



# SPECIFICATION

## SPECIFICATION FOR VACUUM COMPONENT CLEANING

APPROVALS	DATE	REV	DCN NO.	BY	CHECK	DCC	DATE
AUTHOR: REB							
CHECKED:							
APPROVED:							
DCC RELEASE							

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**SPECIFICATION****SPECIFICATION FOR VACUUM COMPONENT CLEANING****1.0 PURPOSE**

The purpose of this procedure is to define the requirements for the cleaning of the Advanced LIGO vacuum equipment components such that all vacuum exposed surfaces are compatible with ultra high vacuum service.

The seller shall develop its own detail cleaning procedure incorporating all the requirements of this specification and submit it to the Buyer for approval. The procedure must be approved prior to use.

**2.0 GENERAL**

This procedure is applicable to any fabricated stainless component that is exposed to UHV service. It applies to the cleaning of these components subsequent to completion of all machining and welding operations.

All Viton O-Rings shall be cleaned per specification E0900431-v1.

All Conflat gaskets shall be cleaned using lint free wipes and isopropyl alcohol or a Liquid CO<sub>2</sub> cleaning gun.

After cleaning, the vacuum components must be protected by cleanrooms certified to Class 5 cleanliness level of ISO standard 14644-1 – 1999 Cleanrooms and Associated Controlled Environments (hereafter referred to as Class 5). Class 5 is approx. equivalent to superceded Federal Standard 209E class 100.

**3.0 RESPONSIBILITY**

The Seller is responsible for identifying all components and portions of components that are subject to this procedure. All cleaning will be as specified on the drawings.

The Seller is responsible for the execution of this procedure in their shop.

The Seller's Quality Assurance Dept. is responsible for monitoring compliance with this procedure in the Seller's shop.

**4.0 EQUIPMENT AND SYSTEMS****4.1 General**

The Seller shall install a cleaning station designed to meet the cleaning requirements of this specification.

The Wash Station shall have the following components:

- Cleaning Solution and Rinse System
- Wash water storage tank

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Rinse water storage tank  
DI Water system and storage tank  
Waste water hold-up tank  
Wash/Rinse water heater  
DI Water heater  
Pumps, filters, piping, valves

#### 4.2 Cleaning Area

An isolated section of the Seller's shop will be provided with an outside air purge to form a clean manufacturing /cleaning area. Class 5 cleanrooms will be operated in this area. The components cleaned in the washing station must be closed up in the Class 5 cleanrooms for packaging (or closure of the vessel ports) without going back into the shop atmosphere.

#### 4.3 Class 5 Cleanroom

Class 5 soft-wall portable cleanrooms shall be used to form a clean area to wash and close-up components. The cleanrooms circulate air through HEPA filters at the tops of the rooms downward. The air exits under the soft-walls (plastic curtains) at the bottom and exits into the shop area.

Cleanroom activities shall be performed in accordance with Standard Cleanroom Procedures. Specific cleanroom training is required for anyone entering the cleanroom. This training, should cover principles, gowning and necessary behavior to maintain the clean environment.

## **5.0 PROCEDURE**

### 5.1 Starting Condition

All welding completed to the degree possible.

Gross contamination shall be removed from all interior and exterior surfaces (including flange faces) by steam cleaning with a portable steam system. If gross contamination is detected (which was prohibited by this contract) such as inks, marking crayon, etc., the Buyer shall be consulted for resolution.

Local tap water shall be analyzed by the Seller and submitted to the Buyer for approval. It must be approved to use it as preliminary rinse water.

### 5.2 Equipment Set-Up

The cleaning detergent shall be Inpro-Clean 1300 mixed in 4% solution (by volume) with clean water.



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Seller shall verify that all wash station materials (detergent/water mix, DI water, etc.) are correct in quantity and concentration to properly wash and rinse the vacuum component that is in the wash station prior to starting a cleaning run. The operation of the Class 5 Clean air system shall also be verified.

The wash/rinse water shall be heated in a closed loop system until the contents of the tank to approximately 150 F as read on the thermometer at the pump inlet. Repeat for the rinse water. Repeat for the DI water using its dedicated pump and heater.

The operator doing the washing shall wear Class 5 suit, shoe covers and clean room gloves. (This applies to anyone handling the cleaned pieces or in the cleaning area.)

A temperature sensor shall be available to measure the final temperature of the part being washed.

Do not let any surface dry between start of washing and end of final rinse.  
Handle each piece or component with appropriate care and clean gloves.

The entire contents of the wash water tank should be drained every 2 months, or sooner if the system is not used continuously. If not changed periodically, the detergent will become ineffective. There is no indication of this condition other than the loss of adequate cleaning (as indicated by the final Cleanliness Test).

### 5.3 Cleaning

#### General

The cleaning detergent shall be Inpro-Clean 1300 mixed in 4% solution (by volume) with clean water.

The cleaning solutions (detergent mix, rinse water, DI water) shall be preheated to approx. 150 F water.

When making DI water, periodically monitor the quality light at the DI system.

#### Wash

Pressure wash the vacuum component with the Inpro-Clean solution until the part being washed is at a temperature of 130 °F or higher for 10 minutes. A rotating spray fixture should be used to clean long parts in conjunction with high pressure spray wands to clean flanges and recesses.

#### Wash Solution Maintenance

The wash solution should be established and maintained at approximately 4% by volume of Inpro-Clean 1300 (manufactured by Oakite).

Initially, and after the first week of frequent wash system usage (and periodically thereafter), a sample from the wash solution tank should be taken and analyzed for detergent concentration by titration using the test kit for Procedure 125. For Procedure 125, the sample volume is 2 ml and the detergent volume percent



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concentration is  $T \times 3.6$  (see instructions in kit). This will assure maintenance of the proper detergent concentration.

1<sup>st</sup> Rinse

Hot Clean Water shall be used for the first rinse of vacuum components. A rotating spray fixture should be used to rinse long parts in conjunction with high pressure spray wands to rinse flanges and recesses. Each part shall be rinsed for a minimum of 15 minutes.

Final D.I. Water Rinse

Hot D. I. Water shall be used for the final rinse of vacuum components. A rotating spray fixture should be used to rinse long parts in conjunction with high pressure spray wands to rinse flanges and recesses. Each part shall be rinsed with D. I. Water for a minimum of 15 minutes.

Drying

Drying will be accomplished by blowing clean Class 5 air over the component before allowing it to cool and dry.

Inspect as soon after drying as possible in a Class 5 cleanroom.

Inspection

Inspection shall be done before removing the piece from the washing /Class 5 station using a black light on all interior surfaces or flange faces. Inspect parts per LIGO Spec. E0900409-v1 (Att. 14).

No visible contaminant of any form is allowed when viewed with the naked eye under both natural and ultraviolet light.

The presence of any hydrocarbon or fingerprints on any interior surface or flange face shall be cause for rejection. Small areas can be cleaned with liquid CO<sub>2</sub> cleaning and re-tested.

A visual inspection shall be made of exterior surfaces. Visible particulates or actual contamination shall be removed.

Bagging/Wrapping

Immediately after drying and inspection, double bag the component using clean, oil-free polyethylene bags or wrap and seal using the same material. Larger components (spools) shall be closed up while in the Class 5 cleanroom using test doors (for vacuum leak testing) or with shipping covers.

Remove the closed component to the clean area for additional testing.



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### 6.0 Required Documentation

A component cleaning data sheet containing the following data shall be filled out after cleaning each component. The data sheet will become part of the component QA package. Attachment 1

Component	Serial Number
_____	_____
_____	_____
_____	_____
_____	_____

Wash Cycle Procedure Used \_\_\_\_\_

Pump Disch. Press. \_\_\_\_\_ Max. Temp.: \_\_\_\_\_ Duration: \_\_\_\_\_

Operator: \_\_\_\_\_ Date: \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Component(s) Inspected By: \_\_\_\_\_ Date: \_\_\_\_\_

Quality Assurance: \_\_\_\_\_ Date: \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Inpro-Clean 1300

**Moderately alkaline, low foaming, non-silicated circulation-in-place cleaner for the pharmaceutical and food industries.**

## DESCRIPTION

Inpro-Clean 1300 is a low-foaming, moderately alkaline, liquid cleanser specifically formulated for circulation-in-place cleaning of process pipe lines and tanks in pharmaceutical and food plants. This product's special surfactant package make it an excellent cleaner for difficult to remove crams and ointments. Inpro-Clean 1300 can be used for spray washers and agitated tanks.

Inpro-Clean 1300 contains ingredients acceptable to the FDA and is authorized by the USDA for use in federally inspected meat and poultry plants.

## APPLICATIONS

**Circulation-in-place cleaning of pipe lines and tanks:**

1. Pre-rinse system with fresh water
2. Recirculate a solution of Inpro-Clean 1300 at a concentration of between 1 to 10% by volume at temperatures between 120° to 150°F for 15 to 30 minutes depending on the type and the extent of the soil.
3. Flush system with fresh water for 5 to 10 minutes.

**Spray washers:** Inpro-Clean 1300 should be used at a concentration between 1 to 4% by volume at temperatures between 120° and 150°F.

## FEATURES & BENEFITS

Non-Silicated	Eliminates silicate drydown.
No Heavy Metals	Safer employee handling, facilitates disposal.
Effective in Hard Water	Minimizes scale and sludge formation
Non-Caustic	Eliminates caustic burns and drydown and allows easy rinsing.
Low-Foaming	Suitable for high pressure washers and agitated tanks.
Liquid Form	Allows for easy automatic dispensing and control.
Free Rinsing	

## CHEMICAL CHARACTERISTICS

Inpro-Clean 1300 is a solution of phosphates, sequestrants and surfactants.

pH, as used - 9.5- 10.2  
Bulk Density- 10.1 lb/gal

\*Safe on most metals except magnesium. Inpro-Clean 1300 may discolor brass and other cuprous alloys. Slight etching on aluminum and zinc alloys may occur at higher temperatures and/or concentrations. Results on aluminum, zinc and cuprous alloy should be verified prior to use. Note 2024 aluminum alloy may etch at a higher rate.

## OPERATING PARAMETERS

Rate of metal loss from immersion in Oakite Inpro-Clean 1300, 10% by volume, 150°F, (°C), projects for one year is as follows:

Metal (alloy)	mm/yr	in/yr
Stainless steel (304)	0.00	0.000
Stainless steel (316)	0.00	0.000

Effect of working solution on metals

For operating parameters on aluminum alloys and cuprous alloys please contact your Oakite Technical Sales Representative.

## PROCESS CONTROL

Concentrations are titrated using either procedures 56 or 125. For Procedure 56 the sample volume is 25 ml.  $T \times 2.9 = \% \text{ by volume of Oakite Inpro-Clean 1300}$ . For Procedure 125 the sample volume is 2 ml.  $T \times 3.6 = \% \text{ by volume of Oakite Inpro-Clean 1300}$ .

## SAFETY PRECAUTIONS

See Material Safety Data Sheet

## DISPOSAL METHODS

Dispose in accordance with federal, state and local regulations.

## SHIPPING

Common carrier, freight classification J - "Cleaning Compound, NOIBN Liquid". Product Code 4401.

## STORAGE

Not affected by high or low temperatures. Freezing point is 32°F. If freezing occurs, simply thaw and use.

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