

3-A STANDARDS



A registered trademark used to identify equipment that meets 3-A Sanitary Standards for design and fabrication. The 3-A Symbol on dairy and food equipment serves three purposes:

1. Assures processors that equipment conforms to sanitary standards
2. Provides accepted criteria to equipment manufacturers for sanitary design
3. Establishes guidelines for uniform evaluation and compliance by sanitarians

BEVEL SEAT FITTINGS

Used on process equipment and piping to ensure rigidity of the system; consist of a threaded ferrule mated with a plain ferrule; offered in T304 and T316L; secured with T304 stainless steel hex union nut

BIOPROCESSING EQUIPMENT (BPE)

Specialized equipment used in industries with strict hygienic requirements, including bioprocessing, pharmaceutical and personal care; also a body of standards for such equipment developed and managed by the American Society of Mechanical Engineers (ASME)

CLEAN IN PLACE (CIP)

CIP is a process designed to clean and sanitize equipment without disassembling it. This process involves running sanitization chemicals, cleaning agents, heat and/or water through intact systems and equipment to remove product residues, microorganisms, and other contaminants, ensuring that equipment remains in a hygienic and compliant state for subsequent production cycles. CIP offers an efficient way to clean smooth-surfaced equipment that may be hard to reach manually or require much time and effort to disassemble.

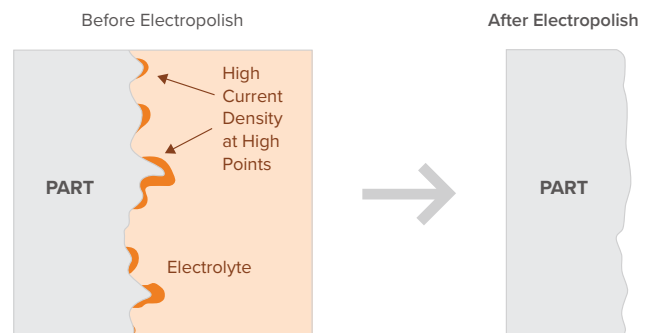
CLEAN OUT OF PLACE (COP)

COP refers to a cleaning method where components or equipment are disassembled and taken to a designated location for cleaning and sanitation. This method is used for equipment that cannot be cleaned in place or in the area where they're used, such as fittings, clamps, impellers and hoses.

ELECTROPOLISHING

A controlled electrochemical process used to improve the surface finish of metal components by running an electrical current through an electrolyte solution in which the component is submerged

Magnified View



ETHYLENE PROPYLENE DIENE MONOMER (EPDM)

A synthetic rubber commonly used in gaskets, seals and other elastomeric components that need to maintain a high level of cleanliness and compliance with sanitary standards

FINISH

Surface texture of metal, achieved through various mechanical and chemical processing methods

- **#1 Finish:** A mill finish for stainless steel; hot rolled, annealed and pickled, sandblasted or tumbled; also referred to as HRAP finish
- **#3 Finish:** Mechanically polished finish; 32 Roughness Average inside diameter only; coarse outside diameter
- **#3A Finish:** Mechanically polished finish; 150 grit outside diameter, 32 Roughness Average inside diameter
- **#4A Dairy Finish:** Polished inside and outside diameter to sanitary standards with a Roughness Average range of 18 to 31
- **#5 Finish:** Polished 150 grit outside diameter only
- **#7 Finish:** Polished outside/inside diameter to sanitary standards 32 Roughness Average

FKM

A family of fluorocarbon-based synthetic materials defined by ASTM International standard D1418; commonly referred to as fluorine rubber or fluoro-rubber; preferred for their advanced heat and chemical resistance

FOOD-GRADE STAINLESS-STEEL TUBING

A category of stainless steel tubing that meets specific criteria and standards for hygiene, corrosion resistance and compliance with regulatory requirements. Food-grade stainless steel is non-reactive with food and beverages, minimizes the risk of product adhesion and easily withstands the harsh conditions common in food and beverage applications.

- **304 Tubing:** 304 stainless steel is one of the most versatile and commonly used austenitic chromium-nickel alloys on the market. The chromium content in the alloy promotes excellent corrosion resistance, a high strength-to-weight ratio and remarkable ductility.
- **316 Tubing:** 316 stainless steel contains many similar chemical and mechanical properties as 304 stainless steel. However, 316 stainless steel incorporates molybdenum, which enhances its corrosion resistance, especially in harsh industrial environments. 316 stainless steel is more resistant to acidic material, industrial solvents, highly concentrated saline solutions and fatty acids at high temperatures.

GASKET

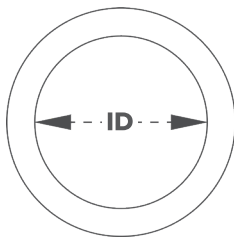
A sealing device placed between two connecting surfaces to prevent the leakage of fluids or gases and maintain a sanitary and hygienic seal; in special applications, gaskets are clamped between the ferrules on fittings to create a leakproof joint

HEX UNION NUT

Primarily used to connect and secure bevel seat fittings; an internally ACME-threaded connector

ID

Inside Diameter; refers to the distance between the interior walls of pipe or tubing; an abbreviation commonly used when discussing surface finishes



I-LINE FITTINGS

Comprise interlocking male and female ferrules, gaskets and clamps; commonly used in food, beverage, dairy and pharmaceutical applications to join separate runs of tubing with a leakproof connection

IMPELLER

A rotor or rotor blade within a pump used to impart motion to a fluid

JOHN PERRY FITTINGS

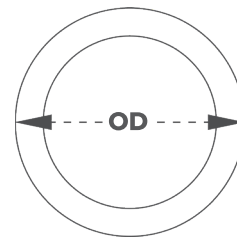
Similar in structure to bevel seat fittings; designed to work with a metal-to-metal seat, but can be paired with a gasket for additional leak security; common to the dairy and beverage markets

MTR

Material Test Report; an abbreviation commonly used in industrial contexts where material quality is critical to the safety and effectiveness of a system

OD

Outside Diameter; refers to the distance from exterior wall to exterior wall of pipe or tubing; an abbreviation commonly used when discussing surface finishes



ORBITAL WELDING

An automated welding technique that involves a machine rotating a welding head 360 degrees around the joint; a preferred method for sanitary applications because of the strength of the weld and the lack of re-polishing required

POLISH

The process of smoothing and refining a surface; in sanitary industrial applications, polishing may be applied to inside diameter, outside diameter or both

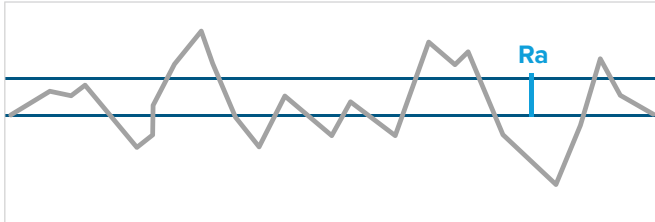
PUMPS

- **Centrifugal Pumps:** The most common type of sanitary pump for their simple design, versatility and efficiency. These pumps use rotational energy to move fluid, drawing it in through the pump inlet and using an impeller to drive the fluid out the impeller eye, increasing the fluid's velocity as it exits the pump.
- **Positive Displacement Pump:** Positive displacement pumps trap a fixed amount of fluid and force it into the discharge pipe. These pumps are preferable for applications that require a constant flow, regardless of pressure.

ROUGHNESS AVERAGE (RA)

Roughness Average—commonly abbreviated as “Ra”—refers to the surface texture of stainless steel products. Ra measures the peaks and valleys of the surface of the steel. The lower the Ra, the smoother the surface.

Cross section of a fitting at a microscopic level.



SANITARY FITTINGS

Specialized plumbing components used in hygienic applications, such as those in the food, beverage and pharmaceutical industries; designed to maintain cleanliness, prevent contamination and promote health and safety

Common sanitary fittings:

- **45° Elbow Fitting:** A hose fitting with female threads that runs off the end of the hose at a 45° angle
- **90° Elbow Fitting:** A hose fitting with female threads that runs off the end of the hose at a 90° angle
- **Adapter:** A pipe fitting that extends a run by joining two pipes of different types
- **Sanitary Barb:** An angled cylindrical feature on the OD of a fitting that grabs and holds the ID of a hose; barbs are designed so that hose is easily mounted but difficult to remove
- **Cap:** A pipe fitting that terminates a run by closing an end; covers the end of a run, attaching on the male end via welded or threaded connection
- **Cross:** 4-way connections, providing one inlet and three outlets or vice versa; less steady than tees; can generate high stress on the vessel with temperature changes

- **Barbed Fitting:** A fluid power fitting used with a hose; characterized by the presence of angled barbs that grab and hold on the ID of a hose
- **Clamp:** A mechanical device used to compress the flange against the O-ring in a split-flange O-ring fitting
- **Compression Fitting:** A type of tube fitting that is sealed by pressure caused by the interaction of threaded portions of the fitting.
- **Concentric Reducer:** A cone-shaped fitting used to join different-sized sections of tubing along the same center line
- **Eccentric Reducer:** A fitting used to join different-sized sections of tubing along the same edge line
- **Ferrule:** A flanged fitting used to connect two separate pieces of sanitary tubing, completed with the use of a clamp and gasket to create a watertight seal
- **Tees:** Connects three sections in a T-shaped intersection, allowing fluid flow to be combined or split apart
- **Wyes:** Connects three sections in a Y-shaped intersection, allowing fluid flow to be combined or separated with less resistance than a tee

SANITARY SPOOLS

Prefabricated lengths of stainless steel tubing with sanitary fittings welded to the ends

SF1 - MECHANICALLY POLISHED SURFACE FINISH

Mechanically polished stainless-steel tubing with a maximum inside-diameter surface Roughness Average of 20

SF4 – ELECTROPOLISH SURFACE FINISH

Electropolished stainless steel tubing with a maximum inside-diameter surface Roughness Average of 15

SPRAY BALLS

A hollow sphere made from hygienic 316L stainless steel with precise perforations; creates jets of fluid in all directions to clean tanks and other hard-to-access enclosed surfaces



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SURFACE FINISH (SF)

All surfaces as defined by Part SF of the current ASME BPE Standards and/or the owner/user or manufacturer and referred in Roughness Average

BIOPHARMACEUTICAL(BPE) SURFACE DESIGNATIONS

ASME BPE Surface Designations	Inside Surface			Outside Surface		
	μ -inMax Ra.	μ m Max Ra.	Surface Treatment	μ -in Max Ra.	μ m Max Ra.	Surface Treatment
SF0	No Finish Requirement	No Finish Requirement	Mechanically Polished	No Finish Requirement	No Finish Requirement	No Finish Requirement
SF1	≤ 20	$\leq .51$	Mechanically Polished	≤ 32	$\leq .8$	Mechanically Polished
SF2	≤ 25	$\leq .64$	Mechanically Polished	≤ 32	$\leq .8$	Mechanically Polished
SF3	≤ 30	$\leq .76$	Mechanically Polished	≤ 32	$\leq .8$	Mechanically Polished
SF4	≤ 15	$\leq .38$	Mechanically Polished OD & Electropolished Polished ID	≤ 32	$\leq .8$	Mechanically Polished
SF5	≤ 20	$\leq .51$	Mechanically Polished OD & Electropolished Polished ID	≤ 32	$\leq .8$	Mechanically Polished
SF6	≤ 25	$\leq .64$	Mechanically Polished OD & Electropolished Polished ID	≤ 32	$\leq .8$	Mechanically Polished

TANGENT PIPE FITTINGS

Tangent pipe fittings add length to one or both ends of the elbow fitting. The extra length is an integral part of the fitting, not added via weld. Typical tangent lengths are 2 inches, but longer lengths are available through custom fabrication. The difference is that one end or both ends of the elbow have extra length added.

Example:



TRI-CLAMP

Tri-clamp fittings comprise two ferrules, a gasket and a clamp to secure the three components around the tubing joint. These fittings are common in sanitary processes because they provide tight, leakproof connections and can be cleaned in place. These fittings are also commonly referred to as “Tri-Clover” after the popular version of the product manufactured by Alfa-Laval.

TUBE FITTING

A length of tubing formed into a usable shape either welded to an apparatus or welded to ferrules for use in an apparatus

TUBING

Lengths of hollow cylinder designed for conveyance; commonly made out of stainless steel in sanitary process applications

VISCOSITY

The measure of a fluid’s resistance to flow; critically important information in flow control applications

WASHDOWN

The process of cleaning a surface to maximize hygiene and reduce contamination; depending on the application, may involve detergents or other cleaning agents



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