Wheel Specifications

Abrasive

A	Brown Aluminium Oxide
BAS	High performance Aluminium Oxide
WA	White Aluminium Oxide
WAB	White Aluminium Oxide+Blue Bond
WAR	White Aluminium Oxide+Red Bond
WAY	White Aluminium Oxide+Yellow Bond
WAG	White Aluminium Oxide+Special Bond I
WAP	White Aluminium Oxide+Special Bond II
WAL	Special grain and bond for improved surface integrity
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 and Brown Aluminium Oxide
SA	Semi-friable Aluminium Oxide
HA	Monocrystal Aluminium Oxide
KA	Bubble alumina
GC	Green Silicon Carbide
C	Black Silicon Carbide

Grain Size

Coarse	24, 30, 36
Medium	46, 54, 60
Fine	80, 100, 120, 150
Very Fine	180, 220, 240

Grade

Soft	B, C, D, E, F, G, H
Medium	I, J, K, L
Hard	M, N, O, P, Q

Structure

Medium/Standard				**Open/Porous**					
6	7	8	9	10	11	12	13	14	15

Bond

V	Vitrified
B	Resinoid
BF	Reinforced Resinoid

Wheel Dimensions

External Diameter	up to 635mm / 25"
Width	up to 500mm / 20"
Internal diameter (bore)	up to 406mm / 16"

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

Abrasive Grain

There are two main categories of grain:

Aluminium Oxide, for grinding high-tensile steels, i.e. hardened or high-speed steels.

Silicon Carbide, for grinding low-tensile steels, cast iron, carbides, and non-ferrous metals.

CGW Grain Types

A - Brown Aluminium Oxide: the most common of all grains, this grain is used for heavy-duty general-purpose work.

BAS - Blue Fired Aluminium Oxide: improved, specially prepared grain for centerless grinding.

SA (94A) - Semi-friable Aluminium Oxide: its principal use is in cylindrical and centerless grinding wheels. It can be used to grind both soft and hard steels.

WA - White Aluminium Oxide: the high friability of this grain enables fast and cool cutting. Suitable for light grinding of steels of all kinds, particularly tool 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. Also available as **WAR - White Aluminium Oxide + Red Bond**, when there is a need to differentiate from AS.

AS - Ceramic Aluminium Oxide: ceramic grain, blended with white aluminium oxide, creates a wheel with maximum grinding performance and long life. Excellent for form holding and cool cut. Available in AS1, AS3, AS5.

PA - Pink Aluminium Oxide: this tough but friable grain makes a good general-purpose wheel, excellent on large surface areas.

RA - Ruby (Red) Aluminium Oxide: harder than PA and WAB, this grain is good for use on high-chromium steel.

DA - The combination of A and WA is ideal for precision grinding operations such as large surface grinding.

WAY - White Aluminium Oxide + Yellow Bond: used primarily in wheels that require a very open structure. For creep-feed grinding with continuous dressing.

WAG - White Aluminium Oxide + New CGW-developed Bond: used primarily in wheels with a very open structure. Excellent for creep-feed grinding with non-continuous dressing.

WAP - White Aluminium Oxide + New CGW-developed Bond: special wheels for 80 M/S cutting speed. Designed to perform light, fast passes over the blade or other workpiece.

WAL - 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) - Monocrystalline Aluminium Oxide: a strong, sharp grain, suitable for a wide range of materials and applications. Especially suitable for use on high-alloy steels that are sensitive to heat.

C - Black Silicon Carbide: sharper than aluminium oxide and therefore more effective in grinding low-tensile materials and non-ferrous metals.

GC - Green Silcon Carbide: more friable than C, recommended for grinding cemented carbide cutting tools.

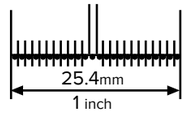
KA - Bubble Alumina: for grinding soft, malleable materials such as rubber and polyester.

Technical Information

Grain Size

Grain size ("MESH" size) is determined by the number of openings per linear inch in the smallest standard mesh through which the given grain will pass and larger grains will not. Thus a fine grain will be designated by a larger number than a coarse grain.

$$1_{mm} \simeq = \frac{25.4}{24} = \text{grit } 24$$
MESH



Grade (Hardness)

The grade of a wheel is designated by a letter of the alphabet from A (soft) to Z (hard) and indicates the ability of the bond to hold the abrasive grains together. The type and amount of bond used determine the hardness of the wheel. In a soft grade wheel, grains that have been worn down are released quickly in order to expose new, sharper grains. In a hard wheel, the eroded grains are retained and can only be released by dressing the wheel.

Hardness-Structure Diagram

Grade		Closed ← Structure → Open						
		5	6	7	8	9	10	11
Soft	H	H5	H6	H7	H8	H9	H10	H11
	I	I5	I6	I7	I8	I9	I10	I11
	J	J5	J6	J7	J8	J9	J10	J11
	K	K5	K6	K7	K8	K9	K10	K11
	L	L5	L6	L7	L8	L9	L10	L11
Hard	M	M5	M6	M7	M8	M9	M10	M11

Structure

"Structure" refers to the spacing of the abrasive grain within the bond, and is measured in terms of the volume content of the abrasive in the wheel. In a dense structure, the grains are close together and the pores small. In a more open structure, the grains are relatively far apart and the pores larger.

Structures 6-9:
medium/standard

Structures 10-15:
open/porous

Bond

The function of the bond is to hold the abrasive grains in a defined spacing to form a product of specified size and shape. Most commonly used are vitrified and resinoid bonds.

Vitrified Bond: various clays or ceramics are used to form bonds that allow for a wide range of structures, each with its special properties and grinding characteristics. Their strength is developed by firing in kilns to temperatures of up to 1,000°C. Vitrified-bonded wheels are excellent for precision grinding and fast stock removal because of their rigidity and friability.

Selecting Grinding Wheels

For maximum efficiency in any grinding operation, it is essential to have the right wheel for the job.

Factors to be considered when selecting a grinding wheel:

Workpiece

Type and hardness of the material: the harder the material, the softer the grade of wheel required.

Aluminium Oxide: most efficient for grinding high-tensile materials such as steel and ferrous castings. The more friable types of alumina are preferred for use on harder steels.

Silicon Carbide: for materials with low tensile strength, carbides, and non-ferrous metals.

Stock removal

The amount of stock to be removed affects the choice of grain size and bond type:

- A coarse grit (24-46 MESH) is suitable for high stock removal rates.
- Fine grits are best for fine finishes and tight tolerances.

Surface finish

High surface finish is achieved using a fine grit. The best quality surface finish also requires, in addition to a fine grit, a dense or close structure.

Grinding machine

- The power available defines the rate of stock removal. The greater the power available, the harder the grade of wheel required for efficient operation.
- Deterioration in machine condition leads to vibration and early breakdown of the wheel.

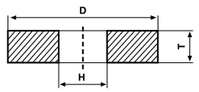
Grinding fluids

- Grinding fluids are used to provide cooling and/or lubrication. Correct use is an important factor in achieving satisfactory results.
- Coolants and lubricants are capable of reducing heat formation. The relative importance of cooling vs. lubrication determines whether a water-based coolant or an oil-based lubricant is used. Coolants are usually able to transfer the heat away from the workpiece, but are unable to prevent heat from developing.
- In dry grinding, the temperature at the grinding point is not much higher than in wet grinding, but the rate of heat formation is much higher.

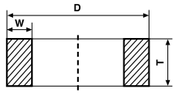
Standard Types and Shapes of Abrasive Wheels

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

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)
W	Width of wall



1 DxTxH



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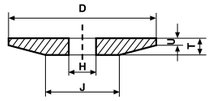

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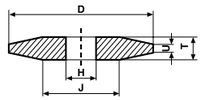

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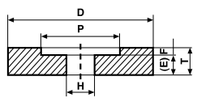
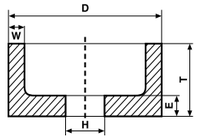
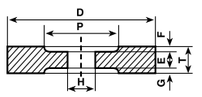


5 DxTxH-PxF



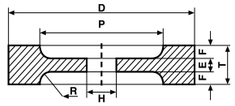
6 DxTxH-W..E..



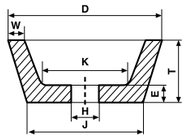
7 DxTxH-PxF

or if recesses are not the same size:

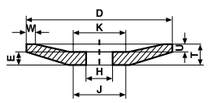
DxTxH-PxF/G



9 DxTxH-PxF R..



11 D/JxTxH-W..E..



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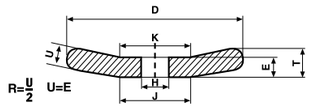

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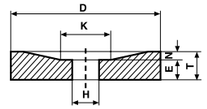
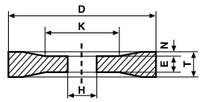


20 D/KxT/NxH



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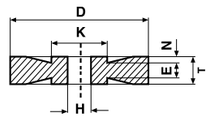
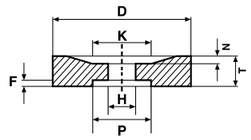
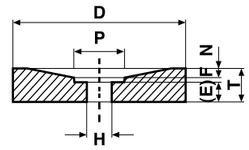


21A D/KxT/NxH

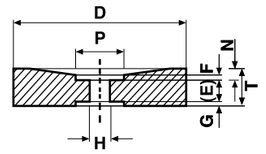


22 D/KxT/NxH-PxF

Standard Types and Shapes of Abrasive Wheels (cont.)



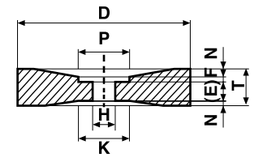
23 DxT/NxH-PxF



24 DxT/NxH-PxF

or if recesses are not the same size:

DxT/NxH-PxF/G



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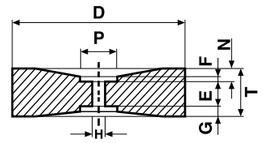
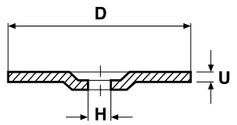


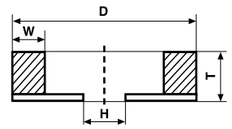
26 DxT/NxH-PxF

or if recesses are not the same size:

DxT/NxH-PxF/G

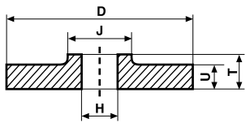


27 DxUxH

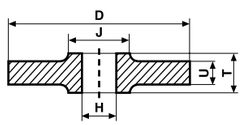


35 DxTxH-W

attached to plate



38 D/JxT/UxH



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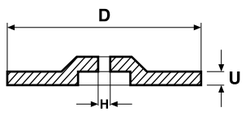
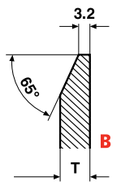


43 DxUxH

Standard Profiles



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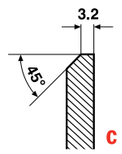

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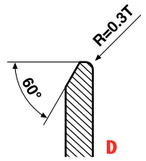

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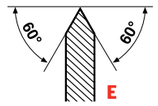

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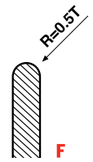

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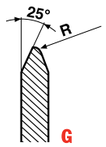
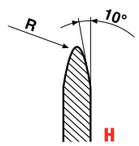
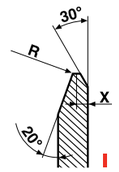


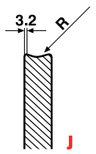
G R=T/8



H R=T/8



I R=T/8 X=T/3



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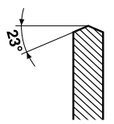

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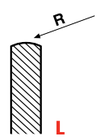
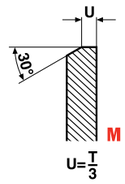
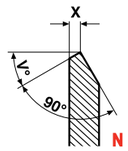


L R=T



M U=T/3



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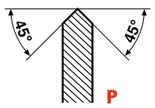

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