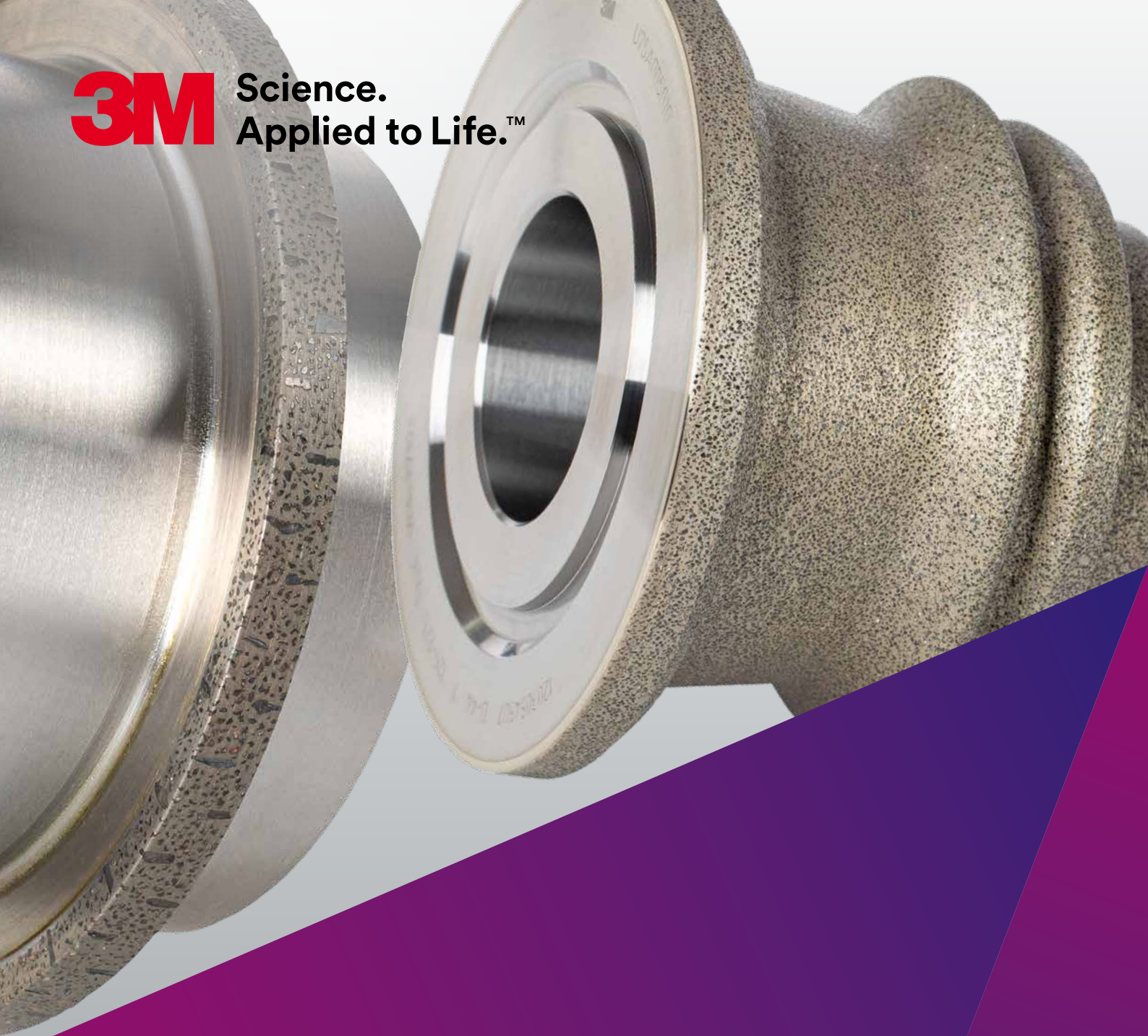




Science.  
Applied to Life.™



3M™ Precision Grinding & Finishing

# 3M™ Diamond Dressing Rollers



# 3M™ Diamond Dressing Rollers

Tailor-made for your specific requirements.

For many years, we have had dedicated dresser roller manufacturing plants and application engineers. We use their expert knowledge in the complete application process (grinding, dressing, machine operation) in combination with their knowledge of the dressing roller design and manufacturing process to enable us to produce a dressing roller tailored to meet your specific requirements in performance and efficiency.

We produce the best tools for your perfect results.

Highly accurate  
profile tolerances

Workpiece quality

Consistent dresser quality

High Productivity

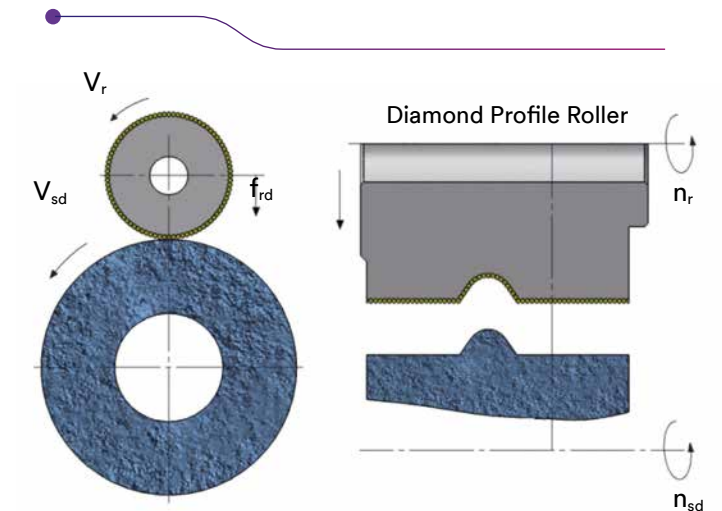
Reliable performance

Cost efficiency



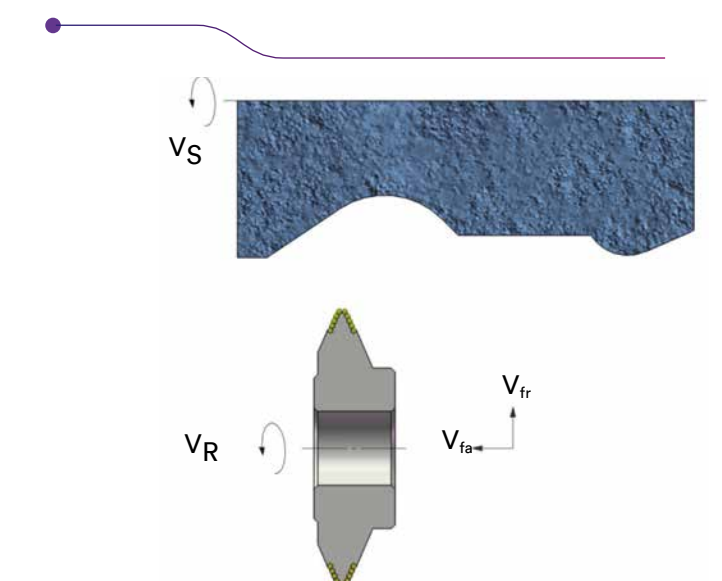
## 3M™ Diamond Profile Dressing Rollers

- Shortest possible dressing cycles
- Plunge-cut dressing method
- Extreme profile accuracy
- Highly complex profile contours



## 3M™ Diamond Form Dressing Rollers

- Greatest flexibility, rapid changes to profiles when required
- By CNC-guided dressing of the contours regardless if simple or highly complex profile contours

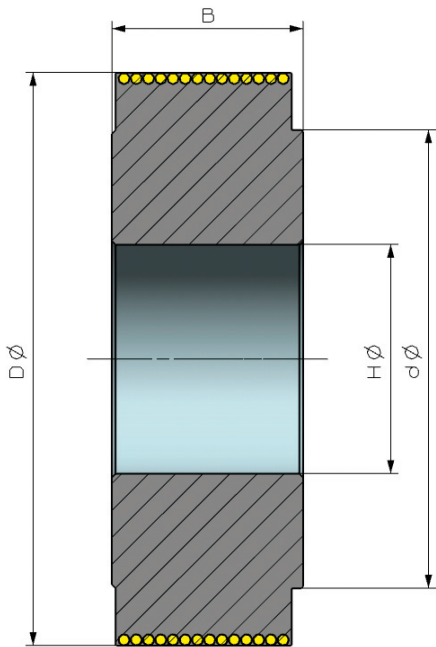


# 3M™ Diamond Profile Rollers

High precision solution for dressing of vitrified CBN and conventional wheels, where high workpiece quality is required.



3M™ Product Name	3M™ 6JGN Diamond Profile Roll	3M™ 6JGP Diamond Profile Roll	3M™ 6JMI Diamond Profile Roll
Manufacturing Method Type	Negative Electroplated	Positive Electroplated	Negative Infiltrated
Diamond Layer	Random (NZ) or Handset (NS) Diamond Orientation	Random Diamond Orientation	Random (IZ) or Handset (IS) Diamond Orientation
MFG Process Complexity	High	Medium	High
Bond Type	Electroplated Bond	Electroplated Bond	Tungsten Bond
Rework possibility	Limited reprofiling possible	Layer replating possible	Limited reprofiling possible
Application	Designed for the highest precision	Standard applications	Designed for the highest precision
Dimension and tolerance (mm)			
D (mm)	50-250	70-250	60-210
R (tolerance)	+/- 0.002	+/- 0.025	+/- 0.004
B (max)	320	320	80
H (min.)	10	10	10
Shape tolerance	0.002	0.01	0.004

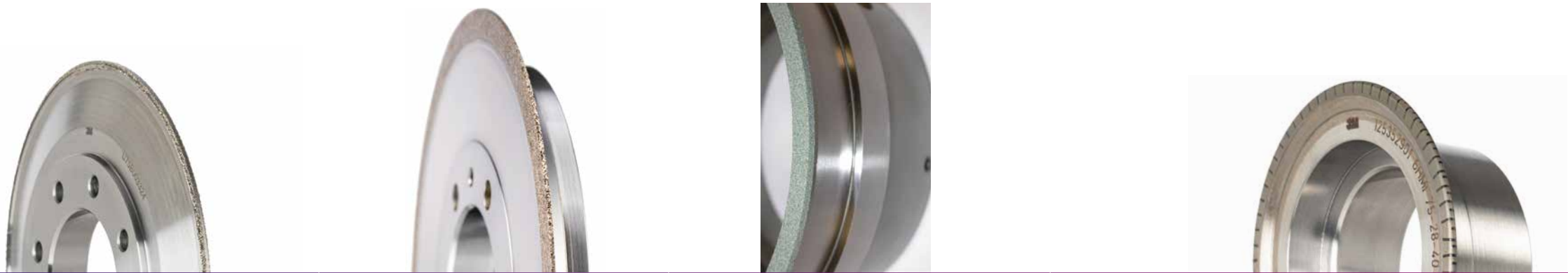


One Standard Shape

We would require a workpiece drawing in order to ensure that correct dimensions and tolerances are used during the design process.

# 3M™ Diamond Form Rollers

High precision dressing solution for dressing of vitrified CBN and conventional wheels, where profile flexibility is required.



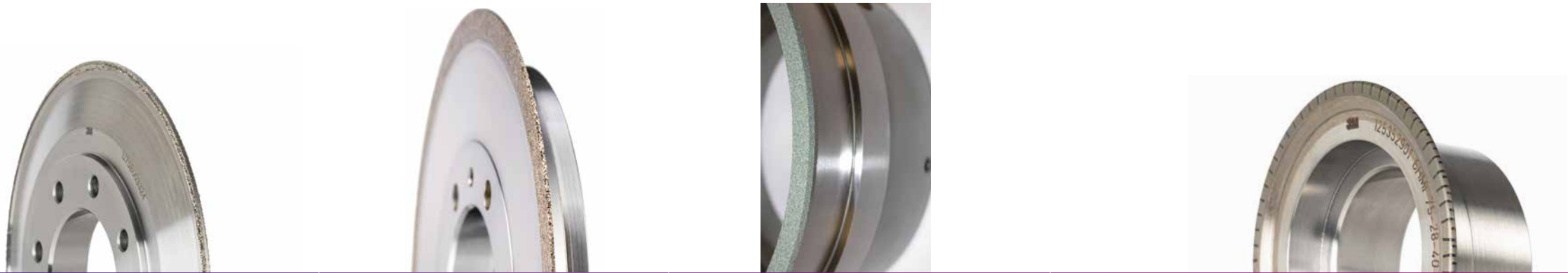
3M™ Product Name	3M™ 6HGP Diamond Form Roll	3M™ 6HMS Diamond Form Roll	3M™ 6HVK Diamond Form Roll	3M™ 6HMI Diamond Form Roll
Manufacturing Method Type	Positive Electroplated (PM)	Positive Metal Bonded (SM)	Positive Vitrified Bonded (VIT)	Negative Infiltrated
Diamond Layer	Random Diamond Orientation	Interspersed Diamond Orientation	Interspersed Diamond Orientation	Random (IZ) or Handset (IS) Diamond Orientation and CVD fitted
MFG Process Complexity	Medium	Medium	Medium	High
Bond Type	Electroplated Bond	Sintered Metal Bond	Vitrified Bond	Tungsten Bond
Rework possibility	Single use	Layer regrinding possible	Layer replating possible	Multiple regrinding possible
Application	Specifically for dressing Vit-CBN grinding pins	Specifically for dressing Vit-CBN grinding pins	Specifically for dressing Vit-CBN grinding pins	Designed for the highest precision

We would require a workpiece drawing in order to ensure that correct dimensions and tolerances are used during the design process.



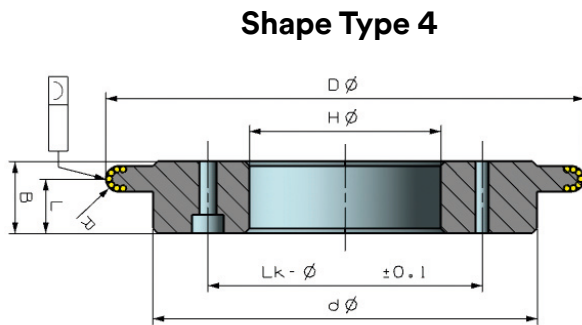
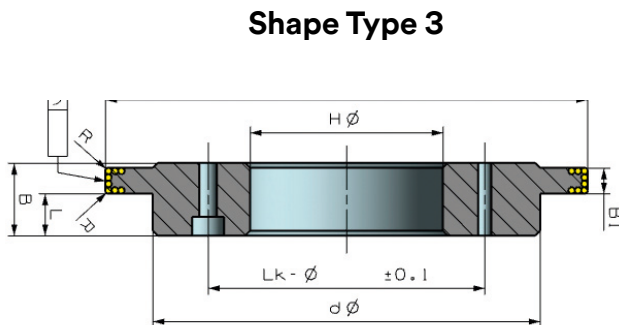
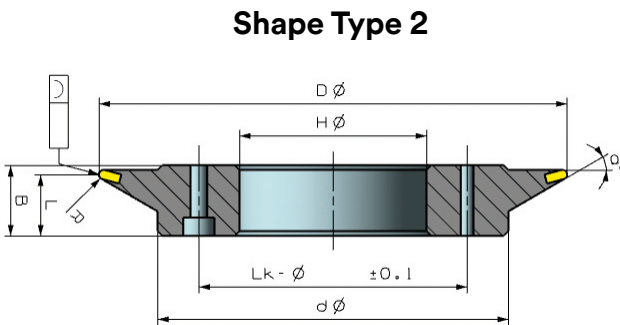
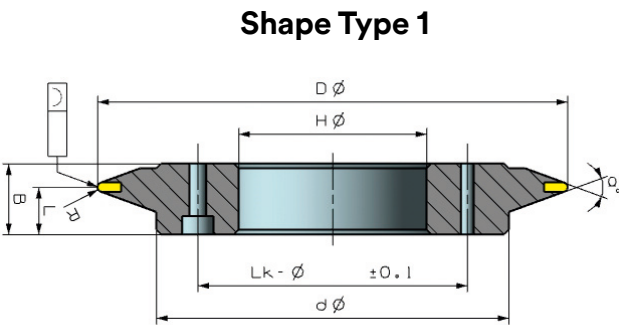
# 3M™ Diamond Form Rollers

High precision dressing solution for dressing of vitrified CBN and conventional wheels, where profile flexibility is required.



3M™ Product Name	3M™ 6HGP Diamond Form Roll		3M™ 6HMS Diamond Form Roll	3M™ 6HVK Diamond Form Roll	3M™ 6HMI Diamond Form Roll					
Manufacturing Method Type	PM		SM	VIT	IZ			IS		
Standard Shape	Type 3	Type 4	Type 3	Type 3	Type 1 or 2	Type 3	Type 4	Type 1 or 2	Type 3	Type 4
Dimension (mm)	50-250		50-250	50-180	50-250			50-250		
R (min)	0.3	1	0.1	0.1	0.3	0.2	1	0.05	0.2	0.5
R (tolerance)	+/- 0.025		+/- 0.025	+/- 0.025	+/- 0.004			+/- 0.002	+/- 0.002	+/- 0.004
B (min)	7		7	8	8			8		
α/° min.	-	-	-	-	30	-	-	18	-	-
H (min.)	6		6	6	10			10		
Shape tolerance	0.01		0.02	0.02	0.004			0.002		

We would require a workpiece drawing in order to ensure that correct dimensions and tolerances are used during the design process.





# Application Requirements and Methods

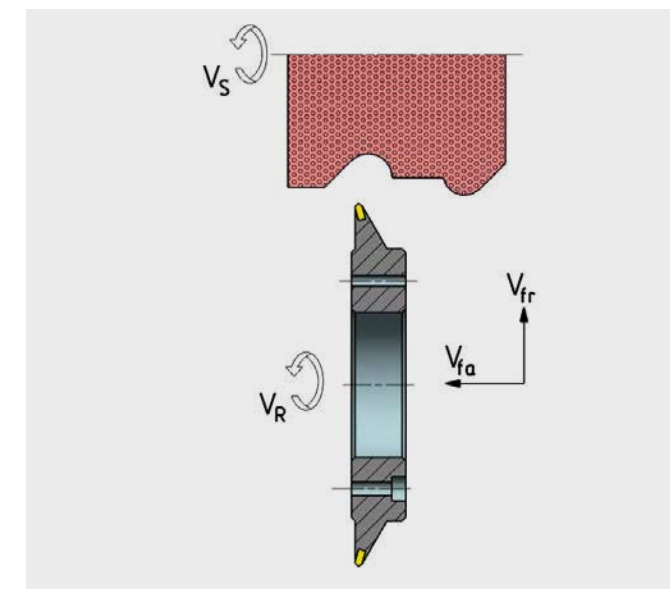
## Machine Requirements (for the use of form rollers)

- CNC-controlled axes
- Rotating dressing spindle

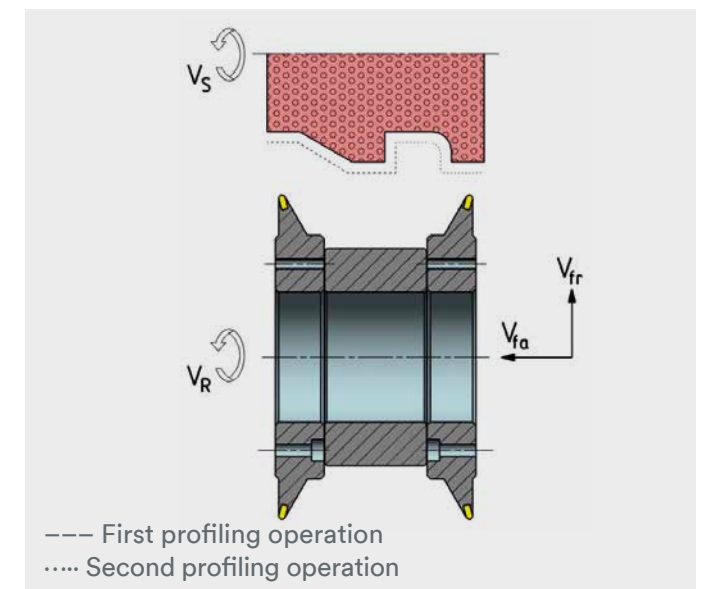


## Methods of Application

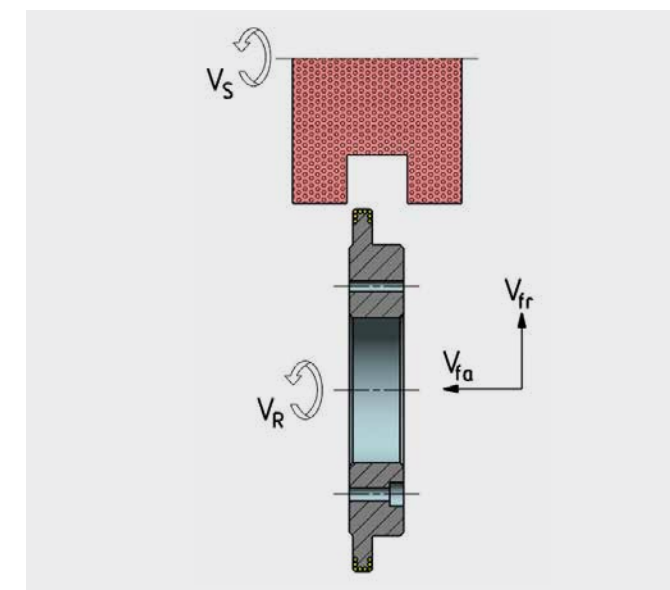
Different types of form dressing rollers are needed depending on desired grinding wheel profile.



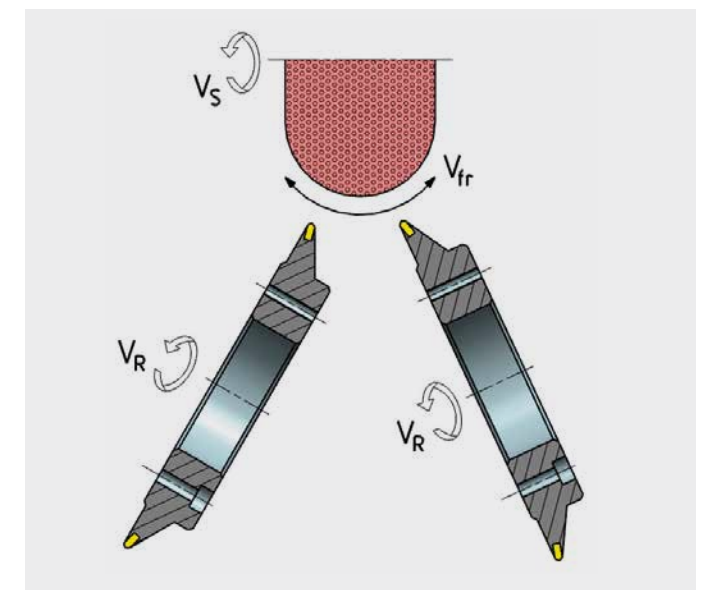
Method 1



Method 2



Method 3



Method 4



# Why do operating conditions matter?

We know how to do it.

When using diamond profile dressing rollers, you have the ability to influence key process parameters, such as operating conditions, configuration of axes, speed ratio, direction of rotation, infeed and the number of rollout revolutions. This offers numerous opportunities for process optimisation.

It is also possible to directly influence the surface topography of the grinding wheel and optimise the results by matching the individual factors.

## Speed ratio ( $q_d$ )

The greatest influence on the effective roughness is obtained by changing the speed ratio  $q_d$ , which is the quotient of the circumferential speed of the dressing roller  $V_R$  to the circumferential speed of the grinding wheel  $V_S$  (Figure 1: Down-cut (synchronous) and Up-cut dressing (asynchronous)) dressing at different feed increments. Speed ratios of 1 or almost 1 are not recommended as the diamond dressing roller is either dwelling on the grinding wheel and this could cause premature wear or damage.

## Direction of rotation

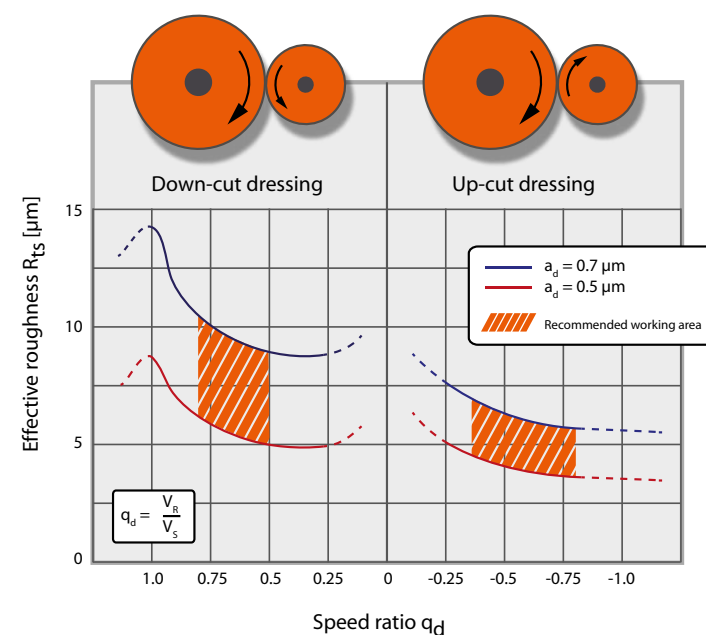
Down-cut (synchronous) and Up-cut (asynchronous) dressing refers to the relative direction of rotation of the diamond dressing roller with respect to the grinding wheel. They each have a different effect on roughness (Figure 1).

Down-cut dressing is associated with increased effective roughness, it is used for high performance applications, the dressing of rough grinding wheels and fine grinding of critical profiles that have a tendency to burn when grinding.

Changing the speed ratio has a greater influence on the effective roughness than with up-cut dressing.

Up-cut dressing is associated with a lower effective roughness and is used for fine grinding wheels when used to grind non-critical profiles that do not tend to burn during grinding.

**3M™ Diamond Profile and Form Dressing Rollers**  
Figure 1



## Overlap ratio ( $U_d$ )

The overlap ratio indicates how many revolutions the grinding wheel makes in the time it takes the dressing tool to advance 1x its effective width ( $a_{pd}$ )

Ud roughing 3-4  
Ud finishing 6-8  
Ud Standard 5

## Axial feed rate ( $v_{fad}$ )

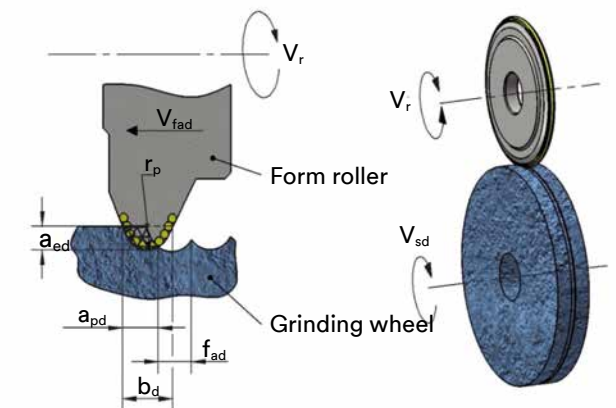
Refers to the velocity at which the dressing rollers move across the face of the grinding wheel. As the feed rate increases (in down-cut – synchronous dressing more than in up-cut asynchronous dressing), the effective roughness increases. Since the feed rate depends on the combination of the application and working conditions, we can only specify 100-300 mm/min as a standard value for rough grinding and 30-100 mm/min for finishing grinding.

## Dressing infeed ( $a_{ed}$ )

Our parameter for the infeed is the radial feed increment  $a_{ed}$  ( $\mu$ ) of the diamond dressing roller per revolution of the grinding wheel. As the infeed increases (for down-cut dressing more than for up-cut dressing), the effective roughness increases. The recommended feed increments are between 0.25-0.5  $\mu$  per revolution of the grinding wheel. The total infeed selected should always be as small as necessary to restore the grinding wheel profile (generally <0.03mm).

When dressing with diamond form dressing rollers, the feed increment depends mainly on the type of form dressing roller, the desired grinding wheel profile, the cutting conditions, and whether you are rough grinding or finishing grinding. Due to the numerous combinations of the application and working conditions, we can only specify 0.1-0.5 mm as a standard value for rough grinding and 0.005-0.05 mm for finishing grinding.

## Terms and Formulas



### Dressing overlap ratio

$$U_d = \frac{a_{pd}}{f_{ad}}$$

with  $b_d = \sqrt{8 \cdot r_p \cdot a_{ed}}$

### Dressing speed ratio

$$q_d = \pm \frac{V_r}{V_{sd}}$$

+ Down-cut  
- Up-cut

$$a_{pd} = \frac{1}{2} (b_d + f_{ad})$$

$a_{pd}$	Width of cut	in mm
$a_{ed}$	Dressing infeed	in $\mu$ m
$b_d$	Effective width of the dressing tool	in mm
$f_{ad}$	Dressing infeed per revolution	in mm/U
$v_{fad}$	Axial feed rate	in mm/min
$v_r$	Dressing roller circumferential speed	in m/s
$v_{sd}$	Grinding wheel circumferential speed	in m/s
$r_p$	Profile radius of the form roller	in mm





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