



Grinding Wheel: Definition, Types, Grain, Grade, Structure, Bond, Specifications, and Selection

As my previous article of [Grinding Machine](#), I told, **grinding is an important operation in a manufacturing industry to get a final product**, so for that we need to know about the **grinding wheel and its properties** so that we easily choose a right wheel for the right material.

I assumed that you already have a brief idea about Grinding Machine. **Don't worry!** if you not learned yet you can check my [complete guide on grinding machine where I mentioned the parts, types, and operations of a grinding machine](#).

So hello viewers in today's article you learn about the **definition, types, grain, grade, structure, bond, specifications, and selection of a Grinding wheel**. Also at the end of the article, I give you **PDF downloadable link**. So let's begin...

Grinding Wheel Definition:

Grinding wheels are expendable wheels composing of an [abrasive compound](#).

A Grinding wheel having multiple cutting edges made up of many hard a particle called as **abrasives**.

The abrasives are crushed to have sharp edges for cutting operations.

The **abrasive grains** are properly mixed with is a suitable bond, which acts as a holder when the wheel in use.

The grinding wheel may be manufactured in one piece or of segments of oppressive blocks build up into a solid wheel.

These wheels are available in different shapes mounted on a different form of Machines for a particular type of work.

Grinding wheels are manufactured with higher geometrical accuracy results in a more uniform and consistent wheel.



Abrasive:

Abrasive is material that helps to provide a shiny look on a surface.

Abrasives are two types:

- **Natural Abrasives** (Diamond, Quartz, Sand)
- **Artificial Abrasive** (Synthetic diamond, Tin oxide, Aluminum oxide, Silicon Carbide)

Superabrasives:

Superabrasives make up a special category of bonded abrasives designed for grinding the hardest, most challenging work materials.

Because carbides, high-speed steels, PCD, PCBN, ceramics and some other materials used to make cutting tools can be nearly as hard as conventional abrasives, the job of sharpening them falls to a special class of abrasives-diamond and the CBN, the super-abrasives.

These materials offer extreme hardness, but they are more expensive than conventional abrasives (silicon carbide and aluminum oxide). Therefore, **super-abrasive grinding wheels** have different construction than **conventional abrasive wheels**.

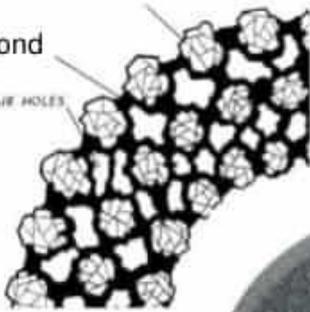
Grinding Wheels



Abrasive Particles

Bond

AIR HOLES



- Grinding wheel consists of **hard abrasive grains** called grits, which perform the cutting or material removal, held in the weak **bonding matrix**.
- A grinding wheel commonly identified by the type of the **abrasive material** used.

Types of Grinding Wheels:

In general, there are **10-types of grinding wheel available** in the market and those are:

1. Straight Grinding wheels
2. Cylinder or wheel ring
3. Tapered Grinding wheels
4. Straight cup
5. Dish cup
6. Saucer Grinding Wheels
7. Diamond Grinding Wheels



8. Segmented wheel
9. Flaring cup wheel
10. Mounted point wheel

Straight Grinding wheels:

The straight wheel is the most common mode of a wheel that is found on [pedestal or bench grinders](#).

This is the one widely used for [centreless & cylindrical surface grinding operations](#).

As it is used only on the periphery, it forms a little concave surface on the piece.

This is used to gain on several tools like chisels.

The size of these wheels differs to a great extent, width & diameter of its face obviously depends on the category of its work, machines grinding power.

Cylinder or wheel ring Grinding wheels:

A cylinder wheel has no center mounting support but has a long & wide surface.

Their width is up to 12" and is used purely in horizontal or vertical spindle grinders.

This is used to produce a flat surface, here we do grinding with the ending face of the wheel.

Tapered Grinding wheels:

A tapered Grinding wheel is a straight wheel that tapers externally towards the midpoint of the wheel.

As this pact is stronger than straight wheels, it accepts advanced lateral loads.

The straight wheel with a tapered face is chiefly used for gear teeth, grinding threads, etc.

Straight cup Grinding wheels:

This Straight cup wheel forms an option for cup wheels in cutter and tool grinders, having an extra radial surface of grinding is favorable.



Dish cup grinding wheels:

In fact, this is used primarily in jig grinding and cutter grinding.

It is a very thin cup-style grinding wheel which permits grinding in crevices and slot.

Saucer Grinding wheels:

Saucer Grinding Wheel is an exceptional grinding profile used for grinding twist drills and milling cutters.

This finds wide usage in non-machining areas, as these saw filers are used by saucer wheels to maintain saw blades.

Diamond Grinding wheels:

In diamond wheels, industrial diamonds remain bonded to the edge.

This is used to grind hard materials like concrete, gemstones & carbide tips. A slitting saw is designed for slicing gemstones like hard materials.



Diamond grinding wheel (CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=90186>)

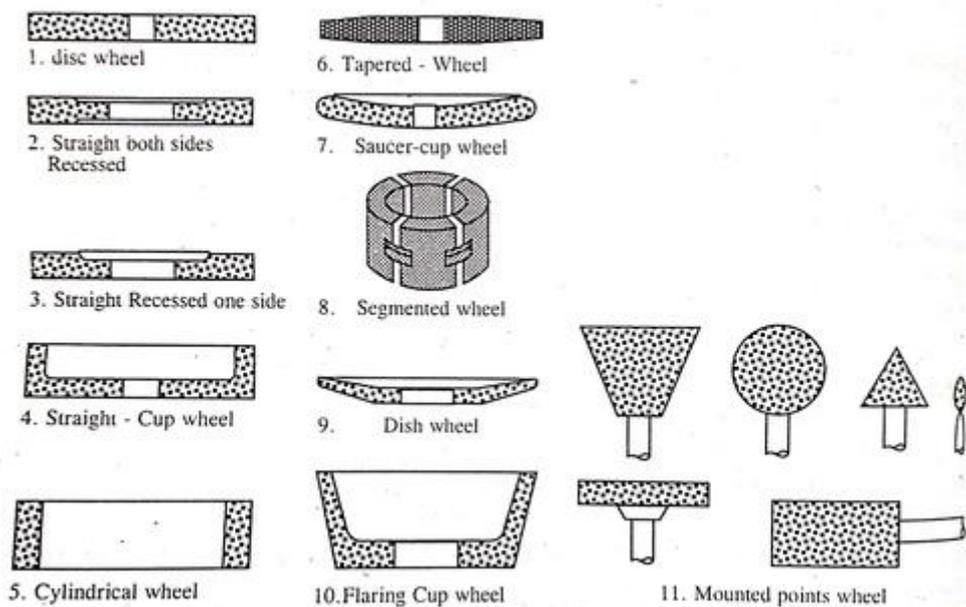


Diagram of all types of grinding wheel

Grit or Grain of Grinding wheel:

The grit or grain is used to indicate a general size of abrasive for making a **grinding wheel**.

Grits or Grain size is denoted by a number indicates the number of meshes per linear inch of the screen through which the grain pass when they are graded after crushing.

Generally, the coarse wheel is used for fast removal of the material and the finely graded wheel should be used to grind Hard, Brittle materials.

The **different Grits or Grain of the grinding wheel** as follows:



Types of Grit	Grit or Grain Size
Coarse	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, 500, 600

Grade of Grinding wheel:

The grade refers to the harness or strength with which the bond holds the abrasive grains of a grinding wheel in a place.

The Grade is indicated by the English alphabet A to Z.

A denotes Softest and Z denotes Hardest Grade.

The **different grade of the grinding wheel** as follows:

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

Structure of Grinding wheel:

The structure refers to the spacing between the abrasive grains in the grinding wheel.

It is denoted by the number of cutting edges per unit area of wheel face and size of void spaces between grains.

If there is a large number of cutting edges per unit area, the structure is called Dense structure otherwise it is called an open structure.



The **different structure of the grinding wheel** as follows:

Dense	1, 2, 3, 4, 5, 6, 7, 8
Open	9, 10, 11, 12, 13, 14, 15

Specification or Nomenclature of Grinding wheel:

The **Indian standard marking system** (IS: SS1-1954) has been used to indicate the various characteristics of a grinding wheel.

Each marking consists of 6 symbols, denoting the following characteristics:

1. Abrasive
2. Grain Size
3. Grade
4. Structure
5. Bond type
6. Manufactures record

W A 30 I 4 V 17

Here,

W (Prefix) = Manufacture abrasive type symbols.

A (Abrasive) = [A = Aluminium Oxide], [C = Silicon Carbide], [D = Diamond]

30 (Grain Size) = 4 Types of grain Size.



- Coarse= 10,12,14,16,20,24
- Medium=30,36,46,54,60
- Fine=80,100,120,150,180
- Very fine=220,240,280,320,400,500,600

I (Grade) = Grade categories in to 3 parts.

- Soft= A,B,C,D,E,F,G,H
- Medium=I,J,K,L,M,N,O,P
- Hard=Q,R,S,T,U,V,W,X,Y,Z

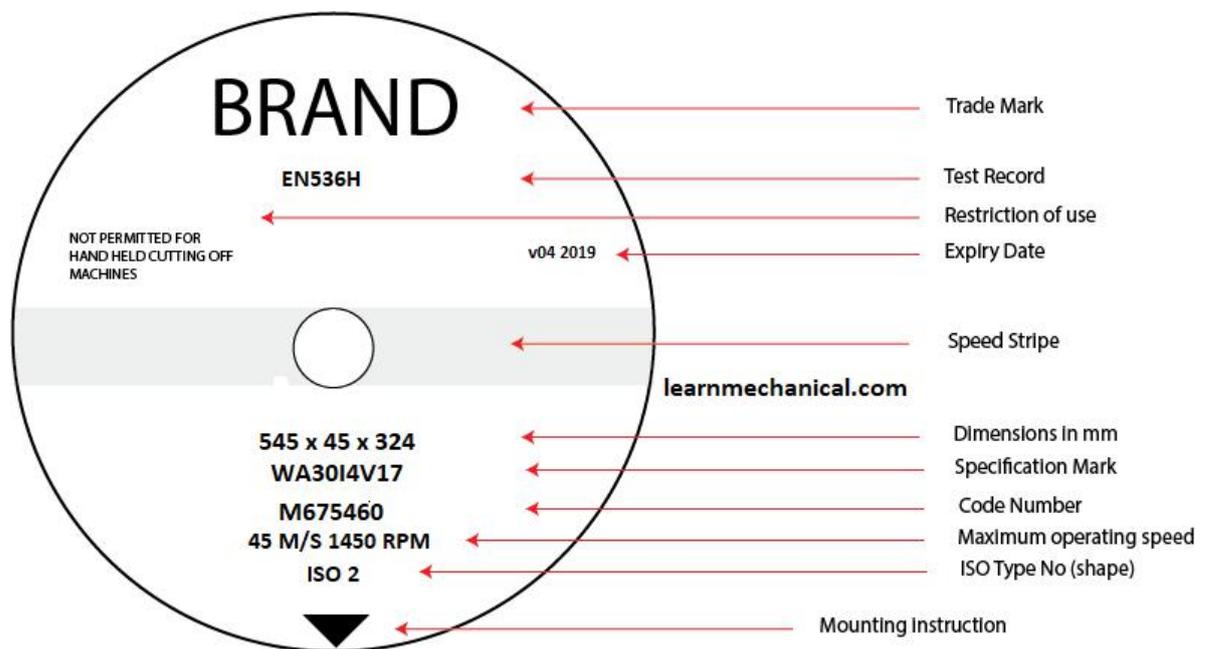
4 (Structure) = Structure categories in 2 parts.

- Dense= 1,2,3,4,5,6,7,8
- Open= 9,10,11,12,13,14,15

V (Bond Type) = Verified Bond

- V= verified
- B= Resionid
- R= Rubber
- E= Shellac
- S= Silicon
- O= Oxychloride

17 (Suffix) = Manufacturing abrasive type symbol



Applications of Grinding wheel:

- The main application of grinding wheel is to remove the material in the form of tiny chips and make the surface smooth as much as possible.
- The Grinding machine is a surface finishing Machine in which Grinding wheels are fixed (This is our tool) for surface finish.
- Even the grinding wheel are different type as discussed above and there uses for the different workpiece.

Grinding wheel bond types:

A bond is an abrasive material used to held abrasive particles together. The bonding material does not cut during the grinding operations.

Its main function is to hold the grains together with varying degrees of strength.

The different standard grinding wheel bonds are [vitrified](#), [resinoid](#), [silicate](#), [shellac](#), [rubber](#), and [metallic](#).



Factors affecting the selection of Grinding wheels:

Proper grinding wheel selection is essential to ensure that the required

- Part quality,
- Production rate, and
- The overall cost per part is achieved.

It is normally depends upon several terms like:

- The type of grinding operation we performed
- Grinding machine condition
- Requirement of surface finishing
- Shape and size of a workpiece
- Work piece material.

Difference between cutting wheel and Grinding Wheel?

In the grinding wheel, there is term Abrasive which we studied, it provides surface finishing helps to get good surface finish of the workpiece and also provides good luster.

Grinding Wheel

The grinding wheel has good strength which avoids cutting improper shape and size.

Cutting Wheel

The normal cutting tool doesn't have abrasive. So it will not provide better finishing accuracy as grinding wheel provides.



The chances of wear and tear are high in cutting wheel

A grinding wheel having low chances of wear and tear.

Price of a grinding wheel is more

The price of the cutting wheel is less than grinding wheel.

Conclusion:

Hola! now you are pro on selection of a grinding wheel, right? I hope you understand the **definition, types, grain, grade, structure, bond, specifications, and selection of a Grinding wheel** well and never forget in the future.

In case you wanna read this type of article on the Shaper machine and Lathe machine you can check these articles "[Shaper Machine: Definition, Parts, Types, and Operations](#)" and "[Lathe: Operation, Parts, and Types](#)"

If you have any queries or doubts about the lathe machine tool, you can ask me in the comment section or we have a dedicated Q&A platform for you where you directly post your question: [Click here to post your question](#), and also you can [join our facebook group](#). I will love to hear from you and glad to help you. Till then enjoy rest your day. Cheers