

# 3-A<sup>®</sup> Sanitary Standards for Refractometers and Energy Absorbing Optical Sensors for Milk and Milk Products, Number 46-03

Formulated by  
*International Association of Food Industry Suppliers (IAFIS)*  
*International Association for Food Protection (IAFP)*  
*United States Public Health Service (USPHS)*  
*The Dairy Industry Committee (DIC)*  
*United States Department of Agriculture – Dairy Programs (USDA)*

It is the purpose of the IAFIS, IAFP, USPHS, DIC, and USDA in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Refractometers and energy absorbing optical sensor specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, DIC, and USDA at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products, and other perishable foods or comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

## A SCOPE

A1 These standards cover the sanitary aspects of refractometers and energy absorbing optical sensors used on milk and milk products equipment for sensing concentration, turbidity and/or color.

A2 In order to conform with these 3-A Sanitary Standards, refractometers and energy absorbing optical sensors shall comply with the following design, material, and fabrication criteria and the applicable documents referenced herein.<sup>1</sup>

## B DEFINITIONS

B1 *Product*: Shall mean milk and milk products.

B2 *Refractometer*: A device to measure the refractive index of a product.

B3 *Energy Absorbing Optical Sensor*: A device to measure the energy absorption, such as infrared energy, of a product.

B4 *Optical Element*: An optical device utilized to transmit, reflect, refract, alter the angle of or in some way interface energy with a milk or milk product.

B5 *Flushing Nozzle*: A device utilized to direct flushing media to the optical surface.

## B6 Surfaces

B6.1 *Product Contact Surfaces*: Shall mean all surfaces that are exposed to the product, or surfaces from which liquids may drain, drop, or be drawn into the product.

B6.2 *Nonproduct Contact Surfaces*: Shall mean all other exposed surfaces.

B6.3 *Optical Surface*: Shall mean the optically sensitive product contact surface of the optical element.

## B7 Surface Modifications<sup>2</sup>

B7.1 *Coatings*: Shall mean the results of a process where a different material is deposited to create a new surface. There is appreciable, typically more than 1 um, build-up of new material.

<sup>1</sup> Use current revisions or editions of all referenced documents cited herein.

<sup>2</sup> Additional information on surface modification is contained in *Advanced Materials and Processes*, Volume 137 (1); "Coatings and Coating Practices" by H. Herman, "Surface Modification" by F. A. Smidt. ASM International, Materials Park, OH 44073 (216) 338-5151.

- B7.1.1 Coating process include:
1. Chemical
  2. Electrodeposition<sup>3</sup> (including gold)
- B8 *Mechanical Cleaning or Mechanically Cleaned:* Shall denote cleaning by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned by, mechanical means.
- B9 *Optical Surface Flushing:* Shall mean the flushing of the optical surfaces with a flushing media so as to provide an obstruction-free interface.
- B10 *Flushing Media:* Shall mean a safe and product-compatible media such as safe water, culinary steam, or milk or milk product.
- B10.1 *Safe Water:* Shall mean water from a supply properly located, protected, and operated, and shall be of a safe, sanitary quality. The water shall meet the standards prescribed in the National Primary Drinking Water Regulation of the Environmental Protection Agency (EPA) as referenced in The Code of Federal Regulations<sup>4</sup> (CFR), Title 40, Parts 141, 142, and 143. (Information also available from the environmental protection agency [EPA] Drinking Water Hot Line: 800-426-4791.)
- B10.2 *Culinary Steam:* Shall mean steam produced using a system meeting criteria in the 3-A Accepted Practices for a Method of Producing Steam of a Culinary Quality, Number 609-.

## C MATERIALS

### C1 Metals

- C1.1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series<sup>5</sup> (except 301 and 302) or corresponding Alloy Cast Institute (ACI) types<sup>3</sup> (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion resistant as

stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

- C1.1.1 Gold or Silver bearing solder may be used for connecting optical elements to the element housing and shall be corrosion resistant, free of cadmium, lead and antimony, nonabsorbent, and shall not impart any toxic substance to the product when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

### C2 Nonmetals

- C2.1 Rubber and rubber-like materials may be used for O-rings, gaskets, and parts having the same functional purposes.
- C2.2 Rubber and rubber-like materials, when used for the above-specified application(s), shall conform with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.
- C2.3 Plastic materials may be used for optical surfaces, optical elements, optical element insulators, optical element holders, gaskets and parts having the same functional purposes.
- C2.4 Plastic materials, when used for the above specified application(s), shall conform with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.
- C2.5 Rubber and rubber-like materials and other materials listed in C2.7, and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics and be thermally stable when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.
- C2.6 The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials, and or other materials listed in C2.7, and bonded plastic materials shall be nontoxic.<sup>6</sup>

<sup>3</sup> MIL-S-13165C (1), *Military Specification: Shot Peening of Metal Parts*. Available from Standardization, Document Order Desk (Department of Navy), 700 Robbins Avenue, Building 4, Section D, Philadelphia, PA 19111-5094 (215) 697-2179.

<sup>4</sup> For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202) 512-1800.

<sup>5</sup> The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, Table 2-1. Available from the American Iron and Steel Society, 186 Thorn Hill Road, Warrendale, PA 15086 (724) 776-1535.

<sup>6</sup> Adhesives shall comply with 21 CFR 175 - Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202) 512-1800.