

## Automated Passivation

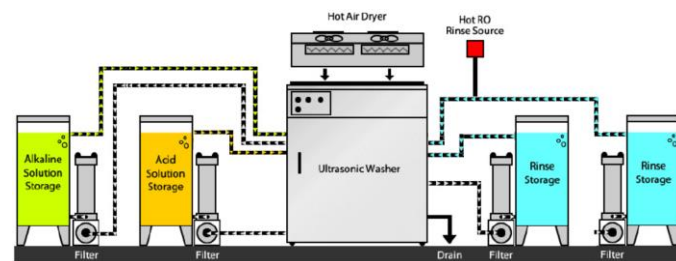
*“We move the fluids, NOT the parts”*

ESMA's automatic ultrasonic passivation systems provide a unique and closed process of cleaning-rinsing-passivating-rinsing and drying all at the push of a button. These systems do not require much floor space and provide great cost savings when compared to automated robotic passivation systems. The Esma process **MOVES FLUIDS NOT PARTS**. By moving fluids in and out of a single high-powered ultrasonic cleaning tank, the process can be **Automated, Covered and Controlled**.



### Automated Process:

By moving fluids with the use of pumps and valves, the Esma automated passivation system eliminates the need of an operator moving parts through a series of baths, and reduces interaction with dangerous chemicals.



See a short introductory video at the link below.

<https://www.youtube.com/watch?v=ITj42KB2PfA&t=7s>

### Covered:

Modular, covered, (ventilated) heated storage tanks are integrated with the system to allow re-use of chemicals and rinse water. Modular tanks can be configured in a layout that will fit your workspace. Storage tanks can potentially be located in a separate location outside of the work environment. This has been beneficial for use in a cleanroom where only the process unit is in the cleanroom and the storage tanks are located outside and piped through the wall.

### Controlled Process :

PLC controls with an integrated HMI touchscreen will allow engineering or quality to create passivation recipes with password protected controls and restrictions. Times, temperatures, pH, conductivity, etc., are all monitored (and data recorded). This removes potential operator error.

The ESMA Automated Passivation System is suitable for use with **ALL** AMS2700 and ASTM967 acid formulations.

### The standard process cabinet come in 2 tank sizes:

E700 – 9 gallon process tank with dimensions of 18”x12”x10” (actual dimensions)

E992 – 18 gallon process tank with dimensions 24”x14”x12” (actual dimensions)

Each system above is available as a single process system or multiple process systems. A multiple process system has two (2) or three (3) of process units (E700 or E992) sharing the same complement of heated storage tanks. This setup is effective in increasing throughput without the cost (or space) of additional full line single setup systems. Storage tanks are sized accordingly for use in single, dual or triple systems such that each process unit can run independently and simultaneously without exhausting the fluids in the storage tanks.

### **Single Automated System**

#### Single Model Process (shown with 4 tanks)

Power Requirement for system:  
120/208 3PH (Y)

E992 and 4, 30g storage tanks:  
40 FLA



### **Dual Automated System**

#### Dual Process (shown with 4 tanks)

Power Requirement for system:  
120/208 3PH (Y)

Dual E992's and 4, 60g storage tanks:  
70 FLA



### **Triple Automated System**

#### Triple Process (shown with 4 tanks)

Power Requirement for system:  
120/208 3PH (Y)

Triple E992's and 4, 100g storage tanks:  
115 FLA



With a simple push button control the following cycle could run  
(SHOWN AS EXAMPLE ONLY – OTHER RECIPES CAN BE CREATED)

1. Alkaline Cleaning

- Alkaline cleaning solution from the storage tank is pumped into the E992 tank.
- Parts are ultrasonically cleaned.
- Alkaline cleaning solution is pumped back to storage.

2. Alkaline Rinse (Rinse Tank#1)

- Rinse water is pumped from the rinse storage Tank#1 into the process unit tank.
- Parts are ultrasonically rinsed. The rinse water is cascaded out of tank overflow and pumped back into the rinse water storage Tank#1.
- After rinse, the tank is pumped back into the rinse water storage Tank#1.

3. Passivation

- Passivation Solution from **selected** acid storage tank is pumped into the process unit tank.
- Parts are ultrasonically passivated.
- Acid passivation solution is pumped back to storage.

4. First Rinse (Rinse Tank#1)

- Rinse water is pumped from the rinse storage Tank#1 into the process unit tank.
- Parts are ultrasonically rinsed. The rinse water is cascaded out of tank overflow and pumped back into the rinse water storage Tank#1.
- After rinse, the tank is pumped back into the rinse water storage Tank#1.

5. Second Rinse (Rinse Tank#2)

- Rinse water is pumped from the rinse storage tank#2 into the process unit tank.
- Parts are ultrasonically rinsed. The rinse water is cascaded out of tank overflow and pumped back into the rinse-water storage Tank#2.
- After rinse, the tank is pumped back into the rinse water storage Tank#2.

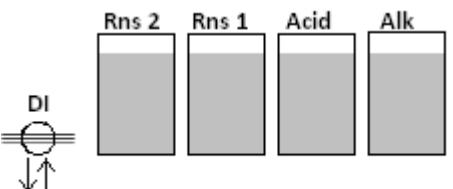
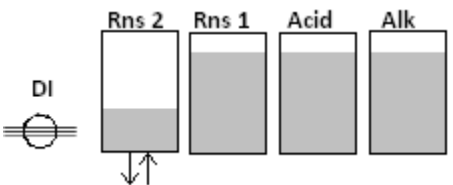
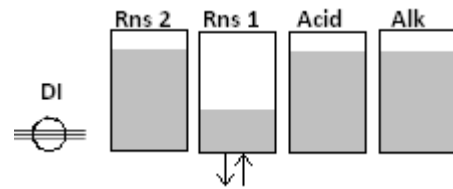
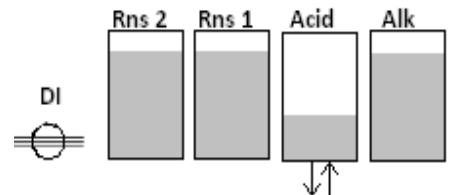
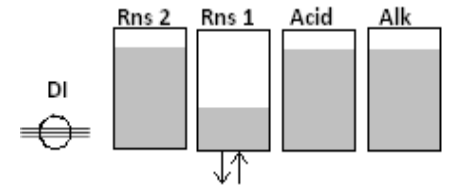
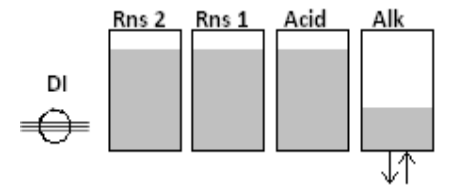
6. Final Rinse (Facility DI Source)

- Rinse water from the **Source**, is pumped into the process unit tank for **final** rinse.
- Parts are ultrasonically rinsed. . The rinse water is cascaded out of tank overflow and pumped to **Drain**.
- After final rinse, tank is drained and rinse water is pumped to **Drain**.

7. Hot Air Dry

- The hot air drying cycle begins.

Pictogram of storage tank levels



## **Process Units - Automatic Ultrasonic Washer**

Self-contained, console mounted automatic ultrasonic washer. Automatically cleans, rinses and dries. Three pumps transferring solutions to storage or drain are integrated into the system. Unit is controlled with an IDEC programmable controller. The console is Stainless Steel and the tank is 316SS. Hinged dryer cover includes variable speed fans capable of 500 cfm and 4,500 watts of heat. The dryer cover will include 6" plenum to be connected via flexible tubing to exhaust or vent system.

\*\*\* Customer is responsible to connect plenum with flexible hose to an adequate ventilation system. If nitric acid is used, the fumes are corrosive to electrical components on the system and could cause early failures if not properly ventilated. System equipped with air actuated valves for use with nitric acid. Customer to supply shop air connection from 50-90 psi.

- Cabinet dimensions: 28"W x 22"L x 39"H
- Solution heaters to maintain temperature during process. Thermocouple will monitor tank temperature and fault system in the event that solution exceeds the limit.
- Equipment stack light (Red/Green/Amber) and end of cycle alarm.



### E700 - 9 Gallon Ultrasonic Washer:

- Tank dimensions: 18"W x 12"L x 10"D (working depth = 8")
- Ultrasonic power: 900 watt, 40 kHz

### E992 - 18 Gallon Ultrasonic Washer:

- Tank dimensions: 24"W x 14"L x 12"D (working depth = 10")
- Ultrasonic power: 1,800 watt, 40 kHz

### System includes a Beijer Touch Screen Interface (HMI)

Interface will allow monitoring of process times, temperature, conductivity, etc. for each cycle. Interface has password protected accessibility to recipe settings. Temperature is monitored and PLC controlled for maintaining solution temperature during cycles. Upper and lower limits can be set which will fault the system when out of spec. upon startup of a cycle



This series has a built-in Ethernet port and the capability of collecting data from the plc and storing the data in the touch screen as a text file. The touch screen can be set up as an FTP server so any data collection system with FTP client capability can access the files. Data is recorded for each cycle which can included (bar code scanned if available) part or "traveler" numbers as well as all the pertinent data from each cycle. This is particularly valuable with validating a process or achieving NADCAP (aerospace) certification.

## Process Unit **STANDARD** Features

### Ventilation Collar

The E992 cover is equipped with a 6" vent collar. This is designed to connect to the facility fume extraction system

The E992 system has two exhaust states:

1. Acid fumes during passivation cycle step
2. Hot air drying
3. Therefore, it will always be exhausting unless it is drying. The draw from the facility system should be roughly 150 cfm on the branch to pull the acid fumes, when acid is in the tank. However, when the drying fans kick on, the air flow from the dryer fans will overpower the exhaust and go out the open end of the tee branch into the room. As the tank will have no fluid in it during the drying step, this will be warm, humid air and not harmful to the work environment.

It is *recommended* to install a 6" CPVC tee on this collar as shown in the example pictures on this page. Connect one end of the tee to the facility ventilation system, leaving the other end open to the room.

See short video on this at the link below.

<https://www.youtube.com/watch?v=zl6dMVggGZ0&t=6s>



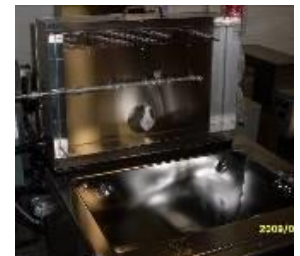
### Rinse Spray Manifold in Cover/Side of tank

Utilizes facility rinse water. PLC controlled steps for spray rinse cycles bar to rinse tank walls and tank bottom following immersion rinse steps to minimize drag out of solutions from process step to process step

Inserts into the dryer cover and only runs during rinse draining steps.

See short video on this at the link below.

<https://www.youtube.com/watch?v=19KVhDTodhl>



### Conductivity Controller and Probe on Process Unit

Internal conductivity transmitter. Process tank will include a probe for monitoring conductivity of the final rinse water to meet ASTM A967 standard for a final rinse water with less than 200 PPM/TDS (parts per million/total dissolved solids).

HMI will display conductivity with alarms when out of spec.

## Process Unit **OPTIONAL** Features

### Pneumatic Lid Opener

- Automated lid lifter using pneumatic pistons
- Push-button activated lid – which can optionally be used as a lid-lock mechanism with password protected access to the tank during cycles.

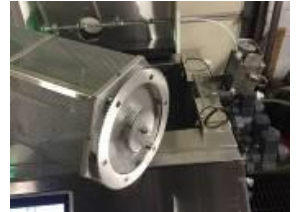


### Ultrasonic Parts Rotation Option

Parts Rotator Mechanism & Basket

REQUIRES ABOVE PNEUMATIC LID OPENER IF SELECTED

- Direct Drive motor to basket  
Illustration at right.
- Basket constructed of 20/20 SS Mesh with .03” openings, Hexagonal shape
- Basket loading is easy with a removable end cap for parts to be loaded and unloaded.
- Tank can be used for standard basket when rotator basket is not in use.
- Includes E-Stop switch on operator interface panel
- Effective cleaning of small parts with blind holes. Allows fluid to flush into blind holes and cavities



E700 Tumbler Basket: - Dimensions 10” dia. X 15” long

E992 Tumbler Basket: - Dimensions 12” dia. X 21” long

## Integrated Modular Heated Storage Tanks

Standard 304 stainless steel tanks unless otherwise noted  
CPVC air actuated solenoids and pumps for liquid transfer  
CPVC ball valve drain  
Low level float switch turns off heaters in case of water loss  
High level float switches will protect against overflow



### Remote PLC Storage Tank Controller Box

- Master control PLC to control storage tanks
- Controls and displays storage tank temperatures
- Mounts away from the storage tanks



### 15 Gallon Tank:

Dimensions with pumps, filters and enclosures attached, 22" Lx18" Wx30"H

### 30 Gallon Tank:

Dimensions with pumps, filters and enclosures attached, 30" Lx30" Wx30"H

### 60 Gallon Tank:

Dimensions with pumps, filters and enclosures attached, 36" Lx30" Wx30"H

### 100 Gallon Tank

Dimensions with pumps, filters and enclosures attached, 36"L x 27"W x 44"H

## Storage Tank **STANDARD** Features

### Rinse Tank#1 – Self neutralization

This Rinse1 tank will see the most dragout and becomes acidic over time. Self-neutralizing is an automated process for continuous conditioning of the rinse to water to pH neutral.

Includes tank mounted metering pump to connect to Sodium Hydroxide solution to allow for constant pH monitoring and automatic neutralization of rinse water.



### Rinse Tank#2 – PPM/TDS DI water control

The Rinse 2 storage tank comes with a PPM/TDS meter and inlet solenoid valve. The water in this tank (final rinse) can be quality controlled by a user defined limit.

Includes conductivity transmitter to open/close freshwater inlet valve for overflow to drain control of water quality in tank. Conductivity (PPM/TDS) set point will open/close the inlet water valve and continuously monitor.



See short video on this at the link below.

<https://www.youtube.com/watch?v=iUEmb3iPuU4&t=59s>

## Storage Tank **OPTIONAL** Features

### Halar Interior Coating

ONLY required if ASTM Nitric1 – AMS270 Method 1 Types 1 & 2 (Nitric with Sodium Dichromate) Stainless steel tanks internal ID coating. Halar 6514 (ECTFE) Black base coat / 6014 Clear topcoat at a total thickness of 30 to 40 mils.

- Teflon Immersion heater – replaces standard bottom mounted pad heaters

### Nitric Storage Tanks Ventilation Plenum

Nitric acid storage tanks can be equipped with ventilation plenum boxes on the top of the tanks. These are designed to connect to an in-house ventilation system and are equipped with a 2" hose barb on the back of each box. A hinged lid is used to create a vent path for air to pull any fumes from escaping the tank. A separate lid (unsecured) is meant to be on the tank **at all times** – except when needing access. This design will create an effective exhaust system for nitric acid fumes. Only a minimal draw is required due to the design of this lip venting. It is recommended to ventilate each tank at a minimum of 1 CFM.



### UV Lamp in filtration circuit

Ultraviolet lamps immersed in any storage tank to reduce bioburden  
Runs when recirculation pump is on to further helps inhibit organic growth in solutions  
Excellent for reducing bio burden in citric acid tanks as well as rinse tanks.







*Celebrating 50 years of excellence in manufacturing ultrasonic cleaning equipment, electropolishing equipment and associated chemistries.*

## **MADE IN U.S.A.**

Standard Warranty: There are no guarantees or warranties as to process or performance standards of fitness of use or purpose. The materials of construction are not warranted for compatibility with any particular chemical or chemical solution. Unless as otherwise stated in writing, the determination of such suitability of materials of construction with the chemical(s) to be used is the sole responsibility of the customer in conjunction with the customer's chemical supplier. If compatibility stated in writing, should any of the material manufactured in the system show defects of manufacture under normal use and service within one year from the date of shipment new parts to replace such defective material will be furnished F.O.B. origin. The liability for such guarantee shall be limited to the replacement of the parts only and shall not include labor or changing parts or consequential damages in any form. All replacement parts for material claimed defective will be invoiced in the usual manner, such invoices being subject to adjustment after the alleged defective material has been returned to the factory for inspection. No materials are to be returned without written permission.

Chemistry selection and process is the responsibility of the user, not Esma Incorporated or its authorized representatives and distributors.

The following is a list of standard wetted components in the Automated Passivation system:

1. Stainless steel (304 & 316)
2. CPVC (piping and fittings)
3. PFA (valve seats)
4. Kynar (PVDF) (fittings)
5. Viton (FKM) (seals and seats)
6. Polypropylene and Ceramic (pump wet ends)
7. Halar (ECTFE) (tank coating if needed on storage tank)
8. PVC (flexible transfer hose)

Other materials may be substituted, if available, at customer request.

**Esma, Inc.**

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