



User Manual

PilotGenizer Series
Microfluidization Technology
High Pressure Homogenizers
(Pilot Scale, Electric Bench-Top)



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1. Open-box Inspection

Check whether there is any packing damage. Refer to the *Packing Slip* for the integrity of the product.

2. Product Introduction

2.1 Brief Introduction

The PilotGenizer is a user-friendly high pressure homogenizer that is designed for laboratory R&D and pilot-scale production at ultra-high pressure. It includes dual intensifier pumps that operate synchronously and generates ultra high pressure up to max. 45,000 psi / 3,100 bar. The PilotGenizer features microfluidics Diamond Interaction Chamber Set with multiple nano-size microchannels inside the chamber where your formulation is subjected to forces of high shear and strong impact and result in nano particle dispersion and nano cell disruption. And it can be widely used in the pharmaceutical, biochemical, cosmetics, food and dairy industries among others.



2.2 Specification

Catalog No.	PilotGenizer-15K	PilotGenizer-20K	PilotGenizer-25K	PilotGenizer-30K	PilotGenizer-45K
Max. Flow rate	60L/Hr	45L/Hr	35L/Hr	30L/Hr	20L/Hr
Min. Sample	200mL	100mL	100mL	100mL	100mL
Max. Pressure	15,000psi	20,000psi	25,000psi	30,000psi	45,000psi
Dimensions (cm)	145×75×50	145×75×50	165×90×65	165×90×65	165×90×65
Weight	~260 kg	~260 kg	~320 kg	~320 kg	~320 kg
Max. Temp.	80°C (176°F)				
Power	380V/430V				
Cleaning	Flush to clean				
Application	Nano emulsion, fat emulsion, liposome, cell disruption, nano dispersion, deagglomeration				
Feature	Notable shear rate; Powerful microjet; Greater repeatability; Guaranteed scalability;				

2.3 Standard Features

Parts	Y/Z-type Diamond interaction chamber
Control System	High pressure programming control systems [®] : Self lubrication, Speed control, Auto stop control by time, pressure or cycle, display of flow rate and time, overload protection, single pump running
Pressure Gauge	Digital display on the touch screen
Inlet type	Tri-clamp or Luer
Outlet type	Tri-clamp or Luer
Feed Reservoir	2L, 316S/S Feed Reservoir Cylinder
Collector Reservoir	Collection piping
Product material	316L Stainless Steel, Tungsten Carbide, Viton, Teflon
Material standard	Pharmaceutical Grade, FDA, GMP
Warranty	1 year against any manufacturing defects

2.4 Options

Parts	High pressure extruders, Homogenizing valves two stages, Heat exchangers
Control System	Speed; Start; Stop Control
Detector	Pressure gauge, Pressure transducer up to 8 optional, Temperature transducer up to 8 optional
Outlet type	Tri-Clamp or Luer Lock Cap
Feed Reservoir	10mL, 20mL, 50mL, 100mL, 200mL, 500mL Syringe, S/S Cylinder, Jacketed Glass Cylinder or Online
Collector Reservoir	10mL, 20mL, 50mL, 100mL, 200mL, 500mL Syringe, S/S Cylinder, Jacketed Glass Cylinder or Online
Cylinder	Titanium High pressure Cylinder (Resistant to strong acid and base)



3. Safety Instructions

Operating the PilotGenizer homogenizer involves the handling of the samples at ultra high pressure. Therefore, the operation instructions must be well noted to avoid any personal injury by ignoring the instructions or equipment damage by improper operations. DO NOT proceed until the operator fully read and understand the instructions listed in this chapter. Also, the personal shield is recommended during the operation, and the high pressure homogenizer and extruder are recommended to be operated in the shielded hood or space.

Instructions of "ATTENTION", "WARNING", "DANGER":



ATTENTION: INDICATE THE CORRECT PROCEDURES AND PRACTICES FOR OPERATION AND MAINTENANCE, TO AVOID DAMAGE TO THE EQUIPMENT OR OTHER PROPERTIES.












WARNING: INDICATE POTENTIAL DANGERS. CORRECT PROCEDURES AND PRACTICES NEED TO BE FOLLOWED TO AVOID PERSONAL INJURY.





DANGER: INDICATE THE IMPROPER HANDLING, WHICH COULD CAUSE HAZARDOUS CONDITION, BODILY INJURY OR EQUIPMENT DAMAGE.


Safety Instructions


-  **Warning:** The equipment or the components cannot be changed without authorization.
-  **Warning:** It's necessary to completely read the user manual before operating the PilotGenizer homogenizer. The operator should be familiar with all the functions and controls of this system.
-  **Warning:** Please wear the proper individual protective gear when operating the PilotGenizer homogenizer.
-  **Warning:** Do not exceed the rated range. The PilotGenizer homogenizer has designed maximum working pressure. Once exceeding, it would cause the equipment damage or bodily injury.
-  **Warning:** Do not screw up the firmware or move the equipment when the equipment is running or is under pressure.
-  **Warning:** Do not use the broken components and always replace them in time.
-  **Warning:** The working pressure of this system should not exceed the maximum pressure of the rated component of this system. A pressure gauge can be installed in the system for checking the pressure condition of the system anytime.
-  **Warning:** DO NOT point the inlet and outlet of high pressure devices and equipments supplied by the Genizer, including high pressure coupling units, interaction chambers, HP valves and other high pressure fittings, to any personnel and object which may induce the safety issue and property loss. The user and buyer should be completely responsible for the violation of the clause and recommendation besides any other unsafe practices.
-  **Warning:** Handle the equipment gently and do not put heavy things on the equipment.

Safety Instructions

 **Attention:** Keep the PilotGenizer homogenizer far away from the open fire and high temperature. The overheated environment would damage the sealing element, hosepipe and parts of the electric appliance components. The performance of the homogenizer will be affected if the ambient temperature is higher than 60°C.

 **Danger:** The parts cannot be fixed only by the force of close-fitting. It would cause personal injuries if popping when the system pressure is too high.

 **Warning:** PilotGenizer homogenizer should be maintained by qualified technician. The user should be responsible for any improper maintenance.

 **Warning:** Using original parts to replace worn or damaged parts. Replacement with non-original parts will not be warranted.

4. Preparation

- Make sure all connectors and hoses, electric wiring are in correct position. The rated pressure class of connectors and hoses should be followed, and the power-supply wiring should use the rated voltage and current.
- The tightness degree of all thread fittings should be in moderate, not too loose or too tight.
- Make sure all pipe fittings are connected properly to the outlet and inlet, which should not exceed the load of PilotGenzier homogenizer.
- The medium must be compatible with 316L stainless steel. Please consult with the manufacturer for details if you are not sure about the medium property. The following is the medium that can be used:
 - Distilled Water
 - Petroleum
 - Diester
 - Silicone Oil
 - Surfactants
 - Strong Acids and Base
 - Soluble oil (water-in-oil emulsion)
 - Alcohol
 - Acetone
 - Lipids
 - Other organic solvent



Titanium cylinder needed



Warning: The large area of corrosion damage of PilotGenzier homogenizer caused by improper use of medium is not covered in the warranty.

5. Installation

The PilotGenizer series electric ultrahigh pressure homogenizer is an ultrahigh pressure homogenizer equipment operated on the touch screen and controlled intelligently by PLC. The power supply for the whole set of the equipment is 380V/430V. The homogenizer should be installed according to the part drawing in the *Components List*.



Warning: Fail to follow the chapter 5 might lead to personal injuries or damage to the equipment.

5.1 Placement of the Homogenizer

The equipment is heavy and should be placed on a stable platform. The equipment has non-slip stabilizer pads which does not need other fixing methods. The equipment requires extra space for safety and convenient operation.

5.2 Assembly of the Homogenizer

The components of this equipment have been assembled before leaving factory. Some peripherals with different joint pipes according to the special requirements of users should be assembled by the operator. For details, please refer to the component detailed parts drawing of *Components List* for assembling.



Figure 1

- 1) Please refer the assembled drawing to Figure 1.
- 2) Remain two-three circles of threads when screw the collar into the tubing as indicated in the Figure 2.

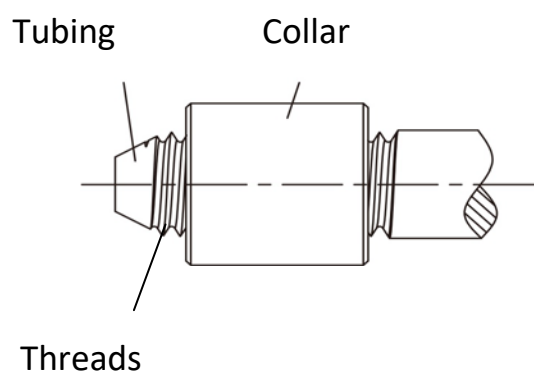
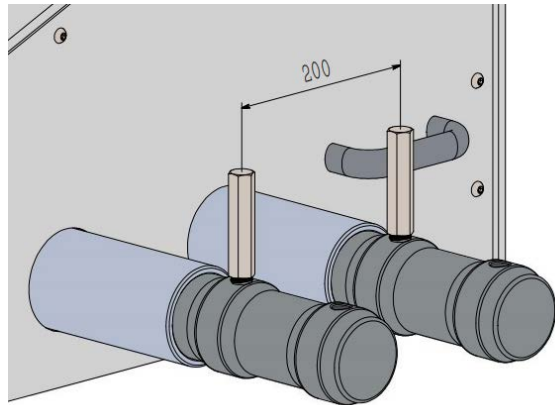


Figure 2

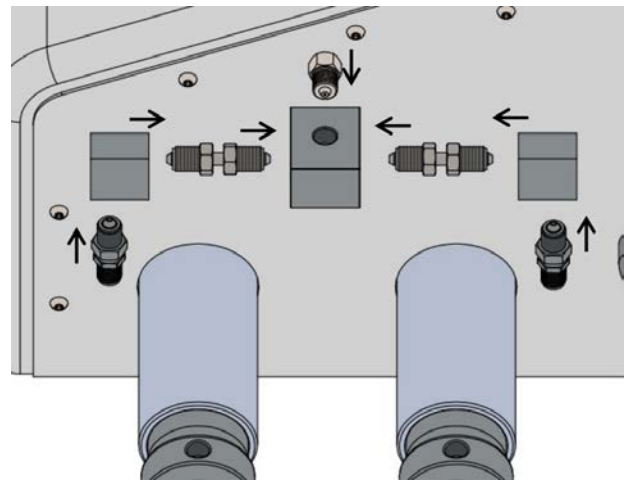
- 3) When installing the high pressure outlet check valve, please pay attention to the installation direction. The arrow of the stream flow has been laser-marked on the valve body.

4) The detailed installation procedure follows:

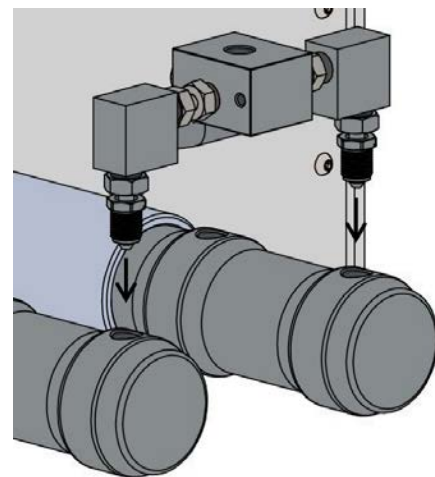
STEP 1: Screw the supplied S/S disassemble rod into the open end of high pressure cylinder and utilize the supplied rubber hammer to hit the two rods to adjust the position of the two cylinders. When the two rods are straight up and the distance between the center of the two rods is 200mm, unscrew the rods.



STEP 2: Connect the components as shown in the picture and make sure that all components are aligned correctly. *(Always use two wrenches to tighten tubing and fittings)*



STEP 3: Install the assembled unit on the high pressure cylinder.



STEP 4: Install the diamond IX chambers unit, U tubing and Adapter cap.



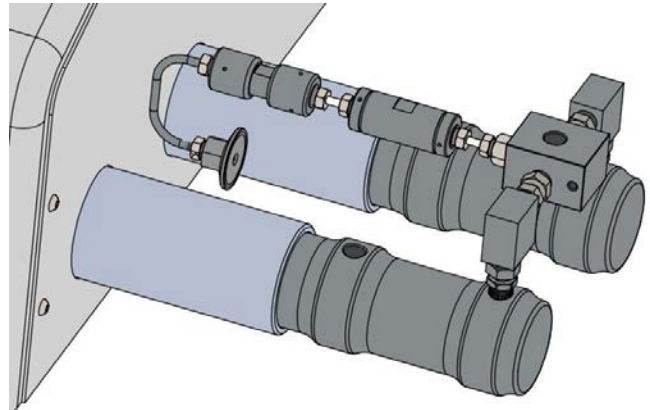
H210Z with Auxiliary Chamber



U Tubing



Adapter Cap



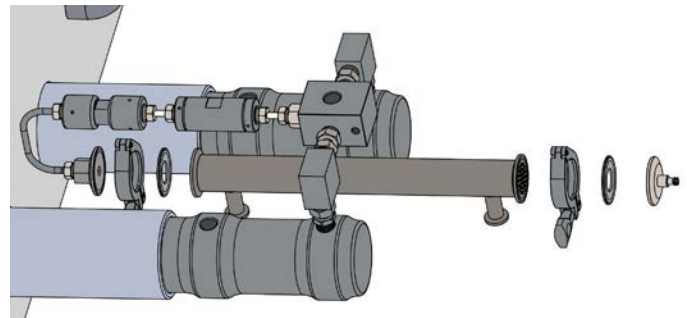
STEP 5: Install the stainless heat exchanger (HPE350) and the Luer fitting cap, tighten it with clamp and gasket.



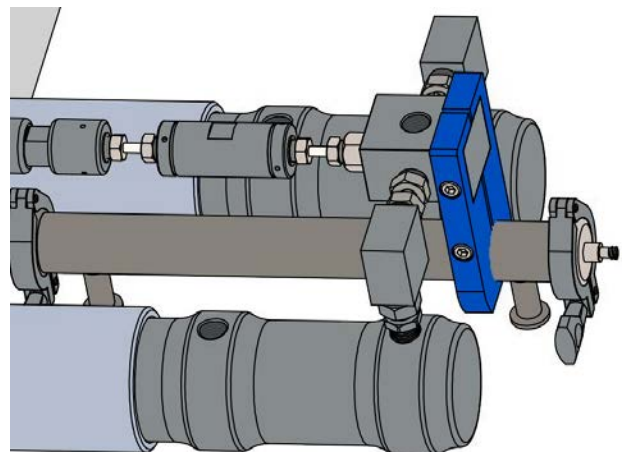
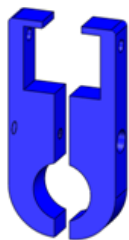
Heat Exchanger, HPE350



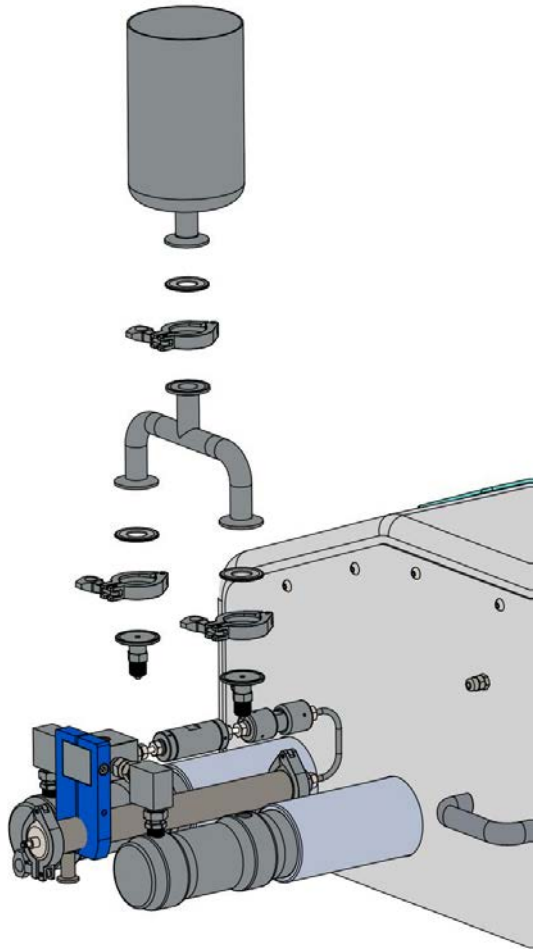
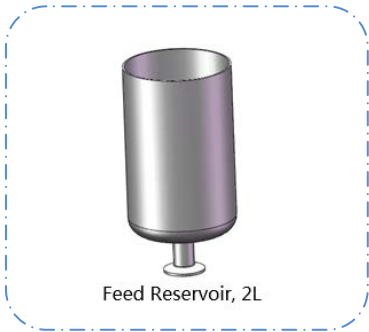
Adapter Cap
(Luer Fitting)



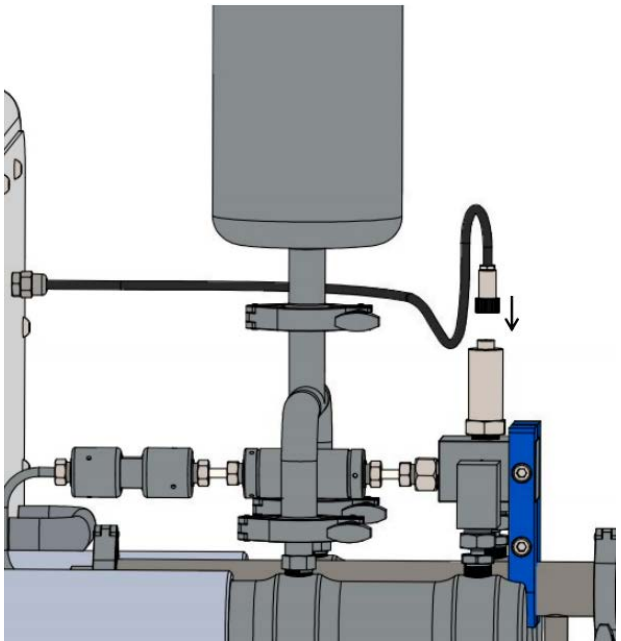
STEP 6: Fix the heat exchanger with supplied holder



STEP 7: Install the inlet check valve, Tee piping and feed reservoir and tighten with clamps and gaskets as shown in the picture.



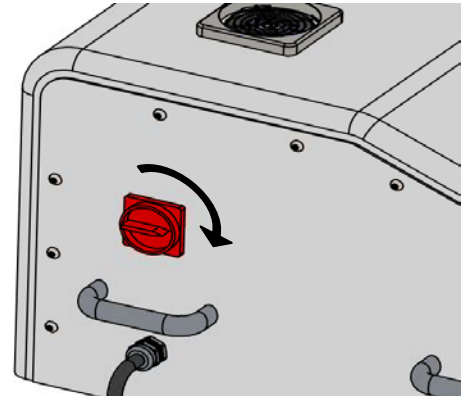
STEP 8: First, install the pressure sensor on the four-way valve, then plug in the signal wire of the pressure sensor and tighten it.



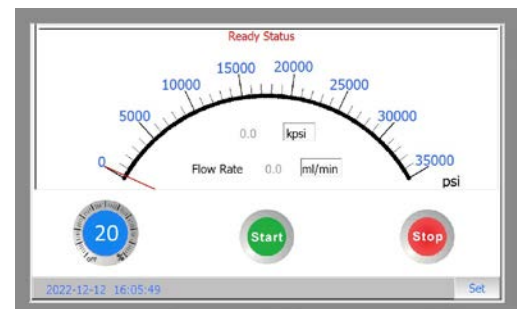
5) Priming procedure for the first use

Before priming the system, please check that all fittings and tubing are connected rightly in case they may get loosened during operations. To prime the system, ensure that clean water or other suitable solvent have fed into the feed reservoir.

STEP 1: Switch on the power at the left of the PilotGenizer homogenizer.



STEP 2: Add sample to the feed reservoir. Adjust speed to ~ 20% on the touch screen, and click "Start" to prime the system.



STEP 3: After few strokes of the pumps, liquid should begin to come out from the priming outlet.

5.3 Disassembly of the Plunger Seal

Regular replacement of the plunger seals is necessary when the seal part is worn out. (The plunger seal requires replacement when process sample comes out from the drain port at the bottom of the isolator.) Use the supplied S/S disassemble tool to separate the high pressure cylinder with the isolator as indicated in Figure 3.

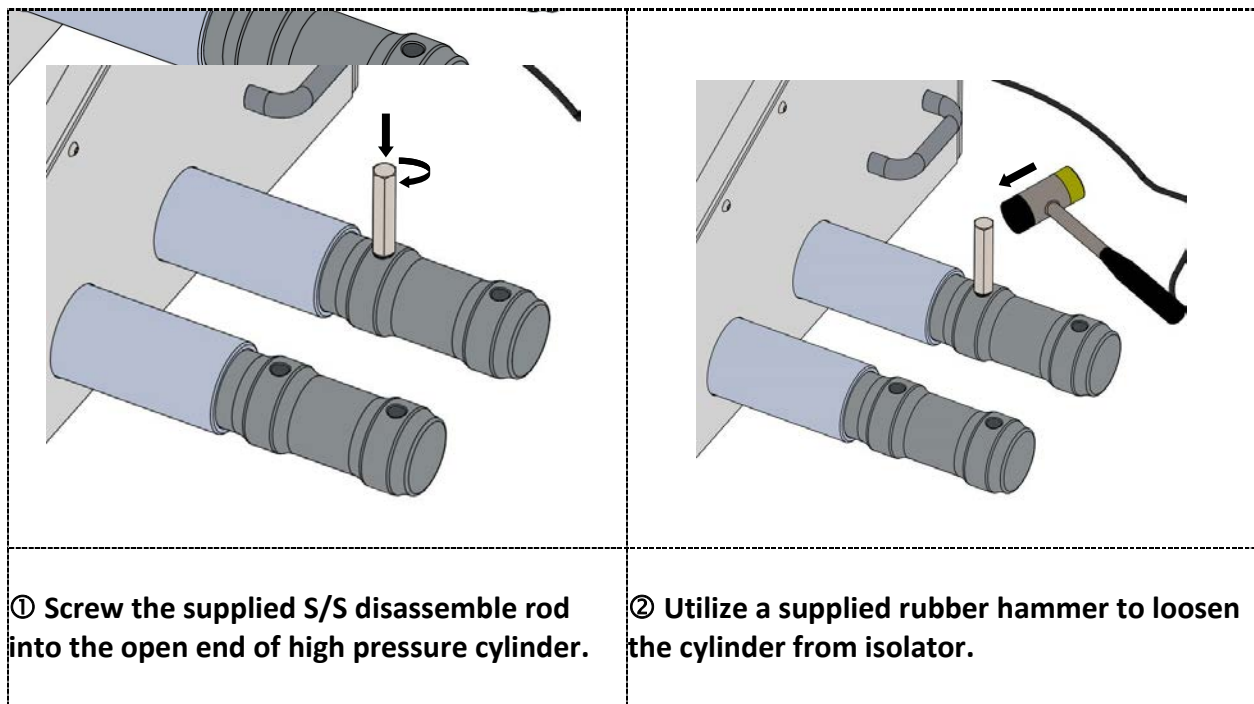
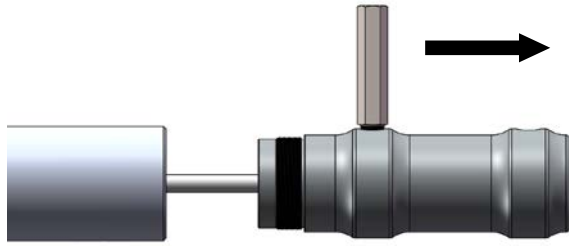


Figure 3



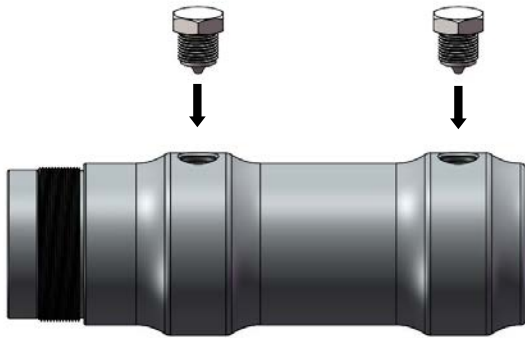
Warning: Before any maintenance procedures, please **TURN OFF** the PilotGenizer first, then remove all the high pressure components from the S/S cylinder, including the diamond interaction chamber, heat exchanger, check valves, fittings, inlet feed reservoir and other connections.

Below shows the plunger seal disassemble details:



③ Pull the cylinder out with hands to separate it with isolator.

④ Remove the S/S disassemble rod.



⑤ Screw the supplied 3/8" glands onto the open ends of the cylinder.

⑥ Upright the cylinder on a table, and fill the center with some water.



⑦ Insert the supplied plastic rod into the center with gentle in case the residual samples spill out.

⑧ Gently tap the rod head until the seal unit pops out from the cylinder.

5.4 Re-Assembly of the Plunger Seal

Empty the cylinder (pour out water) first, then remove two supplied 3/8" glands.



⑨ Screw the supplied plastic assembly cap onto the cylinder.



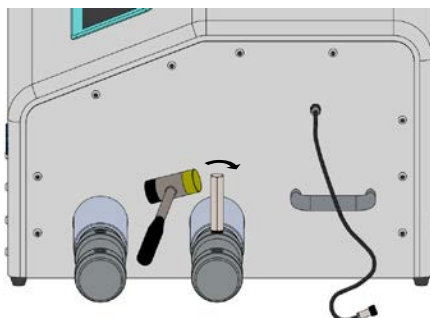
⑩ Insert the replaced UHMW-PE plunger seal. (NOTE: the small O-ring should face up). Lightly press the rod until the seal unit is inside the pump body.



⑪ Insert the back ring back to the cylinder.



⑫ Finally, install the cylinder back to the isolator. (Supplied hammer can assist in installation if necessary)

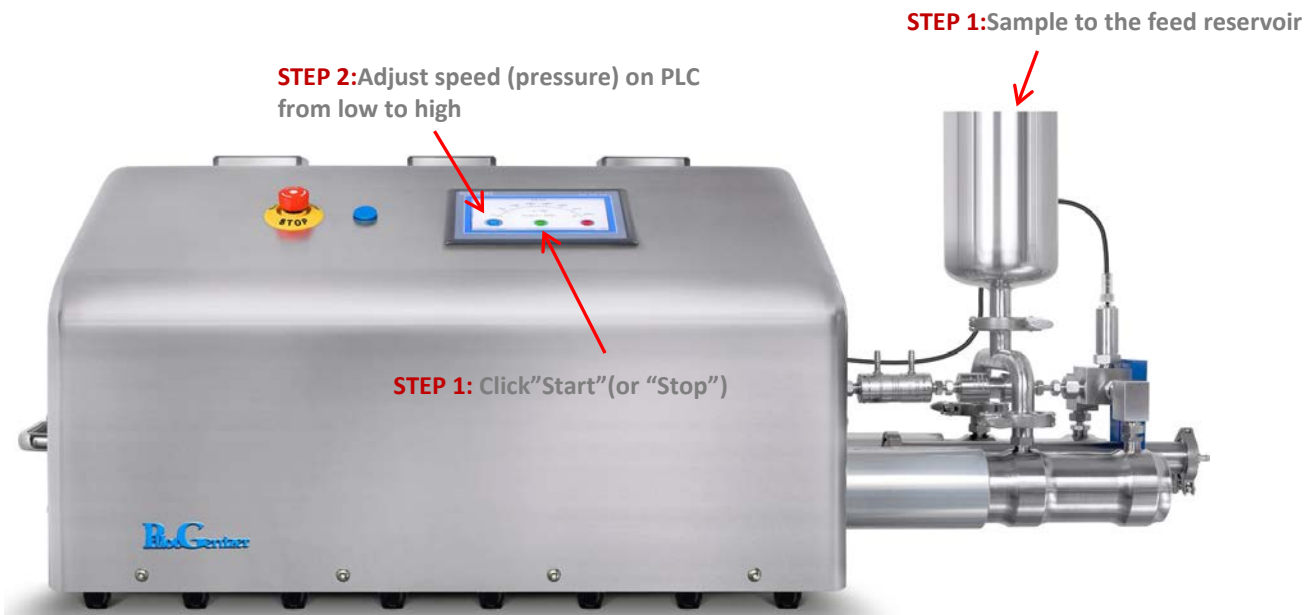


Use the supplied rubber hammer to adjust the position of the cylinder, make sure the open ends is straight up

Note: Reference video for servicing the plunger seal: <https://www.youtube.com/watch?v=njbR-zwsTX8&t=228s>

6. Operation

Three Easy Steps to Run PilotGenizer



Note: Picture shown is subject to change depending on options selected by different customers.

6.1 Operation Instruction

1) Initialization Stage of the System

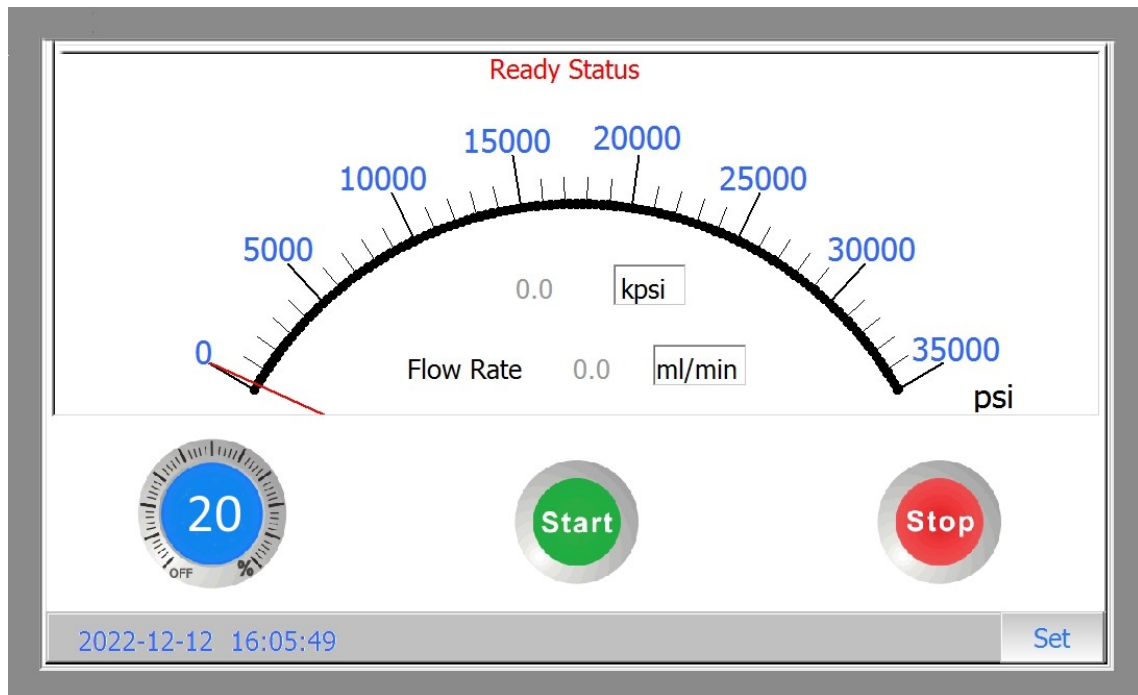
First, connect to the electrical outlet; when the red power light is on, switch on the power at the left of the PilotGenizer homogenizer. Once the touch screen of the homogenizer is started, all the indicator lights at the top right corner of the touch screen will be lit on, and the touch screen will show the initialization picture as following:



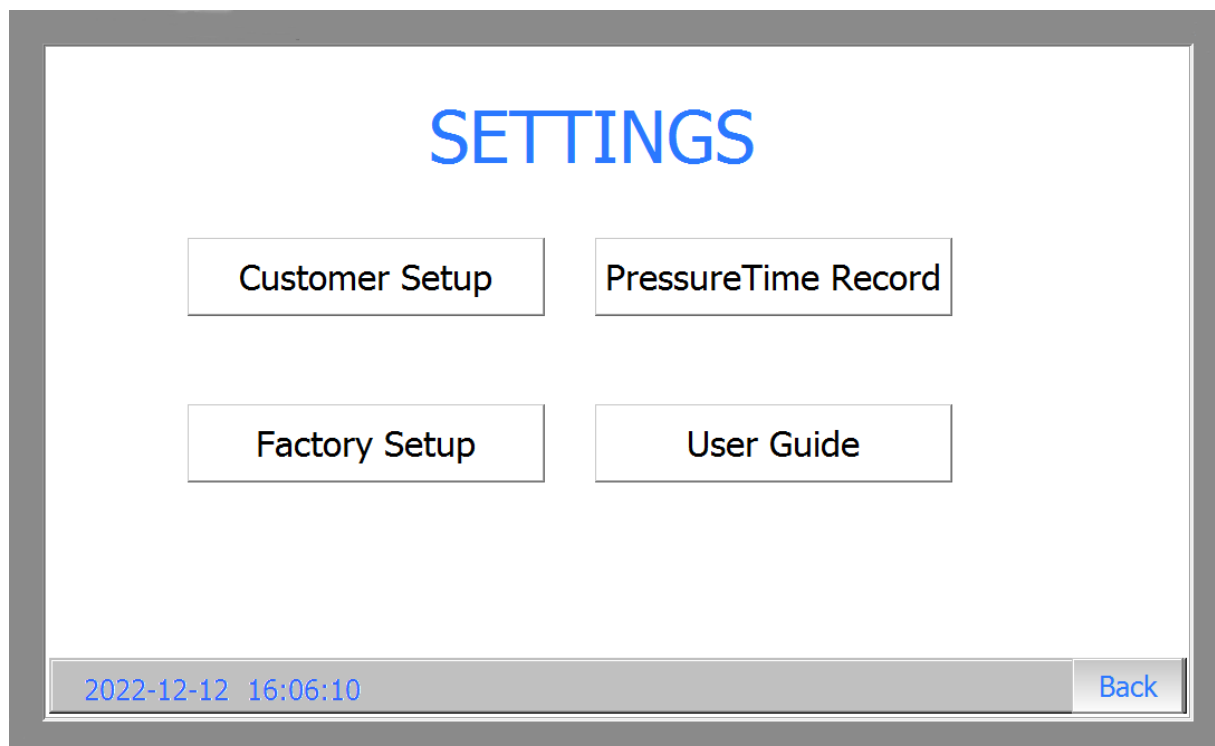
2)The display of the touch screen has three indicator lights on its top right corner. From left to right the three indicator lights are: RUN, the PLC indicator light; COM, the communication light; PWR, the power indicator light of the touch screen. Then machine is ready when all the lights are lit on. Otherwise, inspection is needed and the equipment cannot be started until the malfunction is resolved.

6.2 User Operation Interface

1) A loading progress bar will be shown when initialization. After loading, the touch screen will enter the user operation interface as following:



- 2) Digital pressure gauge: it indicates the pressure of the testing material.
- 3) Pressure value: it indicates the pressure value. And the pressure unit can be converted mutually among kPsi, MPa and Bar when the pressure unit option is clicked.
- 4) Flow rate: it indicates the flow rate of the homogenizer and the unit of the flow rate can be converted mutually among mL/min, L/hr and Gal/hr.
- 5) Power rate: it can be adjusted to reach the operational pressure value according to the requirement of the user.
- 6) Start button: when it is clicked, the homogenizer will start running.
- 7) Stop button: when it is clicked, the homogenizer will stop running. If any special situations, please press the emergency stop button for the emergency stop.
- 8) The parameter setting is mainly divided to the customer setup and the factory setup.



6.3 Selection Interface of "SETTINGS"

Click "SET" in the operational interface to quickly access Settings Panel. It includes "Customer Setup", "Pressure-Time Record", "Factory Setup", and "User Guide".

(Attention: a password is needed before entering "Factory Setup" in case any manufacturing data being modified. Please contact your local agent for assist if it's necessary.)

- 1) Click "Customer Setup" and then enter the interface of the customer setup.
- 2) Click "Factory Setup", input the correct password and then enter the interface of the factory setup.
- 3) Click "Pressure-Time Record" for checking and reviewing the records of the recent-20 strokes.
- 4) Click "User Guide" for the application introduction of NanoGenizer homogenizer.
- 5) Click "Back" option and then return to the previous menu.

6.4 Customer Setup

In this interface, the user can set the running time (default as 60 mins); running passes; safe pressure (once exceeding, the equipment will stop immediately); the movement calibration for pistons; and bearing lubrication options*.

Customer Setup For Homogenizers

Functions
Auto Stop Setup

Time 20 min
Cycle 2 passes
Pressure 35000 psi
Fan OFF

Maintenance
Piston Movement

Forward L Forward R
Backward L Backward R
L Distance(mm) 132.0 R Distance(mm) 25.5

2022-12-12 16:06:35 Back

- 1) Time: Set times and click "**Time**" box (it will turn green) to start timing function, and then press the "**Start**" button in the operation interface to run the homogenizer. The PilotGenizer will stop automatically when the setting time is ended.
- 2) Pressure: Set pressure value and click "**Pressure**" box to start the safe pressure function, then press the "**Start**" button in the operation interface. The system will compare the actual running pressure with the setting safe pressure. Once the pressure is exceeded, the equipment will stop immediately.
- 3) Cycle: set the cycle times and click "**Cycle**" to start the circulation function. Click the "**Start**" button to run the system. The equipment will stop when the circulation passes reach its setting value.
- 4) Forward and Backward: use for priming the system, piston position calibration, maintenance or debugging.

Bearing lubrication*: To increase the servicing time of pump system, the PilotGenizer is designed with self lubrication option. The PilotGenizer will pop out "Refill Lubrication" reminder in the main interface. Go to "Customer Setup" , it will show "Start to Lubricate" box and click it to confirm the action. Once the lubrication is done, the lubrication box will disappear in the "Customer Setup".

6.5 Factory Setup

Contact the manufacturer or your local agent for the information of the factory setup.

6.6 Varieties of Inlet and Outlet for PilotGenizer

Inlet: Feed Syringe; Open Container; Stainless Steel Reservoir

Outlet: Feed Syringe; Open Container; Stainless Steel Reservoir

When circulation operations are needed for the testing material, please using a pipe to connect the Luer outlet into the top of the inlet syringe.

7. Trouble Shootings

7.1 Mechanical Trouble Shootings

7.1.1 Air-blocking, chamber-blocking or overload

Our design has minimized the occurrence of the air-blocking, chamber-blocking or overload. However, the improper operation of the homogenizer can still induce the malfunction or damage of the homogenizer.

1) Air Blocking

Malfunction: There is no pressure or there is no sucking from inlet.

Prevention: Do not run with empty inlet.

Reason: There is air inside the pump.

Solution: Push the Ball in the inlet valve with a pin.

2) Chamber Blocking

Malfunction: Overload of the pressure.

Prevention: Pre-treat the sample carefully; Reduce the speed.

Reason: There are aggregations or large particles in the sample; Or the equipment runs too fast.

Solution: Reverse the interaction chamber with water at low speed.

3) Overload

Solution: Reduce the speed and shut down the power, wait for **30 sec** and restart again; or flush with water or suitable solvent; or run with clean and homo-disperse sample.

7.1.2 When the pressure is down:

1) Circuit malfunction: check whether all the indicator lights are working well.

2) Malfunction in high pressure pump body: check whether the high pressure pump body is working well.

3) Malfunction in the inlet port: check whether the one-way check valve is working well.

4)Leaking of the hydraulic system: check whether every joint is connected correctly.

7.1.3 When the high pressure pump sending out abnormal noise:

If the high pressure pump has foreign matters or serious abrasion, it should be returned to the factory for repair.

7.2 Trouble Shootings of Electric Appliance

7.2.1 The red switch of the power supply does not light on

- 1) If the fuse is blowout, please replace the fuse.
- 2) If the equipment is not connected with power supply, please connect it with the power supply.
- 3) If the outlet is not plugged well, please plug it again.

7.2.2 If the RUN light, COM light and the POWER light of the touch screen do not light on.

- 1) Please check whether touch screen is connected with power supply or not.
- 2) If the touch screen is black out, please contact the customer service.

7.2.3 If the equipment does not work when pressing the green "START" button, please turn off the power supply and restart it after **30 seconds**.



The control system needs a few seconds for rebuilding. If the problem remains, please contact the customer service.

8. Maintenance

8.1 Cleaning

Please clean the equipment before turning off the system. Please use the solvent, alcohol or water in turn for flushing. Do not let the material stay for a long time, especially the viscous or indurate material.



Attention: Service or maintenance work is prohibited when the system is running.



Attention: Ensure that the pressure of the system has been released and the power supply has been turned off safely before implementing the service or maintenance work.

8.2 High Pressure Weep Holes

Some of the high pressure components have weep holes. Please check regularly whether the system is leaking or not, please turn off the equipment once leaking. Because the system is operating under the high pressure, even the little leakage would damage the sealing element in a few minutes.