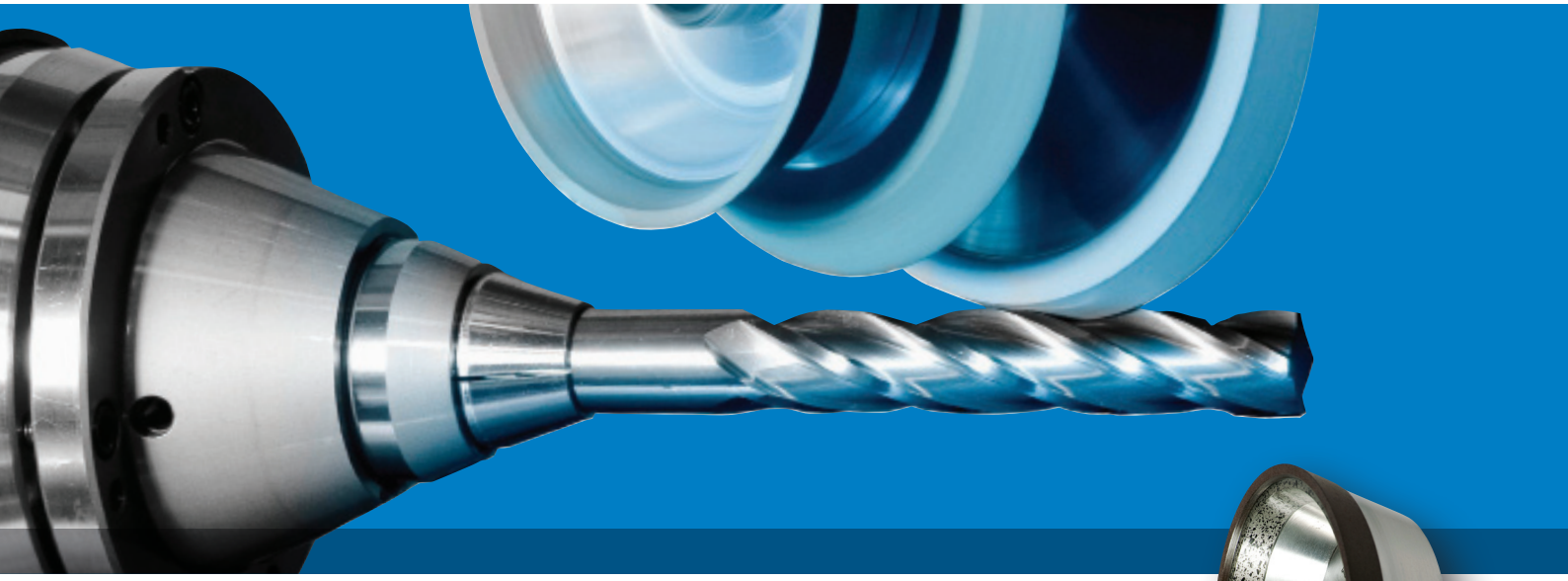
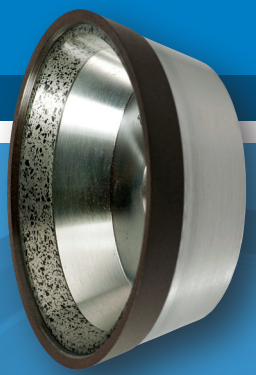
TOOLGAL
Grinding Wheel Division

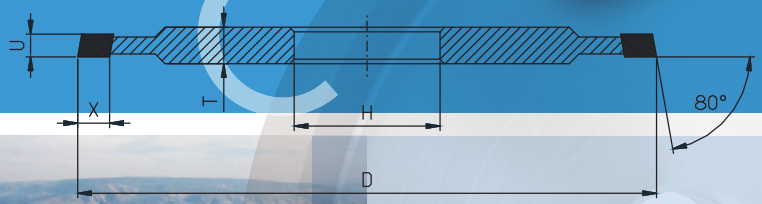




iQ

Line of products for CNC tool grinding machines

C N C



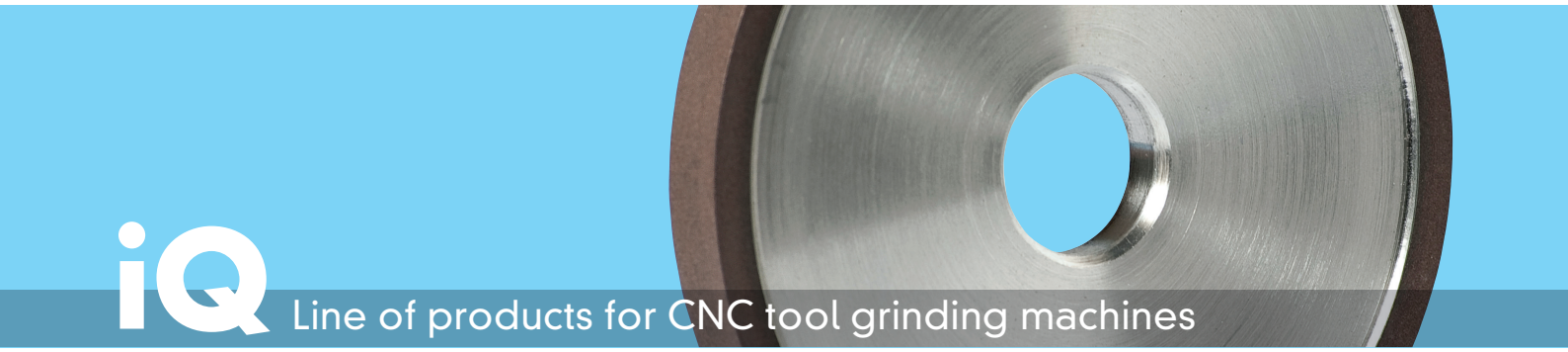
DEVOTION
to
EXCELLENCE

KIBBUTZ DEGANIA was founded in 1910 by a group of 12 young individuals who emigrated from Eastern Europe with the aim of renewing Jewish life and working in the land of Israel. Extremely difficult conditions such as harsh weather, swamps, malaria and antagonistic authorities led them to realize that only through shared efforts and mutual help could they reach their goals and overcome these difficult circumstances.

Degania was the first of about 280 "kibbutzim" established in Israel over the past 100 years, based on the socialist ideas of complete equality of all members and equal sharing of property and assets.

KIBBUTZ DEGANIA 'A', started as a simple farming community and is now a modern agricultural settlement using up-to-date technology in all branches: banana, date, orchard and olive plantations, dairy farm and poultry.

The fourth kibbutz-born generation today continues to progress and develop the community in their forefathers' traditions. On October 2010 Degania celebrates its Centennial Anniversary.



Toolgal's Devotion to Excellence

In 1968 Toolgal Industrial Diamonds Ltd. was founded in Degania. Throughout the years, Toolgal's R&D team has established Toolgal at the frontier of diamond tools market designing and producing state of the art diamond and CBN tools while ensuring repeatability of the highest performance. In its continuous strive to surpass its competition Toolgal remains Devoted to Excellence in every aspect of the trade.

CNC PROGRAM
The Intelligent Grinding Solution

We Ensure:

- High stock removal at high feed rate
- Keeping narrow tolerance of tools
- Excellent surface finish
- Optimized performance
- Fully utilizing grinding wheel and machine capabilities
- Optimizing machine efficiency

With the recently introduced **iQ** bonds line of products, Toolgal Grinding Wheels features the results of years of R&D and hands on practice for your advantage.

Especially designed to be used on highly sophisticated CNC machines, Toolgal's **iQ** line of products ensures high stock removal at short cycle time, while maintaining the highest end product quality. Toolgal's insistence on high customer productivity will enable you to produce superior cutting tools, to meet your customers most demanding needs in the most efficient way possible.

The iQ line of products consists of the following bond types:

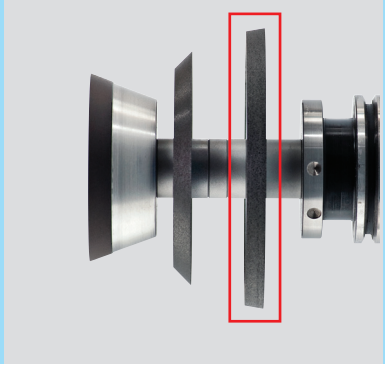
CB- CB452, CB407	Good corner stability for cup wheels in wet grinding
RM5 - RM501, RM515	High-performance wet grinding, creep-feed grinding, oil cooling
RM6 - RM621G, RM644	Ultra high-performance wet grinding, creep-feed grinding, oil cooling

As a part of its company philosophy, Toolgal uses non-toxic materials throughout the production process, and adheres to strict environmental and ecological rules & regulations.

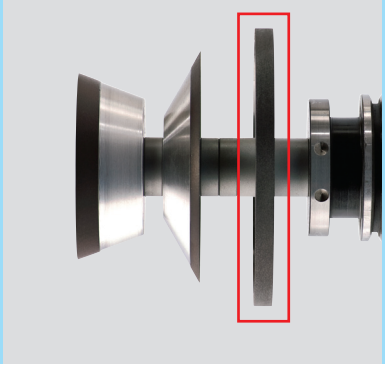
C O N T E N T

iQ for Flute Application

1V1



1A1



We Ensure:

- Fluting time consuming operation is significantly reduced
- Extremely high stock removal
- Very low energy consumption

We enable:

- Perfect flute surface quality

iQ Grinding Wheels per Type and Size (*)

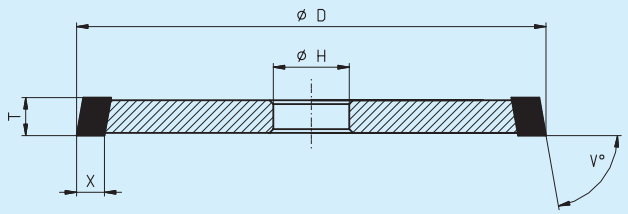
1V1
14V1

D		T / U		X		V	H
mm	Inch	mm	Inch	mm	Inch		
75	3	6-10	1/4 - 3/8	6-10	1/4 - 3/8	30°-80°	Per Request
100	4	6-10	1/4 - 3/8	6-15	1/4 - 5/8		
125	5	6-10	1/4 - 3/8	6-15	1/4 - 5/8		
150	6	6-10	1/4 - 3/8	6-15	1/4 - 5/8		

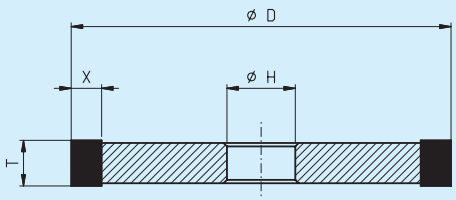
1A1
14A1

D		T / U		X		H
mm	Inch	mm	Inch	mm	Inch	
75	3	6-10	1/4 - 3/8	6-10	1/4 - 3/8	Per Request
100	4	6-10	1/4 - 3/8	6-15	1/4 - 5/8	
125	5	6-10	1/4 - 3/8	6-15	1/4 - 5/8	
150	6	6-10	1/4 - 3/8	6-15	1/4 - 5/8	

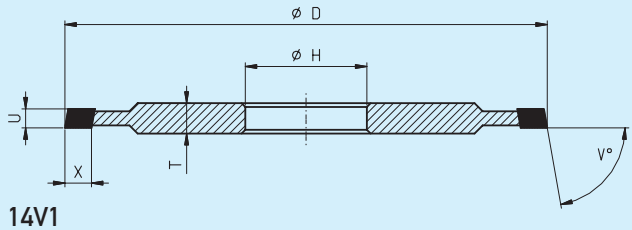
(*) other dimensions are available on request



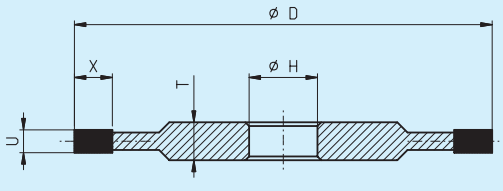
1V1



1A1



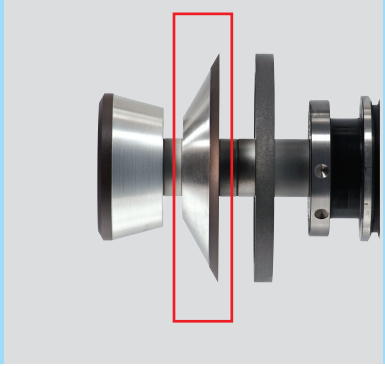
14V1



14A1

iQ for Gash Application

12V9



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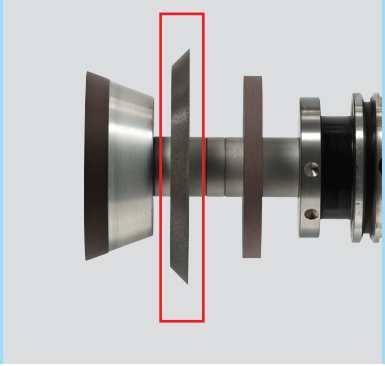


We Ensure:

- Free cutting characteristics
- High stock removal
- Excellent surface quality
- Maintaining wheel profile

We enable:

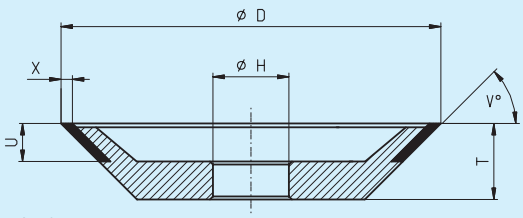
- The production of superior tool edge quality

iQ Grinding Wheels per Type and Size (*)

12V9	D		U		X		V	H
	mm	Inch	mm	Inch	mm	Inch		
	75	3	6-10	1/4 - 3/8	2-3	5/64 - 1/8	30°,45°	Per Request
	100	4	6-10	1/4 - 3/8		5/64 - 1/8		
	125	5	6-10	1/4 - 3/8		5/64 - 1/8		

1V1 14V1	D		T / U		X		V	H
	mm	Inch	mm	Inch	mm	Inch		
	75	3	6-10	1/4 - 3/8	6-10	1/4 - 3/8	30°,45°	Per Request
	100	4	6-10	1/4 - 3/8	6-12	1/4 - 1/2		
	125	5	6-10	1/4 - 3/8	6-12	1/4 - 1/2		

(*) other dimensions are available on request



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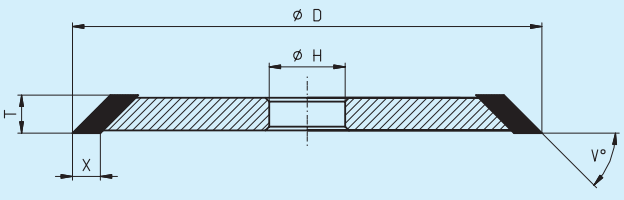

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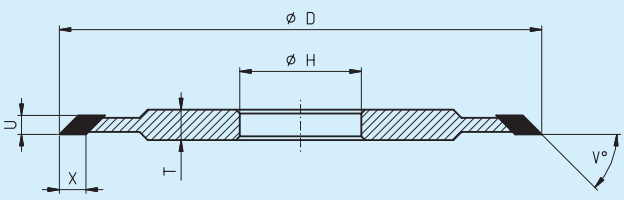
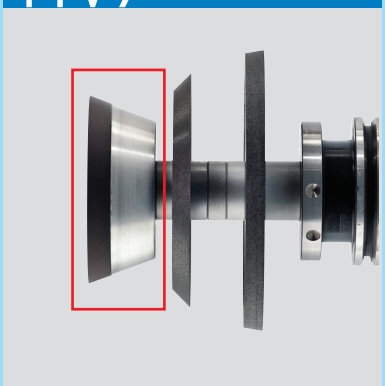


14V1

iQ for Relief & Point

11V9



We Ensure:

- Free cutting characteristics
- Excellent edge quality
- High stock removal at second relief
- Optimization for relief & point grinding

We enable:

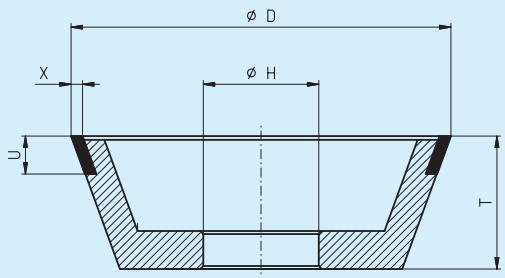
Excellent surface finish and the best profile consistency

iQ Grinding Wheels per Type and Size (*)

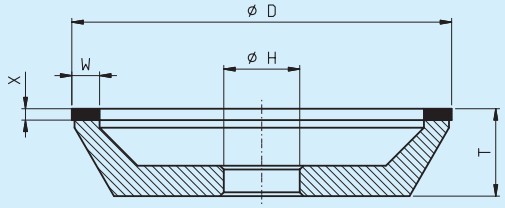
11V9	D		U		X		T		H
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
	75	3	10	3/8	2-3	5/64 - 1/8	35	1 - 1/4	Per Request
	100	4	10	3/8	2-3	5/64 - 1/8	35	1 - 1/4	
	125	5	10	3/8	2-3	5/64 - 1/8	35	1 - 1/4	

11A2	D		W		X		T		H
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
	75	3	4-8	5/32 - 3/8	4-6	5/32 - 1/4	35	1 - 1/4	Per Request
	100	4	4-8	5/32 - 3/8	4-6	5/32 - 1/4	35	1 - 1/4	
	125	5	4-8	5/32 - 3/8	4-6	5/32 - 1/4	35	1 - 1/4	

(*) other dimensions are available on request



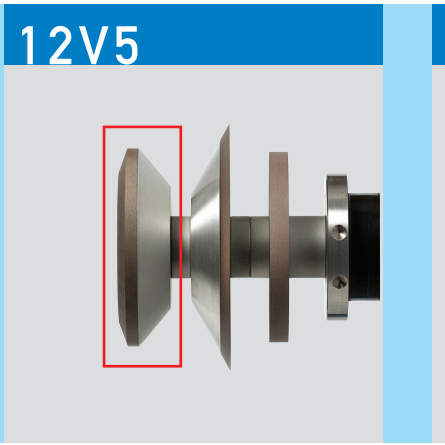
11V9



11A2

iQ for O.D.

12V5



11V5

We Ensure:

Superior polish performance

Free cutting characteristics

We enable:

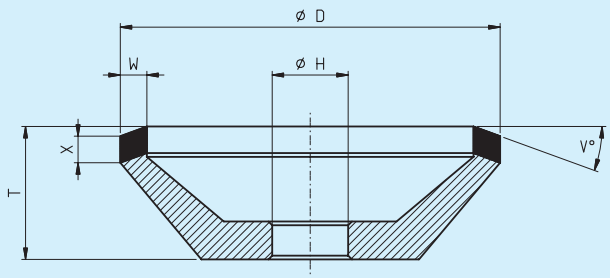
Mirror-like finish

iQ Grinding Wheels per Type and Size (*)

12V5 11V5	D		W		X		V	H
	mm	Inch	mm	Inch	mm	Inch		
	75	3	6-10	1/4 - 3/8	5-10	3/16 - 3/8	20°,30°	Per Request
	100	4	6-10	1/4 - 3/8	5-10	3/16 - 1/2		
	125	5	6-10	1/4 - 3/8	5-10	3/16 - 1/2		

1A1 14A1	D		T / U		X		H
	mm	Inch	mm	Inch	mm	Inch	
	75	3	6-10	1/4 - 3/8	5-10	3/16 - 3/8	Per Request
	100	4	6-10	1/4 - 3/8	5-12	3/16 - 1/2	
	125	5	6-10	1/4 - 3/8	5-12	3/16 - 1/2	
	150	6	6-10	1/4 - 3/8	5-12	3/16 - 1/2	

(*) other dimensions are available on request



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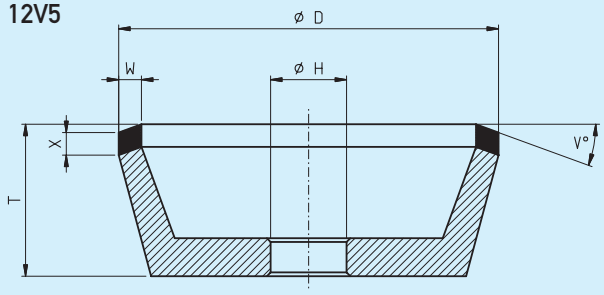
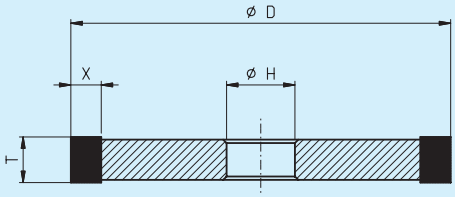


11V5



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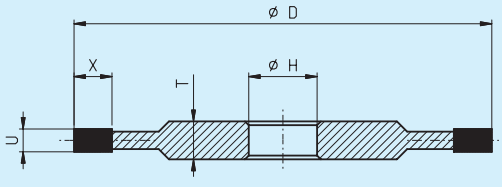
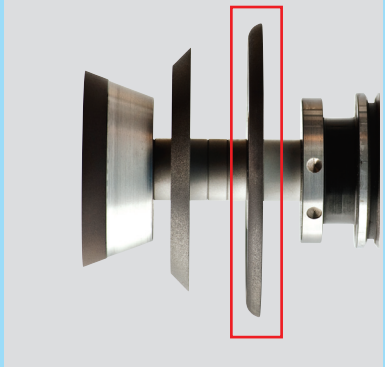


14A1

iQ Flute for Drills

14F1-R.r



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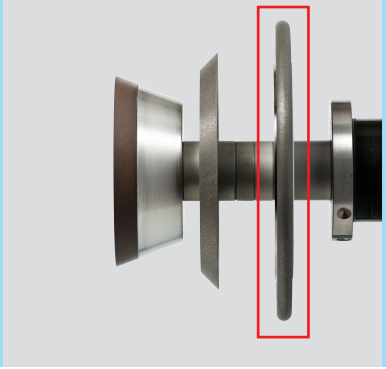


We Ensure:

- Fluting time consuming operation is significantly reduced
- Extremely high stock removal
- Negligible heat generation
- Excellent surface finish

We enable:

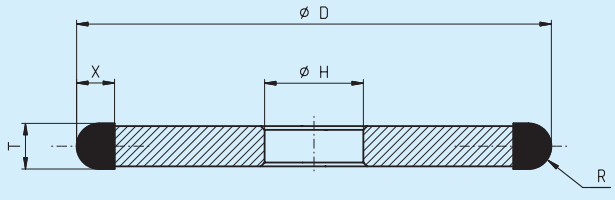
- Production of perfect drills at low spindle load
- Ultimate surface finish (eliminating the need for O.D. grinding)

iQ Grinding Wheels per Type and Size (*)

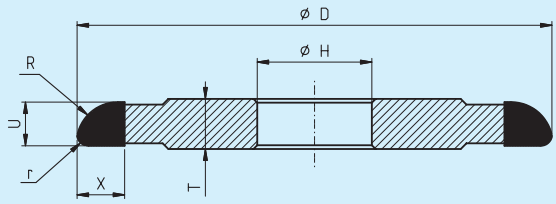
1F1
14F1

D		T / U		X		R	r	H
mm	Inch	mm	Inch	mm	Inch			
75	3	6-10	1/4 - 3/8	4-10	5/32 - 3/8	Per Request	Per Request	Per Request
100	4	6-10	1/4 - 3/8	4-10	5/32 - 3/8			
125	5	6-12	1/4 - 1/2	4-15	5/32 - 5/8			
150	6	6-12	1/4 - 1/2	4-15	5/32 - 5/8			

(*) other dimensions are available on request



1F1



14F1 R-r

iQ Line of Products by Bond

Recommended peripheral speed (Vc) for Diamond grinding wheels various bonds

CB Bond Line

Applications: General purpose, insert grinding, small tools grinding
Grit size: D35-D64, C100-C125

			Wheel diameter (mm)			
Machine	kW		75	100	125	150
All CNC machines		m/s	25-35			

RM5 Bond Line

Application: Flute grinding Medium MRR (Qw'= 4-6 $mm^3/mm/s$) and Gash operation
Grit size: D46-D91, C100

			Wheel diameter (mm)			
Machine	kW		75	100	125	150
Low-medium power	<10	m/s	15-18		18-22	

*Cutting speed for Gash can be increased up to 25 m/s for better surface quality

RM6 Bond Line

Application: Flute grinding very high MRR (Qw'= 6-12 $mm^3/mm/s$) and Gash operation
Grit size: D64-D91, C100

			Wheel diameter (mm)			
Machine	kW		75	100	125	150
Low-medium power	<10	m/s	13-18		15-18	
High power	>10	m/s	10-18		13-18	

*Required cutting speed for Gash operation: 25 m/s

General machine operating instructions:

Adjust the spindle RPM within the recommended range to the point of optimal spindle load.

Incorrect spindle RPM:
Cutting speed lower than recommended might result in high wear of the wheel and poor hold of the form.
Cutting speed higher than recommended might result in over heating, burning and clogging of the wheel.

RPM Table		Wheel Diameter [mm]			
		75	100	125	150
Peripheral Speed [m/s]	13	3310	2480	1990	NR
	15	3820	2870	2290	1910
	18	4590	3440	2750	2290
	22	5610	4200	3360	2800
	25	6380	4780	3830	3180
	30	7660	5730	4590	3820
	35	8940	6690	5360	4460

iQ Line of Products by Application

Recommended peripheral speed (Vc) For Diamond Grinding Wheels by Application

Application: Flute grinding					
Bond type: RM5, RM6 I Grit Size: D46-D91					
		Wheel diameter [mm]			
Machine	kW	75	100	125	150
		Vc [m/s]			
Low-medium power	<10	13-18		15-18	
High power	>10	10-18		15-18	

Application: Flute grinding small diameter tools (ø0.5 - 3 mm)					
Bond type: CB I Grit Size: D46-D91					
		Wheel diameter [mm]			
Machine	kW	75	100	125	150
		Vc [m/s]			
All CNC Machines		25-35			

Application: Gash grinding					
Bond type: RM5, RM6, CB I Grit Size: D46-D76					
		Wheel diameter [mm]			
Machine	kW	75	100	125	150
		Vc [m/s]			
All CNC Machines		18-25(*)			

Application: Gash grinding for small diameter tools (ø0.5 - 3 mm)					
Bond type: RM5, CB I Grit Size: D46-D76					
		Wheel diameter [mm]			
Machine	kW	75	100	125	150
		Vc [m/s]			
All CNC Machines		18-22(*)		18-25(*)	

(*) up to 35 m/s for CB bond type.

General machine operating instructions:

Adjust the spindle RPM within the recommended range to the point of optimal spindle load.

Incorrect spindle RPM:
Cutting speed lower than recommended might result in high wear of the wheel and poor hold of the form.
Cutting speed higher than recommended might result in over heating, burning and clogging of the wheel.

RPM Table		Wheel Diameter [mm]			
		75	100	125	150
Peripheral Speed [m/s]	13	3310	2480	1990	NR
	15	3820	2870	2290	1910
	18	4590	3440	2750	2290
	22	5610	4200	3360	2800
	25	6380	4780	3830	3180
	30	7660	5730	4590	3820
	35	8940	6690	5360	4460

Qw' Table

$$Qw' = \frac{Ae \cdot F}{60}$$

Qw' - specific material removal rate [mm³/mm/min]
F - feed rate [mm/min]
Ap - depth of cut [mm]

Toolgal's Wheel can generate the highest Qw' possible.
To maximize the Qw' please follow the recommendation bellow.

Ae (mm) ▶	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5
40						2.7	3.0	3.3	3.7	4.0	4.3
50					2.9	3.3	3.8	4.2	4.6	5.0	5.4
60				3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.0
80			3.3	4.0	4.7	5.3	6.0	6.7	7.3	8.0	8.7
90		3.0	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.0	9.8
100	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8
120	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	NR	NR
140	3.5	4.7	5.8	7.0	8.2	9.3	10.5	11.7	NR	NR	
160	4.0	5.3	6.7	8.0	9.3	10.7	12.0	NR	NR		
180	4.5	6.0	7.5	9.0	10.5	12.0	NR	NR			
200	5.0	6.7	8.3	10.0	11.7	NR	NR				
F (mm/min) ▲											

Non Economic Small Tools Standard Stock Removal High Stock Removal Not Recommended

Spindle RPM Recommendation Table

Vc [m/s] ▶	22	20	18	15	13	10
100	4200	3820	3440	2870	2480	1910
125	3360	3060	2750	2290	1990	NR
150	2800	2550	2290	1910	NR	
175	2400	2180	1970	NR		
200	2100	1910	NR			
Wheel Diameter [mm] ▲						

Low Power Spindle High power Spindle Not Recommended

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