

A Glossary of Grinding Terms

Abrasive. A substance used in the processes of grinding, polishing and lapping of materials, which actually does the abrading or wearing away. Natural abrasives include corundum, emery, garnet and diamond. Man-made abrasives include aluminium oxide, silicon carbide, boron carbide, cubic boron nitride, and synthetic diamond.

Abrasive file. A special-shaped sharpening stone, used to reach into corners or rounded surfaces for special sharpening jobs.

Accuracy. Conformity in dimension to an exact standard or measurement.

Alumina. Unfused Aluminium Oxide.

Aluminium Oxide. An abrasive made by fusing the mineral Bauxite (Al_2O_3).

Alundum. Norton Company's registered trademark for aluminium oxide abrasive.

Arbor. The spindle of the grinding machine on which the wheel is mounted.

Arbor hole. The hole in a grinding wheel sized to fit the machine arbor.

Arc of contact. That portion of the circumference of a grinding wheel touching the work being ground.

Arkansas stone. An extremely hard quartzite, quarried in the Ozark Mountains, used as sharpening stones and abrasive files for producing the finest precision edges possible.

Armored diamond. A Norton trademarked name for diamond abrasive with a coating of metal applied directly to the diamond. The coating provides a tenacious bond, preventing premature loss to the diamond.

Aztec. A Norton trademark for a special heat-and-wear retardant bond used in CBN grinding wheels.

Balance (dynamic). A piece in static balance is in dynamic balance if, upon rotating, there is no vibration or "whip" action due to unequal distribution of its weight throughout its length.

Balance (static). A grinding wheel is in static balance when, centered on a frictionless horizontal arbor, it remains at rest in any position.

Balancing. Testing a wheel for balance, adding or subtracting weight to put a piece into either static or dynamic balance.

Bauxite. A mineral ore high in aluminium oxide content from which Alundum abrasive is manufactured.

Bearing. Point of support. The part of a machine in which the spindle revolves.

Bench stand. An offhand grinding machine with either one or two wheels mounted on a horizontal spindle, attached to a bench.

Blade. See cut-off wheel.

Blotter. A disc of compressible material usually of blotting paper stock, used between a wheel and flanges when mounting.

Bond. The material in a grinding wheel which holds the abrasive grains together.

Bonded abrasives. Grinding wheels, sharpening stones and other abrasive products in which the abrasive is held together with bonding material.

Boron carbide. An abrasive trademarked by Norton Company as Norbide.

Bort. Industrial-grade natural or man-made diamond suitable for use as an abrasive.

Brick. A block of bonded abrasive used for such purposes as rubbing down castings, scouring castings, general foundry and machine shop use, scouring chilled iron rolls, polishing marble, and work of like nature.

Brinnell hardness tester. A machine used for testing the indentation hardness of metals except very hard ones like tool steels.

Burning (the work). A change in the work being ground caused by the heat of grinding, usually accompanied by a surface discoloration.

Burr. A turned over edge of metal resulting from punching a sheet or form grinding or cutting-off applications.

Burring (pulpstones). Passing over the face of a pulpstone with a special tool to develop a pattern to provide a freer cutting surface.

Bushing. A material, usually lead, babbitt or sulfur, which sometimes serves as a lining for the hole in a grinding wheel.

Cam wheel. An expression used to designate wheels for grinding cam shafts.

CBN. Cubic boron nitride abrasive, a man-made abrasive used for precision grinding of steel.

Centrehole. Tapered precision holes in the ends of workpieces to be ground between centres on a cylindrical grinder.

Centrehole lapping. The cleaning or lapping of centreholes with a bonded abrasive wheel cemented onto a steel mandrel.

Centreless grinding. Grinding the outside or inside diameter of a round piece not mounted on centres not chucked.

Centers. Conical steel pins of a grinding machine upon which the work is centered and rotated during cylindrical grinding.

Ceramics. Science and art of clay working and various related industries. The use of vitrified bonds brings abrasive wheel manufacturing under this classification.

Chatter marks. Surface imperfections on the work being ground, usually caused by vibrations between the wheel and the work.

Chuck. A device for holding grinding wheels of special shape or for holding the workpiece being ground. See also magnetic chuck.

Coated abrasives. Abrasive products in which the abrasive is coated in a relatively thin layer on a backing of cloth, fibre or paper. Coated abrasive products include sheets, rolls, belts, discs and speciality shapes.

Collets. See Flanges.

Cone Wheel. A Type 17 wheel with a conical shape. Used in portable grinding.

Controlled structure. The Norton process of manufacturing grinding wheels, whereby the relationship between the abrasive and bond is positively controlled.

Coolant. See Grinding fluid.

Coping. Sawing stone with a grinding wheel.

Corner wear. The tendency of a grinding wheel to wear on a corner so that it does not grind sharp corners without fillets.

Corundum. A natural abrasive of the aluminium oxide type, of higher purity than emery.

Crank wheel. An expression used to designate wheels for grinding crankshafts.

Critical speed. See Maximum safe speed.

Crush truing (or forming). The process of using steel or tungsten carbide rolls to true or form grinding wheels to special face shapes.

Crystalline. Made up of crystals.

Crystallize. To convert into crystals.

Crystolon. Norton Company's registered trademark for silicon carbide abrasives.

Cubic boron nitride. An extremely hard man-made abrasive used for precision grinding of steels.

Cup wheel. A Type 6 grinding wheel shaped like a cup or bowl.

Cutters. The part of a mechanical dresser for grinding wheels which comes in contact with the wheel and actually does the dressing. See also Star dresser.

Cut-off wheel. A thin grinding wheel, often reinforced and usually made with an organic bond, used for cutting through workpiece material; an abrasive saw.

Cutting rate. The amount of material removed by a grinding wheel per unit of time.

Cutting surface. The surface or face of the wheel against which the material is ground.

Cylinder wheel. A grinding wheel of similar characteristics to a straight wheel, with large hole size in proportion to its diameter, and usually of several inches in height. Often reinforced with winding.

Cylindrical grinding. Grinding the outside surface of a cylindrical part mounted on centers.

Depressed-center wheels. See Raised hub wheels.

Deburring. The process of removing burrs from metal. See Burr.

Diamond dressing tool. A tool for dressing or truing a wheel, made with a single diamond point or with multiple points.

Diamond wheel. A grinding wheel in which the abrasive is mined or manufactured diamond.

Disc grinding. A type of grinding used to produce flat surface on workpieces. Parallel opposing surfaces can be ground with disc grinders having double spindles.

Disc wheel. A grinding wheel used in a disc grinder, with a shape similar to a Type 1 straight wheel. Usually mounted on a plate for reinforcement, using the side of the wheel for grinding.

Discoloration. See Burning (the work).

Dish wheel. A Type 12 wheel, shaped like a dish.

Dog. A device attached to the workpiece by means of which the work is revolved.

Dressers. Tools used for dressing a grinding wheel.

Dressing. The process of restoring, improving or altering the cutting action of the face of a grinding wheel.

Dressing stick. An abrasive stick used to dress the face of the grinding wheel.

Dry grinding. Performing a grinding operation without the use of grinding fluids.

Ductility. A characteristic of a material, usually metal, which indicates its capability of being readily pressed, drawn or otherwise formed into various shapes.

Emery. A natural abrasive of the aluminium oxide type.

External grinding. Grinding on the outside surface of an object as distinguished from internal grinding or cutting-off.

Face. The periphery of a grinding wheel. Also, the part of a grinding wheel that is brought into contact with the workpiece.

Face shape. The physical shape of the periphery or face of a grinding wheel. Designated by a letter in the wheel description.

Feed, cross. In surface grinding, the distance of horizontal feed of the wheel across the table.

Feed, down. In surface grinding, the rate at which the abrasive wheel is fed into the work.

Feed, index. In cylindrical grinding, a measurement indicated by the index of the machine. On most machines this measurement refers to the diameter of the work; on a few to the radius.

Feed lines. A pattern on the work produced by grinding. The finer the finish, the finer and more evident are these lines. Some types of feed lines indicate incorrect grinding condition.

Fin. A thin projection on a casting, usually removed by snagging.

Finish. The surface quality or appearance, such as that produced by grinding or other machining operation.

Finishing. The final cuts taken with a grinding wheel to obtain accuracy and the surface desired.

Flanges. The circular metal plates on a grinding machine used to drive the grinding wheel. (See wheel sleeves.)

Flaring cup. A Type 11 cup wheel with the rim extending from the back at an angle so that the diameter at the outer edge is greater than at the back.

Floorstand grinders. An offhand grinder, mounting either one or two wheels running on a horizontal spindle fixed to a metal base attached to the floor.

Fluting. Grinding the grooves of a twist drill or tap.

Form grinding. A type of grinding used to produce or finish a special form or shape in a workpiece.

Freehand grinding. See Offhand grinding.

Gate. The part of a casting formed by the opening in the mould through which the metal is poured. Often removed by snagging.

Gemini. Norton's trademark name for pre-engineered diamond wheels and cut-off wheels.

Generated heat. Heat resulting from the friction between the workpiece and the running grinding wheel.

Glazing. An extreme condition of loading on a grinding wheel face caused by dulled abrasive and a buildup of swarf, resulting in sharply decreased cutting rates.

G-Ratio. A measurement for grinding efficiency made by dividing cubic inches of metal removed from a workpieces by cubic inches of wheel wear.

Grade. The strength of bonding in a grinding wheel, also referred to as hardness.

Grain. The abrasive particles used in a grinding wheel. Also, loose abrasive materials.

Grain size. See Grit size.

Grain spacing. See Structure.

Grinding. The process of removing material with a grinding wheel.

Grinding action. The cutting ability of, and the finish produced by, a grinding wheel.

Grinding fluid. A liquid or solution used in wet grinding to cool the workpiece, lubricate the grinding wheel, clean away swarf, and prevent rust.

Grinding machine. Any machine on which a grinding wheel is operated.

Grinding wheel. A cutting tool of circular shape made of abrasive grains bonded together.

Grindstone. A flat, circular grinding wheel cut from natural sandstone sometimes used for sharpening tools.

Grit. See Grain.

Grit size. The size of the abrasive particles in a grinding wheel, classified according to the number of holes per square inch in a screen mesh.

Guard. A cover surrounding a grinding wheel, grinding machine table, or any moving part of the grinding machine. Used to protect the operator in case of wheel breakage, to direct sparks, swarf and carry fluid away from the operator, and provide machine safety in operation.

Hand grinding. See Offhand grinding.

Hand hone. A flat, metal stick with vitrified diamond abrasive on one or both ends, used for very fine touch-up jobs.

Hemming machine. A machine or process used for grinding flat surfaces, such as cutlery blades and ice skate blades.

Honing. An abrasive operation typically performed on internal cylindrical surfaces and employing bonded abrasive sticks in a special holder to remove stock and obtain surface accuracy.

Hoods. Metal guards used for protection against wheel breakage.

Huntington dresser. A tool using star-shaped cutters for truing and dressing grinding wheels.

India. Registered trademark of

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India. Registered trademark of Norton Company for oilstones for producing keen cutting edges. Made from Alundum abrasive and oil-impregnated.

Inserted nut. Disc, segment or cylinder wheels having nuts embedded in the back surface for mounting on the machine.

Internal grinding. Grinding the inside surface of the hole in a piece of work.

Lapping. A finishing process typically employing loose abrasive grain, but now often including similar types of operation with bonded abrasive wheels.

Loading. Filling of the pores of the grinding wheel surface with the material being ground, usually resulting in a decrease in a decrease in production and poor finish.

Lubricant. The liquid or solution used to lubricate the wheel and promote a more efficient cutting action.

Magnetic chuck. A workpiece-holding device used in surface grinding, which holds the workpiece by means of magnetic force.

Mandrel. A solid, cylindrical piece of metal on one end of which a grinding wheel or abrasive is mounted. The other end is fixed in the machine chuck. May be made of steel or a heavier metal to provide greater stability and resistance to whipping.

Maximum safe speed. The fastest speed at which a grinding wheel or mounted wheel can be operated safely. May be expressed as RPM or SFPM.

Metal bond. A bonding material used in diamond grinding wheels for work on non-metals such as germanium, stone, silicon, glass, asbestos, ceramics and ferrite.

Mounted wheels. Small grinding wheels, often with special shapes, that are mounted on metal mandrels.

Mounting. Putting a grinding wheel or the arbor or spindle of a grinding machine, and getting it ready to go to work.

Multi-point dressing tools. Dressing tools which use a large number of small, fractional-carat diamonds, embedded in a matrix.

Natural abrasive. A hard mineral found in nature, used as the abrasive component of a grinding wheel. See Abrasive.

Norbide. Norton's registered trademark name for boron carbide abrasive.

NorZon. Norton's registered trademark name for grinding wheels made with NZ Alundum abrasive. NorZon portable wheels and raised hub wheels are used for offhand grinding of steel.

Notching. The grinding of relieving notches in the weld joints of pipelines. Usually done with depressed centre discs.

NZ Alundum. A zirconia alumina abrasive alloy specially formulated for use in NorZon grinding wheels.

Offhand grinding. Grinding by holding the work-piece against the grinding wheel by hand. In floorstand grinding, the operator holds the work. In portable grinding, the operator holds the machine-mounted wheel against the workpiece.

Oilstone. A sharpening stone or abrasive file, usually pre-filled with oil, which uses oil as a lubricant to flush away swarf in operation.

Operating speed. The speed of a grinding wheel expressed in either revolutions per minute or surface feet per minute.

Organic bond. A bond made of organic materials such as synthetic resin, rubber or shellac.

Peripheral speed. The speed at which given point or particle on the face of the wheel is travelling when the wheel is revolved, expressed in surface feet per minute (SFPM). Multiply the circumference in feet by the wheel revolutions per minute.

Periphery. The line bounding a surface – the circumference of a wheel.

Planer type. A type of surface grinding machine built similar to an open side planer.

Plate mounted. Disc, segment or cylinder wheels cemented to a steel back plate having projecting studs or other means for mounting on the machine.

Polishing. An operation to smooth off roughness from a workpiece, or put a high finish on metal by using a polishing wheel.

Polishing wheel. A wheel made of one of several kinds of materials and coated with abrasive grain and glue.

Polypax dressing tools. Norton's trademark name for single-point diamond dressing tools which use a man-made polycrystalline diamond.

Portable grinder. A hand-held grinding machine which uses portable wheels, depressed centre discs, plugs or cones. See also Offhand grinding.

Portable wheel. A grinding wheel used for portable grinding and stock removal. These wheels usually have hard, durable abrasives, coarse grit sizes, organic bonds, and may have molded-in bushings.

Precision grinding. Those types of grinding which result in the workpiece being ground to exact measurements, finish, etc.

Pre-engineered grinding wheels. Grinding wheels made to an established specification for cost-efficiency in handling a specific range of jobs.

Process E. Norton's trademark name for diamond and CBN grinding wheels and mandrels made by electroforming the abrasive directly to a preform shape.

Production. The quantity of workpieces turned out, or the amount of work done in a given time. Also the amount of work done during the life of a grinding wheel.

Profilometer. An instrument for measuring the degree of surface roughness in microinches.

Protection flanges. See Safety flanges.

Protection hoods. See Hoods.

Depressed Centre Discs. Type 27 or Type 28 grinding wheels, with the area near the arbor hole offset to accommodate the mounting nut and flange. Used for light to medium portable grinding/notching jobs.

Recessed wheels. Type 5 or Type 7 wheels, made with a recessed section on one or both sides to fit special types of flanges or sleeves on grinding machines.

Reinforcing. One or more layers of fibreglass material molded into the grinding wheel to add strength and stability in operations. Cut-off wheels, depressed centre discs, floorstand snagging wheels and portable wheels use reinforcing. Cylinder wheels often have several bands of wire wound reinforcing on their periphery to add stability and protection.

Resinoid bond. An organic bonding material made up of synthetic resin.

Rest. A part of the grinding machine used to support the workpiece being ground, or a dresser or truing tool when applied to the wheel. Also called a steadyrest or work rest.

RMS. A term standing for root mean square, which is a measurement of the smoothness or lack of roughness of a surface. The lower the RMS number, the nearer to perfectly smooth the surface and finish.

Rockwell hardness. A measurement of hardness of all metals. The indentation hardness of a metal is measured against a standard numbered scale. The higher the number, the harder the metal.

Roll grinding. A specialized type of cylindrical grinding used to finish or refinish the long, large-diameter rolls used in metal rolling mills, paper mills, rubber and plastic processing and calendering plants.

Rough grinding. A type of grinding used for stock removal, or where a precision dimension or finish is not the primary requirement.

RPM. The revolutions per minute, or speed of a revolving object such as a grinding wheel.

Rubber bond. An organic bonding material composed of natural or synthetic rubber.

Rubber wheels. Grinding wheels made with rubber bond.

Safety devices. Devices made to provide protective safety for a grinding machine operator. Also, devices attached to the grinding machine to provide safe operation and protection in case of a malfunction.

Safety flanges. Special types of flanges designed to hold together a grinding wheel in case it breaks, thus protecting the operator.

Saucer wheel. A Type 13 wheel, with a shallow saucer shape.

Saw gummer. A grinding wheel used for gumming and sharpening saw blades.

Saw gumming. A grinding operation for removing gum resins from wood-cutting saw blades and sharpening the blades.

Scleroscope. An instrument for determining the relative hardness of materials by a drop and rebound method.

Scratches. Marks left on a ground surface caused by a dirty coolant or a grinding wheel unsuited for the operation.

Scythe stone. A long, narrow sharpening stone for sharpening or whetting scythes by hand.

Segments. Bonded abrasive sections of various shapes to be assembled to form a continuous or intermittent grinding wheel.

SFPM. Surface feet per minute. See "Peripheral Speed". Multiply the circumference in feet by the wheel revolution per minute.

Sharpening Stone. A natural or manufactured abrasive product used for sharpening, honing and whetting tools and sharp edges.

Sharpening Stone Oil. A special mineral base oil used to lubricate the sharpening stone and flush swarf from the surface.

Shellac bond. An organic bonding material composed of shellac.

Silica. Silicon Oxide, found in silica sand. One of the raw material components of silicon carbide abrasives.

Silicon Carbide. An abrasive made from silica sand and coke, known as Norton Cystolon abrasive.

Snagging. A type of stock removal grinding, used in foundries to remove gates, fins and sprues from castings.

Spindle. See Arbor.

Stand. See Bench stand, Floor-Stand grinding.

Star Dresser. See Huntington dresser.

Steadyrest. A support for pieces being ground on a cylindrical grinding machine.

Steel Conditioning. A type of stock removal grinding used to condition the surface of steel billets after they have been poured and have cooled.

Stock Removal. The grinding or the abrading away of material from a workpiece. Also a general type of grinding in which stock removal is the primary requirement. See also rough grinding.

Straight Wheel. A type 1 grinding wheel made with straight parallel sides, a straight face, and a straight or a tapered arbor. Straight wheels contain no recesses, grooves, bevels or dovetails.

Structure. A term designating the relative grain spacing in a grinding wheel, and expressed as a number in the wheel marking. Dense structures have low numbers, while open structures have higher numbers.

Stub. That portion of grinding wheel left after it has been used and worn down to the discarding diameter.

Surface Feet per minute. See SFPM.

Surface Grinding. A type of precision grinding used to produce flat plane surfaces.

Swarf. Residue from grinding, usually consisting of small chips from the workpiece, spent abrasive grains and particles of bond.

Swing frame grinder. A grinding machine suspended by a chain at the center point so that it may be turned and swung in any direction for the grinding of billets, large castings or other heavy work.

Table. That part of the grinding machine which directly or indirectly supports the work being ground.

Table traverse. Reciprocating movement of the table of a grinding machine.

Tapered wheel. A Type 4 grinding wheel shaped similar to a straight wheel but having a taper from the hub of the wheel to the face and thus being thicker at the hub than at the face.

Temper. The result of heat treatment of a material to develop required qualities.

Tensile strength. The strength of a material when tested in tension usually given in pounds per square inch.

Thread grinding. A type of precision grinding used to generate screw-type threads.

Tool & cutter grinding. A type of precision grinding used to restore cutting edges and sharpen tooling and cutters.

Treatment. A material used to impregnate a grinding wheel so as to improve its grinding action, often by reducing the tendency for loading and glazing.

Truing. The process of shaping a grinding wheel to an accurate form. This is done to make the wheel face run absolutely true and grind without making chatter marks. A diamond tool is usually used for truing.

Type of wheel. See Wheel type.

Universal grinding machine. A machine which can be set up to do several types of grinding, usually cylindrical, internal and surface. Generally used for toolroom work.

Vitrified bond. An inorganic bonding material, usually composed of clay. The bonding becomes vitrified when the wheel is fired in a kiln.

Wet grinding. A kind of grinding where a flow of grinding fluid is directed over the wheel and workpiece.

Wheel sleeve. A form of flange used on precision grinding machines where the wheel hole is larger than the machine arbor. Usually, the sleeve is so designed that the wheel and sleeve are assembled as one unit.

Wheel speed. The speed at which a grinding wheel is revolving, measured either in revolutions or in surface feet per minute.

Wheel traverse. The rate of movement of the wheel across the work during grinding.

Wheel type. A description of the overall shape and dimension of a grinding wheel, designated as a number. A Type 1 wheel is a straight wheel.

Work, workpiece. The material, part, component or job piece to be processed by grinding.

Work rest blade. A blade used on a centerless grinding machine to support the workpiece between the two wheels during grinding.

Work speed. In cylindrical, centerless and internal grinding, the rate at which the work revolves, measured in RPM or SFPM. In surface grinding, the rate of table traverse, measured in feet per minute.

ZF Alundum. A zirconia alumina abrasive alloy specially formulated for use in floorstand and wing frame grinding wheels.

Zirconia alumina. An abrasive made by a proprietary Norton process, where aluminium oxide and zirconium oxide are fused to produce a true abrasive alloy.

ZS Alundum. A zirconia alumina abrasive alloy specially formulated for use in steel conditioning and other high pressure grinding applications.