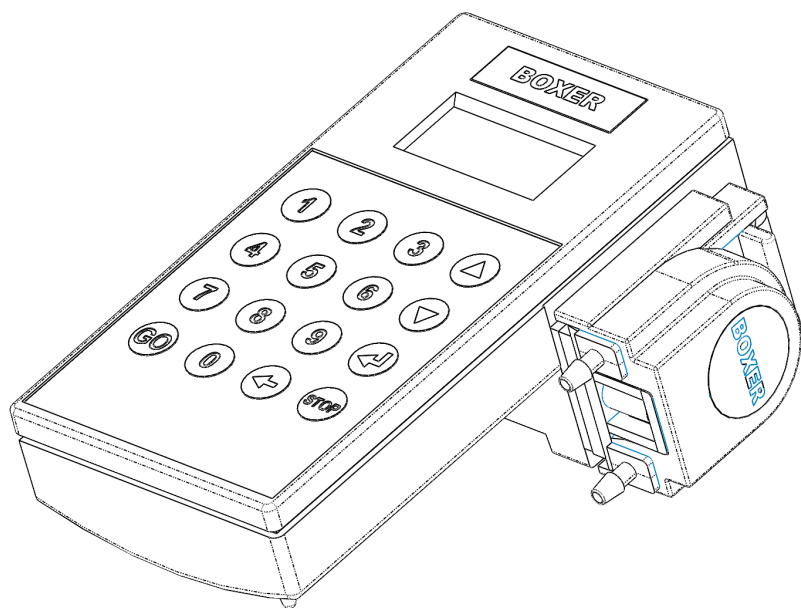


BOXER 9100

Electronically controlled
dispensing pump



User Manual

Box contains

The following:

Boxer 9100 pump controller	Cat. No. 9110.000
PSU output 24V 1A with universal plug adapters	Cat. No. 9200.004
Set tube clips No. 1	Cat. No.9000.601
Set tube clips No. 2	Cat. No.9000.602
Set tube clips No. 3	Cat. No.9000.603
(1)IDØ2.0mm Silicone tube—1 metre	Cat. No. 9000.509
(2)In line connector tube to yellow tip	Cat. No. 3923
(3)Tip holder support	Cat. No. 9100.3003
(4)Yellow Dispense Tip 1-100µl LW1035	Cat. No. 3530
This instruction manual	Cat. No. 9110.003

Accessories & spares:

Silicone Tubing IDØ1.0mm complete with connectors	Cat.No.9000.504
Silicone Tubing IDØ2.0mm complete with connectors	Cat.No.9000.505
Silicone Tubing IDØ3.0mm complete with connectors	Cat.No.9000.510
Santoprene Tubing IDØ1.0mm complete with connectors	Cat.No.9000.501
Santoprene Tubing IDØ2.0mm complete with connectors	Cat.No.9000.502
Santoprene Tubing IDØ3.0mm complete with connectors	Cat.No.9000.518
Santoprene tubing ID Ø1.00mm1meter running length	Cat.No.9000.521
Santoprene tubing ID Ø2.00mm1meter running length	Cat.No.9000.506
Santoprene tubing ID Ø3.00mm1meter running length	Cat.No.9000.515
Silicone tubing ID Ø1.00mm1meter running length	Cat.No.9000.507
Silicone tubing ID Ø2.00mm1meter running length	Cat.No.9000.509
Silicone tubing ID Ø3.00mm1meter running length	Cat.No.9000.508
Bag of 25 Yellow Dispense Tips1-100µl LW1035	Cat.No.9100.005
Spare dispense set consisting of above items 1-4	Cat. No. 9100.006
Unoverse 9100 wall mounting bracket/stand	Cat.No.9100.001
Foot Switch	Cat.No. 6013

Product Specification:

Mains Voltage	100V-240V 0.3A MAX 47-63Hz
Power Supply Unit output	+24VDC 1A
Environmental operating temp	+10°C to +40°C
Environmental storage temp	+4°C to +40°C
Environmental operating RH	90%
Environmental storage RH	95%

uno.

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It is the stated philosophy of Uno International Ltd to preserve the environment wherever possible. Uno International Ltd. will only use materials and production techniques that cause least environmental damage.



The CE sign certifies that the instrument meets the requirement of the EEC directives and has been tested according to the specified test methods.

Chemical compatibility chart

Acetaldehyde	Chloroacetic acid	Linseed Oil	Potassium salts
Acetic acid	Chronic acid	Magnesium salt	Silver salts
Acetic Anhydride	Chromium salts	Maleic acid	Soap solutions
Acrylonitrile	Copper salts	Manganese salts	Sodium salts
Aluminum Chloride	Ethylene glycol	Mercury salts	Sodium hydroxide
Aluminum sulfate	Ferric salts	Methanol	Sodium hypochlorite
Ammonia	Fluoborate salts	Natural gas	Stearic acid
Ammonium salts	Fluoboric acid	Nickel salts	Sulfur dioxide
Ammonium hydroxide	Fluosilicic acid	Nitric acid-10%	Sulfuric acid, dil.
Amyl acetate	Formaldehyde	Nitroethane	Sulfurous acid
Antimony salts	Formamide	Nitrogen oxides	Tannic acid
Arsenic salts	Formic acid	Nitrous acid	Tanning extracts
Barium salts	Glucose	Oils, animal	Trisodium phosphate
Benzoic acid	Glycerins	Oils, mineral	Urea
Bleaching liquor	Hydrochloric acid	Oils, vegetable	Uric acid
Boric acid	Hydrocyanic acid	Oxalic acid	Water
Bromine	Hydrogen peroxide	Oxygen	Water (brine)
Butyric acid	Hydrogen sulfide	Phosphoric acid	Water (steam)
Calcium salts	Iodine and solutions	Phthalic acid	Zinc salts
Carbon Dioxide	Lactic acid	Phosphoric acid	
Chlorine (wet/dry)	Lead salts	Plating solutions	

Little or no effect on Santoprene

Acetates	Butane	Me Et Ketone	Skydrol 500-B4
Acetone	Butanol	Nitric acid-30%	Sulfuric acid-90%
Alcohols	Essential Oils	Nitrobenzene	Tetrahydrofuran
Amyl alcohol	Ethers	Oleic acid	Turpentine
Aniline	Ethanol	Phenol	
Benzaldehyde	Furfural	Propanol	
Benzyl alcohol	Lithium grease	Pyridine	

Moderate effect

Benzene	Cyclohexane	Kerosene	Nitric acid- 70%
Carbon tetrachloride	Ethyl chloride	Trichloroethylene	Perchloroethylene
Chlorobenzene	Freon	Lacquer	Toluene
Chloroform	Gasoline, unleaded	Naphtha	Xylene

Severe

1. A. Unpacking

Remove the packing materials, unpack the pump controller and the power supply unit.

Make sure that you have got all the components as specified in 'Box Contains' last page of this manual.

Please contact your supplier if you notice any one of the components is missing or damaged.

Note: Do not attempt to assemble a unit using damaged components.

Retain the packaging so it can be used for future shipping.

The plug-in power supply unit is Switch Mode and automatically adjusts itself to the mains power supply characteristics. It will work with any mains voltage supply from 100V to 240V. The power supply unit is shipped with three alternative plug adaptors to fit European, American and UK power outlets. Select the correct adaptor for your needs and clip it into the power supply.

2. General information on peristaltic pumps

Peristaltic tube pumps are ideal for fluid transfer, metering and dispensing. In contrary to centrifugal and gear pumps, peristaltic pumps handle fluids of various viscosities, are self priming and can operate in either flow direction.

With no valves, seals or packing to come in direct contact with the pumped fluid, they are ideal for pumping high purity & corrosive fluids and for contamination free dosing.

The principle of the peristaltic pump is based on a tube which is occluded by a series of rollers. As a general rule, the higher the number of rollers and the smaller the tube diameter—the lower are the flow rates but better is the accuracy and precision.

The 9100 controller is equipped as a standard with 3 roller system and Ø2.0mm ID tube. This tube diameter together with maximum speed delivers a flow rate of 48ml/min.*

The highest dispense accuracy is achieved by using a semi rigid tube on the outlet of the pump. We recommend thin wall tubing such as FEP or PVC tube.

*83ml/min for the 9110.010 which has max rotor speed of 520rpm

3. The peristaltic tube

The supplied peristaltic tube is made from Silicone. Please make sure the reagents you intend to use are compatible with these material.

3. A. Clamping the peristaltic tube

The pump controller is delivered with a IDØ2.0mm Silicone tube.

Move the lever up to open the clamp and remove the clamp from the pump.

Insert the tube into the two tube holders on each side of the tube clamp and make sure the tube follows tangent and the arc of the clamp.

Push the tube clamp back onto the pump and lower the lever—the tube is now occluded by the rollers.

3.B. Releasing the peristaltic tube when you have finished

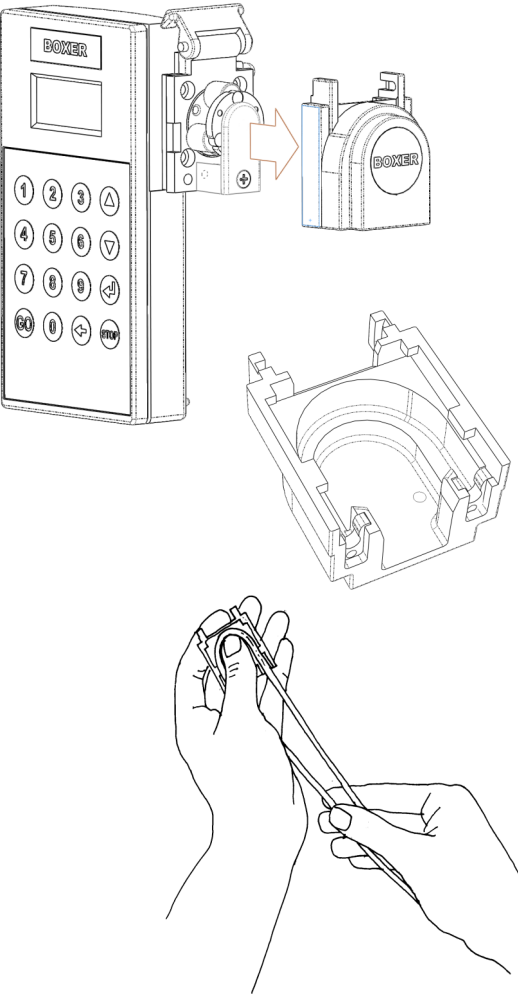
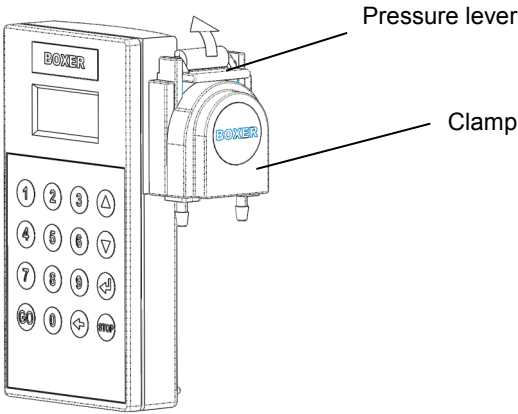
Whenever the pump is not in use for long periods of time it is important to release the pressure off the tube. This will reduce tube deformation and ensure that accuracy/precision is maximised.

Release the pressure by lifting the pressure lever

3.C. Replacing the tube

Tube need replacing when worn out or wherever you intend to change the dispense volume range in which you work—for smaller or larger dispense volumes.

Lift the pressure lever and replace the tube, making sure that you have installed the tube centrally and that the tube is fully engaged by the tube guides.



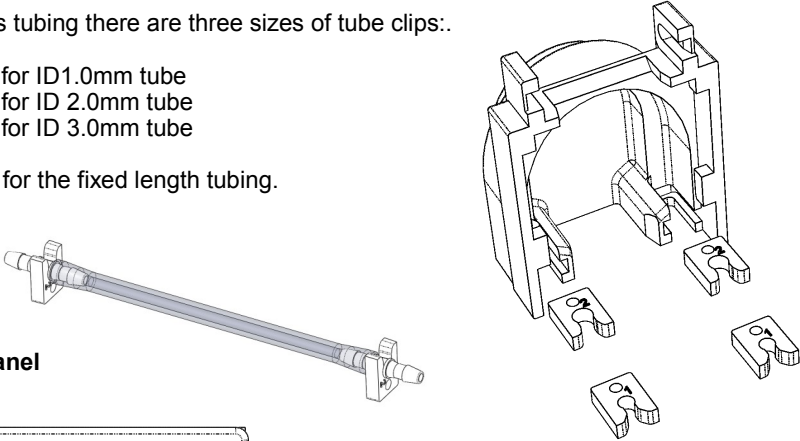
4. The choice of tubing

The unit can work either with fixed length tubing—75mm long within the tube clamp, or with continuous tubing which in effect does not have any length restriction. In both cases, the correct tube clips have to be installed in the clamp.

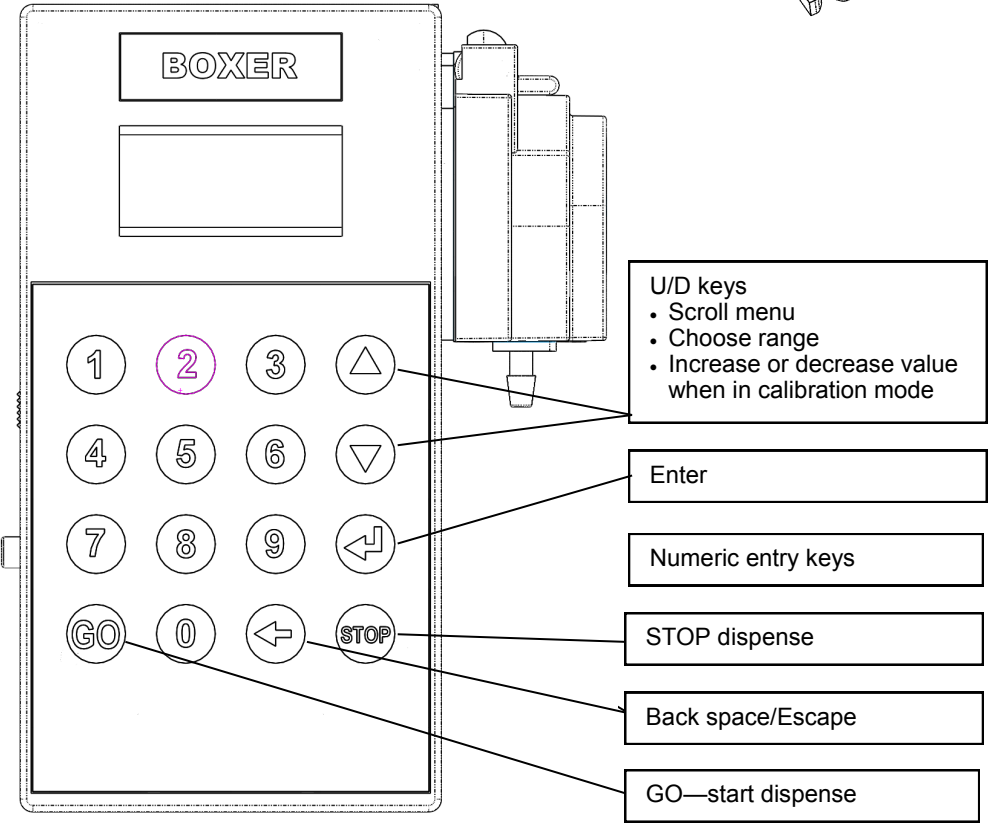
For the continuous tubing there are three sizes of tube clips:.

- 1. Marked '1' for ID1.0mm tube
- 2. Marked '2' for ID 2.0mm tube
- 3. Marked '3' for ID 3.0mm tube

Clip No. 2 is used for the fixed length tubing.



5. The Control Panel

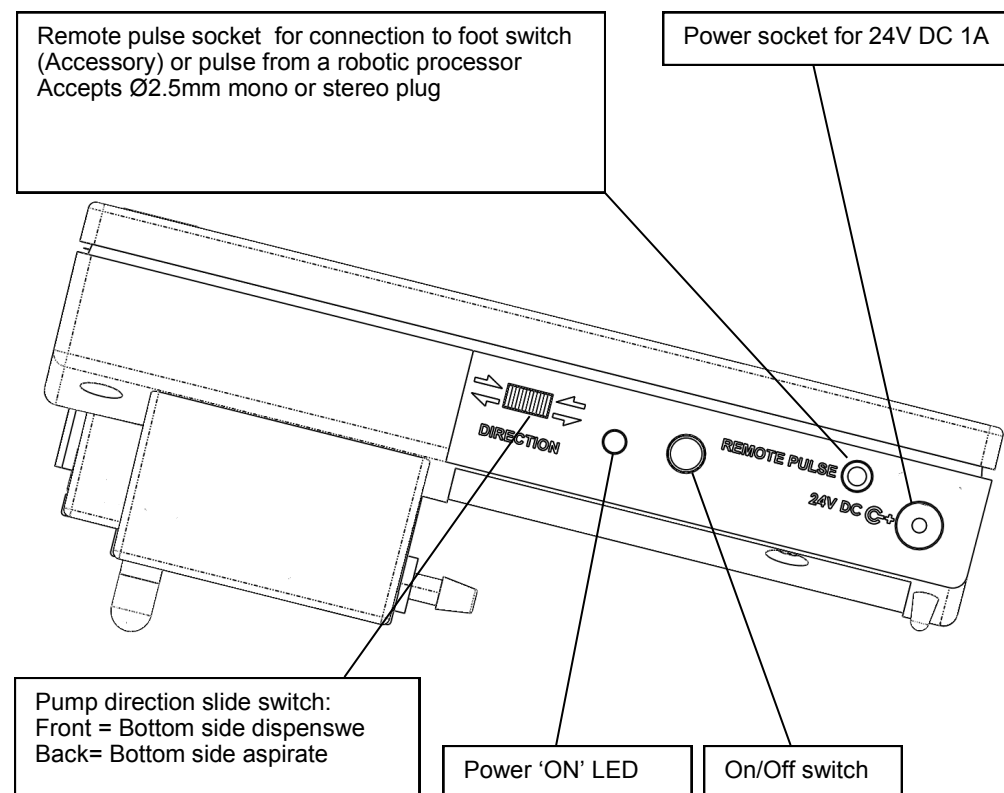


6. Preparing the pump for use

Plug the supplied PSU into your power socket and the low voltage plug into the socket on the left side of the unit, switch it on by pressing the 'ON' button. The green LED on the side and the display will illuminate indicating that the unit is operational.

The display will temporarily read 'BOXER 9100' and then the display will show the value it has in it's memory.

Note the direction of flow. The pump can be reversed in flow direction using the slide switch, so that you can aspirate any unused reagent back into the reservoir.



IMPORTANT: CHOOSE THE RANGE THAT MATCHES THE ONE YOU ARE MOST LIKELY TO USE IN YOUR APPLICATION.

7. Choosing the correct working range

There are 4 working ranges to choose from. These working ranges correspond to tube diameters. The decimal point is shifted corresponding with the working range.

R1	ID Ø0.5mm for < 9ml	max display 9.000ml
R2	ID Ø1mm for < 25ml	max display 25.000ml*
R3	ID Ø2mm for < 90ml	max display 90.000ml
R4	ID Ø3mm for <190ml	max display 190.0ml

* The single µl digit can not be entered in R2 & R3

Working with low volume dispenses with large diameter tube will reduce both precision and accuracy of dispenses.

Using the U/D keys scroll to the screen displaying "Range Enter?" Press Enter.

Using the U/D keys choose the range corresponding to your tube diameter and press Enter.

The display will show the last volume you worked with at that particular range.

Range Enter?

Range 1 Up/Down

R3 <90ml
56.730ml

8. Gravimetric pump calibration procedure

Pump flow performance is subject of many factors among them the condition of the peristaltic tube and the viscosity of the reagent. It is therefore important that you calibrate the pump before it is commissioned using your reagent and at periodic intervals.

Carry out the calibration procedure using a volume nearest to the volume you are most likely to dispense. You can choose any volume.

1. Carry out 5 identical dispenses into a vessel and establish the gravimetric volume dispensed in each operation.
2. Calculate the mean dispensed volume.
3. Using the U/D keys scroll to display saying "Calibrate Enter?"
4. Press Enter
5. The display shows "C" to indicate that you are in the calibration mode and next to it the range which you calibrate i.e. 1 to 4.
6. Using the U/D keys correct the volume to your calculated mean volume *
7. Press Enter and the display shows the volume you intended to dispense. The unit is now calibrated with a particular tube within your chosen working range.

Calibrate Enter?

C1 <9 ml
0.599 ml

* Volumes in R2 & R3 will increment by steps of 10µl

The unit will store the calibration you carried out for each individual range.

9. Prime the tube

To prime the tube direct the dispense tube towards the reservoir and hold down the GO key. As soon as the tube is primed, release the key and the pump will stop.

10. Entering the dispense volume

Press 1 to 0 to enter your required volume. Note that the digits move from right to left with the decimal point staying stationary. The unit will always display on the top line the range in which you are working.

To correct an error entry press the back space key.

Press GO to start dispensing.



The unit will remember the volume only for this single dispense. Following this dispense, the unit will revert to the previously displayed volume. In order to enter the typed volume into the unit's memory, press the Enter button after entering the volume.

11. The STOP button

The STOP button will stop the dispense immediately. The unit "remembers" the remaining undispensed volume it will display the amount you dispensed so far. Press GO and the unit will dispense the remainder of the volume you originally wished to dispense.

If you prefer the unit to "forget" the remaining volume press the ESCAPE key after you pressed the STOP key. The unit will display the last volume you entered.

12. Changing the pumps direction

The pump controller can be used for dispensing or aspirating reagents. The slide switch on the left side of the unit sets the direction that the pumps' rotor rotates.

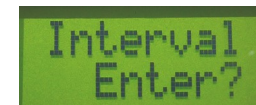
You can not change direction when the pump is in dispense mode. You can however press the STOP key, change direction by moving the slide switch, and continue by pressing the GO key allowing the pump to dispense or aspirate the remainder of the entered volume in the reversed direction.

13. Interval Dispense

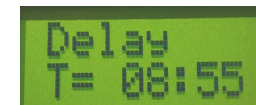
You can set the unit to dispense any volume for a number of times in predefined intervals. This feature is useful in repeatable operations either in manual mode or when the dispense head is held by a robotic arm. Intervals can be set between 0.5 sec to 100 minutes.

To set repeat dispensing:

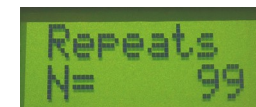
- 1 Using the U/D keys scroll to the screen saying "Interval Enter?"



- 2 Press Enter and you are asked to enter the Delay in minutes and seconds. Any number up to 99:59 will be accepted whereby any number bigger than 59 for the seconds will be rejected. Using the numeric keys enter the numbers of minutes and seconds. The number '00.00 represents 1/2 second. Press Enter to confirm.



- 3 Repeats screen asks you to enter the number of repeats—from 1 to 98. Entering 99 repeats will result in continuous number of dispenses which can only be stopped by pressing the STOP button. Using the numeric keys enter the number of repeats. Press Enter to confirm



- 4 You can exit the interval mode by pressing the ESCAPE key.

14. Pump speed adjustment

To adjust the dispense speed scroll the menu using the U/D arrows until the "Speed Enter?" is displayed. Press Enter and the screen will display Speed with 8 bars on bottom line. Use the U/D keys to increase or decrease number of bars. More bars represent higher speed. Press the Enter key to enter the desired speed into the instruments memory.

15. Continuous dispense mode

To run the pump continuously scroll the menu using the U/D arrows until "Constant Enter?" is displayed. Press Enter and the screen will display "Constant Stop/Go". Press the "GO" button to start the pump and the "STOP" button to stop it at any point.



Press the ESCAPE key to leave the continuous dispense mode.

Please note: running the peristaltic tubes dry over a long period will shorten their life.



16. Remote control operation

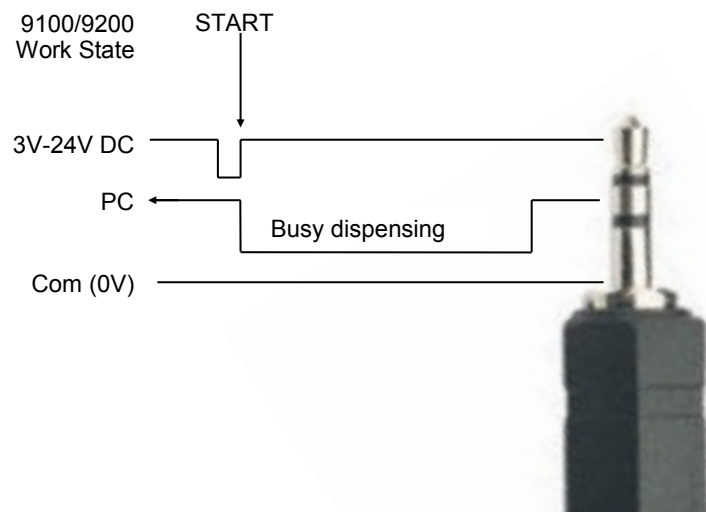
The instrument is fitted with a stereo type Ø2.5mm socket for remote control. Through this socket you can plug in the foot pedal which will provide the unit with a GO signal.

The unit can be controlled from a computer via a USB relay controller which will convert an signal from your computer to a closed circuit on the remote wire connection. A USB relay controller is available from many electronic components suppliers.



Full control of the unit is then possible using the software supplied with such relay.

The stereo cable to the unit can be fitted with 3 core wire allowing the equipment to send a “busy” signal back to the controller.



17. Care & maintenance

The control unit is maintenance free. The peristaltic tubes however require replacement as soon as excessive wear or a large variation in dispense volumes are noticed.

The operational life of the tubes is a function of the speed, load and reagent being dispensed.

Avoid running the tubes dry for longer than a few minutes.

Check the peristaltic tubes weekly for signs of excessive wear and replace if required.

Pump tubes which remain clamped in the pump will deform with time. Therefore, rotate the tube clip at the top of the pump to ‘open’ position in order to relieve the pressure whenever the pump is not being used for long periods or overnight.

18. Exclusion

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment might be impaired.
This instrument is NOT suitable for use in explosion hazard environments.

This equipment is not suitable and should not be used for medical applications.

19. FAQ

1. Q. Why does the pump stalls or runs slower than expected when new tubing is installed?

A. A new tube is stiff when new so has to be shaped for some time before it gains it's elasticity. Run the pump in continuous mode for a total of approx 5 minutes with the clamp lever half open to start with, gradually moving the clamp lever to fully closed position.

2. Q. I have entered a volume but nothing happens after pressing the GO button

A. The volume you entered is too small for the tube size you use. The motor can not turn accurately a very small amount and the dispense is cancelled. Use a smaller tube diameter for low volume dispenses

3. Q. What is the life of the tube?

A. The life of a peristaltic tube depends on many variants such as speed, the reagent it is pumping and temperature. In general you should expect approximately 800 hours operation from one Pharmed tube and approx 150 hours from a Silicone tube.

4. Q. Why does the displayed value sometime ‘jump’ in double figures?

A. This happens when dispensing small volumes and instrument in course calibration. Following the calibration procedure the instrument's mathematical calculation divides the volume to be dispensed by the number of pulses received from the motor's encoder and stores this value. If the volume per rotor rotation is relatively large, the ratio of pulses to volume is coarse. In these circumstances the required volume input does not divide into stored values, and therefore the calculator will round up or down to the nearest whole figure.

5. Q. Can I leave the unit switched ‘ON’ throughout the day?

A. Yes, you can. The dispenser requires very little energy when the pump is not running so continuous power into the unit will not harm it.

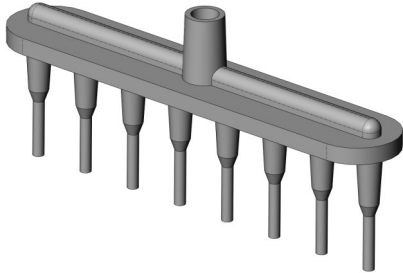
6. Q. Can I dispense hot reagents using the dispenser?

A. Yes, the dispenser works safely with media temperatures of up to 100°C. Be aware that the internal electronics could be damaged by any ingress of fluids or steam vapours.

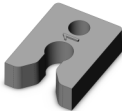
19. Accessories & spares:

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Silicone tubing ID Ø3.00mm1meter running length	Cat.No.9000.508
Tube clamp for continuous Ø1.0mm tube (set of 2).....	Cat.No. 9000.601
Tube clamp for continuous Ø2.0mm tube (set of 2).....	Cat.No. 9000.602
Tube clamp for continuous Ø3.0mm tube (set of 2).....	Cat.No. 9000.603
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Foot Switch.....	Cat. No 6013
8 way dispense comb	Cat. No. 3022
Yellow tip 1-200µl	Cat. No. 3530
Tip holder support.....	Cat.No. 9100.3003

3022



9000.601



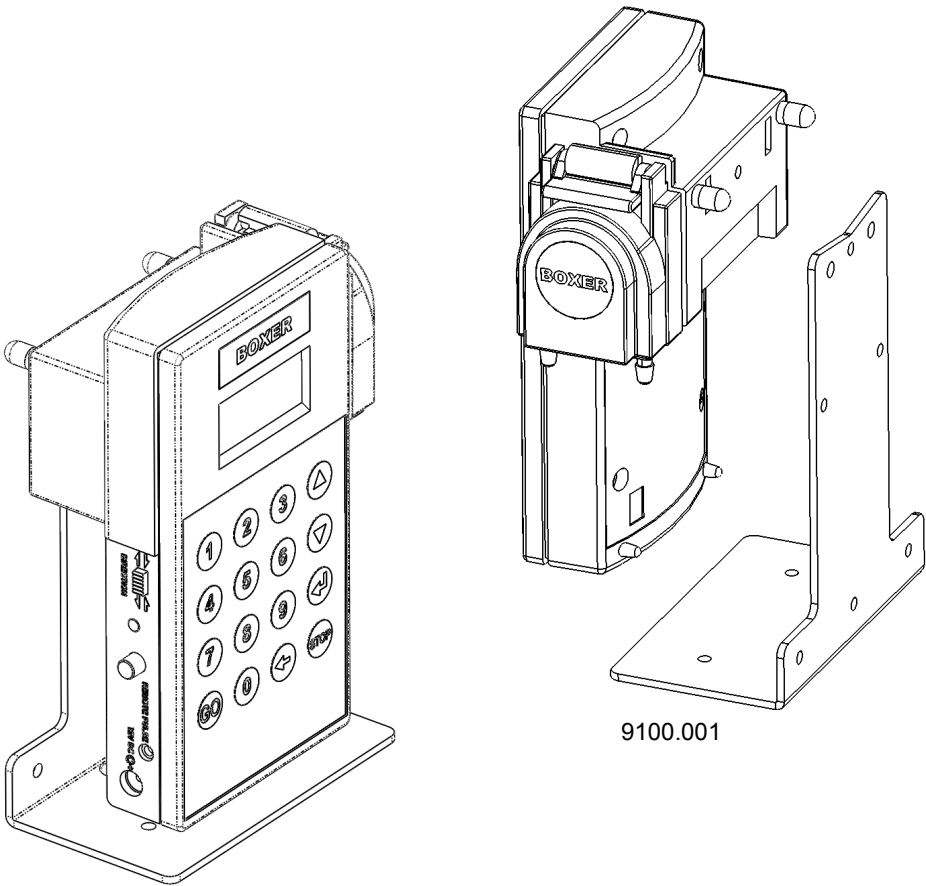
9000.602



9000.603



9000.502



9100.001

9100 on mounting bracket (available as accessory)