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Threaded Products | Fasteners & Gaskets | Precision Machining



GLOSSARY (ENGINEERING DEFINITIONS)

ACID ETCH TEST

The use of a suitable acid applied on a metal surface to determine grainflow, grain size surface imperfections and chemical segregation.

Macroetching; re: ASTM E 340.

ANCHOR FLANGE

A flange used to prevent ground laid pipe from moving in any direction except along its length. It's usually set in concrete.

ANNEALING

A softening of metal consisting of heating carbon or alloy steel to an appropriate temperature at a specified duration, and cooling to room temperature. Austenitic stainless steels and nonferrous alloys are normally water quenched.

ASTM

American Society for Testing and Materials, is a leading standards development organization. This committee has jurisdiction over fastener standards.

ATS

All-thread Stud

AUSTENITE

A solid solution in which gamma iron (face centered cubic crystal structure) is the solvent. In low carbon steel austenite exists above 1670°F, and austenitic stainless steels austenite exists between room temperature and their melting point.

AUSTENITIC

A stainless steel or other single phase alloy which has a stable austenite structure between room temperature and the melting point.

AVERAGE COATING THICKNESS

This is determined as either the value obtained by analytical methods or the mean value of a specified number of local thickness measurements that are evenly distributed over the significant surface.



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“AX” RING GASKET

A specific description for a special ring joint gasket for a specific customer.

BAR

This describes carbon and alloy steel bar that is produced from hot rolled or cast billets with the cross sectional dimensions that have a relatively constant dimension.

BEND TEST

This test is meant to determine the toughness or ductility of a fastener. It is usually performed by bending the fastener through its axis or on a round mandrel.

BOLT

A headed and externally threaded fastener designed to be assembled with a nut.

BRINELL HARDNESS TEST

A common method for determining hardness of metals by pressing a 10 mm hardened steel ball onto a ground surface portion of the metal under a 500-3000 Kg (Kilogram) load. Comparison of the diameter of the impression with that of a known material hardness provides an indication of hardness of the piece of metal being tested. The result represents the Brinell hardness number, which is the value obtained by dividing the applied load in Kg., by the surface area of the impression in mm².

BRINELL HARDNESS TESTING

This is a common method of determining the hardness of metal products. A test is conducted by forcing a carbide ball indenter into the surface of the test specimen. The resulting indentation is measured and the brinell hardness number is calculated by using a formula that divides the test force by the indentation. Standards for this test are defined under ASTM E10.

“BX” RING GASKET

A style of Ring Joint Gasket , octagonal in shape having equal angles. This gasket relies on full angular contact to provide a seal against the mating contact surfaces of the corresponding ring joint flange. It is used in high pressure applications at pressures up to 20,000 psi.

CAD PLATED & BAKED

Cadmium plating and then baked to relieve hydrogen embrittlement.

CAD PLATED (DAN GOLD)

Cadmium plating with yellow chromate top coat. “Dan Gold” is a proprietary Dan Loc trade name. All studs & nuts when cad plated are chromated, while RTJ gaskets requiring cad plating are cad plated clear.

CARBIDE PRECIPITATION

The migration and preferential combination of carbon with chromium in the grain boundaries of certain austenitic stainless steels. This carbide precipitation occurs when one part carbon combines with seventeen parts of chromium while the stainless steel is heated, or cooled in the 8000 to 15000F temperature range.

CARBIDES

Compounds formed when carbon combines with one or more metallic elements. For example; in stainless steels when excess chromium carbides form, corrosion resistance can be reduced.

CARBON

The principal non-metallic element which when combined with iron in controlled amounts below 2.0% form carbon steels.

CARBON EQUIVALENT

A numerical value in weight percent, calculated from a mathematical equation, designed to relate the combined hardening effect of various alloying elements used in making carbon steel to an equivalent amount of carbon. By reducing the carbon content in the steel and adding controlled amounts of alloying elements the desired strength levels can be achieved by proper heat treatment. The result will produce a steel with good weldability and low temperature notch toughness.

The current widely used CE formula is as follows:

Depending on customer and industry specifications, CE can be required as low as 0.40% max., and as high as 0.5% max. carbon content.

CARBON STEEL

A metal alloy that principle elements are carbon and iron. Contains other trace elements in undetectable amounts.

CARBURIZING

Heating a carbon or alloy steel to austenitizing temperature while in a carbon rich atmosphere to cause absorption of carbon at the surface.

CERTIFICATION

A procedure and action to verify in writing a process or material meets a set of applicable standards. This helps ensure consist products for both manufacturer and end users.

CHARPY IMPACT TEST

A test method comprising of three "notched specimens" at a selected temperature, impact tested, to determine resistance to crack initiation in metals. The three specimens results are averaged and units are reported in foot pounds of energy or Joules, re: ASTM A370 for details.

CHROMIUM

A metallic element when added to steel will improve mechanical properties, increase resistance to oxidation, corrosion and wear. A minimum of 12% chromium is required to produce stainless steel.

CLAMP LOAD

Also called initial load or preload, is created when tension is applied on a bolt and results in equal force and measures of the compression of two parts. It is commonly calculated as 75% of minimum proof load.

COLD FORMING

Processing material by forcing metal through various dies, below the recrystallization temperature. Most mass produced fasteners use this technique and require large production runs with long lead times.

COLUMBIUM

A metallic element when added to steel acts as a grain refiner. It also improves hot working. In the range of 2-3% it serves as a stabilizer in austenitic steels. Also known as Niobium (Nb).

COMPRESSION LOAD

The load which tends to compress or shorten the member. The value for compressive strength may depend upon the degree of distortion.

COPPER

A metallic element when added to low to medium carbon improves the resistance to atmospheric corrosion.

CORROSION RESISTANCE

This describes the ability of a fastener to resist corrosion under specified conditions.

COUNTRY OF MANUFACTURE

The geographic site where the steel billets are transformed into finished products. This may include heat treating, machining, coating, welding and several other processes-anything that make the bolt ready for sale.

COUNTRY OF ORIGIN

The geographic site where the iron ore and other raw materials were smelted into steel billets. This is often the most veiled part of a bolt's lineage, yet it is also the most critical, as it determines the ultimate metallurgical chemistry and purity of the steel.

CUT THREAD

A threading method produced by removing material from the surface with a form cutting tool.

DOUBLE END STUD

A stud having equally threaded ends interrupted by an unthreaded center portion.

DRAW DIE

A die used in producing blank studs to the proper PD size.

DRAW LINE

The equipment or machinery used to produce blank studs from coil. (Ajax or Lewis)

DRAWING

See tempering, also see, "PD" bar for homonym "Draw".

DUCTILITY (EXTERNALLY THREADED FASTENERS)

The measure of a fastener's ability to deform prior to the point of fracturing. Machined test pieces are made to evaluate the metal's elongation and reduction of area. The lower the ratio of its specified minimum yield strength to its specified minimum tensile strength, the greater the fastener's ductility.

DYE PENETRANT INSPECTION (PT) (LIQUID PENETRANT INSPECTION)

A non destructive test to examine surface defects. The metal surface to be examined is coated with a red-dyed penetrating oil which is drawn into the defects by capillary action. The red dye is removed after some time and a developer is applied. The developer will then draw the penetrant to the surface, where the geometry and size of the defect can be determined.

ELASTICITY

The stretching of a material without undergoing plastic deformation and permanent distortion.

ELEVATOR

A cleated conveyor belt and hopper used to transport blanks to the roll threaders, one blank at a time. (feeding mechanism for the roll threaders)

ELONGATION

The extent that a material can plastically deform or permanently stretch, without exceeding the tensile strength and experiencing failure. In a tensile test this is reported as percent (%) elongation.

"END TO END"

One of two methods to measure the overall length of a stud. Actual length determined from end to end of the stud. (For other method of length determination, see 1st thread to 1st thread.)

EXTENSOMETER

This device measures the linear deformation of a fastener to sense the elongation under tensile stress in a controlled test environment.

FASTENER

A mechanical device that holds or joins two or more components in definite positions with respect to each other and is often described as a bolt, nut, rivet, screw, washer, or special formed part.

FASTENER IDENTIFICATION MARKING

A stamp, paint, or other permanent identifier that may include manufacturer information and applicable grade markings for certification purposes.

FASTENER TESTING

A determination or verification that the fastener meets its specification requirements.

FIRST THREAD TO FIRST THREAD

The measurement taken from the first usable thread on opposite ends of a stud to determine length. It is approximately 1/4" shorter than the physical bolt length. Also described as "1st to 1st".

FOOT POUND ENERGY

The impact energy rated in foot pound force required to break Charpy impact specimens. Also units used in relation to torque; rotational force.

FORGED

A process of forming ingots, blooms and billets into wrought shape products by applying pressure at elevated temperatures using a press, hammer or ring mill. The end results are forgings.

GALLING

This can happen when a stainless steel fastener is tightened, the thin oxide layer on the surface of the steel may scrape off resulting in the nut and washer welding together. When disassembled, the welded material may be torn and pitted.

GRADE IDENTIFICATION SYMBOLS

Permanent markings denoting the specification used to manufacture a fastener. This would indicate the appropriate material, mechanical properties and other criteria used to produce the bolt.

GRAIN FLOW

The macro structure characteristic of a part, after polishing and etching, which reveals the principal direction in which the metal has been worked by mechanical methods such as pressing, hammering or rolling.

GRAIN SIZE

This term normally applies to the austenitic grain size as determined in carbon and alloy steels by the McQuaid-Ehn test. ASTM E 112 defines methods of rating grain size. When specifying grain size it should be clearly stated when austenitic grain size is required and when ferrite particle size is required.

HARDNESS

A measure of the resistance of a material to indent when an indenter of known geometry is impressed against a surface under a given load.

HEAT ANALYSIS

A chemical analysis of a given heat by the producer, which determines the percentages of its elements.

HEAT NUMBER "HDG"

An Alphanumeric system used to identify heat treated materials for the purpose of Traceability. Hot dipped, galvanized. A coating providing corrosion resistance. It exhibits better corrosion resistance than that of mechanically galvanized fasteners due to the thicker application of the coating.

HEAT RESISTANCE

This describes the extent to which a bolt retains specified properties as measured by exposure of the material to a certain temperature and environment for a specified time.

HEAT TREATMENT

A controlled heating and cooling operation applied to metals to attain the desired physical and /or mechanical properties.

HIGH TEMPERATURE BOLTS

Bolts specifically manufactured from high temperature alloys to maintain tensile loads at temperatures between 500°F and 1800°F. Refer to ASTM A193 for more information.

HOT-DIP GALVANIZING

The process of the immersion of fasteners in a bath of molten zinc for a controlled time period to obtain specified coating weight or thickness. This is a cost effective method for creating highly corrosive resistant steel products.

HYDROGEN EMBRITTLEMENT

The process by which high strength steel becomes brittle and fractures following absorption of hydrogen. There is a danger of this occurring when attempting to zinc coat high strength bolts. This can occur during the acid washing process prior to galvanizing.

IMPACT STRENGTH

See Charpy Impact Test

INGOT

A casting of metal, square, round or rectangular shaped, which can be rolled , forged into blooms, billets or slabs for use as forgings.

INTERGRANULAR CORROSION

An attack at the grain boundaries of steels. In the case of 300 series stainless steel the formation of chromium carbides in the grain boundaries where at elevated temperatures the chromium content is depleted at the surface of the grain. This leaves the areas around the grains susceptible to certain types of corrosion.

JOULE

A unit defining work, or energy, related to Charpy impact testing. One Joule equals approximately 0.74 foot pounds.

MACRO-STRUCTURE

The appearance of a cross section of a part at low magnification, after polishing and acid etching which will reveal grain flow, and other internal structural characteristics.

MAGNETIC PARTICLE INSPECTION (MT)

An inspection performed on carbon or alloy steel by magnetizing and spraying of magnetic particles which will adhere to surfaces indicating cracks, laps and seams. This method of inspections are not applicable on austenitic and nonferrous alloys, which are non-magnetic.

MATERIAL TEST REPORT

A document verifying the raw material meets specified requirements and includes results of mechanical tests and chemical analyses.

MCQUAID-EHN GRAIN SIZE

The austenitic grain size developed in steels by carburizing at 1700 OF followed by slow cooling and determined by ASTM E 112.

MECHANICAL PROPERTIES

The fastener characteristics which relate to its reaction to applied loads; these properties may be those of the basic raw material or result from the manufacturing process.

MECHANICALLY GALVANIZED

Describes a coating technique of applying cold zinc powder to bolts by either cold welding or barrel finishing.

MICRO ALLOYED STEELS

Grades of plain carbon steel which have been melted with deliberate additions of metallic elements known to improve hardenability, tensile properties and impact strength and toughness; without sacrificing weldability.

MICRO-STRUCTURE

The appearance of a metal surface at high magnification after fine polishing revealing structural characteristics such as grain size inclusions, and the amount and configuration of such metal constituents as ferrite, pearlite, austenite and martensite.

MILS LATERAL EXPANSION (MLE)

The increase in thickness (mils; 0.001") at the surface of a Charpy specimen directly opposite the notch where the narrow edge of the pendulum strikes the specimen during testing. For example: a Charpy specimen is 0.394" x 0.394" in cross section. If the surface opposite the notch expands to 0.419", the Mils Lateral Expansion is 25, (25 MLE) re: ASTM A 370.

MOLYBDENUM

A metallic element added to steel which goes into solid solution and also forms carbides. Molybdenum effectively increases the strength of steel at elevated temperatures and reduces the susceptibility to temper brittleness in chromium steels. In stainless steels it improves resistance to certain types of corrosive media.

NICKEL

A metallic element which forms a solid solution with iron when added to steel. It does not form carbides, but assist in hardening to improve tensile properties and resistance to embrittlement at low temperatures. Nickel in excess of 7% is responsible for making the 300 series stainless steel austenitic.

NIOBIUM

European Equivalent for columbium. Columbium is more widely used.

NORMALIZING

A heat treatment of carbon and alloy steel above the upper critical transformation temperature (approx. 1650 ° F), holding at temperature for about an hour and cooling at room temperature in still air.

NOTCH TOUGHNESS

The ability of steel or other metal alloy containing a notch to resist fracturing under load. (Charpy Impact Test)

NUT

An internally threaded product intended for use on external or male screw threads such as a bolt or a stud for the purpose of tightening or assembling two or more components.

OIL QUENCH

A cooling method for hardening steels, heated above the upper critical temperature, by immersing into liquid oil. This cooling method is normally reserved for medium to high carbon and alloy steels which may crack if hardened by quenching in water.

PANGBORN

Equipment used to shotblast, specifically to blast coils of wire to remove scale prior to drawing. (Blast cleaning)

PASSIVATION

The process of forming an oxide film on the surface of stainless steel by chemical treatment to improve corrosion resistance of stainless steel fasteners. This process is usually done after the steel has been subjected to thermal treatment.

“PD” BAR

Material that has been purchased or drawn to the outside diameter size capable of being roll threaded to the finish diameter required.

PEARLITE

A lamellar microstructure in carbon and alloy steel which consists of alternate layers of ferrite (alpha iron) and cementite (iron carbide) resembling mother-of-pearl.

PITCH DIAMETER (PD)

The diameter measured from the point half way between the crest and the valley of a thread.

PLATING

A coating of various materials used as a protective barrier to resist corrosion, and in some instances to enhance resistance to friction.

PLUG GAGE

A tool used to assess accuracy of form or fit of internal threads.

“PMI”

“Positive Material Identification”: A test to verify chemistry of metals. Normally done with a “Nuclear Analyzer” or a spectrograph.

PROOF LOAD (EXTERNALLY THREADED FASTENER)

The tension applied load that a fastener must withstand without any indication of permanent deformation or failure. Proof load is typically calculated at 90-93% of the minimum yield strength.

PROOF LOAD (INTERNALLY THREADED FASTENER)

The axially-applied load using a bolt or threaded mandrel that must be supported by a nut without indication of thread stripping or failure.

PROOF STRESS LOAD

The proof stress is the amount of stress (on a stress -strain curve) where a material will exceed the elastic/plastic limit. In other words, it begins to get a permanent set on further stressing. The 0.2% is the offset from the normal stress/strain curve (a line drawn parallel to the normal curve – offset 0.2% of strain).

“QA” HOLD TAG

Tags used by QA to prevent questionable material from being processed further. Typically material is being held for dispositioning.

QUENCHING

A rapid cooling method used for increasing the hardness and strength of carbon and alloy steels, following by a tempering cycle. Quenching normally is an immersion of the steel in a liquid such as oil or water.

RADIOGRAPH

A photograph film placed behind the object being radiographed, which shows differences in absorption created by discontinuities, thickness variations or density after being developed.

RADIOGRAPHIC INSPECTION (RT)

A non-destructive method of internal examination in which the metal is penetrated by a beam of x-ray or gamma radiation.

RAISED FACE FLANGE (RF)

One of the types of facings on flanges. The raised portion is 1/16" for classes 150 & 300, while the raised faces for class 400 & above are 1/4".

REDUCED DIAMETER BODY

A fastener having a body diameter not less than the minimum pitch diameter of its thread nor more than its minimum full body diameter.

REDUCTION OF AREA

As determined in a tensile test this is the difference between the original cross-sectional area of the test specimen and the smallest area at the point of rupture.

REDUCTION OF AREA

The difference between the original cross sectional area of a tensile test specimen and its minimum cross section after the test sample has fractured.

RING GASKET ("R")

A metal gasket used in a ring joint flange having either an "Oval" or "Octagonal" cross sectional shape. The octagonal "R" type gasket can be used with the modern flat bottomed type oval ring joint flanges.

RING GAUGE

A tool used to determine the accuracy of form or fit of external threads.

RING JOINT FLANGE

A raised face flange which is grooved to accommodate a ring joint gasket. Flanges are manufactured IAW ASME B16.5 or API 6B.

ROCKWELL HARDNESS TEST

A test method for determining the relative hardness of metal by impressing a diamond indenter, or a 1/16" or 1/8" ball into a ground surface specimen with a prescribed load not exceeding 150 Kg. This test is usually performed on small hardened parts or on surfaces where the larger impressions made by the Brinell hardness test is undesirable.

ROLL THREAD

The threading method that uses dies to displace rather than remove material in order to create threads. Often used in conjunction with reduced diameter body.

“RTJ”

Ring Type Joint

“RX” TYPE

A metal gasket used in a ring joint flange having an octagonal cross section with asymmetrical angles.

SCHEDULE

A numerical value assigned for piping also referring to a bore size on flanges. Typical designation, i.e. schedule 160; S160.

SET PLUG

A precision tool used to calibrate ring gauges.

SHEAR FRACTURE

After Charpy impact specimens are broken, and the energy absorbed during breaking recorded, the fractured surfaces are visually examined to determine if the fracture has a brittle or ductile appearance. Fractured surfaces which contain both brittle and ductile areas are classified as to the percentage of shear (ductile) area. A normally specified requirement is 50% minimum shear, which is considered by most pipeline material specification writers as representative of a material's ability to resist crack propagation after a fracture has been initiated.

SHEAR STRENGTH

A maximum load applied to a fastener's axis that can be withstood prior to failure.

SHEAR STRESS AREA

An area perpendicular to the fastener axis which is based on the root diameter (minor diameter) of an externally threaded bolt or screw.

“SO”

An abbreviation designating a “Slip-on” flange. (See illustration in the flange section.)

SOFT IRON

Iron with a maximum Brinell hardness of 90, typically used on ring joint gaskets.

SOLUTION ANNEALING

Also known as annealing, or carbide solution treating. This process involves the heating of austenitic stainless steels and alloys to an elevated temperature known to ensure that carbides will be dissolved into austenite. After sufficient holding time the material is rapidly cooled, or quenched to prevent carbides from forming.

STAINLESS STEEL

A steel which has as its primary alloying element, chromium ranging from 10% to 30%. Other alloying elements such as nickel and molybdenum may also be added.

STEEL

Used in the context at DAN LOC; steel with a maximum Brinell hardness of 120.

STRAIN HARDENING

Also known as work hardening. The increase in shear stress and overall strength of certain metals, achieved by means of drawing, forging or rolling. Typical examples are strengthening wire by reducing its cross-section by drawing it through a die, producing the head on a bolt by forging it, and rolling sheet metal for automobile bodies.

STRESS RELIEF ANNEALING

A heating process applied to forged/headed fasteners to relieve any mechanical stresses generated during the forming process.

STRESS RELIEVING

The reduction of residual stresses in a metal part, or welded fabrication, either thermally, or mechanically. Stress relieving is generally considered to be a thermal treatment, when the part is heated to a suitable sub-critical temperature and held at temperature long enough to relieve the major stresses and then air cooled.

SURFACE DISCONTINUITIES

Irregularities of a fastener. These may include cracks, head bursts, shear bursts, seams, folds, thread laps, voids, tool marks, and nicks or gouges.

SWIVEL RING FLANGE

An assembly of a ring with bolt holes and a flange body that permits alignment with any fixed flange of the same type and rating. (See illustration in the flange section.)

TEMA FLANGE

Flanges for use in heat exchangers governed by TEMA, (Tubular Exchanger Manufacturers Association)

TEMPERING

The thermal treatment at a predetermined temperature below the critical range (below 1300 OF) followed by the quenching cycle in the heat treatment of carbon and alloy steels. It reduces the as -quenched hardness and significantly improves toughness and impact strength, particularly at low temperatures. Normalized parts may also be tempered to reduce hardness and improve toughness and impact strength.

TENSILE STRENGTH

The ultimate stress which a metal undergoes prior to failure as determined by maximum load applied during testing divided by the cross sectional area of the specimen at the moment the load reading was observed. (re: ASTM A 370).

TENSILE TEST

The testing of a tensile specimen to determine the yield strength, ultimate tensile strength, elongation and reduction of area. (re: ASTM A 370)

TEST REPORT

A written or electronic document provided by the authorized party to certify that a tested fastener's chemical and mechanical properties conform to the specification required.

TFE, PTFE

Abbreviations for Teflon* (Tetrafluoroethylene, Polytetrafluoroethylene)

*Teflon is a DuPont trade name.

"TFL"

"Threaded full length"

THREAD GALLING

The displacement of material between mating threads during tightening, which causes contact points to shear, producing friction, increased resistance to tightening, and even seizing of the threads. Thread galling is most common with fasteners made of materials that self-generate an oxide surface film such as stainless steel.

TRACEABILITY

The capability to authenticate manufacturing history by documentation of raw material, heat number, locations, or application of the product.

ULTIMATE TENSILE LOAD

The maximum tensile-applied load a fastener can support prior to fracture, and normally expressed in terms of pounds per square inch (psi) or pounds-force (lbf).

VANADIUM

A metallic element added to steel to improve hardenability and provide secondary hardening. It promotes fine grain by raising the grain coarsening temperature of austenite.

XYLAN

A fluoropolymer coating – essentially the same as Teflon of austenite.

YIELD STRENGTH>

The stress under load at which the proportionality between stress and strain in a tensile specimen is no longer equal. From this point on the specimen elongates at a reduced stress level with increasing load until rupture occurs.

ZYGLO INSPECTION

A liquid penetrant inspection method using a fluorescent penetrating oil and requiring a black light examination to detect surface imperfections and defects

Our ultimate goal always is to provide the highest level of quality in everything we make and everything we do. We work to exceed industry standards in our products and to exceed customer expectations in our service. While stud bolts and ring joint gaskets may seem like simple items, they are critical components to our customers operations, and they absolutely must perform. We believe one of our greatest duties is to help our customers prevent failures, thus all of our procedures are geared toward reducing their risk, and boosting their confidence.