CGW®

CAMEL GRINDING WHEELS

Advanced Grinding Solutions for the Engineering Industry

Highest Quality + Excellent Service = Cost Effectiveness

January 2010

CGW Offers GRINDING SOLUTIONS for the Aerospace Industry

CGW®
CAMEL GRINDING WHEELS

CERTIFIED QMS SI ISO 9001: 2000
THE STANDARDS INSTITUTION OF ISRAEL

Organization for the Safety of Abrasives OSA®

EN 12413

CONTENTS

CGW Abrasives

Established in 1956, CGW has gained international recognition as a world-class manufacturer of bonded and coated abrasive products. The quality and cost-effectiveness of CGW products have made CGW the choice of leading corporations in Europe and the USA.

CGW's well-equipped R&D department, staffed by highly experienced engineers, enables the development of vitrified and resin bonded wheels for special applications, according to customer requirements, as well as ongoing analysis and grinding performance tests in support of product development. The R&D team collaborates with the Technion Haifa - Institute of Technology on a number of development projects.

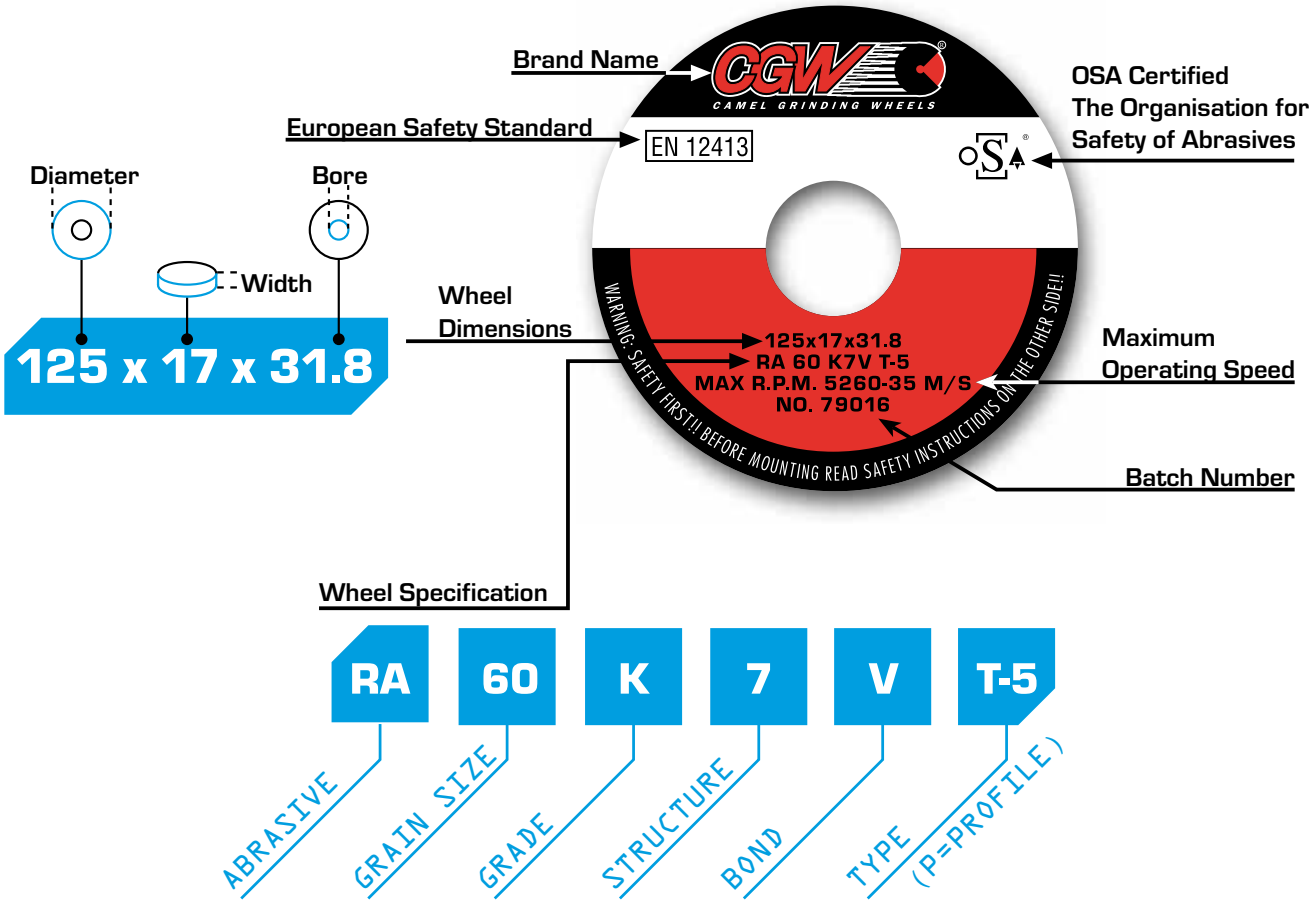
CGW specializes in abrasive products for the aerospace and land-based turbine blades industry. Thanks to its excellent engineers, technical support, short lead time, and competitive prices, CGW has become a major supplier of abrasive wheels and diamond rolls to this industry, serving the world's leading manufacturers.

CGW vitrified bonded wheels, resin bonded discs, and coated abrasive products are also a preferred choice worldwide for grinding and cut-off applications of all kinds, in the metal, construction, rail, and other industries.

CGW has experienced an accelerated growth rate of 20% per annum during the past three years, and plans to sustain this rate of growth for the next three years.

CGW markets its products in Europe, North America, Latin America, Australia, Asia, and Africa. Its US subsidiary, CGW-USA, maintains a 90,000 sq. ft. warehouse, from which CGW products are shipped throughout North America.

CGW products are manufactured under strict quality control. CGW is certified to the highest industrial standards: EN 12413, EN 13743, ANSI B7.1, OSA and ISO 9001:2000.



Abrasive

A	Brown Aluminium Oxide
WA	White Aluminium Oxide
WAB	White Aluminium Oxide + Blue Bond
WAG	White Aluminium Oxide + Special Bond I
WAP	White Aluminium Oxide + Special Bond II
WAR	White Aluminium Oxide + Red Bond
WAY	White Aluminium Oxide + Yellow Bond
PA	Pink Aluminium Oxide
RA	Ruby Aluminium Oxide
AS1	10% Ceramic Aluminium Oxide
AS3	30% Ceramic Aluminium Oxide
AS5	50% Ceramic Aluminium Oxide
DA	White & Brown Aluminium Oxide
SA	Semi-Friable Aluminium Oxide
HA	Monocrystal Aluminium Oxide
KA	Bubble Alumina
WBH	Special grain and bond
ZA	Zirconia
GC	Green Silicon Carbide
C	Black Silicon Carbide

Grain Size

Coarse:	8, 10, 12, 14, 16, 20, 24
Medium:	30, 36, 46, 54, 60
Fine:	80, 100, 120, 150, 180,
Very Fine:	220, 240, 280, 320, 400, 600

Grade

Soft:	B, D, E, F, G, H
Medium:	I, J, K, L, M, N, O, P
Hard:	Q, R, S, T, U, V, W, X

Structure

Dense ← → Open/Porous

5 6 7 8 9 10 11 12 13 14 15

Bond

V:	Vitrified
B:	Resin
BF:	Reinforced Resin
RX:	Natural Rubber

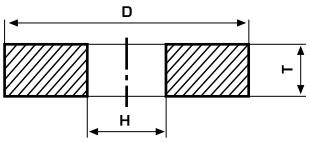
Wheel Dimentions

External Diameter: Up to 1,200 mm
Width: Up to 508 mm
Internal Diameter (Bore): Up to 508 mm

Standard Wheel Types and Shapes

Types and profiles of CGW abrasives are marked in accordance with international standards.

A,B Width of segment or abrasive wheel
C Height (of segments)
D Outer diameter
E Thickness around bore
F Depth of recess
G Depth of second recess
H Diameter of bore
J Diameter of flat outer surface
K Diameter of flat inner surface
L Length of segment or abrasive wheel
N Depth of release on one side
O Depth of release on other side
P Diameter of recess
R Radius
T Thickness (general)
U Thickness of edge
V Angle (of profiles)
V1 Second angle (of profiles)



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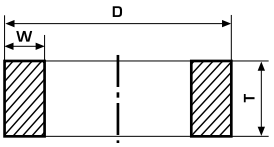

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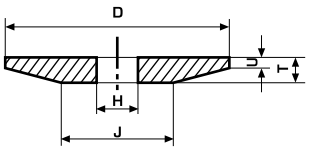

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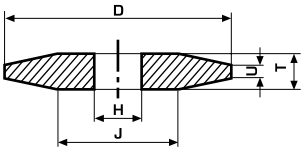

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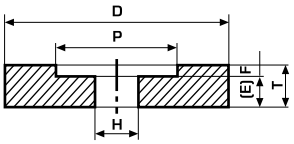

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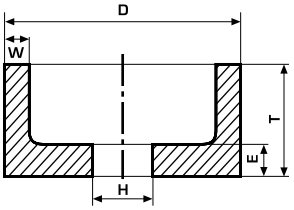
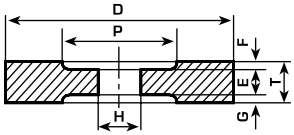
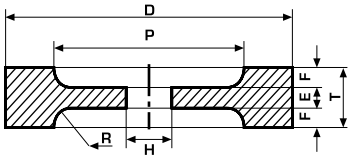


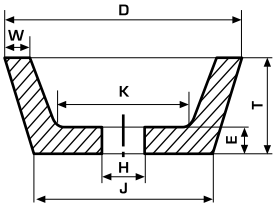
6 DxTxH-W..E..



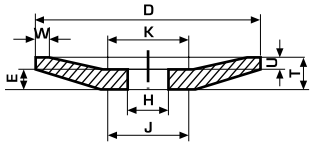
7 DxTxH-PxF
or if recesses are not the same size:
DxTxH-PxF/G



9 DxTxH-PxF R..



11 D/JxTxH-W..E..K



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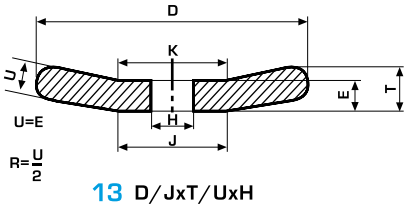

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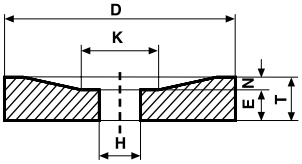

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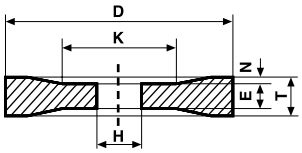

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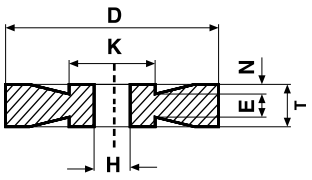
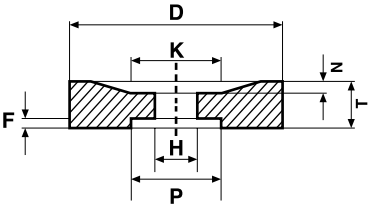


21A D/KxT/NxH



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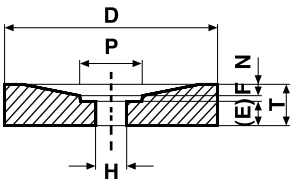

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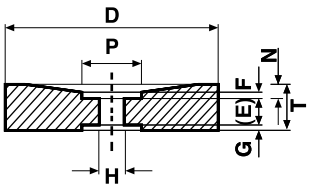

24 DxT/NxH-PxF
or if recesses are
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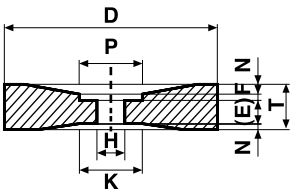
DxT/NxH-PxF/G



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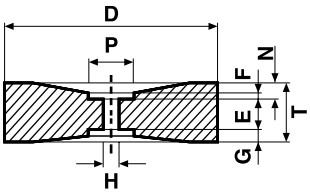

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or if recesses are
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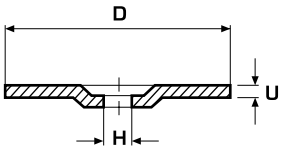
DxT/NxH-PxF/G



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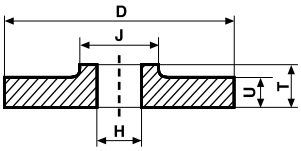

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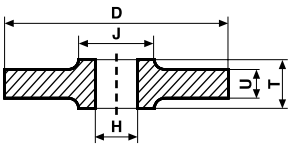

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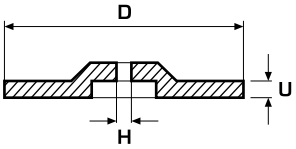
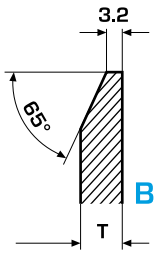


43 DxUxH

Standard Profiles



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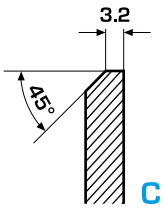

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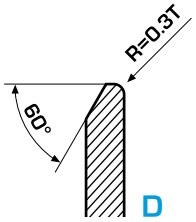

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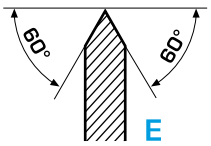

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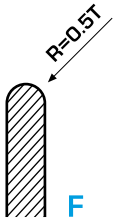

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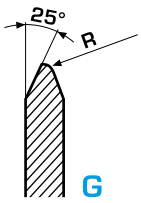

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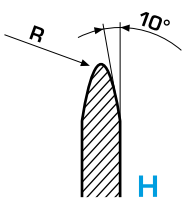
$R=\frac{T}{8}$



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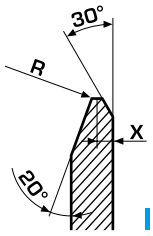
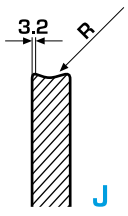


I

$R=\frac{T}{8}$ $X=\frac{T}{3}$



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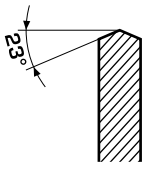

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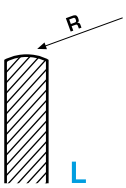
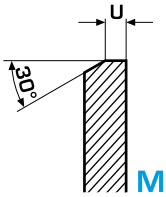


L

R=T



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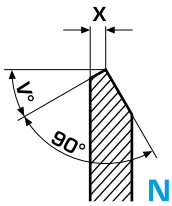
$U=\frac{T}{3}$



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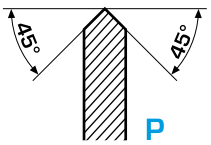


P

The CGW grinding wheel is made up of abrasive grains held together by a bond. By varying the properties of the abrasive, the type of bond, and the structure of the wheel, it is possible to produce innumerable grinding characteristics.

The Abrasive

There are two main categories of grain:
Aluminium Oxide - For grinding high tensile steel, i.e. hardened or high speed steels.
Silicon Carbide - Low tensile steels, i.e. cast iron and non-ferrous metals.

Bond

The function of the bond is to hold the abrasive grains in a definite spacing to form a product of defined size and shape. The most commonly used bonds are:
Vitrified - The rigidity of this bond is excellent for precision grinding and fast stock removal.
Resin - Organic bond makes the wheel tougher, suited for heavy-duty operations, high operating speeds, rough grinding, and cut-off applications.

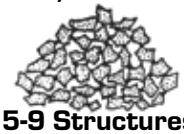
Structure

Structure is defined according to the spacing of the grain in the wheel, held in position by the bond. The closer the grains (the smaller the pores), the denser the structure. The farther apart the grains (the larger the pores), the more open the structure.

Open / Porous

10-15 Structures

Closed / Dense



5-9 Structures

CGW Grain Types

A - Brown Aluminium Oxide: The most common of all grains. This grain is used for heavy-duty general purpose work.
SA (94A) - Semi-Friable Aluminium Oxide: Its principal use is in cylindrical and centreless grinding wheels. It can be used to grind both soft and hard steels.
WA - White Aluminium Oxide: The high friability of this grain gives it the characteristic of fast and cool cutting. Suitable for light grinding of steels of all kinds, particularly on tool and die steel.
WAB (AZ) - White Aluminium Oxide + Blue Bond: Particularly suited for grinding HSS over 55 RC. Provides exceptionally cool, fast cutting action. Requires minimum dressing.
Available also as **WAR - White Aluminium Oxide + red bond** - when there is a need to differentiate from AS.
AS - Ceramic Aluimium Oxide: Ceramic grain, blended with white aluminium oxide, creates a wheel with maximum grinding performance and life. Excellent for form and corner holding. Available in AS1, AS3, and AS5.
PA - Pink Aluminium Oxide: Good general purpose wheel. The grain is tough but friable, excellent on large surface areas.
RA - Red Aluminium Oxide (Ruby): This grain is harder than PA and WAB. Good for high-chromium steel.
DA (91A) - White & Brown Aluminium Oxide: Mixed grain Combining A and WA. Ideal for precision grinding operations such as large surface grinding.
WAY - White Aluminium Oxide + Yellow Bond: Used primarily in wheels with very open structure. For creep feed grinding with continuos dressing.
Saturn - WAG - White Aluminium Oxide + Latest CGW-Developed Bond: Used primarily in wheels with very open structure. Excellent for creep feed grinding with non-continuos dressing.
Jupiter - WAP - Special wheels for blade grinding at 80 M/S.
Meteor - WBH: Special wheel designed for creep-feed grinding. Contains a unique combination of special grain and bond which enables improved form holding and longer life span. The wheel is characterized by interconnected pores, which enable maximum cooling action and stock removal.

HA (32A)- Monocrystal Aluminium Oxide: A strong, sharp grain, suitable for a wide range of materials and applications. Especially good for high alloy steels that are sensitive to heat.
C (72C) - Black Silicon Carbide: Sharper than Aluminium Oxide and therefore more effective in grinding low tensile materials and non-ferrous metals.
GC - Green Silicon Carbide: More friable than C, recommended for grinding cemented carbide cutting tools.
KA - Bubble Alumina: for grinding soft, malleable materials such as rubber and polyester.
ZA - Zirconia Aluminium: a blend of ZrO2 and AL2O3 gives this type of grain extremely high mechanical strength. Suitable for coarse grinding of steel castings.

Additional combinations of the basic grain types are possible, in order to achieve a broader range of characteristics:
VA - a mixture of RA and WA
XA - a mixture of HA and SA
AC - a mixture of A and C

Wheels for the Gas Turbine Industry

Very soft, excellent burn prevention in sensitive inconel parts, especially in large turbine blades

ABRASIVE — PA/WA
GRAIN SIZE — 60
GRADE — D
STRUCTURE — P
BOND — V

Wheels for the Aerospace Industry

WAY — ABRASIVE
70 — GRAIN SIZE
F — GRADE
15 — STRUCTURE
V — BOND

>COOL GRINDING
>OPEN STRUCTURE
>CONTINUOUS DRESSING

CGW is proud to introduce the eco-friendly grinding wheel for eco-friendly industries

METEOR

NEW!

METEOR

The latest development from CGW's R&D team. The Meteor features:
1. Superior profile holding
2. High G-ratio for both high and low stock-removal rates.
3. Unique cool cutting properties.
4. Improved surface integrity.

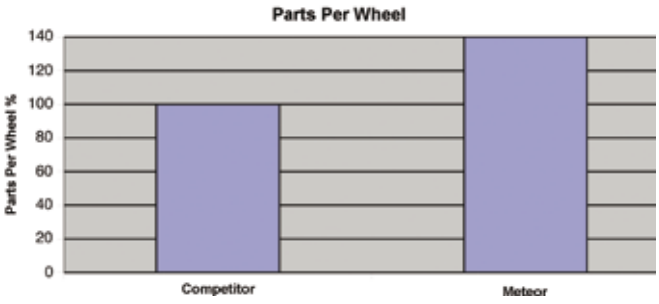
The new Meteor wheel has been developed by CGW's application engineers and R&D team, in response to customer demands. It offers a unique combination of an innovative ceramic bond with special advanced aluminium oxide and interconnected pores. The Meteor has been rigorously tested on CGW's new creep-feed application grinding machine.

CGW's new creep-feed application grinding machine

The Part: Turbine blade root form

The Machine: Blohm creep-feed grinder

The Goals:
1. Avoid thermal damage
2. Improve form holding
3. Reduce grinding costs

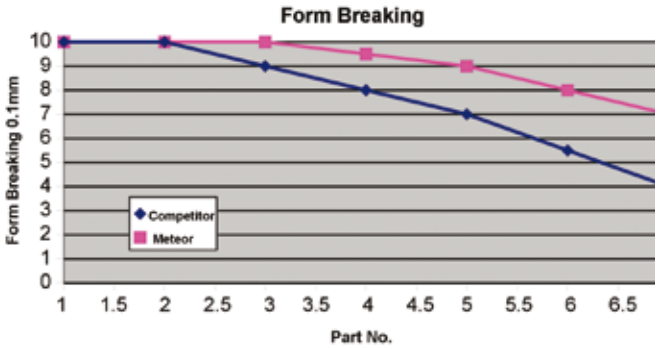


The Meteor gives 40% more parts per wheel than the competitor

The Wheel: The Meteor (WBH60/2 F13VS) from CGW - optimized using the GKS - Grinding Knowledge System (see page 18).

Technical information:
diameter up to 635 mm
thickness up to 200 mm
grit size from 46 to 120
cutting speeds of up to 63 M/S
structure 10-15
feed rate up to 10,000 mm/min
cutting depth range up to 10 mm

The Application Method: Using the GKS, CGW's experienced application engineers will optimize your grinding operation, ensuring the establishment of high-process CPK as well as improved quality and higher production rates.



The Meteor maintains better form than the competitor

The Meteor edge: The new bond, specially designed for creep-feed grinding applications using either continuous or non-continuous dressing, gives the Meteor an indisputable advantage. The Meteor has been developed especially for aerospace, turbine, gear grinding, and all creep-feed applications.

The CGW Edge: By examining and addressing the entire grinding process, CGW provides a holistic approach to issues involving application parameters as well as dressing, coolant, filtration, and clamping.

Grinding wheels ***and*** grinding solutions - that's the CGW edge.

SATURN

>FORM HOLDING
>COOL GRINDING
>CREEP FEED WITH
NON-CONTINUOUS DRESSING

The part Turbine blade root form

The machine Blohm creep-feed grinder

The goals
1. Eliminate visible burn
2. Ensure no "white layer"
3. Reduce wheel consumption

The wheel The Saturn from CGW
Optimized with GKS - Grinding Knowledge System

The method Assess the entire process with GKS
Optimize the Saturn wheel to achieve the goals above

The Saturn edge The Saturn wheel has been specifically designed by the CGW R&D team to achieve a "controlled hardness". In other words, the bond material achieves the delicate balance between self-sharpening and form-holding.

	original parameters, competitor's wheel		modified parameters, Saturn wheel		
	1st pass	2nd pass	1st pass	2nd pass	3rd pass
wheel speed	22 m/s	34 m/s	22 m/s	25 m/s	34 m/s
depth of cut	10 mm	0.1 mm	9.8 mm	0.2 mm	0.1 mm
table speed	90 mm/min	550 mm/min	90 mm/min	555 mm/min	600 mm/min
dressing in-feed rate	0.2 µm/rev	none	none	2 µm/rev	none
time of traverse	75 s	9 s	75 s	9 s	8 s

Dressing only 0.2 µm/rev may reduce wheel consumption, but it dulls the wheel, resulting in excessive heat generation and burn.

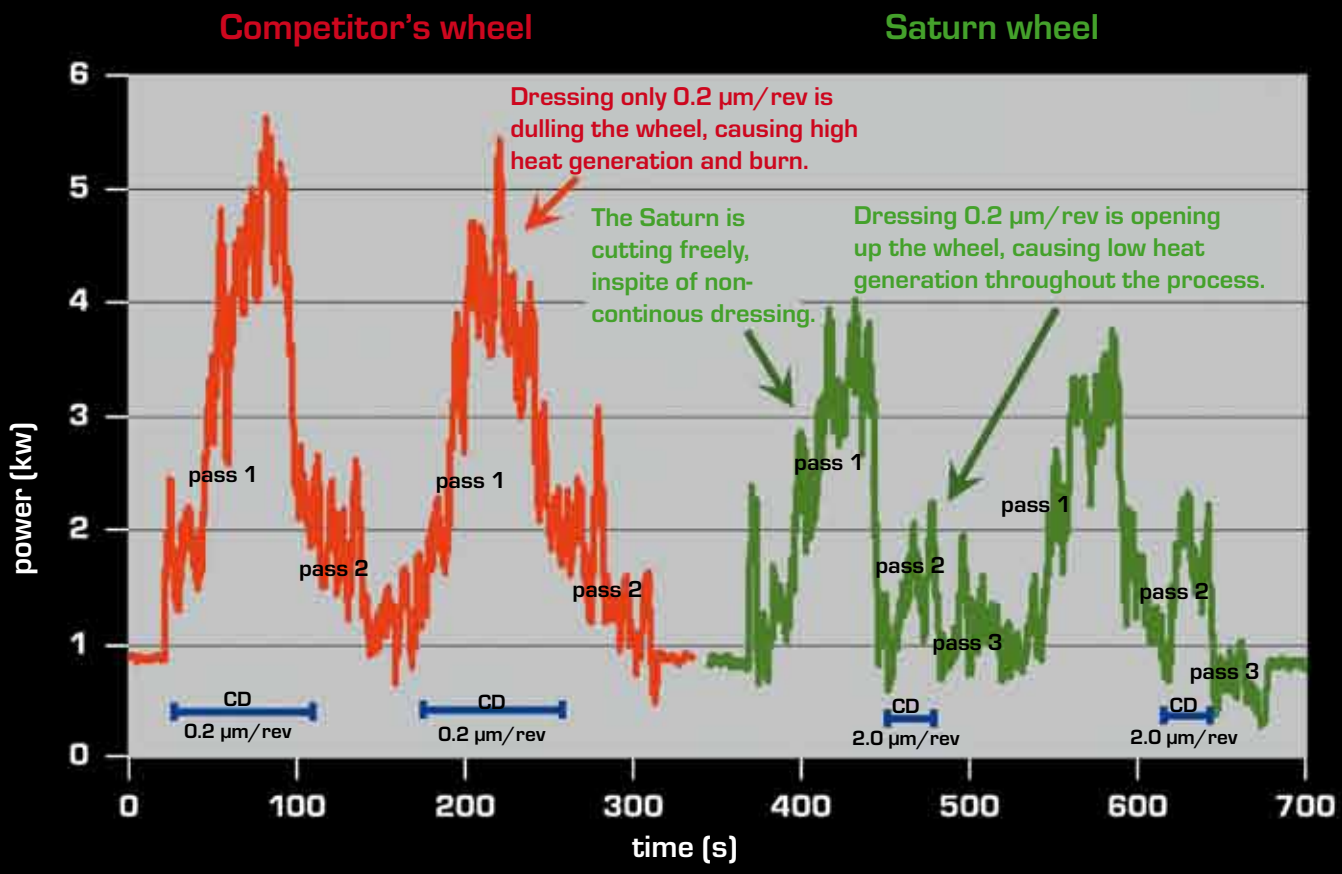
Continuous dressing for 75 seconds causes excessive wheel consumption.

During the first roughing pass we don't dress the wheel. This is what the Saturn was designed for. The wheel self-sharpens during use, keeping heat down but maintaining form.

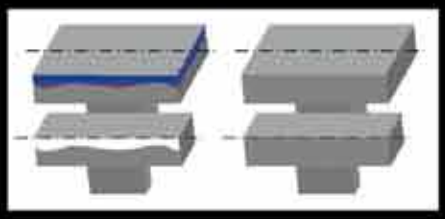
Here we dress the wheel 2 µm/rev to create a sharp wheel that generates less heat.

But because we do it on this fast, finishing pass, we can increase the speed, requiring only 9 seconds, meaning less wheel consumption.

The CGW Edge CGW engineers not only have extensive experience in grinding, they also have an in-depth understanding of grinding fundamentals, enabling them to assess the entire grinding process and make major improvements.



Power signal from the GKS for the competitor's wheel and the Saturn wheel. By dressing aggressively and using the controlled-hardness Saturn wheel, GKS engineers were able to reduce power and heat generation by 25% – and reduce wheel consumption.



Visible burn and white layer

Current cycle with competitor's wheel

- severe visible burn
- white layer
- 1.01 mm/part wheel consumption
- 85 parts/wheel
- 340 second cycle time

Modified cycle with CGW's Saturn wheel

- NO visible burn, perfectly clean
- NO white layer
- 0.54 mm/part wheel consumption
- 45% wheel cost savings per part
- 160 parts/wheel
- 350 second cycle time

The CGW Edge

CGW understands that grinding involves not only the wheel, but the optimum speeds and feeds, wheel speed, dressing parameters and coolant application for **that particular wheel.** Let our engineers come to your facility with our equipment and optimize your process for higher productivity, lower costs and better quality.
Grinding wheels *and* grinding solutions – that's the CGW edge.

JUPITER

Enables blade grinding at 80 M/S. Utilizing advanced tooling techniques.

Jupiter, the latest in CGW's line of blade grinding wheels, developed in response to today's market demands for improved advanced production methods.
Jupiter provides the following features and advantages:

- Jet blade grinding at 80 M/S
- Cool grinding
- Excellent form holding
- Non-continuous dressing
- High G values (longer life)
- High throughput of blades per wheel

Technical Information

- Diameter up to 300 mm**
- Thickness up to 40 mm**
- Grit size from 60 to 120
- Cutting speeds of up to 80 M/S
- Hardness - J-N
- Structure 10-12
- Feed-rate up to 80,000 mm/min
- Cutting depth of 0.05 mm

**For larger sizes contact your CGW representative.

>INNOVATIVE VITRIFIED TECHNOLOGY FOR HIGH SPEED JET BLADE GRINDING
>COOL CUTTING
>EXCELLENT COST EFFECTIVENESS

Innovation

The new concept of high speed grinding focuses on light and fast passes [low thickness grinding] over the blade so that any heat generated during the operation will be dissipated on chips rather than onto the surface of the blade. CGW's R&D team has developed a quality high performance 80 M/S grinding wheel, while maintaining the highest levels of safety and reliability.

INTERNAL GRINDING WHEELS

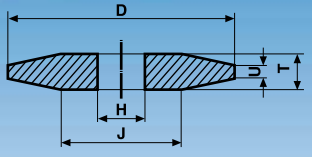
The recommended wheel for internal grinding has a diameter of up to 2/3 of the final bore required.
For grinding inside surfaces of bearings, rings, cylinders, and bores.
Internal grinding wheels are available in all sizes up to 6" (150 mm) in diameter Types: 1, 5, 6.
Abrasive types: WA, RA, AS, PA, GC.
Special abrasive types are available on request.

SUPER FINISHING STONES

CGW offers sticks, honing stones, and precision-finishing grinding wheels up to 1200 grit size.
In standard abrasives and CBN Vitrified.

High-performance grinding wheels with cutting speed up to 80 M/S.
Soft and very hard wheels, with open and closed structure and fine grits up to 150 mm.

GEAR GRINDING WHEELS



4 D/JxT/UxH

CGW specializes in customized solutions for the gear-grinding industry.

With a broad perspective on the constant technical progress in the gear-grinding industry, CGW has developed a wide range of grinding wheels to cope with complex demands in this field:

- In standard or ceramic grain. In open or closed structure, straight or pre-profiled.
- Diameter: up to 450 mm; 500, 610, 635 mm by special order
- Thickness: all thicknesses required for gear grinding.
- All the standard bore sizes: 76.2, 100, 127, 152.4, 160, 203.2, 254, 304.8 mm

THREAD GRINDING WHEELS

CGW thread-grinding wheels offer cool cutting with excellent form holding to meet strict tolerance requirements.
These wheels are manufactured with very high performance grains, using our special blue bond.

- Grits: up to 220
- Diameter: up to 20”
- Thickness: up to 25 mm (more if required - please check with our technical office)
- Bore size up to 304.8 mm
- Cutting speed up to 80 M/S

ADVANCED DIAMOND ROLLS AND ELECTRO PLATED C.B.N.

CGW diamond rolls (profilers and dressers for abrasive wheels) have applications in various sectors of the mechanical industry: production of valves, bearings, constant velocity joints, injectors, ball screws, shafts, and gears. They are also used in the production of blades for the aerospace industry and land-based turbines.

Diamond rolls can be produced with well-defined profiles for dressing grinding wheels and faithfully reproducing the profile on the work piece, profiles for dressing abrasive wheels, enabling the abrasive wheels to precisely reproduce the profile on the work piece.

In addition to diamond rolls, the company also produces electro-plated CBN grinding wheels (boron crystals) which are gradually replacing the diamond roll and the abrasive wheel. Used on mechanical and aeronautical components, especially gears (straight and helical teeth, both internal and external).

EL-DS

EG

SN

EB

CHOOSING ABRASIVES

General Recommendations for Choosing Abrasives Depending on Grinding and Material Types

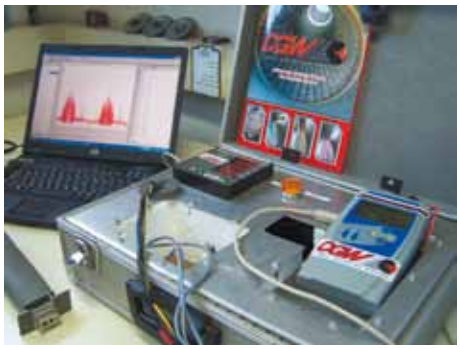
		Grinding Type		
Material		**Bench**	**Cylindrical (OD)**	**Surface (wheels)**
General Purpose (Universal)		A46N6V	WA60H8V	WA46H8V
Steel	Soft, untempered	A36P5V	A60M6V	WA46H8V
	Tempered (up to 55 Hrc)	WA46K7V	WA60H8V	WA46K7V
	Tempered (above 55 Hrc)	WA60K7V	AS360J10V PA80J10V	AS360J7V
Stainless Steel	Soft	A36P5V	A60M6V	DA46H8V
	Hard	A46N6V	WA60K7V	WA46K7V
Chrome Plated		WA60K7V	PA80J10V	AS360M3V
Nickel Alloy		WA60K7V	WAG80H8V	WAG60F15V
HSS and Tool Steel		WA60K7V	AS346H8V GC60J7V	AS360I13V
Titanium		GC60J7V	C60J7V	GC46H12V
Carbide/ Tungstan		GC60J7V	GC60J7V	GC60J7V
Casted	Gray Cast	A36P5V	C60K7V	C46H8V
	Steel Cast	A46M6V	PA60J7V	WA46H8V
Non-Ferros Metals	Aluminium, Copper, Brass, etc.	GC60J7V	C60E12V	GC60J7V
Ceramics		GC60J7V	GC60J7V	GC60J7V
Plastics		KA2-3H10B	KA2-3H10B	KA2-3H10B
Rubber		KA2-3H10B	KA2-3H10B	KA2-3H10B

Grinding Type					
Surface (segments)	**Internal (ID)**	**Centreless**	**Tools**		**Material**
PA/ WA30D9V	WA60K7V	A60L7V	WA60K7V		**General Purpose (Universal)**
DA36G10V	WA60K7V	A60L7V		Soft, untempered	**Steel**
DA36G10V	RA60J7V	PA60J7V		Tempered (up to 55 Hrc)	
AS336D12V	AS360J8V	AS360K7V		Tempered (above 55 Hrc)	
DA36G8V	WA46K7V	DA60K7V		Soft	**Stainless Steel**
WAR36E8V	WA46H8V	GC80L7V		Hard	
WAR36E8V	RA46J7V	AS360K7V			**Chrome Plated**
WAB46D12V	WAY60G10V	WAG80H8V			**Nickel Alloy**
WA36D8B AS336D13V	AS360J8V GC46J5V	AS360K7V GC80L7V	AS360J8V PA60L7V		**HSS and Tool Steel**
GC36H8V	GC60J7V	C60H8V			**Titanium**
GC36H8V	GC60J7V	GC60J7V	GC60J7V		**Carbide/ Tungstan**
C36G8V	C60J7V			Gray Cast	**Casted**
PA/ WA30D9V	RA46J7V			Steel Cast	
PA/ WA30D9V	GC60J7V	GC60J7V		Aluminium, Copper, Brass, etc.	**Non-Ferros Metals**
GC36H8V	GC60J7V				**Ceramics**
	KA2-3H10B				**Plastics**
	KA2-3H10B				**Rubber**

TECHNICAL SUPPORT
GKS - GRINDING KNOWLEDGE SYSTEM

As part of CGW's commitment to providing you not only with state-of-the-art grinding wheels, but also with superior customer service and expertise in using our products on the shop floor, we have developed The Grinding Knowledge System, or the GKS.

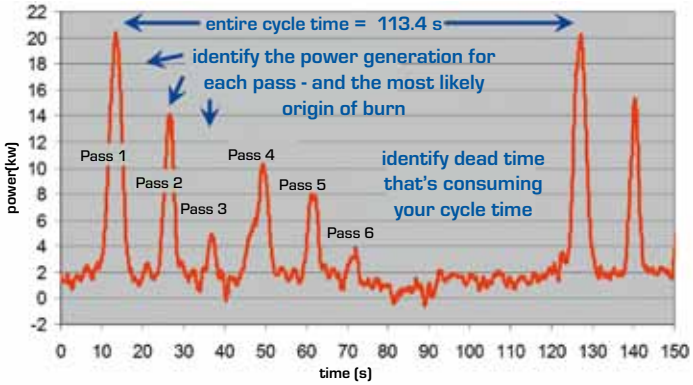
The GKS is a simple yet powerful tool that measures the power consumption in the wheelhead motor of a production grinding machine. This gives valuable information as to how the grinding cycle is behaving. The GKS can also measure wheelhead and table displacement, giving even more information on the grinding process.



Our field engineers will come to your facility and spend a few hours on your machine. The GKS takes about five minutes to hook up. Then, while you are running regular production, we will spend a few hours recording data, mapping out your entire grinding cycle and looking at how your cycle time is being taken up, and the source of any burn. Next, we'll sit down with you and discuss what you want to accomplish: cycle-time reduction, elimination of burn and "white layer", reduction in wheel consumption, or any other issue.

Cycle-time reduction

The GKS tells us what is happening in every second of the cycle, enabling us to identify bottlenecks and other areas that are unnecessarily consuming cycle time.



Mapping out of the entire cycle using the GKS

Grinding burn and "white layer"

Because the GKS's primary output is power – and higher power means higher heat and temperatures – it is extremely useful in finding just the right parameters that eliminate "white layer", without having to rely on erratic visual burn or time-consuming examination in the lab.

Wheel consumption

Because the GKS tells us what is happening in the entire process, it is very useful in reducing wheel consumption, both in continuous and non-continuous dressing mode.

Wheel optimization

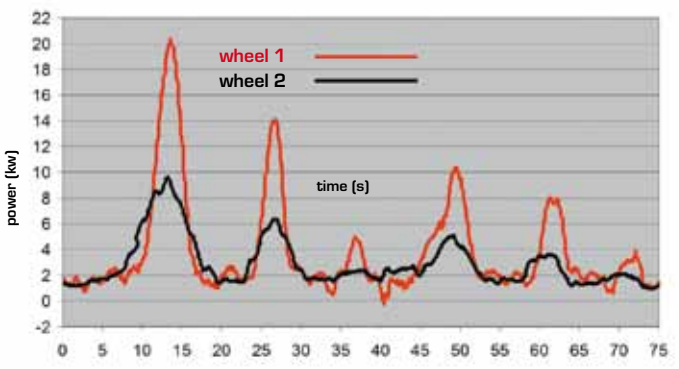
The GKS tells you how your wheel is behaving during grinding. Is the power increasing drastically? Then your wheel is probably too hard. Is power rising and then falling? Then you may have loading. Is it generating more heat during continuous dressing? Perhaps your dressing feedrate is too low.

Wheel comparison

Often when trying out a new grinding wheel, operators adopt the "stick it on and see what happens" approach. The GKS allows for a scientifically sound comparison between wheels.

Parameter variation

The GKS allows you to vary your parameters in the process – speeds, feeds, dressing, number of passes – to see exactly how they affect heat generation and cycle time.



The GKS is useful for comparing wheels. Wheel 2 is generating much less heat.

Process

Because the GKS maps out the process and gives output for several cycles, it is a very useful tool in identifying unknown problems in the cycle. Is the table stalling in the middle due to excessive load from the grinding? The GKS will identify this. Is there an unnecessary dwell in the cycle? The GKS will pinpoint it.

What we need from you

- 10 minutes of down-time to hook up the GKS.
- Let us record data for a few hours during regular production.

What you'll get from us

- We'll optimize your process for whatever you are looking for: higher productivity, reduced burn, less wheel consumption, better surface finish, etc.
- We'll give you a method to truly assess the performance of new wheels.
- We'll work with you in the long term to improve your process one step at a time.

An example

Our field engineers at CGW spent a day at the production facility of one of our customers grinding root-forms for the aerospace industry. The process was consuming about a dollar's worth of abrasive on every part and exhibited sporadic "white layer". They had spent months with the "trial and error" approach, trying to eliminate burn while trying not to consume too much wheel. We spent 10 minutes hooking up the GKS and then several hours recording data during regular production. We then spent an hour analyzing this data and getting an understanding of what was happening in the process. Next, we devised a new set of parameters, changing the dressing parameters and speeds and feeds based on what we learned from the GKS. The final cycle reduced heat generation by 40%, eliminated visual burn and white layer, and decreased wheel consumption by 40% – all without any increase in cycle time.

At your facility

Do you want to achieve similar results at your facility? It's not going to be done simply by choosing a better wheel. It's going to be done by choosing a better wheel and optimizing that wheel. Let CGW's field engineers help you achieve results you never thought possible.

Precision Grinding Wheels

CGW engineers have developed specially formulated wheels for resharpening single- and multi-point cutting tools, for surface, cylindrical, and all other grinding operations.
For grinding steels and high-speed steels (HSS), CGW offers a large selection of abrasive types: white, blue, red and pink aluminium oxide, and AS (ceramic abrasive). For tungsten carbide applications, we recommend green silicon carbide.
Standard types: 1, 5, 6, 7, 11 & 12. Special types are available on request.

Creep Feed Grinding Wheels

CGW offers a broad range of creep feed grinding wheels for both continuous dressing and periodic (non-continuous) dressing. Our R&D department has developed bonds with high porosity for wheels of different abrasive types: WAG, WAB, WAY, WAR, AS, RA, PA.
Our large finishing department is equipped with CNC machines that profile wheels according to customer requirements.

Surface Grinding Wheels

Surface grinding wheels are used for heavy stock removal and precision surface grinding.
CGW offers a wide range of sizes, with diameters of up to 25" (625 mm), in all types and grits.
Standard types: 1, 2, 5, 6, 7. Segments and special types by request.
Abrasive types WA, PA, AZ, RA, AS, GC, DA, C.

Cylindrical Grinding Wheels

Wheels for general purpose cylindrical grinding applications (O.D. - outside diameter grinding) are available in all abrasive types and profiles, up to 25" (625 mm) in diameter.
Standard types: 1, 5, 6, 7, 20, 21, profile N. Special profiles are available on request.
Abrasive types: WA, PA, AZ, RA, AS, GC, DA.

Centreless Grinding Wheels

CGW manufactures a wide range of dimensions in centreless and regulating wheels, for three types of feed grinding:
Thrufeed - the workpiece passes between the grinding and regulating wheels, from one side of the machine to the other.
Infeed - the workpiece is placed on the work-rest between the grinding and the regulating wheels and held in position against the end-stop.
Endfeed - used to produce tapered cylindrical parts. The grinding wheel, the regulating wheel and the workpiece are set in fixed positions, and the workpiece fed from the front to a fixed end-stop.

Regulating wheels:
Diameter up to 350 mm (14")
Thickness up to 500 mm (20").

Centreless wheels:
Diameter up to 635 mm (25")
Thickness up to 500 mm (20")

Tool Room Grinding Wheels

Tool room wheels are available in the following abrasive types:
WA (white) for light stock removal, multi-purpose.
PA (pink) for medium stock removal, good for holding form.
AZ (WAB) (blue) for medium stock removal, good for holding form and for heat-sensitive materials.
RA (red) for heavy stock removal, good for holding form and for heat-sensitive materials.
AS (blue ceramic abrasive grit) for heavy stock removal, good for holding form, long life.
GC (green) for grinding carbide and non-ferrous metals.
Standard types: 1, 6, 11, 12. Additional shapes available on request.

Internal Grinding Wheels

For grinding internal diameters (I.D.), one of the most challenging grinding processes. The recommended wheel for internal grinding has a diameter of up to 2/3 of the final bore required.
CGW offers all sizes up to 150 mm (6") in diameter, types: 1, 5, 6.
Abrasive types: WA, RA, AS, PA, GC. Special types available on request.

Bench Grinding Wheels

Straight T-1 wheels are used for off-hand tool sharpening and grinding.
General purpose vitrified wheels for use on bench and pedestal grinders,
CGW bench wheels are available in diameters of up to 450 mm (18").
A - Aluminium oxide for steel and metal
GC - Green silicon carbide for carbide or non-ferrous metals
WA/PA - White or pink aluminium oxide for high-speed steel (HSS).

Dressing Wheels, Blocks and Sticks

CGW produces all types and dimensions of dressing wheels for diamond and CBN wheels, by customer request.
All types of sticks and blocks are available for various applications such as cleaning and knife sharpening (single- or double-layered).

Mounted Points

CGW offers a complete range of shaped and cylindrical mounted points.
Standard abrasive types:
PA for general purpose grinding
A for stainless steel (resin bond)
C for stone
All abrasive types are available on request.
Group A: shaped mounted point wheels with 6 mm (1/4") shank, for general purpose off-hand applications.
Group B: shaped mounted point wheels with 3 mm (1/8") shank, for light deburring of small areas.
Group W: cylindrical mounted points with 6 mm (1/4") or 3 mm (1/8") shank, used in off-hand and precision grinding operations for medium to heavy stock removal.

SPEED CONVERSION TABLE

High Cutting Speed Wheels are colour-coded in accordance with EN safety standard:

50 M/S	63 M/S	80 M/S	100 M/S
blue stripe	yellow stripe	red stripe	green stripe

Speed conversion table for speed of rotation and peripheral operating speed depending on the outside diameter of bonded abrasive products.

Wheel Diameter		Cutting speed (M/S)					
		10	16	20	25	32	35
inch	mm						
1/4	6	31,900	51,000	64,000	80,000	102,000	112,000
5/16	8	24,000	38,200	48,000	60,000	76,500	84,000
3/8	10	19,100	30,600	38,200	48,000	61,200	67,000
1/2	13	14,700	23,550	29,500	35,600	47,100	51,500
5/8	16	11,950	19,100	23,900	29,850	38,200	41,800
3/4	20	9,550	15,300	19,100	23,900	30,600	33,500
1	25	7,650	12,300	15,300	19,100	24,500	26,800
1-1/2	40	4,800	7,650	9,550	11,950	15,300	16,750
2	50	3,850	6,150	7,650	9,550	12,250	13,400
2-1/2	63	3,050	4,850	6,100	7,600	9,750	10,650
3	78/80	2,400	3,850	4,800	6,000	7,650	8,400
4	100/102	1,950	3,100	3,850	4,800	6,150	6,700
4-1/2	115	1,700	2,700	3,350	4,200	5,350	5,850
5	125	1,550	2,450	3,100	3,850	4,900	5,350
6	150/155	1,300	2,050	2,550	3,200	4,100	4,500
7	175/180	1,100	1,700	2,150	2,700	3,400	3,750
8	200/205	955	1,550	1,950	2,400	3,100	3,350
9	230	830	1,350	1,700	2,100	2,700	2,950
10	250/254	765	1,250	1,550	1,950	2,450	2,700
12	300/305	640	1,050	1,300	1,600	2,050	2,250
14	350/356	550	875	1,100	1,400	1,750	1,950
16	400/406	480	765	960	1,200	1,550	1,700
18	450/457	425	680	850	1,100	1,400	1,500
20	500/508	385	615	765	960	1,250	1,350
24	600/610	320	510	640	800	1,050	1,150
30	750/762	255	410	510	640	820	895
32	800/813	240	385	480	600	765	840
36	900/914	215	340	425	535	680	750
40	1000/1015	195	310	385	480	615	670

*mm sizes are approximate cutting speed = peripheral operating speed

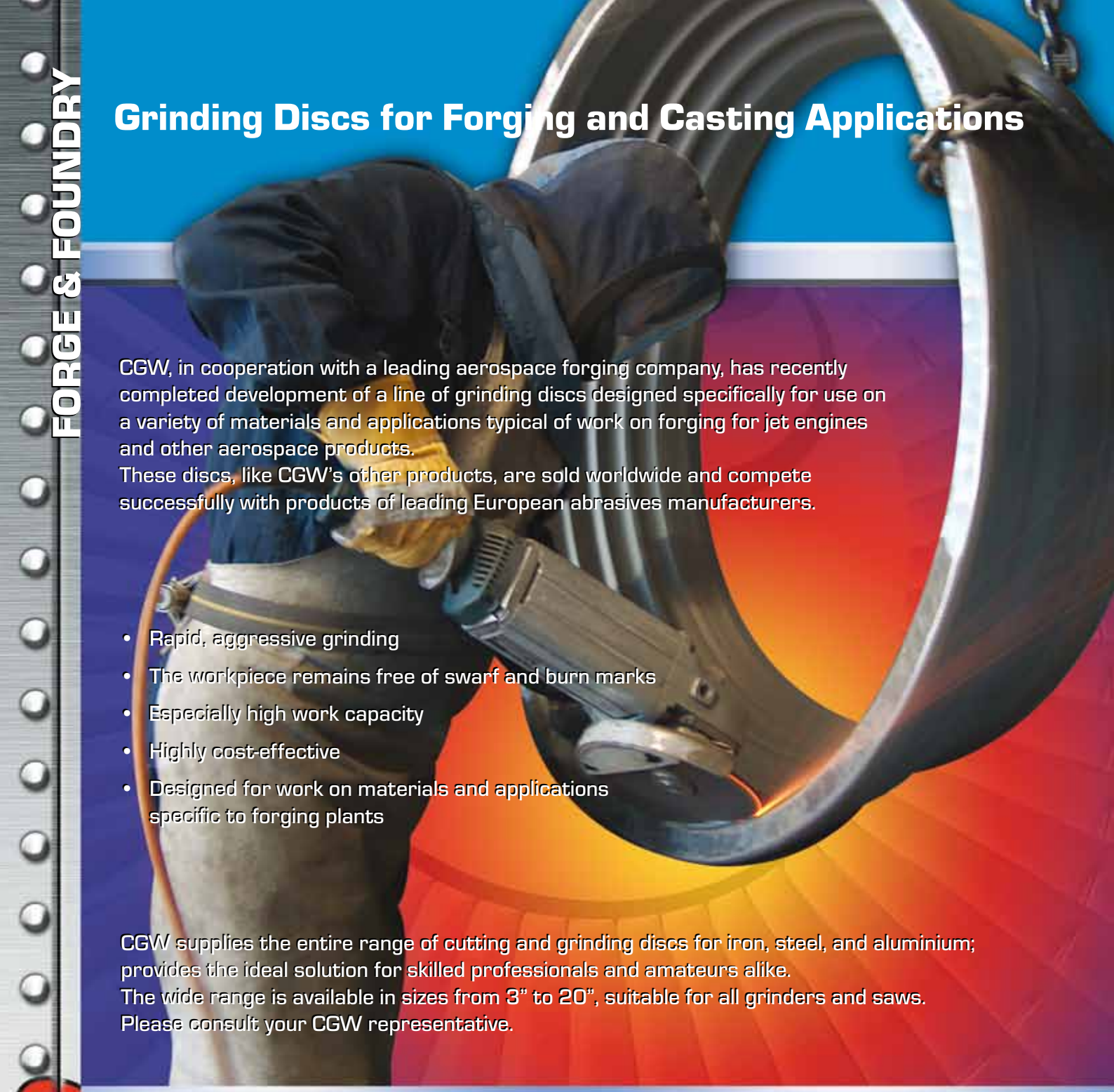
Equation for cutting speed (M/S) conversion to R.P.M. and back:

$$\frac{\text{cutting speed (M/S) x 60,000}}{\text{wheel diameter (mm) x 3.14}} = \text{R.P.M.}$$

$$\frac{\text{R.P.M. x wheel diameter (mm) x 3.14}}{\text{60,000}} = \text{cutting speed (M/S)}$$

Cutting speed (M/S)						Wheel Diameter	
40	50	63	80	100	125	inch	mm
128,000	160,000	201,000				1/4	6
95,500	120,000	150,500	191,000			5/16	8
76,500	95,500	120,500	153,000	191,000		3/8	10
58,800	73,500	92,100	118,000	147,000	184,000	1/2	13
47,800	59,700	75,200	95,500	120,000	150,000	5/8	16
38,200	47,800	60,200	76,500	95,500	120,000	3/4	20
30,000	38,200	48,200	61,200	76,500	95,500	1	25
19,100	23,900	30,100	38,200	47,200	59,700	1-1/2	40
15,300	19,100	24,100	30,600	38,200	47,750	2	50
12,150	15,200	19,100	24,300	30,250	37,900	2-1/2	63
9,500	12,000	15,100	19,100	23,900	29,850	3	78/80
7,650	9,550	12,100	15,000	19,100	23,900	4	100/102
6,650	8,350	10,500	13,300	16,650	20,800	4-1/2	115
6,150	7,650	9,650	12,250	15,300	19,100	5	125
5,100	6,400	8,050	10,200	12,700	16,000	6	150/155
4,250	5,350	6,700	8,500	10,650	13,300	7	175/180
3,850	4,800	6,050	7,650	9,300	11,650	8	200/205
3,350	4,200	5,250	6,650	8,350	10,400	9	230
3,100	3,850	4,850	6,150	7,650	9,400	10	250/254
2,550	3,200	4,050	5,100	6,400	8,000	12	300/305
2,200	2,750	3,450	4,400	5,500	6,850	14	350/356
1,950	2,400	3,050	3,850	4,800	6,000	16	400/406
1,700	2,150	2,700	3,400	4,250	5,350	18	450/457
1,550	1,950	2,450	3,100	3,850	4,800	20	500/508
1,300	1,600	2,050	2,550	3,200	4,000	24	600/610
1,050	1,300	1,650	2,050	2,550	3,200	30	750/762
960	1,200	1,550	1,950	2,400	3,000	32	800/813
850	1,100	1,350	1,700	2,150	2,700	36	900/914
765	960	1,250	1,550	1,950	2,400	40	1000/1015

Grinding Discs for Forging and Casting Applications



CGW, in cooperation with a leading aerospace forging company, has recently completed development of a line of grinding discs designed specifically for use on a variety of materials and applications typical of work on forging for jet engines and other aerospace products.
These discs, like CGW's other products, are sold worldwide and compete successfully with products of leading European abrasives manufacturers.

- Rapid, aggressive grinding
- The workpiece remains free of swarf and burn marks
- Especially high work capacity
- Highly cost-effective
- Designed for work on materials and applications specific to forging plants

CGW supplies the entire range of cutting and grinding discs for iron, steel, and aluminium; provides the ideal solution for skilled professionals and amateurs alike.
The wide range is available in sizes from 3" to 20", suitable for all grinders and saws.
Please consult your CGW representative.

SIZE (mm)	SPECIFICATION	TYPE	M/S	Max. R.P.M.	Package Qty	APPLICATION
180 x 8 x 22.23	A 24 N BF	T-27	80	8,500	25	WASPALOY
230 x 8 x 22.23	A 24 N BF	T-27	80	6,650	25	WASPALOY
180 x 7 x 22.23	C 24 R BF	T-27	80	8,500	25	TITANIUM
230 x 7 x 22.23	C 24 R BF	T-27	80	6,650	25	TITANIUM
180 x 7 x 22.23	ZA 24 T BF	T-27	80	8,500	25	INCONEL
230 x 7 x 22.23	ZA 24 T BF	T-27	80	6,650	25	INCONEL

* Other sizes are available upon request


FLAP DISCS
CGW supplies the entire range of coated abrasive products: flap-discs in a variety of grains and sizes, fiber discs of all types, flap wheels on shafts, Garnet Paper sheets, and paper rolls with aluminium oxide or silicon carbide.
CGW
CAMEL GRINDING WHEELS
camelflap-

ELECTROPLATED GRINDING PINS

Description and principle use:

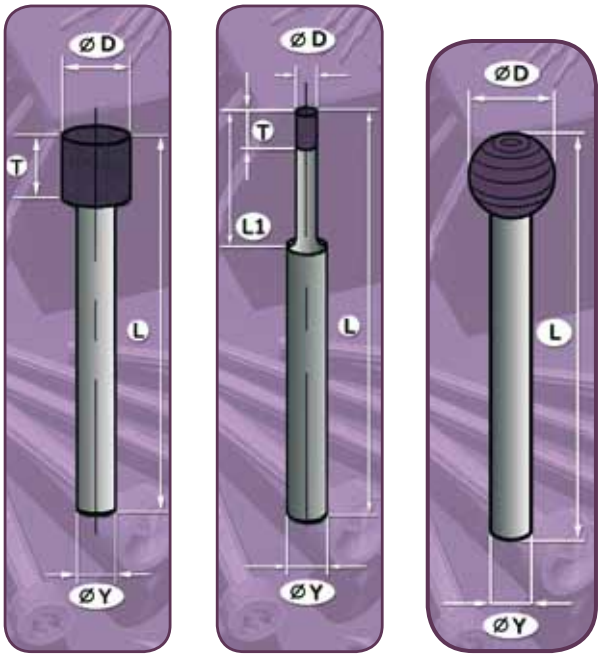
CGW's pins are used for grinding carbide, ceramics, glass, and hardened steels. Commonly used on die grinders. May also be used on internal grinding machines.

Grit Size:
Available in D from grit 30 up to 252.
Addtional grit sizes are available upon request.

Shank sizes of Ø8 and Ø10mm, as well as carbide shanks, are also available.
Tolerance: D<Ø2mm = ±0.05mm,
D>Ø2mm= ±0.15mm, T= ±1.0mm, L1= ±1.0mm,
Y= h6, L= ±1.0mm

All PM grinding pins are available in diameters, grit sizes and in inch measurements, upon request.

D = Diamond
B = CBN



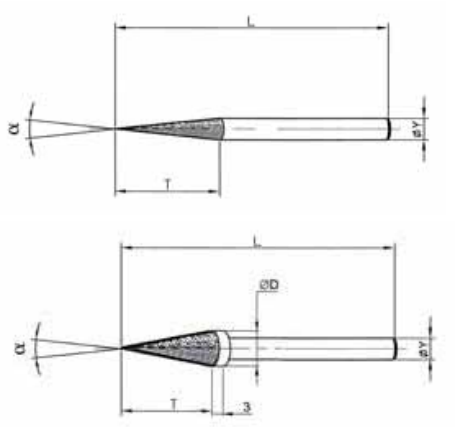
PK Pins for grinding tungsten carbide wire drawing dies

Description and principle use:

CGW's diamond-plated tapered pins are ideal for grinding or ripping tungsten carbide drawing dies for the wire and tube industries. They are also used for cold heading dies.

Grit Size:
Available in D or B91 (#170/200), D or B126 (#120/140), D or B181 (#80/100).
Additional grit sizes are available upon request.

Cat. no.	D	T	Y	L	α
PK3x8-01	3	19	3	55	8
PK3x10-01	3	17	3	55	10
PK3x12-01	3	14	3	55	12
PK3x15-01	3	11	3	55	15
PK3x20-01	3	8.5	3	55	20
PK5x8-01	5	36	6	75	8
PK6x10-01	6	33	6	100	10
PK6x12-01	6	29	6	100	12
PK6x14-01	6	24	6	100	14
PK6x16-01	6	21	6	62	16
PK6x20-01	6	18	6	58	20
PK6x30-01	6	12	6	52	30
PK⅛x8-01	⅛	21	⅛	63	8
PK⅛x10-01	⅛	17	⅛	63	10
PK⅛x12-01	⅛	14	⅛	63	12
PK¼x8-01	¼	44	¼	76	8
PK¼x10-01	¼	35	¼	76	10
PK¼x12-01	¼	29	¼	76	12
PK⅜x8-01	⅜	67	¼	100	8
PK⅜x10-01	⅜	53	¼	89	10
PK⅜x12-01	⅜	44	¼	76	12



Minimum clamping length = half of total length: Le=0.5xL
Shank sizes of Ø8 and Ø10mm, as well as carbide shanks, are also available.
Grinding pins are available in inch measurements.
For this type of custom-made shape pin, please refer to the PK drawing.

NF ELECTROPLATED DIAMOND NEEDLE FILES

Description and principle use:

CGW's medium-sized needle files are a popular choice for grinding a range of metals and hard materials, such as tungsten carbide, steels of 40Hrc and harder, ceramic materials, and glass. They are a must in any tool and die shop, and in extrusion and repair of hardened alloys and ceramics. The NF file has a round shank of Ø3.0mm, suitable for handle (available upon request).

Sizes:
Needle files are manufactured in 2 lengths:
NF - Total length 140mm; diamond-coated length 70mm.
NFB - Total length 160mm; diamond-coated length 85mm.

Grit size:
Standard grit sizes: D91 (#170/200), D126 (#120/140), D181 (#80/100).
Additional grit sizes and profiles are available upon request.

Set: Cat. no. 4205 Includes the following 5 profiles:
2112 ▭, 2132 △, 2142 ▯, 2152 ◠, 2162 ●.
Available in grit sizes: D30, D54, D91, D126, D181.

Set: Cat. no. 4205B Includes the following 5 profiles:
2112B ▭, 2132B △, 2142B ▯, 2152B ◠, 2162B ●.
Available in grit sizes: D91, D126, D181.

Profile	Description	Size mm*	Item no.	
	Barrette	5.0x1.7 5.2x2.0	2102T 2102TB	
	Equalling	5.1x1.4 5.7x1.6	2112 2112B	
	Equalling One Side	4.8x1.3	2112-1	
	Equalling Round Edge	5.1x1.5	2112R	
	Warding	5.2x1.4	2122	
	Crochet	5.0x1.5	2122R	
	Three Square	3.9 4.3	2132 2132B	
	Square	2.5 2.7	2142 2142B	
	Half Round	5.4x1.9 5.9x2.2	2152 2152B	
	Round	3.0 3.2	2162 2162B	
	Knife	5.4X1.6	2172	
	Slitting	5.1X2.3	2182	
	Crossing	4.7X2.2	2192	

HB ELECTROPLATED DIAMOND FILES

Description and principle use:

CGW's HB files are manufactured in large dimensions for long life on heavy duty applications. Especially suitable for filing large areas of various metals, hard plastics, fiberglass, graphite, and epoxy materials. The HB file has a square shank, suitable for handle (available upon request).

Size:
Total length 220mm; diamond-coated length 110mm.

Grit Size:
Standard grit sizes: D91 (#170/200), D126 (#120/140), D181 (#80/100).
Additional grit sizes are available upon request.

Cat. no. HB2627
The HB set includes one of each of the above files.

Profile	Description	Size mm*	Item no.	
	Equalling	10.4x2.8	HB2601	
	Half Round	12.6x3.9	HB2602	
	Three Square	9.7	HB2607	
	Square	6.1	HB2608	
	Round	6.8	HB2610	

MI ELECTROPLATED ESCAPEMENT FILES

Description and principle use:

CGW's Mini files are used in a variety of applications that require fine and accurate work. Mini files are manufactured in 7 popular profiles. The compact Mini set fits easily into a pocket.

Size:
Total length 140mm, diamond-coated length 40mm.

Grit Size:
Available in grit sizes: D30 (#600), D54 (#325/400), D91 (#170/200), D126 (#120/140), D181 (#80/100).
Additional grit sizes are available upon request.

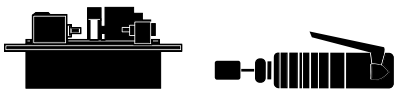
Cat. no. MI8632
The Mini set includes 5 files: 8608, 8614, 8617, 8619 and 8621.

	Half Round	4.3x1.8	MI8608	
	Crossing	4.2x1.8	MI8609	
	Barrette	3.9x1.4	MI8610	
	Three Square	3.1	MI8614	
	Equalling	3.9x1.1	MI8617	
	Square	2.0	MI8619	
	Round	1.7	MI8621	

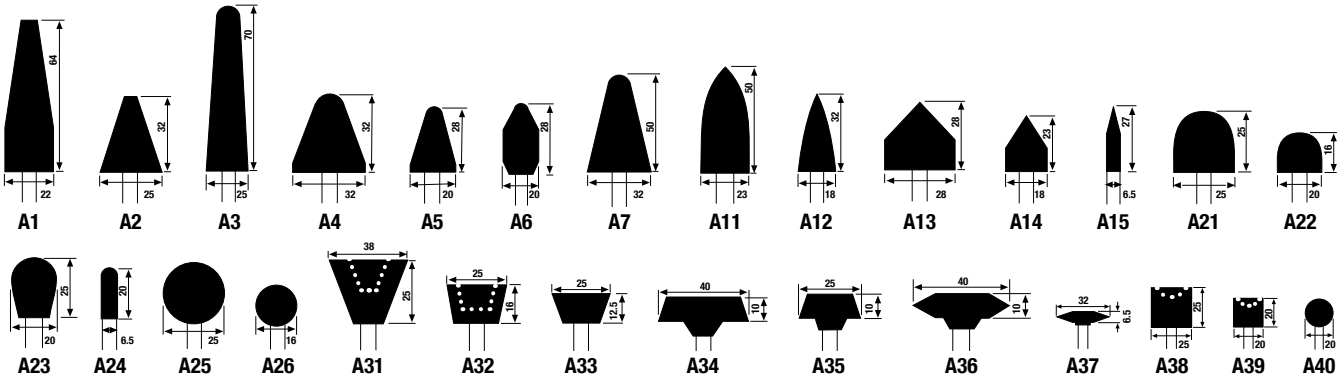
MOUNTED POINTS

CGW offers a full range of mounted points:

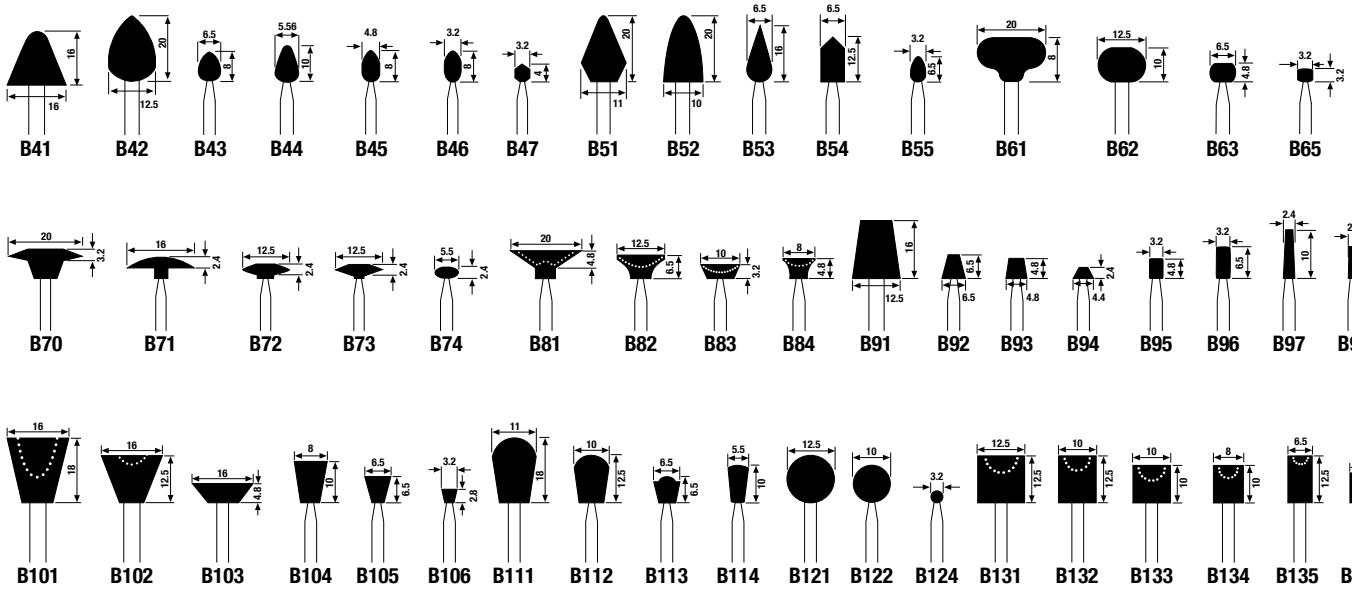
General purpose: PA60P/QV
Heavy duty use: PA36P/QV
Non-ferrous metals and stone: C36QV
Stainless steel: A46QB
Castings: A/PA20S5V



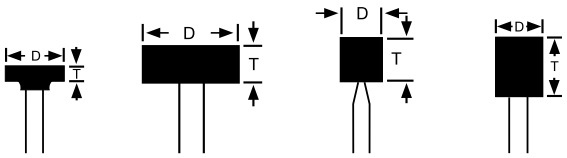
Group A (6mm mandrel)



Group B (3mm mandrel)



Group W (3mm and 6mm mandrel)



D = diameter (from 3.2mm to 50mm)

T = height (from 3.2mm to 50mm)

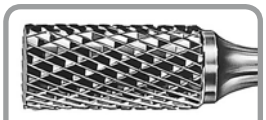
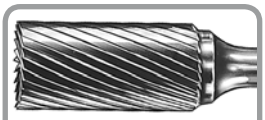
* All mounted points are available in packages of 10 or 50 pcs.
To order special items, please consult your CGW representative.

CARBIDE ROTARY BURRS


DIE GRINDER

Carbide burrs or rotary files are made in a variety of shapes and types, and are used for deburring, drilling, milling, and finishing numerous shapes and materials, including aluminium, copper, plastic, stainless steel, iron, castings, and titanium. For use on hand-held pneumatic and electric die grinders.

Matching burr type to application

BURR TYPE / APPLICATION	 ALU	 C	 D	 S
Aluminium	●			
Copper		●	●	●
Fibreglass			●	
Cast iron		●	●	●
Plastic	●	●	●	●
Hard rubber	●	●	●	●
Iron alloys			●	
Stainless steel		●	●	●
Nickel		●	●	●
Titanium			●	●
Zinc alloys	●			
Magnesium	●			

S Standard tooth formation for general-purpose deburring
D Diamond tooth for use on hard metals. Produces high surface quality, very small metal shavings and no blockage (double tooth)
C For general-purpose deburring on high-tensile steel; small shavings, fast and easy (double tooth)
ALU Aluminium tooth for processing non-metals and soft materials. Quick, easy stock removal.

Recommended operating speeds, by application

	Ø 3 mm	Ø 6 mm	Ø 10 mm	Ø 12 mm	Ø 16 mm
Steel	60,000 - 90,000	45,000 - 60,000	30,000 - 40,000	22,500 - 30,000	18,000 - 24,000
Hardened steel	60,000 - 90,000	30,000 - 45,000	19,000 - 30,000	15,000 - 22,500	12,000 - 18,000
Stainless steel	60,000 - 90,000	30,000 - 45,000	19,000 - 30,000	15,000 - 22,500	12,000 - 18,000
Grey castings	45,000 - 90,000	22,500 - 60,000	15,000 - 40-000	11,000 - 30,000	9,000 - 24,000
Titanium	60,000 - 90,000	30,000 - 45,000	19,000 - 30,000	15,000 - 22,500	12,000 - 18,000
Nickel	60,000 - 90,000	30,000 - 45,000	19,000 - 30,000	15,000 - 22,500	12,000 - 18,000
Copper	45,000 - 90,000	22,500 - 60,000	15,000 - 40-000	11,000 - 30,000	9,000 - 24,000
Aluminium	30,000 - 90,000	15,000 - 70,000	10,000 - 50,000	7,000 - 38,000	6,000 - 30,000
Plastic	30,000 - 90,000	15,000 - 70,000	10,000 - 50,000	7,000 - 38,000	6,000 - 30,000

* All burrs are available separately.
To order individual items, please consult your CGW representative.

SETS OF CARBIDE BURRS

Set of 10 burrs

EAN code: 597 482

Contents:
1 pc each of 10 assorted shapes
Shank diameter: 6mm

Set of 20 or 40 burrs

EAN code: 753 789

Contents:
1 or 2 pcs each of the following 20 different shapes:

1402D
1502D
1602D
1702D-1
3400D
3500D
3600D
3700D-1
9400D
9500D
9600D
9700D
6400D
6450D
6800D
4400D
4500D
4600D-1
4700D

IQNet®

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and
THE STANDARDS INSTITUTION OF ISRAEL
hereby certify that the organization

C.G.W - CAMEL GRINDING WHEEL WORKS
SARID LTD.
SARID

for the following field of activities

MANUFACTURE OF ABRASIVE GRINDING WHEELS, ABRASIVE CUT-OFF DISCS, COATED ABRASIVES, MOUNTED POINTS AND FLAPDISCS.

has implemented and maintains a

Quality Management System

which fulfills the requirements of the following standard/s

ISO 9001:2008

Issued on :	*16 . 07 . 2009*
Date of expiration:	*16 . 09 . 2012*
Date of initial approval:	*26 . 09 . 1996*

Registration number: ***IL- 48763***

IQNet

René Wasmer
President of IQNet

Dire

IQNet Partners*: AENOR *Spain* AFAQ AFNOR *France* AIB-Vincotte International *Belgium* ANCE CQC *China* CQM *China* CQS *Czech Republic* Cro Cert *Croatia* DQS *Germany* DS *Denmark* ELOT *Greece* HKQAA *Hong Kong China* ICONTEC *Colombia* IMNC *Mexico* Inspecta Certification *Finland* IRAM *Argentina* Nemko AS *Norway* NSAI *Ireland* PCBC *Poland* QMI *Canada* Quality Austria *Austria* RR SII *Israel* SIQ *Slovenia* SIRIM QAS International *Malaysia* SQS *Switzerland* SRAC *Romania* TE IQNet is represented in the USA by: AFAQ AFNOR, CISQ, DQS, NSAI Inc., C
* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is av

Membership Certificate

The Organization for the Safety of Abrasives (oSa®)

herewith grants to the company

C.G.W. - CAMEL GRINDING WHEELS

based on the Application Form, oSa®-Constitution and Conditions of Use for the oSa® Trademark the right until withdrawn to use the oSa® mark in the described colours for the abrasives notified.

The membership also covers affiliated companies on condition that these fulfill the requirements stipulated in § 6 para. 1 of the oSa®-Constitution and § 2.4 of the Conditions of Use for the oSa®-Trademark respectively.

This right applies to the designation of the registered tools as well as their packaging or labelling.

Bonn, 01 August 2003

Executive Board

Organization for the Safety of Abrasives (oSa®) · Oxfordstraße 8 · D-53111 Bonn · Germany

CGW
CAMEL GRINDING WHEELS

CAMEL GRINDING WHEELS (Israël)

awarded

by

Philippe DANIEL LAMAZIERE

Deputy Purchasing General Manager

for the

Best non producting purchasing supplier - Snecma 2008

J.-P. Louis	B. Delahaye	E. Dautriat	D. Vaugier	P. Daniel Lamazière
VP Industrial Operations	*Purchasing General Manager*	*VP Quality*	*General Manager Supply Chain*	*Deputy Purchasing General Manager*

Ce diplôme a été remis officiellement par les membres du jury Snecma à l'occasion du Symposium Fournisseurs 2008.

Snecma
SAFRAN Group

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