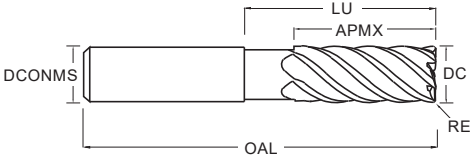


Corner radius



< 42 HRC

M



		(2) Grade code		1F	Dimensions Dimensões Dimensiones (mm)					
(1) Order code		Reference Referência Referencia	NOF	PHF920						
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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

HC40SS Corner chamfer



 Short

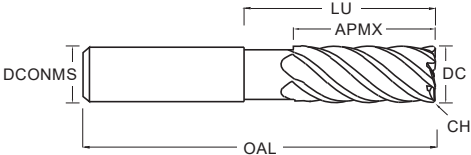
 Variable pitch
4

 Variable helix
40° | 41°

 Reduced neck

 45°
Corner chamfer

 M
< 42 HRC



		⁽²⁾ Grade code		Z9	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHU920							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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

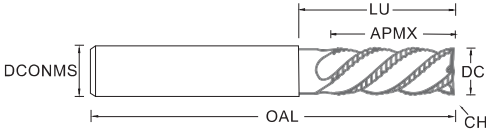
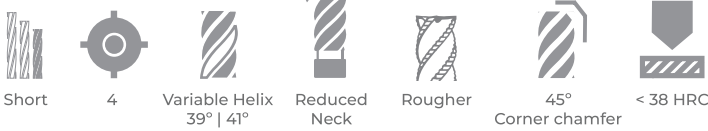
 Stock item | Produto de stock | Itens de stock

 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



		⁽²⁾ Grade code		Z9	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHU920							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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

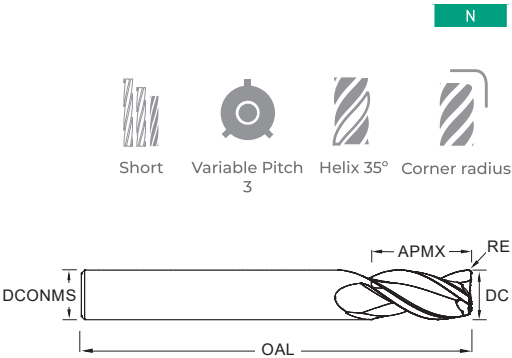
⊗ Stock item | Produto de stock | Itens de stock ○ Available under request | Disponível sobre consulta | Disponible bajo consulta End mill order code = (1) Geometry Code + (2) Grade Code

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

ISO	Material	fz (mm/t)			Vc (m/min)		
		ae = 25%	ae = 40%	ae = 100%	ae = 25%	ae = 40%	ae = 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

Note¹: 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%.
Note²: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

NEW HR35HPAS Corner radius



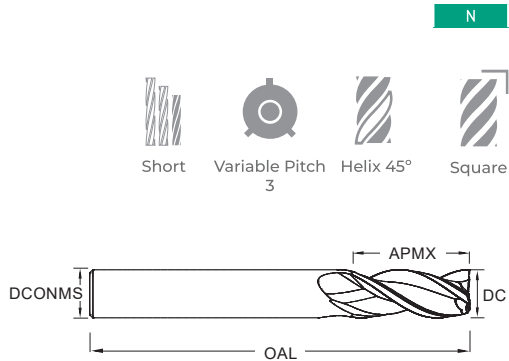
		(2) Grade code		H3	Dimensions Dimensões Dimensiones (mm)				
(1) Order code		Reference Referência Referencia	NOF	PHT910					
HA (Cylindrical)	HB (Weldon)				DC	APMX	RE	DCONMS	OAL
1182443	-	HR35HPAS 3 020 04 R050	3	○	2	4	0,5	6	57
1182444	-	HR35HPAS 3 030 06 R050	3	○	3	6	0,5	6	57
1182445	-	HR35HPAS 3 040 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

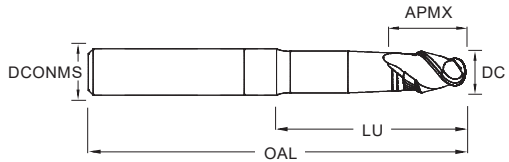
NEW HF45HPAS Flat top



		⁽²⁾ Grade code		H3	Dimensions Dimensões Dimensiones (mm)			
⁽¹⁾ Order code		Reference Referência 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

NEW HB50HPAS Ball nose



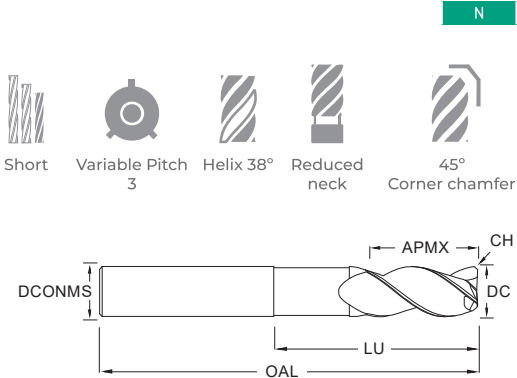
		(2) Grade code		H3	Dimensions Dimensões Dimensiones (mm)				
(1) Order code		Reference Referência Referencia	NOF	PHT910					
HA (Cylindrical)	HB (Weldon)				DC	APMX	DCONMS	LU	OAL
1182456	-	HB50HPAS 2 020 02	2	○	2	2	6	10	57
1182457	-	HB50HPAS 2 030 03	2	○	3	3	6	12	57
1182339	-	HB50HPAS 2 040 04	2	⊗	4	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



		⁽²⁾ Grade code		12	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PH0920							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	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

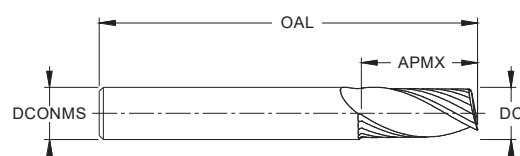
⊗ Stock item | Produto de stock | Itens de stock ○ Available under request | Disponível sobre consulta | Disponible bajo consulta End mill order code = (1) Geometry Code + (2) Grade Code

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

HF30AS Single flute



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



(1) Geometry code	(2) Grade code		12 PH0920	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência 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	22	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	f _z (mm/t)			V _c (m/min)		
		a _e = 25%	a _e = 40%	a _e = 100%	a _e = 25%	a _e = 40%	a _e = 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

Note¹: Recommended feed values for maximum a_p. For reduced a_p, consider increasing f_z up to 25%.

Note²: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

HF30HL Flat top



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



Long



4



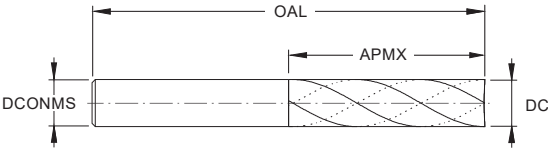
Helix 30°



Square



< 70 HRC



(1) Geometry code	(2) Grade code		X4 PHH603	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência 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

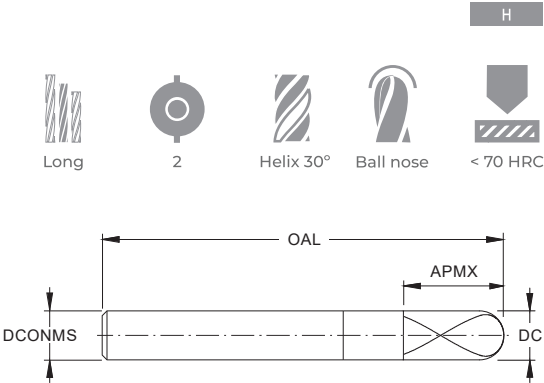
Stock item | Produto de stock | Itens de stock Available under request | Disponível sobre consulta | Disponible bajo consulta

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

HB30HL Ball nose



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



	(2) Grade code		X4	Dimensions Dimensões Dimensiones (mm)			
(1) Geometry code	Reference Referência Referencia	NOF	PHH603				
				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 endmills designed for specific applications. The high quality is a direct outcome of specialized endmill 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 340

- > High feed milling
Fresagem de alto avanço | Fresado de alta avance
- > Special radius roughing endmills
Fresas especiais de raio para desbaste | Fresas especiales de radio para desbaste

NEW



DYN INTEG > page 342

- > 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 344

- > 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 346

- > 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 348

- > Micro milling
Microfresagem | Microfresado
- > Ball nose end mills
Fresas de topo redondo | Fresas de topo redondeado



CHAMF INTEG > page 351

- > 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 TS - Trochoidal milling HP - High Performance

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

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

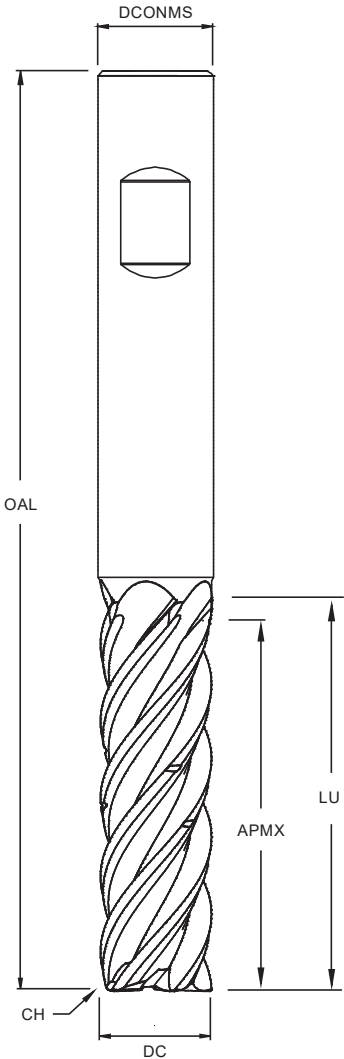
9 - Max cutting depth (APMX)
Example for APMX ≥ 1 mm: 04 = 4 mm ; 06 = 6 mm Example for APMX < 1 mm: 002 = 0,2 mm ; 005 = 0,5 mm

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 - α/2 = 18° , 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

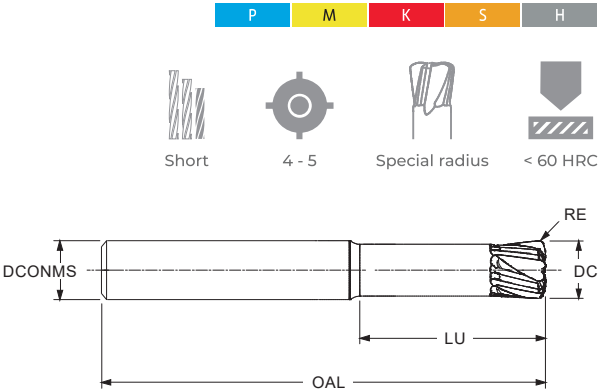
Guia de seleção para fresas de metal duro integral | Guía para fresas en carburo monobloque

	DC	NOF	HELIX ANGLE	GEOMETRY	FINISHING	ROUGHING	MATERIAL	DESCRIPTION	PAGE
 HIFEED INTEG HXR30HFGS NEW	3-12	4-5	-	 Special radius	   	   	PMKSH	Special radius Roughing End mills	A-340
 DYN INTEG HR38TSM NEW	6-20	5	38°	 Corner radius	   	   	MS	Trochoidal Milling	A-342
 DYN INTEG HC40TSP	6-20	5	40° 41° 42°	 Corner chamfer	   	   	PK		A-343
 RAD INTEG HXC30GL	8-16	4	30°	 Radial segment	   	   	PMKS	Radial Segment End mills	A-344
 RAD INTEG HXT30GL	6-16	4	30°	 Radial segment	   	   	PMKS		A-344
 FIN INTEG HC45FL	3-20	6	43° 45°	 Corner chamfer	   	   	PMKH	Finishing End mills	A-346
 MIN INTEG HB30MINS	0,4-3,0	2	30°	 Ball nose	   	   	PMKSH	Micro Machining End mills	A-348
 CHAMF INTEG HCHGS	3-20	4	0°	 Conical Top	   	   	PMK	Chamferings End mills	A-351

NEW HXR30HFGS Special radius roughing



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



(1) Geometry code	(2) Grade code		2A PHU910	Dimensions Dimensões Dimensiones (mm)							
	Reference Referência 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

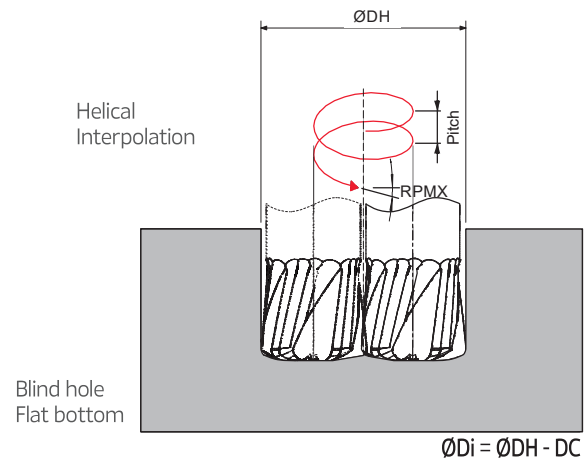
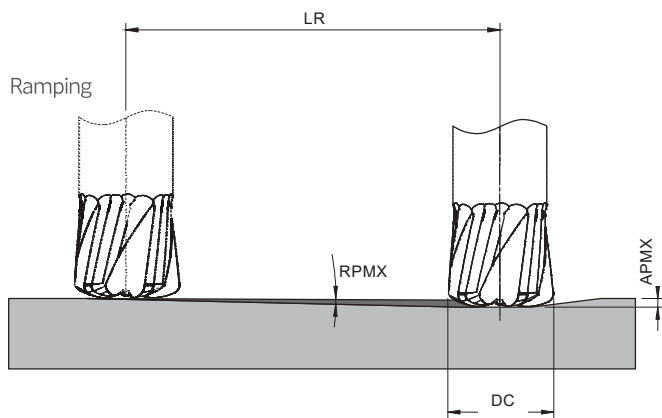
RECOMMENDED CUTTING CONDITIONS Condições de corte recomendadas | Condiciones de corte recomendables

ISO	Workpiece Material	fz (mm/t)			vc (m/min)			Plunging	
		ae = 25%	ae = 50%	ae = 100%	ae = 25%	ae = 50%	ae = 100%	fz (mm/t)	vc (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

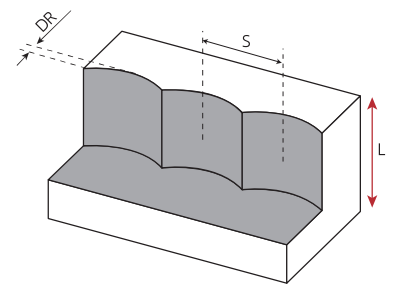


DC	Ramping			Helical Interpolation			Max Angle (°)
	RPMX	APMX	Min LR	ØDHmin	ØDHmax	Max Pitch/Rev.	
3	1,5	0,2	7,6	4,0	-	0,07	1,5
				-	6,0	0,20	1,5
4	1,5	0,3	11,5	5,3	-	0,10	1,5
				-	8,0	0,30	1,3
5	1,5	0,3	11,5	6,7	-	0,10	1,5
				-	10,0	0,30	1,0
6	1,5	0,4	15,3	8,0	-	0,15	1,5
				-	12,0	0,40	1,2
8	1,5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

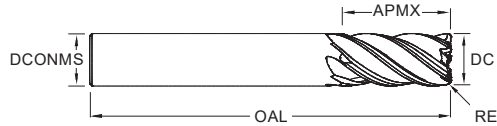
Note: During helical interpolation do not exceed APMX.

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



		⁽²⁾ Grade code		4F	Dimensions Dimensões Dimensiones (mm)				
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHF910					
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	APMX	RE	OAL
HR38TSM5									
1182486	1182501	HR38TSM5 5 060 12 R100	5	○	6	6	12	1,00	57
1182477	1182502	HR38TSM5 5 060 12 R050	5	⊗	6	6	12	0,50	57
1182478	1182503	HR38TSM5 5 080 16 R100	5	○	8	8	16	1,00	63
1182479	1182504	HR38TSM5 5 080 16 R050	5	⊗	8	8	16	0,50	63
1182480	1182505	HR38TSM5 5 100 20 R100	5	⊗	10	10	20	1,00	72
1182481	1182506	HR38TSM5 5 100 20 R050	5	○	10	10	20	0,50	72
1182332	1182507	HR38TSM5 5 120 24 R100	5	⊗	12	12	24	1,00	83
1182482	1182508	HR38TSM5 5 120 24 R050	5	○	12	12	24	0,50	83
1182331	1182509	HR38TSM5 5 160 32 R100	5	⊗	16	16	32	1,00	92
1182483	1182510	HR38TSM5 5 160 32 R200	5	○	16	16	32	2,00	92
1182484	1182511	HR38TSM5 5 180 36 R100	5	○	18	18	36	1,00	92
1182485	1182512	HR38TSM5 5 180 36 R200	5	○	18	18	36	2,00	92
1182486	1182513	HR38TSM5 5 200 40 R100	5	○	20	20	40	1,00	104
1182486	1182514	HR38TSM5 5 200 40 R200	5	○	20	20	40	2,00	104
HR38TSM1									
1182488	1182515	HR38TSM1 5 060 18 R100	5	○	6	6	18	1,00	57
1182489	1182516	HR38TSM1 5 060 18 R050	5	⊗	6	6	18	0,50	57
1182490	1182517	HR38TSM1 5 080 24 R100	5	○	8	8	24	1,00	63
1182491	1182518	HR38TSM1 5 080 24 R050	5	⊗	8	8	24	0,50	63
1182492	1182519	HR38TSM1 5 100 30 R100	5	⊗	10	10	30	1,00	72
1182493	1182520	HR38TSM1 5 100 30 R050	5	○	10	10	30	0,50	72
1182494	1182521	HR38TSM1 5 120 36 R100	5	⊗	12	12	36	1,00	83
1182495	1182522	HR38TSM1 5 120 36 R050	5	○	12	12	36	0,50	83
1182390	1182523	HR38TSM1 5 160 48 R100	5	⊗	16	16	48	1,00	100
1182496	1182524	HR38TSM1 5 160 48 R200	5	○	16	16	48	2,00	100
1182497	1182525	HR38TSM1 5 180 54 R100	5	○	18	18	54	1,00	104
1182498	1182526	HR38TSM1 5 180 54 R200	5	○	18	18	54	2,00	104
1182499	1182527	HR38TSM1 5 200 60 R100	5	○	20	20	60	1,00	110
1182500	1182528	HR38TSM1 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: “HR38TSM5 080 16 R100-W”

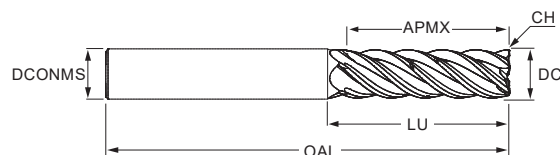
End mill order code = (1) Geometry Code + (2) Grade Code

3xD
5xDLong
Extra longVariable Pitch
5Variable Helix
40° | 41° | 42°Reduced
Neck

Chip-divider

45°
Corner chamfer

< 50 HRC



		⁽²⁾ Grade code		T1	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência Referencia	NOF	PHP920							
HA (Cylindrical)	HB (Weldon)				DC	DCONMS	AMPX	CHW	KCH	LU	OAL
HC40TSP											
1180118	1180456	HC40TSP 5 060 20	5	⊗	6	6	20	0,15	45°	26	63
1180119	1180457	HC40TSP 5 080 25	5	⊗	8	8	25	0,15	45°	32	70
1180225	1180458	HC40TSP 5 100 32	5	⊗	10	10	32	0,20	45°	38	79
1180690	1180689	HC40TSP 5 120 41	5	⊗	12	12	41	0,20	45°	48	100
1180226	1180460	HC40TSP 5 160 50	5	⊗	16	16	50	0,25	45°	60	110
1180123	1180461	HC40TSP 5 180 60	5	⊗	18	18	60	0,30	45°	66	130
1180462	1180463	HC40TSP 5 200 64	5	⊗	20	20	64	0,35	45°	70	130
HC40TSPXL											
-	1180514	HC40TSPXL 5 060 30	5	⊗	6	6	30	0,15	45°	36	75
1180508	1180515	HC40TSPXL 5 080 40	5	⊗	8	8	40	0,15	45°	46	81
-	1180516	HC40TSPXL 5 100 50	5	⊗	10	10	50	0,20	45°	59	100
-	1180517	HC40TSPXL 5 120 60	5	⊗	12	12	60	0,20	45°	67	120
-	1180520	HC40TSPXL 5 200 100	5	⊗	20	20	100	0,35	45°	104	162

⊗ 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

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

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

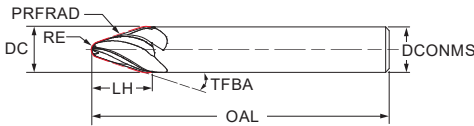
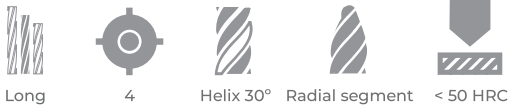
Note¹: Feed valid for when the end mill works with its whole ap, for when the end mill is working with lower depths of cut consider increasing the feed up to 25%.Note²: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

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.

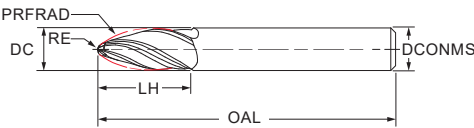
(1) Geometry code	(2) Grade code		T1		Y3						
	Reference Referência Referencia	NOF	PHP920	PHH920	Dimensions Dimensões Dimensiones (mm)						
					DC	DCONMS	TFBA	PRFRAD	RE	LH	OAL
1180046	HXC30GL 4 080 10 18RM030	4	⊗	⊗	8	8	18	300	1	10	75
1180047	HXC30GL 4 120 14 18RM045	4	⊗	⊗	12	12	18	450	2	14	83
1180048	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.

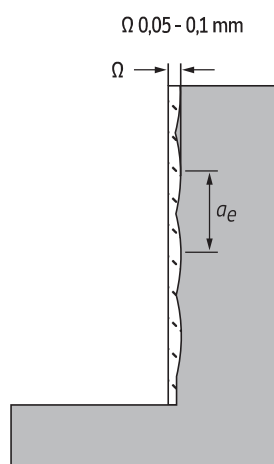
	(2) Grade code		T1	Y3	Dimensions Dimensões Dimensiones (mm)					
(1) Geometry code	Reference Referência Referencia	NOF	PHP920	PHH920						
					DC	DCONMS	PRFRAD	RE	LH	OAL
1180045	HXT30GL 3 060 22 RM095	4	⊗	⊗	6	6	95	1	22	63
1180037	HXT30GL 4 080 24 RM095	4	⊗	⊗	8	8	95	1	24	70
1180038	HXT30GL 4 100 28 RM085	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

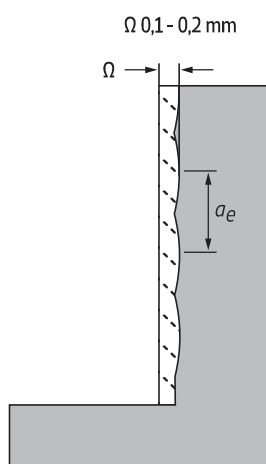
ISO	Material	Grades	
		PHP920	PHH920
P	Unalloyed Steel	✓	
	Low-Alloyed Steel	✓	
	High-Alloyed Steel	✓	
M	Stainless Steel (Ferritic / Martensitic)		✓
	Stainless Steel (Austenitic)		✓
	Stainless Steel (Austenitic/Ferritic/Duplex)		✓
K	Malleable Cast Iron	✓	
	Grey Cast Iron	✓	
	Nodular Cast Iron	✓	
S	Heat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

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

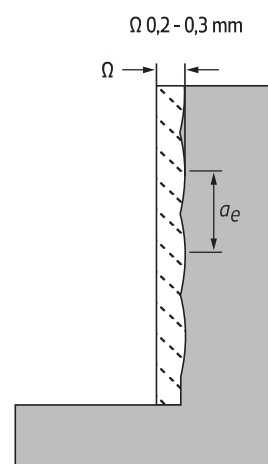
Ω - Allowance
a_e - Stepover



Fine Finishing



Finishing



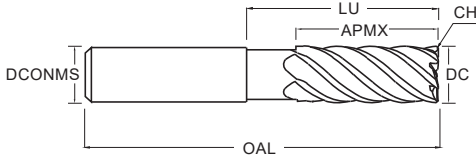
Semi-Finishing

ISO	Workpiece Material	V _c (m/min)	f _z (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

HC45FL Corner chamfer



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



	(2) Grade code		T1	X7	Dimensions Dimensões Dimensiones (mm)						
(1) Geometry code	Reference Referência Referencia	NOF	PHP920	PHP603							
					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

Note¹: 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%.

Note²: Cutting speeds selected for an economic use of the tool, for higher productivity consider increasing up to 70%.

HB30MINS Short neck



P M K S H



Short



2



Helix 30°



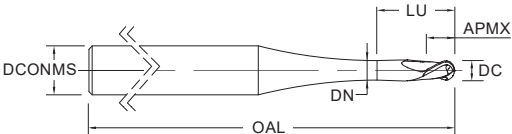
Reduced Neck



Ball nose



< 70 HRC



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

(1) Geometry code	(2) Grade code		X4 PHH603	Dimensions Dimensões Dimensiones (mm)					
	Reference Referência 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



P M K S H



Short



2



30°



Reduced Neck

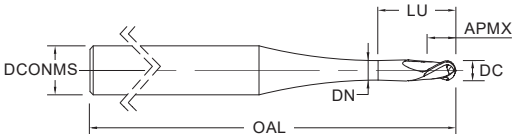


Ball nose



< 70 HRC

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



(1) Geometry code	(2) Grade code		X4 PHH603	Dimensions Dimensões Dimensiones (mm)					
	Reference Referência 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

HB30MINS Long neck



P M K S H



Short



2



30°



Reduced Neck

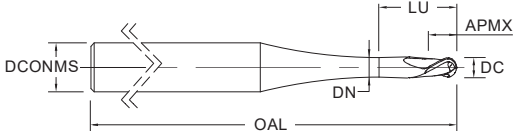


Ball nose



< 70 HRC

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



(1) Geometry code	(2) Grade code		X4 PHH603	Dimensions Dimensões Dimensiones (mm)					
	Reference Referência 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)			
		α < 15°	α > 15°	AP = 0,05 DC α < 15°	AP = 0,25 DC α < 15°	AP = 0,05 DC α > 15°	AP = 0,25 DC α > 15°
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.



P M K



Short



4



Helix 0°



Conical Top



< 45 HRC



		⁽²⁾ Grade code		Z9	Dimensions Dimensões Dimensiones (mm)			
⁽¹⁾ Order code		Reference Referência 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

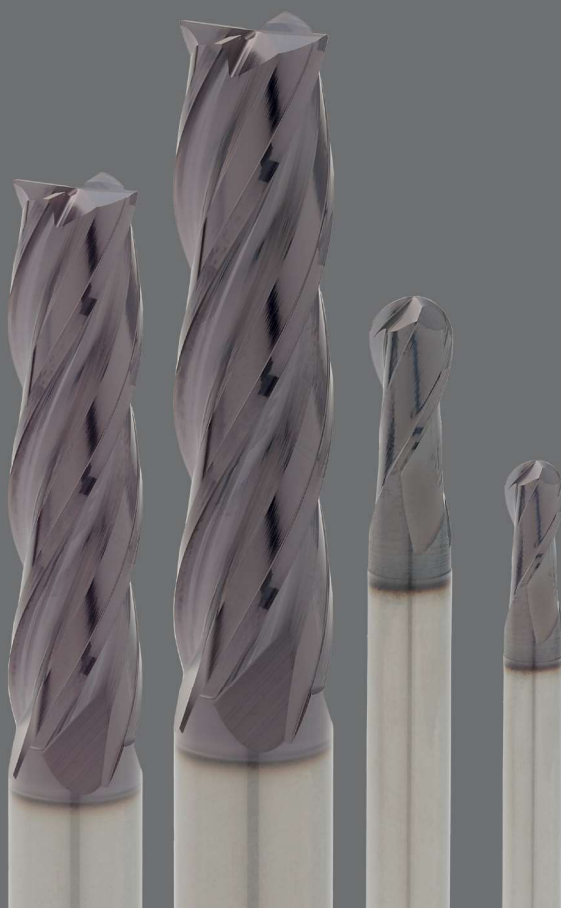
End mill order code = (1) Geometry Code + (2) Grade Code

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 INTEG



Solid carbide endmills 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 356

- > 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 359

- > 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 360

- > 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 362

- > 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:

H	F	30	-	G	S	2	080	19	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
G - General application
F - Finishing
P - Steel
S - Stainless steel
H - Hard materials
MIN - Micro milling

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

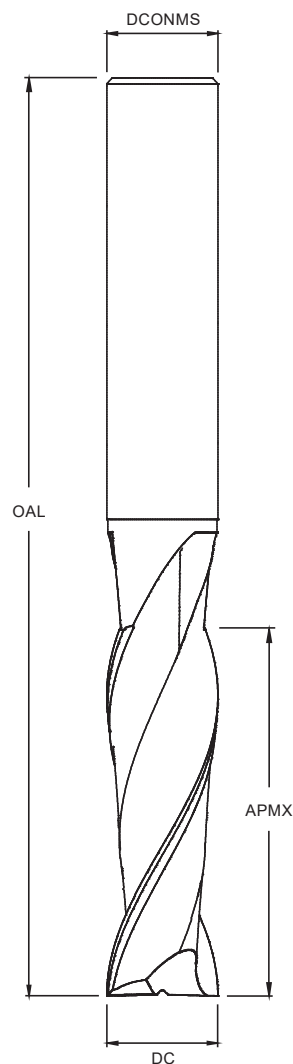
11 - Angle (Only for chamfering end mills)

Example: $90 = 90^\circ$

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
 INTEG HF30GS 2	2-20	2	30°	 Square			PMK	Flat Top End mills	A-356
 INTEG HF30GS 4	2-20	4	30°	 Square			PMK		A-357
 INTEG HF30GXL 4	2-12	4	30°	 Square			PMK		A-358
 INTEG HR30GS 4	3-20	4	30°	 Corner radius			PMK	Round Corner End mills	A-359
 INTEG HB30GS 2	2-12	2	30°	 Ball nose			PMK	Ball Nose End mills	A-360
 INTEG HB30GL 2	4-12	2	30°	 Ball nose			PMK		A-360
 INTEG HB30GS 4	2-12	4	30°	 Ball nose			PMK		A-361
 INTEG HB30GL 4	2-20	4	30°	 Ball nose			PMK		A-361
 INTEG HRO45GS	3-20	4 6	45°	 Corner chamfer			PMK	Rougher End mills	A-362

HF30GS 2 Flat top



P

M

K



Short



2



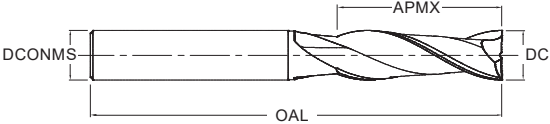
Helix 30°



Square



< 45 HRC



		⁽²⁾ Grade code		T1	Dimensions Dimensões Dimensiones (mm)			
⁽¹⁾ Order code		Reference Referência 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



Short



4



Helix 30°



Square



< 45 HRC



		⁽²⁾ Grade code		T1	Dimensions Dimensões Dimensiones (mm)			
⁽¹⁾ Order code		Reference Referência 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

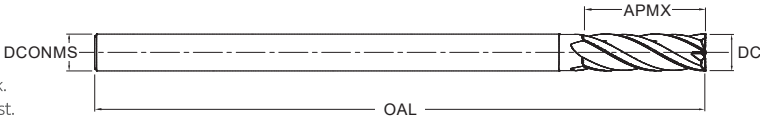
HF30GXL 4 Flat top



P M K



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



(1) Geometry code	(2) Grade code		T1		G4			
	Reference Referência 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



Short



4



Helix 30°

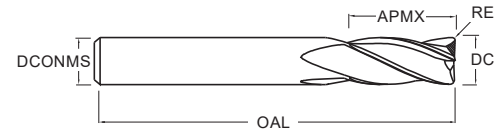


Corner radius



< 45 HRC

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



(1) Geometry code	(2) Grade code		T1	Dimensions Dimensões Dimensiones (mm)				
	Reference Referência 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

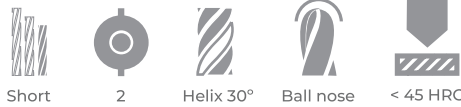
⊗ Stock item | Produto de stock | Itens de stock ○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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

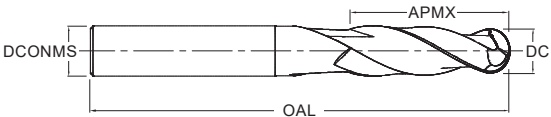
HB30GS 2 Ball nose



P M K



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



(1) Geometry code	(2) Grade code		T1	G4	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência 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 | Disponible bajo consulta End mill order code = (1) Geometry Code + (2) Grade Code

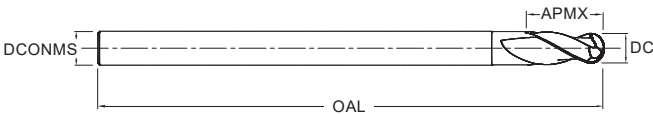
HB30GL 2 Ball nose



P M K



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



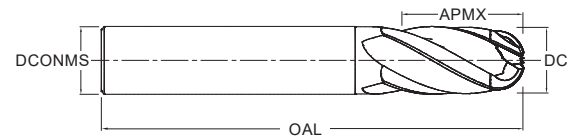
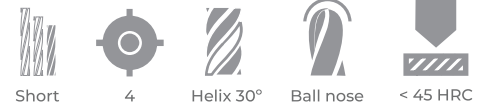
(1) Geometry code	(2) Grade code		T1	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência Referencia	NOF	PHP920				
				DC	DCONMS	APMX	OAL
1180688	HB30GL 2 040 08	2	⊕	4	6	8	75
1180128	HB30GL 2 060 12	2	⊕	6	6	12	75
1180029	HB30GL 2 080 14	2	⊕	8	8	14	100
1180030	HB30GL 2 100 18	2	⊕	10	10	18	100
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 | Disponible bajo consulta End mill order code = (1) Geometry Code + (2) Grade Code

HB30GS 4 Ball nose



P M K



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

(1) Geometry code	(2) Grade code		T1 PHP920	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência 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) Geometry code	(2) Grade code		T1 PHP920	Dimensions Dimensões Dimensiones (mm)			
	Reference Referência 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

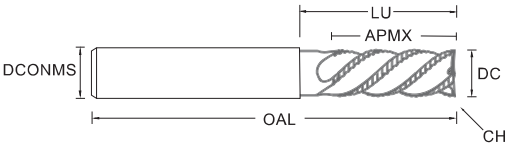
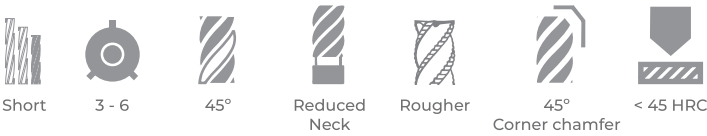
○ Available under request | Disponível sobre consulta | Disponible bajo consulta

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

HRO45GS Rougher



P M K



		⁽²⁾ Grade code		Z9	Dimensions Dimensões Dimensiones (mm)						
⁽¹⁾ Order code		Reference Referência 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

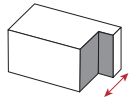
⊗ Stock item | Produto de stock | Itens de stock ○ Available under request | Disponível sobre consulta | Disponible bajo consulta End mill order code = (1) Geometry Code + (2) Grade Code

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

ISO	Material	f _z (mm/t)			V _c (m/min)		
		a _e = 25%	a _e = 40%	a _e = 100%	a _e = 25%	a _e = 40%	a _e = 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

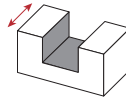
CUTTING PARAMETERS Parâmetros de corte | Parámetros de corte

Side milling



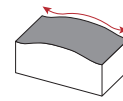
Finishing: $a_e < 0,15 \times Dc$
 Semi-finishing: $0,15 \times Dc < a_e < 0,3 \times Dc$
 Roughing: $a_e > 0,3 \times Dc$

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: $a_e > 0,40 \times Dc$
 $a_p > 0,10 \times Dc$

α : 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			
		$a_e = 12,5\%$	$a_e = 25\%$	$a_e = 40\%$	$a_e = 100\%$	$AP = 0,05 DC$ $\alpha < 15^\circ$	$AP = 0,25 DC$ $\alpha < 15^\circ$	$AP = 0,05 DC$ $\alpha > 15^\circ$	$AP = 0,25 DC$ $\alpha > 15^\circ$
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: $n = \frac{Vc \times 1000}{\pi \times 2 \sqrt{a_p(Dc - a_p)}}$

COATINGS

PHP

- Unmatched 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.

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.

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