

NORTON

SAINT-GOBAIN

Transforming
surfaces
...and beyond

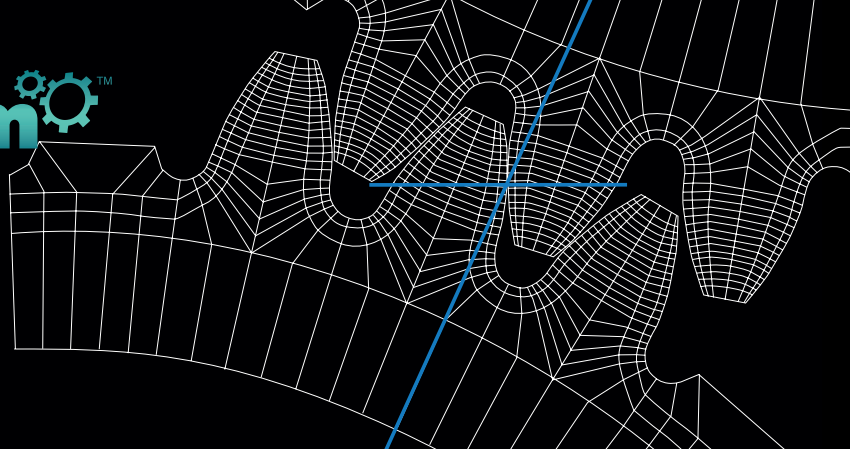
XtrimiumTM



TECHNICAL SOLUTIONS FOR
GEAR GRINDING



SAINT-GOBAIN



Increasingly stringent requirements for gears result in tighter tolerances, higher profile accuracy and improved surface finish. The choice of abrasive is key in the production of high quality gears. In order to select the right abrasive, it is important to understand the terminology and technical criteria.

GEAR CHARACTERISTICS

DEFINITIONS

Line of action: line along which the force between two meshing gear teeth is directed.

Pitch point: the point where the line of action crosses a line joining the two gear centres.

Pitch circle: the circle centred on the gear axis and passing through the pitch point.

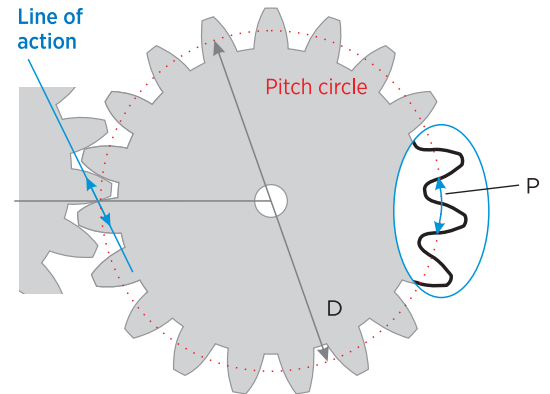
Circular pitch (P): the distance from one face of a tooth to the corresponding face of an adjacent tooth on the same gear, measured along the pitch circle.

Pitch diameter or reference diameter (D): diameter of a pitch circle.

Modulus or "size coefficient" (M): the module of a gear is equal to the pitch diameter divided by the number of teeth Z.

Pressure angle (α): the angle at a pitch point between the line of action which is normal to the tooth surface, and the plane tangent to the pitch surface.

Profile angle (V): the angle at a specified pitch point between a line tangent to a tooth surface and the line normal to the pitch surface (which is a radial line of a pitch circle).

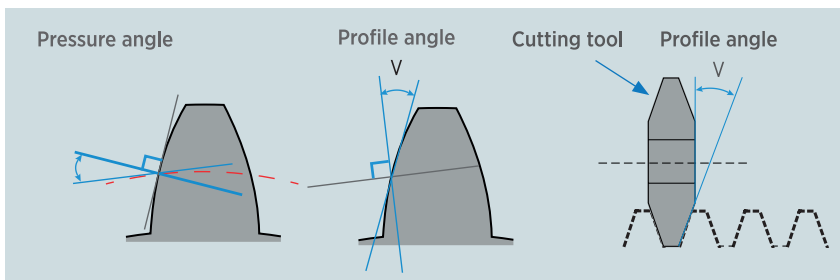


$\pi \cdot D = \text{Gear perimeter} = P \cdot Z$
Module "M" is defined as

$$M = \frac{P}{\pi} \Rightarrow M = \frac{D}{Z}$$

KEY:

- D = Pitch diameter
- P = Circular pitch
- M = Module
- Z = Number of teeth



Number of entries (E): the number of threads of a worm wheel.

As a general rule, E should:

- not be a multiple of the number of teeth (Z)
- be as high as possible (maximum 7)

Direction: rotational orientation (left or right) of the threads

UNDERSTANDING THE PARAMETERS

Use the information below as a guide to calculating the wheel parameters.

Part speed: PS (RPM) or (m/s)

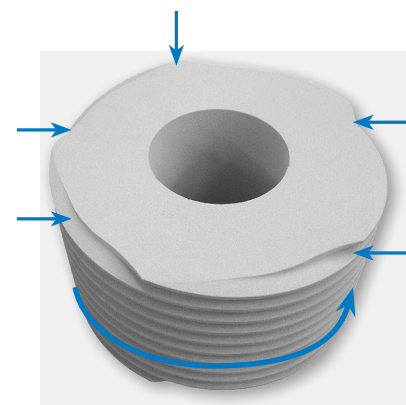
Wheel speed: WS (RPM) or (m/s)

Number of entries: E

Number of teeth: Z

$$(1) P_S = \frac{W_S \times E}{Z}$$

Choice of E (depends on Z, see example below)



Worm wheel with E=5
Direction: left
(seen from top)

Example calculation:

- gear with Z = 30
- max PS = 600 RPM
- max WS = 4000 RPM

Based on (1) $E = \frac{P_S \times Z}{W_S} \Leftrightarrow E = \frac{600 \times 30}{4000} = 4.5$

In this example, the general rule suggests 5 should be selected as the number of entries. However, 5 is a multiple of 30 so 4 should be chosen to optimize wheel speed.

The part speed is calculated by:

$$P_S = \frac{W_S \times E}{Z} \Leftrightarrow P_S = \frac{4000 \times 4}{30} = 533 \text{ RPM}$$

Norton offers high performance grinding wheels engineered to deliver a complete technical solution for worm and dual worm grinding, profile grinding and bevel grinding.

THE XTRIMIUM COLLECTION

WORM GRINDING

An engineered micro-structured ceramic grain provides excellent free cutting action and durability to maximize performance and quality.

- Perfect homogeneity throughout wheel thickness
- Increased form holding
- Friction free

TARGET	MODULE	SPECIFICATION
High productivity	All	Xtrimium - Fast
High quality	Small	Xtrimium - Quality
Universal	All	Xtrimium - Dynamic

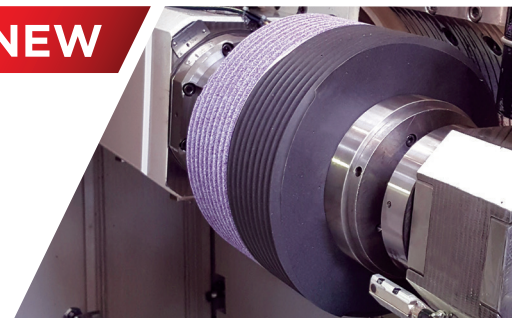


DUAL WORM GRINDING

The dual wheel combines a vitrified section to grind, and a fine grit section to polish the gear teeth.

- High surface quality providing Rz=1,0µm Rpk=0,05µm
- Wheels can be adapted to existing machines

NEW



PROFILE GRINDING

High porosity and permeability in this ceramic based wheel offering the fastest metal removal rate on the market.

- Unrivalled DIN quality
- Fast material removal

TARGET	PLATFORM	SPECIFICATION
High productivity	Altos	Xtrimium - Fast
High quality	Norton Quantum X	Xtrimium - Quality



BEVEL GRINDING

Altos is the 'must have' wheel, no other wheel for Bevel grinding compares.

- Burn free cutting
- Extremely fast grinding
- Reduces part rejection, overall lowering the cost per unit



The choice of abrasive is key in the production of high quality gears, and selecting the right wheel helps in getting the best productivity. However, the overall productivity and repeatability depends on a host of other factors such as machine condition, input parameters, coolant pressures, etc.

OPTIMIZE YOUR GRINDING SYSTEM

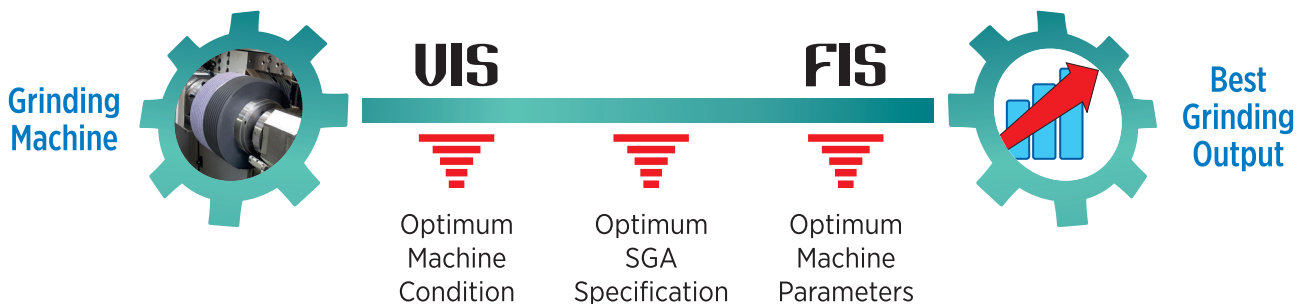
Are you struggling with -

- Chatter issues?
- Low wheel life?
- Bad visual output?
- Increased machine downtime?

If yes,

Machine Vibration Study : Norton Vibration Analysis Specialist can help you to diagnose the problem and recommend a solution.

FIS Study: Live diagnosis and understanding of grinding behavior. Looking at the Power vs Time curves, our Application Engineers can provide optimized grinding parameters to achieve best quality output.



Norton's skilled and experienced technical team can help you in -

- Analyzing your machine condition,
- Recommending an optimum wheel specification,
- Suggesting grinding parameters to suit the wheel specification, which would increase overall productivity and reduce CPC.

Please contact Norton Gear Grinding Specialist for more information and to find out how they can help you.

Call: 1800 3000 8199 (Toll Free)

Write to: nortonabrasives@saint-gobain.com



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