



BEARING DICTIONARY

Bearing Dictionary

A

ABEC

Annular Bearing Engineers Committee. Used as a prefix for tolerance grades of bearings as set up by this committee.

ABEC 1, 3, 5, 7, 9

Annular Bearing Engineers Committee classes or grades of ball bearing precision.

ABMA

American Bearing Manufacturers Association. This is a non-profit association consisting of American manufacturers of anti-friction bearings, spherical plain bearings or major components thereof. The purpose of ABMA is to define national and international standards for bearing products and maintain bearing industry statistics.

ABRASION

The wearing away of a surface by mechanical action such as rubbing, scraping or erosion.

ABRASIVE BLASTING

Process for removing scale from product after heat treatment and prior to grinding; product pieces are placed in a tumbler that bombards the surface with high-velocity metal shot particles. This process also acts as a tempering or stabilizing process. (Also called Shotblasting)

ABRASION RESISTANCE

The ability of a rubber compound to resist mechanical wear.

ABS (ANTILOCK BRAKE SYSTEM)

Ability to brake and steer at the same time. A braking system, usually electronically controlled, that prevents wheel lock during heavy brake application.

ACCELERATED LIFE TEST

Any set of test conditions designed to reproduce in a short time the deteriorating effect created under normal service condition.

ACID ETCH

The process of checking surface of ground product for cracks or burns by using a series of acids or neutralizers. Also called Nital Etch.



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ALL PURPOSE BEARING

The Timken Company "AP" Bearing; a self-contained pre-assembled, pre-adjusted, pre-lubricated, completely sealed unit. Applied to and removed from an axle without exposing the bearing elements, seal or lubricant to contamination or damage.

AMBIENT TEMPERATURE

The surrounding temperature. Note that ambient temperature is not necessarily the same as atmospheric temperature.

AMERICAN NATIONAL STANDARDS INSTITUTE - ANSI

An agency that develops standards and requirements regarding all things which affect the health and safety of associates.

ANGULAR CONTACT BEARING

A type of ball bearing whose internal clearances and ball race locations result in a definite contact angle between the races and the balls when the bearing is in use.

ANSI

The American National Standards Institute is a private organization that identifies industrial standards and coordinates their development. Many ANSI standards relate to safe design, performance and practices for equipment.

ANTI-FRICTION BEARING

These bearing types use rolling contact to cut power loss resulting from friction.

ANTI-OXIDANT

An additive that is usually incorporated in a relatively small proportion to retard oxidation of lubricants, including greases and gear lubricants. It is an oxidation inhibitor.

ANTI-RUST OR ANTI-CORROSION ADDITIVES

These additives help prevent oxidation of metal by displacing water from metal surfaces. They plate to metal with a polarized effect to give the metal an internal "umbrella," helping to deter iron-oxide formation.

APEX

The common point on the axis of a bearing where angular lines of each of the various tapered roller surfaces meet.

AXIAL CLEARANCE

The gap between the toe face of the head section and the inside surface of the inner case.

AXIAL INTERNAL CLEARANCE

In a ball bearing assembly, the axial internal clearance is the total maximum



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possible movement parallel to the bearing axis or the inner ring, in relation to the outer ring.

AXIAL LOAD

A type of load on a bearing that is parallel to the axis of rotation.

AXIAL RUNOUT

Also called lateral runout, is the measurable irregularity or wobble parallel to the axis of rotation.

AXIS

A straight line about which an object rotates; a straight line about which the parts of a bearing are regularly arranged. The center line of a shaft serves as an axis for a bearing; the cup and housing remain stationary while the shaft and cone rotate OR the cone and shaft remain stationary and the cup and housing rotate around it. The relative motion of the cup and cone is accommodated by the rolling motion of the rollers.

AXLE

Rod or spindle on or with which a wheel revolves; the bar connecting two opposite wheels. The shaft (axle) of an automobile fits through the bore of a cone of the tapered roller bearing.

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BALL

A spherical rolling element.

BALL BEARING

An anti-friction bearing that uses a series of steel balls held between inner and outer bearing races.

BALL DETENT

A spring-loaded ball mechanism that aligns the needle rollers of a full complement drawn cup bearing before it is pressed into a housing. The rollers are aligned when the ball detent forces the rollers apart, gathering circumferential clearance in one location.

BENCH TEST

A modified service test in which service conditions are approximated using conventional laboratory equipment, not necessarily application-identical equipment.

BORE

The inside diameter of the inner ring or cone.



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BORE CORNER

The maximum shaft fillet radius that will provide for proper bearing fit.

BORE SIZE

The inner diameter of a cone, which accommodates a shaft.

BOUNDARY LUBRICATION

A state of lubrication that occurs when, due to speed, load or lubricant combination, the “thick film” or hydrodynamic conditions do not completely separate the rubbing surfaces. Special additives sometimes are used for bearing protection under these conditions.

BRUISING

A form of bearing surface damage from other fatigued parts.

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CAGE

The separator that spaces and holds rolling elements in their proper positions along the races.

CAGE DEFORMATION

Improperly installed or dropped bearing.

CAGE POCKET WEAR

Heavy contact between the rollers and cage pocket surfaces caused by a bearing's operating too loosely.

CAGED BEARING

Similar to a full complement bearing, except that there are fewer rollers, allowing room for the cage.

CLOSED-END BEARING

A drawn cup bearing where one end of the cup has a solid face, which fully encloses that end of the bearing. This allows the housing to be through bored (straight housing). The closed end of the installed bearing seals the housing.

COEFFICIENT OF FRICTION

The ratio of the friction between two surfaces to the pressure between them. A low coefficient of friction means low friction losses that are influenced by the viscosity and character of the lubricant and by materials, surface conditions and other factors.

COHESION:

The molecular attraction between grease particles that causes them to stick together. This attraction contributes to its resistance to flow.



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COMBINED LOAD

Both radial and thrust loads applied to the same bearing at one time.

CONE:

The bearing's inner ring that is fixed to and/or pressed onto a rotating shaft.

CONE BORE DAMAGE

Fractured cone due to out-of-round or over-sized shaft.

CONE LARGE RIB FACE DEFORMATION

Metal flow from excessive heat generation.

CONE LARGE RIB FACE SCORING

Welding and heat damage from metal-to-metal contact.

CONRAD DEEP-GROOVE BALL BEARING

Standard single-row deep-groove bearing. Also referred to as a radial ball bearing.

CONTACT LINE HEIGHT

The axial distance from the outside seal face to the lip contact line.

CONTACT POINT

The line of intersection between the outside and inside lip surfaces of a radial lip seal. In a cross-sectional view, this intersection is illustrated as a point.

CONTAMINATION

The pollution of a lubricant by an external agent.

CORROSION

A chemical attack on metals by acids, alkalies, oxygen, chlorine, sulfur or other chemicals. This is distinct from metal destruction by wear and may be evident by either discoloration or pitting.

CORROSION INHIBITOR

An additive that protects lubricated metal surfaces from chemical attack by water or other contaminants.

CUP

The bearing's outer ring that sits on the housing and remains stationary during rotation.

CUP-FACE DENTING

Indentations from hardened driver.



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CUP SPINNIN:

A loose cup fit in a rotating wheel hub.

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DEAD-END HOUSING

A housing that is not through bored. The machining stops part way through the housing forming a blind hole.

DIAL INDICATOR

A measuring device, equipped with a readout dial, used most often to determine end motion or irregularities/runout.

DRAWN CUP NEEDLE ROLLER BEARING

A needle roller radial bearing with a thin, pressed steel outer ring (drawn cup). It is usually employed without an inner ring. Available in caged and full complement designs. Drawn cup bearings are normally supplied with both ends open, but most sizes are also available with one end closed. A drawn cup bearing can only carry a radial load.

DYNAMIC SEAL

A seal required to prevent leakage past parts that are in relative motion.

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ECCENTRIC

Circles or diameters not having the same exact centers.

ECCENTRICITY

This is determined by measuring the shaft runout, TIR and the shaft-to-bore misalignment.

ELASTOHYDRODYNAMIC LUBRICATION (EHD)

A lubricant regime characterized by high-unit loads and high speeds where the mating parts, usually in roller bearings, deform elastically, causing an increase in lubricant viscosity and load-carrying capacity.

END PLAY

The amount of axial or end-to-end movement in a shaft due to clearance in the bearings.

ETCHING

Rusting with pitting and corrosion from moisture and water exposure.



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EVAPORATION LOSS

The portion of a lubricant that evaporates under the effects of temperature, pressure and time. The test methods include ASTM D 972 and ASTM D 2595.

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FACE

The side surface of a bearing.

FALSE BRINELLING

Wear caused by vibration or relative axial movement between the rollers and races. (See *Fretting*.)

FATIGUE

The fracture and breaking away of metal in the form of a spall. Generally, three modes of contact fatigue are recognized. They are: inclusion origin, geometric stress concentration and point surface origin.

FILLET RADIUS

Shaft or housing corner dimension that bearing corner must clear.

FIXED BEARING

Bearing which positions shaft against axial movement in both directions.

FLOATING BEARING

Bearing so designed or mounted as to permit axial displacement between shaft and housing.

FLUTING

A series of small axial burns caused by an electric current passing through the bearing while it is rotating.

FPM

Feet per minute.

FRETTING

Wear characterized by the removal of fine particles from mating surfaces. Fretting is caused by vibratory or oscillatory motion of limited amplitude between contacting surfaces. (See *False Brinelling*.)

FRICITION

Resistance to motion due to the contact of surfaces.

FRICITION BREAK-OUT

Friction developed during initial or starting motion.



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FRICITION RUNNING

Constant friction created during the operation of a dynamic seal.

FULL COMPLEMENT BEARING

A bearing without a cage that contains the maximum number of rollers and has maximum load carrying ability. The rollers are mechanically retained by the cup in most full complement drawn cup bearings.

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GALLING

A form of wear in which seizing or tearing of the gear or bearing surface occurs.

GEOMETRIC STRESS CONCENTRATION

Spalling from misalignment, deflections or heavy loading.

GROOVING

Large particle contamination imbedding into the soft cage material.

GROSS MARGIN

The difference between the cost of merchandise and its selling price.

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HARDNESS

The resistance to indentation. This is measured by the relative resistance of the material to an indenter point of any one of a number of standard hardness testing instruments.

HDLTM

Timken Hydrodynamic Labyrinth (HDLTM) Seal.

HEAD SECTION

The portion of a lip seal that is generally defined by the inside and outside lip surfaces and the spring groove.

HEAVY-DUTY NEEDLE ROLLER BEARINGS

A needle roller radial bearing with a machined and ground channel-shaped outer ring with a complement of needle rollers, retained and guided by a cage. A heavy-duty needle roller bearing can only carry a radial load.

HEAVY PARTS

Examples of heavy parts are chassis (shock absorbers, mufflers and exhaust system products, struts), drivetrain (U-joints, transmission parts, clutches), brake parts (rotors, discs) and crash parts (body repair kits, fenders and bumpers, fiberglass panels, glass).



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HIGH SPOTS IN CUP SEATS

Localized spalling on the cup race from stress riser created by a split housing pinch point.

HOUSING

A rigid structure that supports and locates the seal assembly with respect to the shaft.

HOUSING FIT

Amount of interference or clearance between bearing outside surface and housing bearing seat.

HUB BEARING ASSEMBLY

A packaged wheel-end unit that contains bearings, seals and all components necessary for easy installation. It is pre-sealed, pre-lubricated and pre-set for precise performance.

HUB GREASE CAP/DUST COVER

A metal cap that fits over the outer end of the hub to keep grease in and dirt out of the bearing assembly.

HYDRODYNAMIC (FLUID-FILM) LUBRICATION

That state of lubrication in which the shape and relative motion of the sliding surfaces cause the formation of a continuous fluid film under sufficient pressure to prevent any contact between the surfaces. It is commonly called fluid-film lubrication.

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INCLUSION ORIGIN

Spalling from oxides or other hard inclusions in the bearing steel.

INNER CASE

A rigid, cup-shaped component of a seal assembly that is placed inside the outer seal case. It has one or more of the following devices: reinforcing member, shield, spring retainer or a lip-clamping component.

INNER RING

Bearing component with the inner raceway on its OD surface.

INNER RING RACE

The surfaces on the cup and cone where the rolling elements make contact.

INSIDE CASE INNER DIAMETER

The inner diameter of the inner case of a radial-lip seal.



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INSIDE FACE

The surface of the inner case that faces and is usually in contact with the sealed fluid.

INSIDE LIP ANGLE

The angle between the inside lip surface and the axis of the seal case.

INSIDE LIP SURFACE

The inside truncated conical surface of the lip.

INTERNAL CLEARANCE

The internal clearance of a single-row radial contact ball bearing is the average outer ring race diameter, minus the average inner ring race diameter, minus twice the ball diameter. It also is known as the radial internal clearance or end play.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

Most commonly referred to as the ISO STANDARD. An international standard setting body that is composed of representatives from various national standards organizations.

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LIFE TEST

A laboratory procedure that is used to determine the amount and duration of resistance of an article to a specific set of destructive forces or conditions.

LINE SPALLING

Roller spaced spalling from bearings operating after etching damage.

LIP HEIGHT

The axial distance from the outside seal face to the toe face.

LIP LENGTH

The axial distance between the thinnest part of the flex section and the contact line.

LOAD-CARRYING CAPACITY

The property of a lubricant that forms a film on the lubricated surface, which resists rupture under given load conditions. It is expressed as the maximum load the lubricated system can support without failure or excessive wear.

LUBRICANT

Any substance used to separate two surfaces in motion and reduce the friction or wear of the surfaces.



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LUBRICATION

The control of friction and wear by introducing a friction-reducing film between moving surfaces that make contact. It may be a fluid, solid or plastic substance.

LUBRICITY

A term used to describe the ability of a lubricant to reduce friction between rubbing surfaces. There are no generally accepted test methods available to evaluate this property. Lubricity is important mostly in conditions of boundary lubrication and probably represents some relationship to the ability of the oil to wet the bearing surfaces and to resist being rubbed off. Lubricity has no known direct relationship to oil viscosity. It is also referred to as oiliness.

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MAXIMUM CAPACITY BEARING

A bearing with filling notches to allow the loading of the maximum number of balls.

METAL (OUTER) CASE

The outer, thin-wall, rigid structure of the lip-seal assembly that contains the primary sealing ring and, if present, the inner case, spring and secondary seal.

MISALIGNMENT

An irregular roller path from deflection, inaccurate machining or wear of bearing seats.

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NEEDLE ROLLER

Cylindrical roller with large length to diameter ratio. The length is between three and ten times the diameter, which does not usually exceed 5 mm. The ends of the needle roller may be one of several shapes.

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OPEN-END BEARING

A drawn cup bearing that does not have a closed end. This allows a shaft to extend through the bearing.

OUTER RING

A bearing component with the outer raceway on its bore surface.

OUTER RING RACE

The ball or roller path on the bore of the outer ring.



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OUTSIDE CASE INNER DIAMETER

The inside or smallest diameter of the outer case of a lip-seal assembly.

OUTSIDE DIAMETER

The diameter of the outer ring or cup. It also is known as O.D.

OUTSIDE FACE

The surface of the seal case perpendicular to the shaft axis that is not in contact with the fluid being sealed.

OUTSIDE LIP ANGLE

The angle between the outside lip surface and the axis of the seal case.

OUTSIDE LIP SURFACE

The outside truncated conical surface of the lip.

OVERALL BEARING WIDTH

The overall dimension when the cup and cone are mated, including rollers and cage.

OXIDATION

This occurs when oxygen attacks petroleum fluids. The process is accelerated by heat, light, metal catalysts and the presence of water, acids, or solid contaminants. It leads to increased viscosity and deposit formation.

OXIDATION INHIBITOR

A substance (chemical additive) added in small quantities to a petroleum product to increase its oxidation resistance, thereby lengthening its service or storage life.

OXIDATION STABILITY

The resistance of a petroleum product to oxidation and, therefore, a measure of its potential service or storage life.

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PEELING

Micro-spalling due to a thin lubricant film from high loads/low RPM or elevated temperatures.

PITTED

Small indentations appearing as black dots on finished surfaces of any piece of product; undesirable surface defects.

POINT SURFACE ORIGIN

Spalling from debris or raised metal exceeding the lubricant film thickness.



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PRELOAD

Thrust load applied to bearings that support a rotating part; eliminates axial endplay or movement.

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RACES

The surfaces on the cup and cone where the rolling elements make contact.

RACEWAY

The functional surfaces in an anti-friction bearing that contact the rolling elements.

RADIAL DEVIATION

The amount of deviation from the true circular form.

RADIAL INTERNAL CLEARANCE

Also called radial clearance. It is the total distance the inner ring (or shaft) may be displaced relative to the outer ring of an assembled, installed bearing.

RADIAL LOAD

A load applied perpendicular to the axis of the shaft.

RADIAL RUNOUT

Measurable irregularity or out-of-roundness in a rotating assembly, at a right angle to an axis.

RIB (HELIX)

In seals, a long, narrow projection that is normally triangular in the cross section. It is molded into the outside lip surface of a helix seal. The rib is oriented at an angle to the shaft axis. One end of the rib forms part of the seal-lip contact surface. In tapered roller bearings, it is a raised structure at the end of the raceway that guides or supports the rollers.

RMS

Root mean square.

ROLLER BINDING SKEWING

Cage ring compressed during installation or interference during service.

ROLLER END SCORING

Metal-to-metal contact resulting from the breakdown of lubricant film.

ROLLER NICKING/DENTING

Damage from rough handling or installation damage.



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ROLLER SPACE NICKING

Raised metal on races from contact with roller edges.

ROLLERS

Rolling elements that are located between the cone and cup.

RUNOUT

Measurable irregularity across a plane surface, such as a disc brake rotor, hub or wheel assembly.

RUNOUT (SHAFT)

This is the same as gyration. When it is expressed in inches alone or accompanied by the abbreviation TIR (total indicator reading), it refers to twice the radial distance between the shaft axis and axis of rotation.

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SCALLOPING

Uneven localized wear resulting from excessive endplay.

SCUFFING

Abnormal wear due to localized welding and fracture. It can be prevented through the use of anti-wear, extreme-pressure and friction-modifier additives.

SENSOR-PAC™ BEARING

A light-duty packaged bearing that includes a sensing system for antilock brake and traction control systems.

SHAFT FIT

Amount of interference or clearance between bearing inside diameter and shaft bearing seat outside diameter.

SHAFT HARDNESS

The resistance to indentation. At minimum, it should be Rockwell C45.

SHAFT LOBING

Uniform radial deviation of the shaft surface. An oval shaft is said to have two lobes. Faulty centerless grinding usually causes an odd number of lobes to occur. Higher order lobing is also referred to as chatter.

SHAFT OUT-OF-ROUND

The deviation of the shaft cross section from a true circle. Out-of-round is measured as the radial distance, on a polar chart recording, between concentric, circumscribed and inscribed circles that contain the trace and are centered to minimize the radial distance.



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SHAFT TOLERANCE

This is the allowable variation in the shaft diameter.

SPALLING

Metal flaking (off) of the race or roller caused by inclusions in bearing steel, misalignment, deflection or heavy loading.

SPINDLE

A short tapered axle that supports a free rolling wheel. Also referred to as a stub axle.

SPINDLE NUT

A nut threaded on the end of the spindle for adjusting the wheel bearing endplay or preload.

SPLINES

External or internal slots or grooves cut in a shaft/gear/hub or yoke used so that two different components must rotate together.

STAINING

Surface stain with no significant corrosion from moisture exposure.

STATIC POINT:

The section of the helix seal lip incorporating the contact line.

STRAIGHT HOUSING

A housing that is through bored. The machining passes all the way through the housing forming a through hole.

STRAIGHT MINERAL OIL

A petroleum oil not containing compounds, animal or vegetable oils or chemical additives.

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TAPERED ROLLER BEARING

A friction reducing bearing that is made up of a cup, cone and tapered rollers, which rotate around the raceway of the bearing.

THERMAL EXPANSION

The expansion caused by the increase in temperature. This may be linear or volumetric.

THRUST

The continuous pressure of one object against another, parallel to the center of the axis.



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THRUST LOAD

A load applied parallel to the center line of rotation.

THRUST NEEDLE BEARINGS

A needle roller thrust bearing contains a cage that holds needle rollers in a spoke-like configuration. A thrust needle roller bearing can only carry a thrust load.

TIER ONE SUPPLIERS

Automotive parts manufacturers that supply final equipment directly to automakers (OEMs or original equipment manufacturers). Increasingly, tier one suppliers are becoming "systems integrators" or producers of major subassemblies and modular components that can be installed into a vehicle as a unit, such as a complete chassis.

TORQUE

The turning force of a shaft.

TORQUE WRENCH

A torque wrench measures the amount of turning force being applied to a fastener (nut or bolt). Scales usually read in foot-pounds or Newton-meters.

TRUE BRINELLING

Damage from shock or impact.

TRUE ROLLING MOTION

Tapered roller bearings naturally align themselves as a result of the balance of forces on the bearing, keeping rolling elements moving smoothly in wheels and other automotive applications.

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UNIPAC-PLUS™ BEARING

An enhanced UNIPAC design that incorporates a flange to ease mounting of the bearing assembly.

UNIPAC™ BEARING

A double-row tapered bearing configuration originally designed for light- and heavy-duty automotive applications.

UNIT BEARING

An automotive bearing that is sold as an assembled set and is non-adjustable; characterized by a cone with no large rib.

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WEAR

Damage resulting from the removal of materials from surfaces in relative motion. Wear is generally described as: Abrasive- Removal of materials from surfaces in relative motion by a cutting or abrasive action of a hard particle, which is usually a contaminant. Adhesive- Removal of materials from surfaces in relative motion as a result of surface contact. Galling and scuffing are the extreme cases. Corrosive- Removal of materials by chemical action.

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ZERO CLEARANCE

No clearance between the roller and races.