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Packaging/Bottling Machinery and Engineering Services

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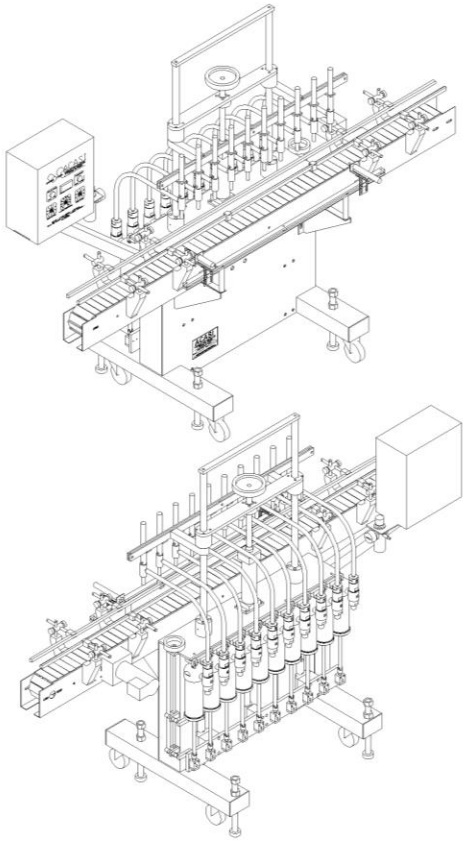
OPERATION MANUAL
PISTON FILLING MACHINE
MODEL: PI 3100

SERIAL # 1197

ALL EQUIPMENT OPERATORS MUST READ AND UNDERSTAND THIS MANUAL BEFORE OPERATING THIS MACHINE

ALL GUARDS MUST BE IN PLACE WHILE OPERATING THIS MACHINE



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I. INTRODUCTION

The operating manual is an important guide on how to work with the equipment you have purchased. Following the instructions on this manual will prevent problems on the start up of the machine, it will give you better production speeds, and improvement on volume control and it will increase the life of your machine.

Please don't hesitate to contact us if any problem presents or if you need technical assistance.

MAKE SURE THE AIR HAS BEEN CUT OFF BEFORE YOU DO ANY MAINTENANCE OR SET-UP ON THE MACHINE.

Disregard of maintenance for the machine will cancel the machines GUARANTEE.

II. RECEPTION OF THE EQUIPMENT

When transporting the machine, in the case of having the option of the feeding tank, the hoses should be disconnected of the valves system. In this case the hoses should have the clamps tightened in order to be fixed in the valves.

If the machine has been purchased with a conveyor it will be dismounted for transportation purposes. If this is your case please follow the assembly instructions on the Drawing: Conveyor Assembly.

III. INITIAL MACHINE SET-UP:

The purpose of this procedure it's to get the user familiarized and ready for the start up of the machine.

PROCEDURE:

a) Once the conveyor is on the machine, place the equipment on the desired working area and level the machine. To do this adjusts the height of the four top adjustment screws (Part 56, Drawing: Frontal). Once the machine is leveled, you will have to level the conveyor on top of the machine.
b) Make sure all the switches are off.
c) Install the electricity on the bottom of the electric panel, 110 Volts, 60/50 Hz.
d) Install the air on the quick connect coupling mounted on the air filter regulator of the machine.
e) Before the start up of the equipment we recommend extensive cleaning of the machine.

IV. REQUIREMENTS FOR THE START UP OF THE MACHINE

Electrical requirements: 110 Volts, 60/50 Hz, 15 Amp.
Air requirements: 20 CFM (Cubic feet per minute) at 80 p.s.i.

V. MAINTENANCE

Creating a maintenance plan based on the recommendations specified bellow would significantly increase the life of the machine.

The air for the machine must be dry; if this is not possible it should have as little water as possible. Small quantities of hydraulic based oil on the air-line will not harm the machine.

Cleaning and maintenance procedures shouldn't be done with bleach or acid solutions, they will damage the stainless steel components.

Filter - Regulator:

The filter-regulator should be checked periodically to purge water and any dirt caught on the trap.

Calibrated shaft lubrication:

These shafts (Part 2, Drawing: Frontal) must be lubricated weekly with food grade grease.

Pneumatic cylinders lubrication:

Although all pneumatic cylinders are pre-lubricated on the factory, we advise a monthly lubrication on the inside with compressor grade oil.

General lubrication:

All parts with bushings, bearings or grease points must be lubricated weekly with a good quality bearing grease.

All threaded rods and height adjustment screws must be lubricated monthly with a good quality bearing grease.

After every wash down of the machine all areas must be lubricated.

Conveyor drive:

All bearings are sealed and pre-lubricated for life.

Brushes should be periodically checked, they have an initial length of 1.25 inches, when they get to 0.625 inches they should be replaced. (The common usage is around 18 months).

PLC:

The PLC has a lithium battery; this should be replaced every 4 years.

VI. FAMILIARIZATION WITH THE MACHINE

VI.1 Control Panel

In the control panel all the electric functions of the machine are managed, bellow you will find the explanation of its functioning.

Start button: This activates all the electric functions of the machine, if all the switches are on this will start the complete functioning of the equipment. When the machine is on the button should be illuminated.

Emergency stop button: This is a security switch; this will cut the electricity to the machine and stop all the functions in it. Once activated you will have to give it a half twist to get it out of the off position.

Filling nozzles selector (Fixed or bottom up): This switch determines if the filling nozzles will go downwards before beginning the filling process and then start going upwards to give a "bottom up" filling, or if the machine keeps the nozzles fixed in one position during the process.

Operation selector (Normal or Cleaning): This switch determines if the machine will produce (Regular operation cycle) or if it is going to activate the cleaning cycle. By selecting the cleaning cycle, the machine will charge and discharge product until the switch is turned back to the "Regular" position.
The cleaning is made by connecting the nozzles to the feeding tank through a hose; with this it generates a recirculation of the cleaning solution.
The cleaning operation can be used to purge the filling pistons.

Bottler counter: This display keeps track of the containers that have been filled. When the machine is turned off it will not loose the sequence thanks to the battery-powered memory. If you want to reset the counter just press the reset key “res”.

Strokes by cycle: This coder determines the number of times that the charge and discharge of the pistons is done. Common applications are to fill gallons with 1000cc pistons (4 strokes of 0.946cc) or to fill 1000cc with 600cc pistons (2 strokes of 500cc).

Conveyor speed (Optional): A speed control potentiometer is installed on the machines control panel when the equipment is sold with a conveyor. It can be setup to stop or keep running when it begins the filling cycle.

Nozzle code: This knob determines the quantity of containers that will be filled on every cycle. The code is fixed according to the amount of nozzles installed on the machine.

Nozzle Code	1	2	3	4	5	6	7	8	9	10
Container Quantity	2	4	6	8	9	10	11	12	13	14

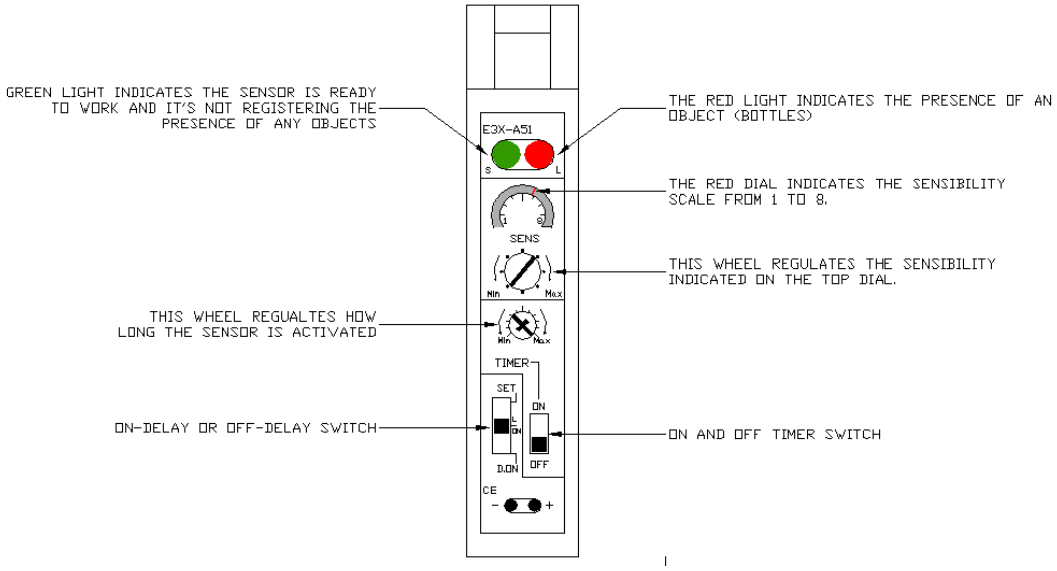
VI.2 Electrical System

The electrical system controls all the functions of the machine based on the information it gets trough all the sensors installed throughout the machine. With this information, the solenoid valves that control all pneumatic functions are turned on and off. Also the relay that controls the conveyor is activated or deactivated.

PLC: This component controls all the logic of the machine. The PLC "ins" (On top) receives electrical signals from the sensors, and with a programmed logic the PLC sends "out" electrical impulses that control solenoid valves, relay, and bottle counter.

Entry and Exit optical sensors: These sensors are connected to the control panel trough a fiber optic cable, they can be in contact with non-corrosive liquids. The sensors determine the amount of containers that enter or exit the machine. Please read the figure bellow for further information:

FIGURE: SENSORS



Nozzle cylinder position sensors: This sensors, located on the nozzle rack cylinder that bring up and down the filling nozzles (Parts 19-22, Drawing: Frontal), indicate their position.

Top and bottom proximity sensors: This proximity sensors are located on the filling point adjustment screw (Parts 50-54, Drawing: Frontal), they are activated when the pneumatic cylinder is extended (pistons charged or discharging). When the superior sensor gets activated the filling process ends up and the charge of the pistons begins.

Solenoid Valves: This valves control all the pneumatic functions of the machine.

The standard solenoid valves control the following:

- Nozzle rack up or down.
- Block or not containers coming in.
- Block or not containers coming out.
- Filling drive.
- Charge of pistons drive.

Optional solenoid valves control:

- Opening and closing of pneumatic nozzles.
- Bottle centering guide.
- Drip tray.

Note: The solenoid valves that control the filling and charge of pistons drives act over a pneumatic valve (Part 138, Drawing: Back) which allows, or not, the air to get into the pneumatic main cylinder (This is fixed in the chassis interior).

VI.3 Pneumatic flow controls

The speeds of the air cylinders can be controlled if they have pneumatic flow controls installed. They control the speed by restricting the amount of air that comes out on the opposite side of the air cylinder.

The standard machine has the following flow controls:

- Flow control for the speed of filling. (Part 156, Drawing: Back)

- Flow control for the speed of charge of pistons. (Part 154, Drawing: Back)
- Flow control on the bottom of the air cylinder rack, this controls the "down" speed of the nozzles. (Part 18, Drawing: Frontal)
- Flow control on the top of the air cylinder rack, this controls the "up" speed of the nozzles. (Part 18, Drawing: Frontal)
- Flow control on the back of the bottle entry cylinder, this controls the spacing between bottles. (Part 124, Drawing: Top)
- Flow control on the back of the bottle exit cylinder. (Part 122, Drawing: Top)

Optional: in case of requiring more constant movements of the cylinders hydraulic system for speed regulation is available (call for specifications).

VI.4 Filling Nozzles

The nozzles should be used depending on the product, container and possibilities of use with other presentations. Due to the particularity of this application, there are several options of filling nozzles, from completely open to nozzles of closing by individual pneumatic cylinders. On the drawing pages of this manual you will find the kind you have purchased. (See Drawing: Nozzles)

All nozzles are manufactured in 316L Stainless Steel, Teflon seals and Viton O-rings. Special materials can be specially ordered.

VI.5 Filling Pistons

The filling pistons are manufactured in different capacities, all of them are made of stainless steel 316L, with Teflon seals. For the piston part break down installed in your machine please refer to the drawing (See Drawing: Pistons)

For filling control, the pistons have a double check valve system that works by metal-metal seal. The gaskets which seal all the components system are made of Teflon.
The hydraulic seals mounted on the main cylinder are stainless steel spring energized Teflon seals.
For sanitary applications we recommended to use the stainless steel spring energized Teflon seals covered in sanitary silicone. These seals prevent the accumulation of product over the spring simplifying cleaning and maintenance.

VII START UP OF THE MACHINE

EVERY TIME THE SETUP REQUIRES AIR FEED, AIR CUT-OFF, OR ELECTRICTY CONECTIONS, MAKES SURE THE GUARDS ARE ON PLACE.

We now present all the steps that should be done for the correct start up of the machine, before following this procedure make sure the machine is placed as explained on Part III.
The nozzle code knob on the control panel should be in the position according to the quantity of nozzles on the machine (See part VI.1)

VII.1 Nozzle height and stroke adjustment

a) Without connecting the electricity to the machine install the air on the quick connect coupling, open the safety lockout valve (Part 90, Drawing: Side) and regulate the pressure between 80 and 100 p.s.i.
b) When the air was installed the filling nozzles should have gone up until the nozzle rack system hit the bumpers (Part 14, Drawing: Frontal). The initial height is predetermined before connecting the air.
c) Place 2 containers, one on the first and the other on the last filling nozzle. Once in position disconnect the air with the safety lockout valve (Part 90, Drawing: Side) and

adjust the height with the central hand wheel. Make sure the nozzle rack cylinder (Part 18, Drawing: Frontal) is completely retracted.

d) On c) we graduated the "down" position for the nozzles, to adjust the "up" position place the nozzle height bumpers (Part 14, Drawing: Frontal) on an even line where the tip of the nozzle will be 3/8" higher than the container. To test this position feed and cut-off the air with the safety lockout valve (Part 90, Drawing: Side).

e) Once the nozzle height and stroke has been adjusted, connect the electricity and open the air. Move the up rack cylinder sensor (Part 19, Drawing: Frontal) until the light is turned on. Cut the air off without any containers in the machine, once the nozzles have gone down move the down rack cylinder sensor (Part 22, Drawing: Frontal) until the light is turned on.

f) Remember that the nozzles can work two ways, lowering before filling or fixed.

VII.2 Nozzle separation and container control cylinder placement.

If you are in this step the up and down position for the nozzles should be already adjusted.

a) Make sure the machine is turned off and connect the air to the air filter regulator.

b) Open the side guides (Part 36, Drawing: Frontal) and place the container control cylinders (Parts 122-126, Drawing: Sensor and Container Set-up) on the far left and far right respectively.

c) Place the containers next to each other centered bellow the nozzle rack.

d) Place the container exit cylinder (Part 122, Drawing: Sensor and Container Set-up) touching the exterior part of the first filled container that will leave the machine. The height of the exit cylinder should be below the center of mass of the container, making sure that it doesn't hit the side guide.

e) Adjust the separation of the nozzles centering very carefully the tip with the containers opening.
f) With the containers in place, adjust the side guides as close as possible without restricting the movement of the containers throughout the conveyor.
g) Place the container entry cylinder (Part 126, Drawing: Sensor and Container Set-up) on the space between the last container that went into the machine and the first container that will go inside on the next cycle (See Drawing: Sensor and Container Set-up). The height of the exit cylinder should be below the center of mass of the container, making sure that it doesn't hit the side guide.
h) In case your containers present instability, keep in mind that additional sets of side guides can be installed.

VII.3 Optical sensor graduation

a) Place the entry optical sensor (Part 66, Drawing: Sensor and Container Set-up) on the center of the body of the last bottle that goes into the machine for each cycle. If this sensor doesn't detect the presence of the last bottle for 0.5 seconds it will not start the filling cycle since it assumes the bottles are not in place.
b) Place the exit optical sensor (Part 26, Drawing: Sensor and Container Set-up) next to the containers exit cylinder. It should be placed approximately to the distance equivalent to one width of the container you are working with.
c) The sensors may need adjustment on intensity, activation delay on or delay off. For this setup go to Part VI.2.
d) Each container has a different intensity setting, delay on time, etc. These factors depend on the material of the container, container shape, working speed, type of label, design of label.

VII.4 Filling and charge of pistons graduation

a) The filling volume depends of the piston stroke. To increase or decrease the volume turn the hand wheel (Part 91, Drawing: Side) making the sensor (Part 50, Drawing: Frontal) read lower or higher the position of the pistons rack (Part 150, Drawing: Back).
b) To modify the speed of filling open or close the respective valve as convenient (Part 156, Drawing: Back).
c) To modify the speed of charge open or close the respective valve as convenient (Part 154, Drawing: Back).
d) To modify the going down speed of the nozzles open or close the respective valve as convenient.
e) To modify the going up speed of the nozzles open or close the respective valve as convenient.

Note: Be aware that modifying the filling or charge velocities will also modify the volume due to the sensors will not read in the same position the presence of metal.

At this moment your machine should be ready to run, to make sure everything is in order try a dry run. The normal functioning of the machine is described on the next part.

VIII MACHINE STANDARD FUNCTIONING

In order to describe the functioning we will assume that the machine will work lowering the nozzles and with one stroke per cycle.
In case that the nozzles are fixed the functioning is the same omitting the nozzle movement steps.

a) When the air is turned on the nozzles will go up to the height determined by the bumpers.
b) When the machine is turned on the conveyor should start running. The main cylinder (Part 144, Drawing: Back) should go down until it activates the bottom proximity sensor (Part 54, Drawing: Frontal).
c) The exit cylinder (Part 122, Drawing: Top) should be extended and the entry cylinder (Part 126, Drawing: Top) should be retracted.
d) When the containers have been fed into the machine they should run freely in the conveyor until the exit cylinder stops them. (Part 122, Drawing: Top).
e) Once all the containers are in place the conveyor should stop, the nozzles come down and the entry cylinder extend (Part 126, Drawing: Top).
f) When the nozzles come to the down position the filling should begin.
g) When the filling is over the nozzles should go up and the pistons (Part 136, Drawing: Back) should recharge.
h) Once the nozzles are up, the conveyor should start functioning and the exit cylinder (Part 122, Drawing: Top) retract to let the filled containers out of the machine.
i) When the exit optical sensor reads the second container coming out it sends a signal so the entry cylinder will (Part 126, Drawing: Top) retract and let the next lot of empty containers inside the machine.
j) After the exit sensor (Part 26, Drawing: Frontal) has counted all the containers coming out of the machine it sends a signal so the exit cylinder (Part 122, Drawing: Top) will extend and block the empty containers to start the cycle over again.
k) When the empty containers are in position, and the pistons recharged, the cycle starts again.

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IX TROUBLESHOOTING

A. IF THE MACHINE DOESN'T START, CHECK:

- That the stop button is not pressed, to unlock turn it 90 degrees.
- Make sure the machine has the electricity correctly installed.
- Check the fuses.
- Make sure the machine has air and the safety lockout valve is open.

B. IF THE PISTONS DO NOT DISPENSE PRODUCT, CHECK:

- The nozzle inferior sensor (Part 22, Drawing: Frontal) is not working. If that is the case, make sure there is not any object blocking the pistons movement and adjust the sensor if necessary.

- The pistons are not ready to work, check if the bottom proximity sensor is activated (Part 54, Drawing: Frontal).
- Check the valves to be sure they are not clogged because of dried product or particles which stop the normal functioning of the valves. If this is the problem, take apart the valves and clean all the components.
- Check that the balls and weights (Parts 50-52-62 and 64, Drawing: Piston) are correctly installed.
- The speed of filling speed (Part 156, Drawing: Back) is adjusted too low.
- In case of having filling nozzles driven by air, they could not be opening on time causing the liquid to not come out through the nozzles. Check for any obstructions in the air line and make sure that the nozzle's piston that is presenting problems is working correctly.

C. IF THE MACHINE IS NOT CYCLING CORRECTLY, CHECK:

- Entry and exit optical sensors (Parts 26 and 66, Drawing: Frontal) may be blocked by spilled product. In this case clean the sensors with a wet cloth.
- The sensors (Parts 26 and 66, Drawing: Frontal) may not be reading correctly, for adjustments please see Part VI.2.
- Side guides may be too separated causing problems on the sensors correct reading, do to distance variation between the container and the sensors.
- Side guides may be too close restricting the free displacement of the containers.
- If the exit cylinder (Part 122, Drawing: Top) hits the empty containers after all the full containers have left the machine, slow down the retracting speed of the entry cylinder (Part 124, Drawing: Top) so it will give a larger spacing between the full and empty containers. Remember there should be a space between the empty and full containers and is in that space that the exit cylinder has to extend.

D. PRODUCT COMPATIBILITY

- The product being filled must be compatible with the seals and hoses installed on the machine. If you are having this type of problems please contact us so we can advice you on the right components.
- If you are going to work at high temperatures, seals and hoses may have to be changed.
- Nozzles are manufactured in 316L stainless steel, be sure not to use bleach based or highly acid solutions that may react with stainless steel.

E. UNEVEN FILLING VOLUME

- Make sure all the hoses and clamps are tightly installed.
- Check the valves to be sure they are not clogged because of dried product or particles which stop they normal functioning. If this is the problem, take apart and clean all the components.

- Check that the balls and weights (Parts 50-52-62 and 64, Drawing: Piston) are correctly installed.
- There shouldn't be any air bubbles in the hoses, this sometimes happens when the purge of the machine is not done completely.
- The pistons rack (Part 139, Drawing: Back) must be well fixed and completely horizontal.
- Allow enough time for the pistons charging to be done. This point is especially important for high viscosity products.

F. NOZZLE DRIPPING

- Make sure that all hoses and clamps are tightly installed.
- The Teflon tip of the nozzle could be deformed or worn down.
- With open nozzles would be necessary to install nozzles of closure by piston.
- Use the shortest nozzles possible.