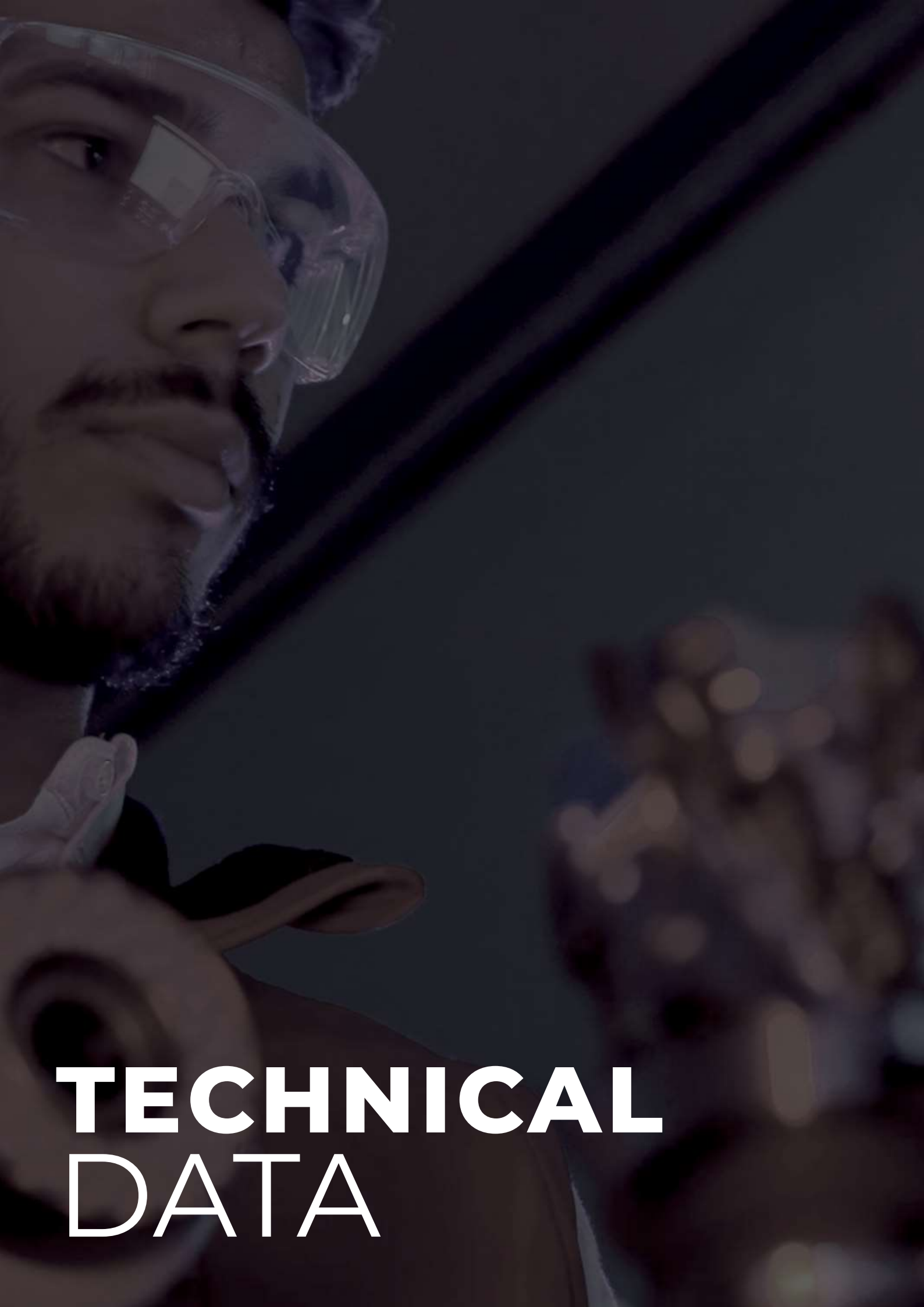




TECHNICAL DATA

1 MILLING GRADES

> See page A - 304

2 CUTTING DATA CALCULATION

> See page A - 308

3 POWER REQUIREMENT CALCULATION

> See page A - 309

	1	5	10	15	20	25	30	35	40	45	50		
P STEEL	NEW PHF603											PVD	
	PHH603												
		NEW PHF910											
		PHH910											
		PHP910											
		PH7910											
			PHP920										
			PH7920										
					PHP930								
					PH7930								
						PHP530							
							PHP808						
							PH7740						
							PHS740					CVD	
M STAINLESS STEEL					PHH930							PVD	
					PH7930								
						PHH530							
						PHP530							
							PHH808						
							PH7740						
K CAST IRON			PHP910									PVD	
			PH7910										
			PHP920										
			PH7920										
					PHP930								
					PH7930								
							PH7740						
			PH5705									CVD	
			PH5320										
							PH5740						

		1	5	10	15	20	25	30	35	40	45	50	
N ALUMINIUM & NFM		PH0910											UNCOATED
			PHD103										CVD
		PDP403											PCD
		PDP410											
S HEAT Resistant / TITANIUM ALLOYS							PHH930						PVD
							PH7930						
							PHH530						
							PHH808						
							PH7740						
H HARDENED MATERIALS			PHH603										PVD
				PH7603									
				PHH910									
		PBH920											PCBN

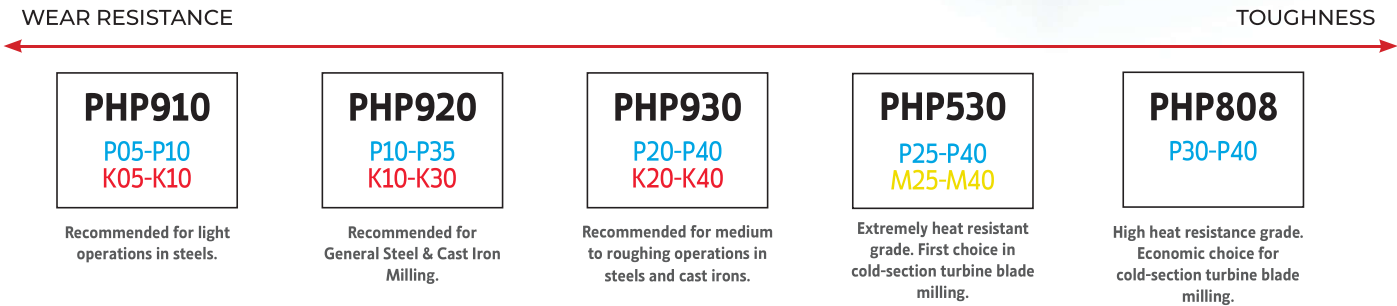
MILLING GRADES DESCRIPTION

PVD GRADES

PHP..

Product of the latest coating technology, the new PHP coating comes to revolutionize the milling of Steel and Cast Iron. PHP is a balanced PVD coating that combines high hardness and high cracking resistance.

It's composition and structure ensure an optimal adhesion which results in a very smooth surface preventing built-up edge, coating worn-out and keeps the insert in a lubricated-like condition.

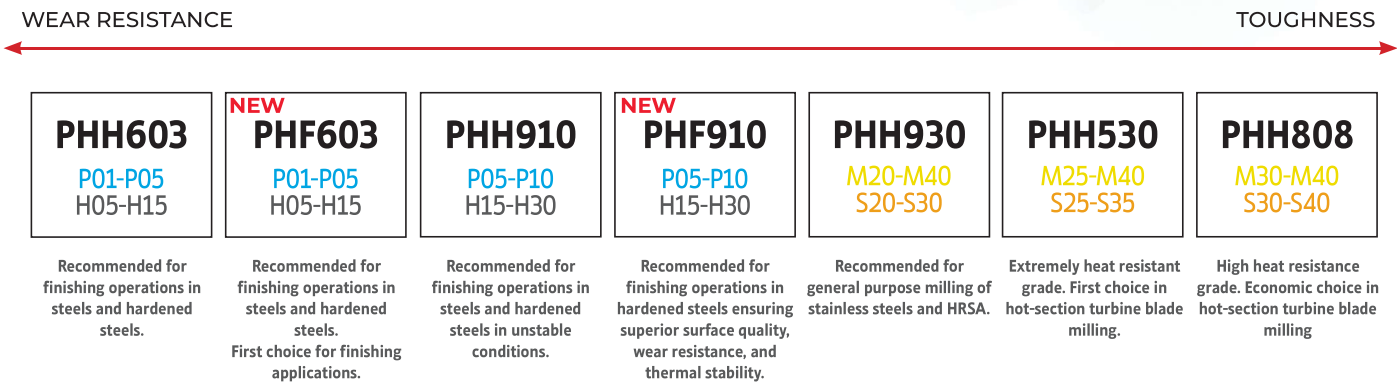


PHH...

Product of the latest coating technology, the new PHH coating comes to revolutionize the milling of stainless steel, HRSA as well and hardened steel.

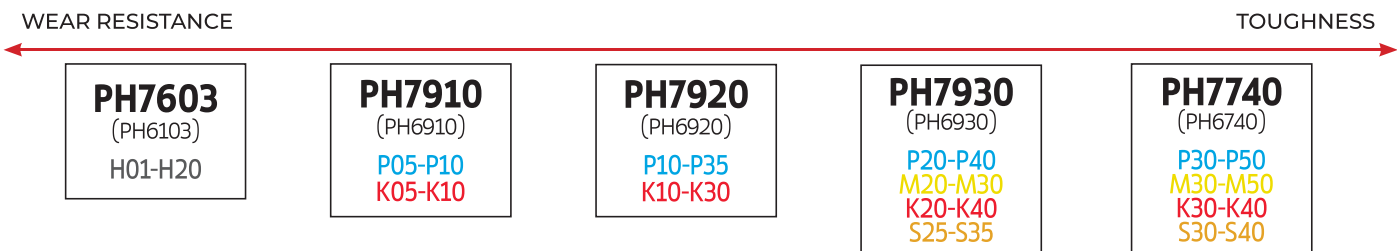
PHH is a stable PVD coating that merges both high hardness and an unmatched heat resistance.

It's structure contains refractory materials which allows it to work at the highest temperature and the hardest conditions.



PH7... | PH6...

A medium thickness PVD coating with good compatibility with steels, stainless steels, cast irons and HRSA.



Note: PH6... grades are very similar to PH7... The difference being that PH7 is mostly used in proprietary milling lines while PH6... is used on interchangeable inserts.

MILLING GRADES DESCRIPTION

Descrição de graus para fresagem | Descripción de calidades para fresagem

CVD GRADES

PHS740...

A tough substrate combined with a thin CVD coating with excellent thermal resistance and hardness at high temperature. 1st choice solution for removal of oxide layer from workpiece surface and for unstable conditions where a lot of heat is generated (ex: heavy duty applications).

PHS740
P30-P50



PH5...

A thick CVD coating with very smooth surface. Can be used wet or dry. Ideal for machining cast irons.

WEAR RESISTANCE

TOUGHNESS

PH5705
K05-K10

PH5320
K10-K30

PH5740
K20-K40

PHD103

A carbide substrate with high abrasion resistance coated with crystalline diamond CVD coating. Ideal for graphite machining.

PHD103
N05-N15

PH0910 - UNCOATED GRADE

Uncoated carbide micro-grain grade combining a good abrasive wear resistance and toughness. Suitable for rough to finish operations of aluminum alloys.

PH0910
N01-N05

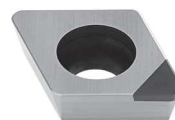


PCBN GRADE

PBH920

Carbide insert with Polycrystalline Cubic Boron Nitride tip for finishing operations on hardened steels.

PBH920
H01-N05



PCBN

PCD GRADE

PDP4...

Carbide insert with Polycrystalline Diamond tip for finishing operations on aluminums and non-ferrous metallic materials.

PDP403
N01-N10

PDP410
N01-N20

PCD

A CUTTING DATA CALCULATION

Cálculo de condições de corte | Cálculo de datos de corte

MILLING

Face milling

High feed milling

Shoulder milling

Profile milling

Specialty

Spare Parts

Technical Data

End Mills

> Formulas

Spindle Speed (rev/min)

$$n = \frac{v_c \cdot 1000}{\pi \cdot D_c}$$

Cutting Speed (m/min)

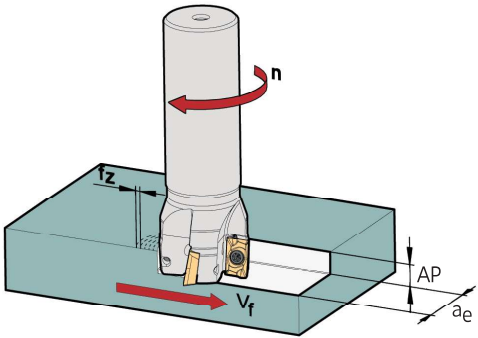
$$v_c = \frac{n \cdot \pi \cdot DC}{1000}$$

Feed Speed (mm/min)

$$v_f = n \cdot Z_n \cdot f_z$$

Feed per Tooth (mm/tooth)

$$f_z = \frac{v_f}{n \cdot Z_n}$$



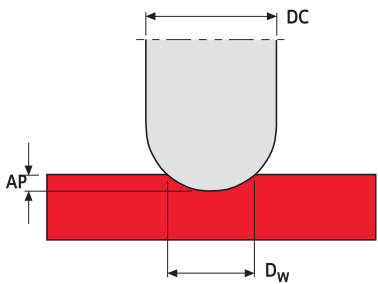
Feed per Revolution (mm/rev)

$$f = Z_n \cdot f_z$$

Metal removal Rate (cm³/min)

$$Q = \frac{a_e \cdot AP \cdot v_f}{1000}$$

> Cutting Speed and Spindle Speed for Copying



$$v_c = \frac{n \cdot \pi \cdot D_W}{1000} \quad (\text{m/min})$$

$$n = \frac{v_c \cdot 1000}{\pi \cdot D_W} \quad (\text{RPM})$$

$$D_W = 2 \cdot \sqrt{a_p(DC - AP)} \quad (\text{mm})$$

NOMENCLATURE

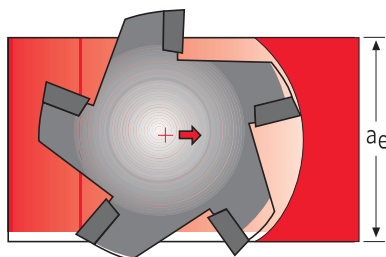
a_e	- Width of cut mm/radial depth of cut	(mm)
AP	- Depth of cut mm/axial depth of cut	(mm)
DC	- Cutter diameter	(mm)
D_W	- Effective diameter in cut	(mm)
f	- Feed per Revolution	(mm/rev)
f_z	- Feed per Tooth	(mm/tooth)
n	- Spindle Speed	(rev/min)
Q	- Material removal Rate	(cm ³ /min)
V_c	- Cutting Speed	(m/min)
V_f	- Feed Speed	(mm/min)
Z_n	- N° of teeth	

POWER REQUIREMENT CALCULATION

Cálculo de potência requerida | Cálculo del requerimiento de potencia

> Calculating the power demand

$$P_c = \frac{AP \times a_e \times v_f}{60\,000\,000 \times \eta} \times k_c$$



P_c - Power (kW)
 AP - Depth of cut (mm)
 a_e - Width of cut (mm)
 v_f - Feed speed (mm/min)
 η - Efficiency
 k_c - Cutting force per mm²

> Calculating average chip thickness (h_m) and cutting force per mm² (k_c)

$$h_m = \frac{360 \times f_z \times a_e}{\pi \times DC \times \omega_e} \times \sin k_r$$

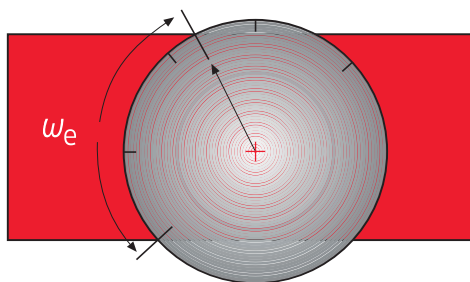
h_m - Average chip thickness (mm)
 f_z - Feed per tooth (mm/tooth)
 DC - Cutter diameter (mm)
 ω_e - Engagement angle
 k_r - Lead angle

$$k_c = \frac{1}{h_m^{m_c}} \times k_{c^*}$$

m_c^* - Exponent
 k_{c^*} - Cutting force for 1 mm chip thickness (N/mm²)

* Please see these values on page 1023.

> Engagement angle



Engagement a_e / DC	Engagement angle ω_e
70%	89°
100%	180°

Engagement a_e / DC	Engagement angle ω_e
5%	26°
10%	37°
75%	60°

LOOKING FOR MORE TROUBLESHOOTING OR COMPARATIVE GRADES CHART?



Check the qrcode for more information.