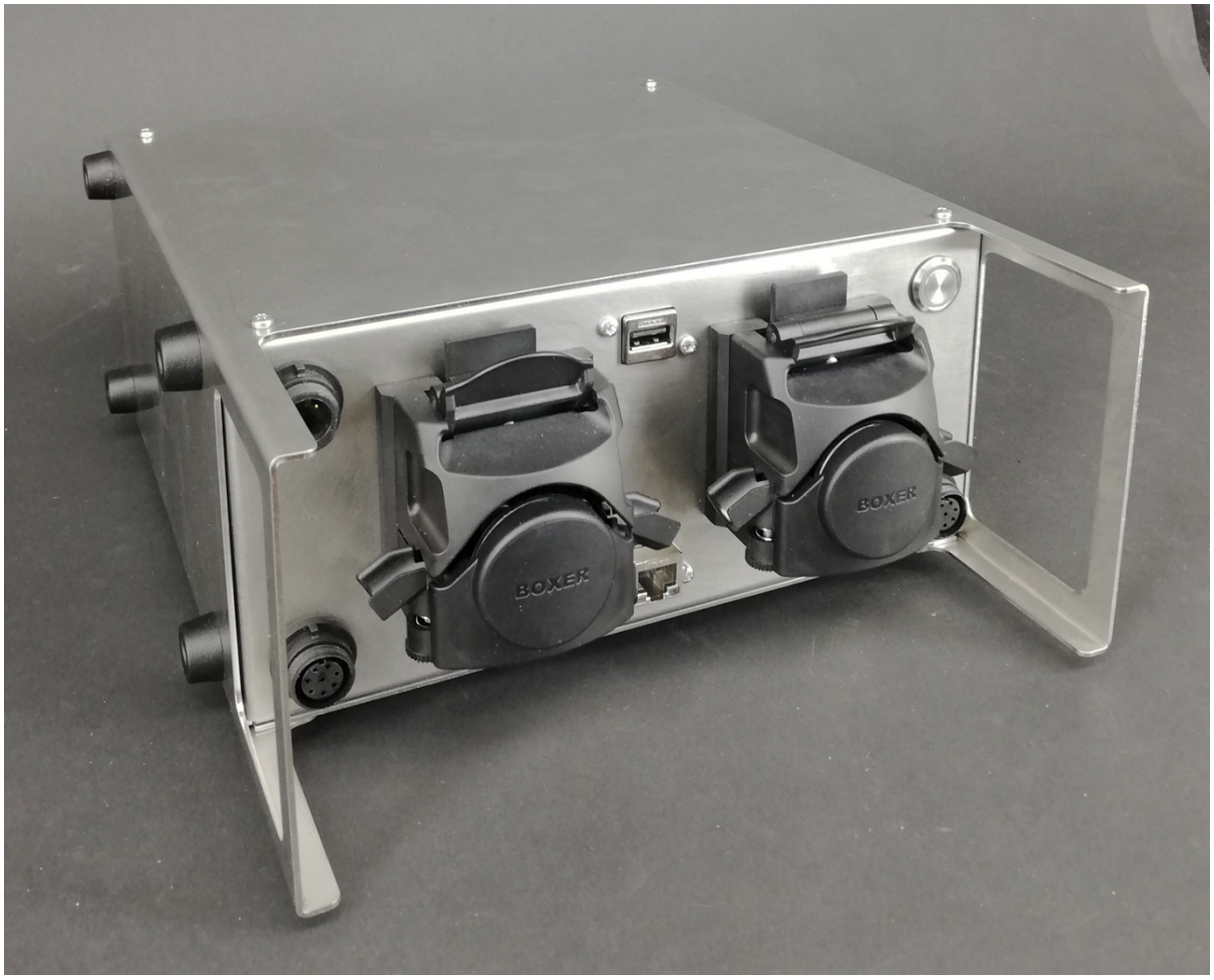
Operating Instruction & Manual
Otrera peristaltic pump



Cronus-PCS

Version 1.0
Document date: 2020-06-18
Otrera is designed and manufactured by www.cronus-pcs.com

Contents

1.0 - Concept overview

Otrera is a dual channel peristaltic pump unit integrating two Boxer 15KS peristaltic pump heads with 3 or 4 rollers. Each pump head are coupled directly to a NEMA-17 stepper motor for un-parallel low liquid flow control and accurate performance at any RPM and direction. Recommend continuously max 400 RPM and intermediate 500 RPM - depending on the chosen hose size and material. Build-in RPM controlled cooling fan and IP31 protective design.

1.1 - Product purpose

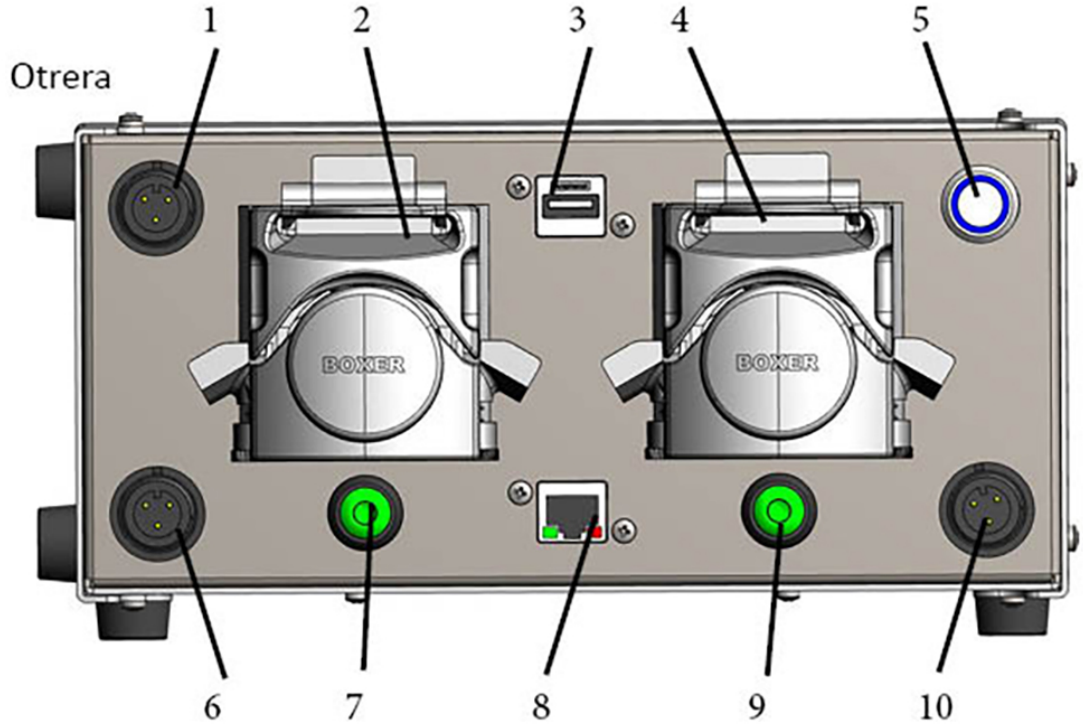
The scope of the Otrera product is:

- convey liquids independent by the 2 pump heads – manual calibration
- convey liquids independent by the 2 pump heads – with Levitronix flow sensors for constant calibration (optional hardware equipment)

2.0 - Device Overview

Harmonia is a product from www.Cronus-PCS.com housed in a Hephaestus size U2 cabinet.

2.2 – Otrera external design



The front panel is equipped with:

1. Buccaneer 3 pin 24 VDC power input
2. Boxer 15KS - A
3. USB socket for Wi-Fi access
4. Boxer 15KS - B
5. Button main power breaker
6. Flow sensor socket – channel A
7. Manual push bottom for low RPM hose filling - channel A
8. RJ45 socket for Local-Are-Network (LAN) connection
9. Manual push bottom for low RPM hose filling - channel B
10. Flow sensor socket - channel B

2.1 – Otrera internal design

Otrera facilitate the Aramis PLC for external LAN, Wi-FI connection and internal CANbus connection for communication with the 2 step motor drivers. Which features operation from few RPH and dual direction.

2.3 - Specification

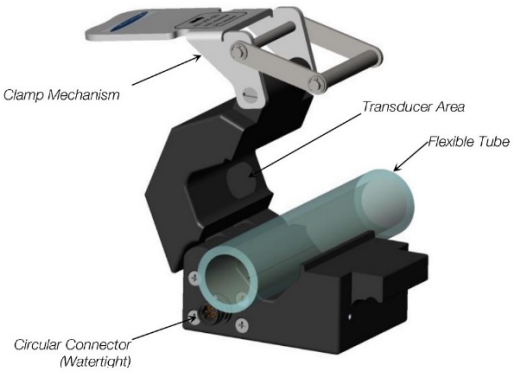
When connection to a suitable supply of power the spec is:

Revolution span	10 RPH to 700 RPM
Hose dimension capacity	OD 8 mm
External sensors (optional)	Dual Levitronix flow sensor
Power breaker	Integrated SSR 5 amp
GUI	no display – use smart-phone, PAD, PC
Computer power	900 MHz quad-core ARM Cortex-A7 CPU running Linux with Code-Sys PLC software
USB socket	for Wi-Fi and data download
RJ45 socket	for IP/TCP via LAN – ModBus and OPC
Power supply	24 VDC - >6 amp
Noise level, dBa	<45
Duty cycle	100%
Orientation	any
Operating conditions	10°C to 50°C, <80% relative humidity, non condensing
Life time, estimated, hours	>50,000
MTBM (mean time before maintenance)	10,000
Cabinet size and material	U2 – AISI304
Weight, kilo	3.5

2.4 – Automatic calibration

Further feature for Otrera is the selectable connection of external clamp-on hose flow sensors.

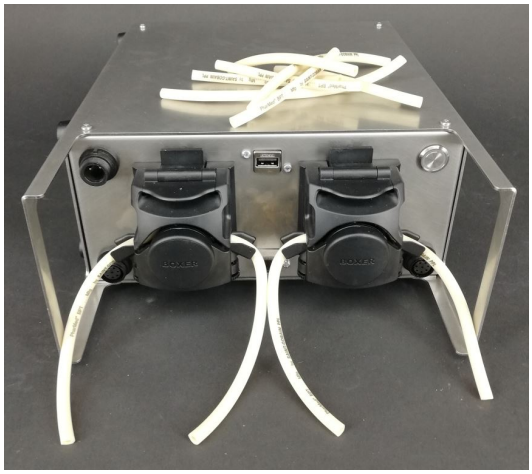
Otrera integrate 2 clamp-on LeviFlow sensor input. Functionality is integrated in the software. The Apollon PLC inside Otrera and software ensures constant calibration when the clamp-on sensor is installed. Move the Levitronix clamp-on sensor cable connector between channel A and B and select which pump head to be calibrated. Or get a second flow sensor for constant calibration on both channels.



Planned introduction ultimo 2020 - the manual expanded accordingly.

3. Pump design

Otrera facilitate two latest pump head design coupled directly to step motors. Benefits are both directions, ultra-low RPM, actual RPM identical to programmed, no wear parts in motor.



3.1 - Silicone hoses and volume

Typical silicone hoses recommended to use with Otrera.

Flow per Revolution	
ID Ø 1.6 mm	210 / 190 / 170 µl per revolution (3 / 4 / 6 Rollers)
ID Ø 2.4 mm	435 / 390 / 320 µl per revolution (3 / 4 / 6 Rollers)
ID Ø 3.2 mm	730 / 660 / 495 µl per revolution (3 / 4 / 6 Rollers)
ID Ø 4.8 mm	1340 / 1250 / 830 µl per revolution (3 / 4 / 6 Rollers)

Flow at 500 rpm (max recommended speed)	
ID Ø 1.6 mm	105 / 95 / 85 ml/min (3 / 4 / 6 Rollers)
ID Ø 2.4 mm	217 / 195 / 160 ml/min (3 / 4 / 6 Rollers)
ID Ø 3.2 mm	365 / 330 / 257 ml/min (3 / 4 / 6 Rollers)
ID Ø 4.8 mm	670 / 625 / 415 ml/min (3 / 4 / 6 Rollers)

Its worth to remember that silicone hose are an extruded elastomeric product. Which do vary in dimension from lot to lot and throughout the lot.

4. Start-up

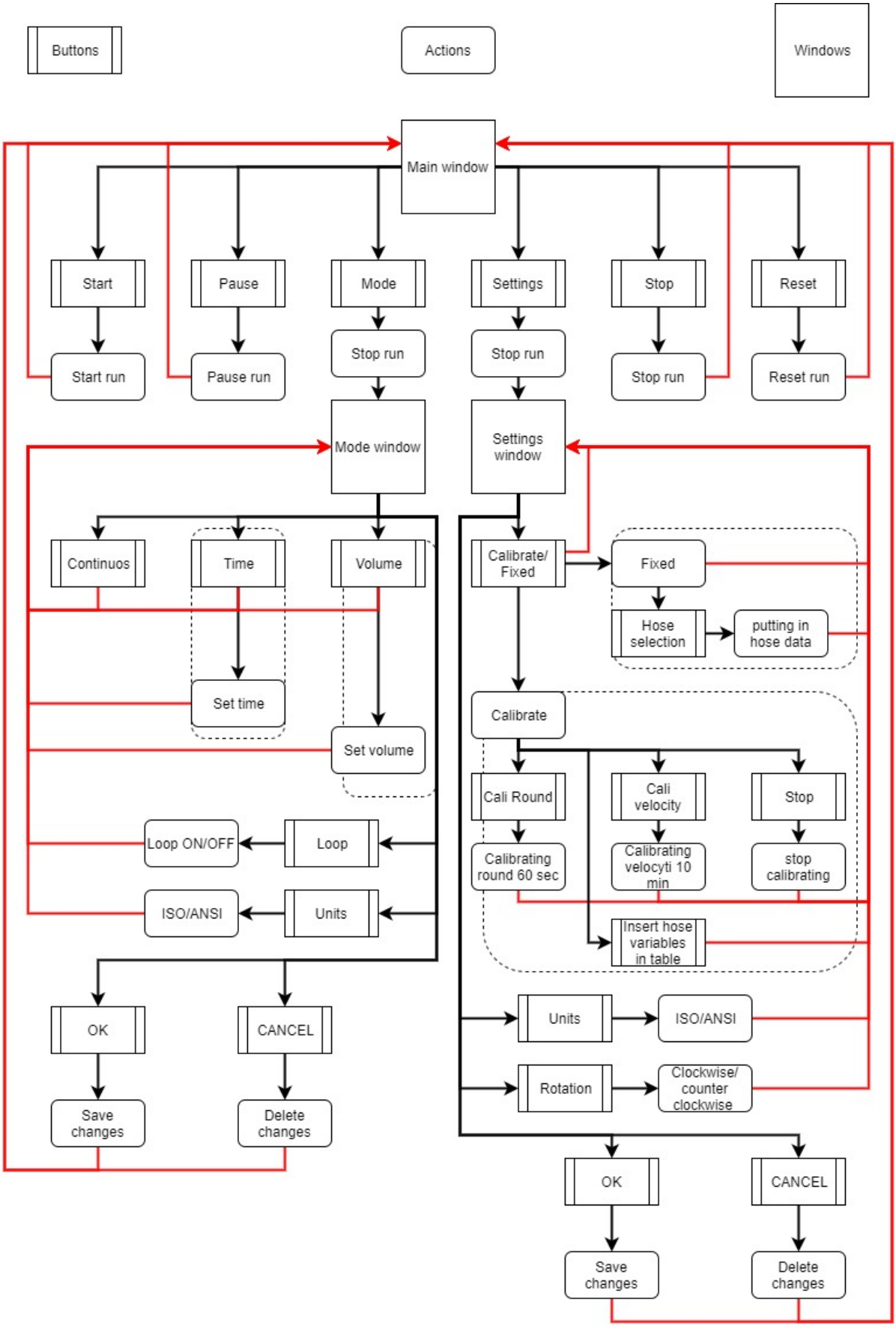
The scope of the product is to convey liquid by two independent circuit. The Otrera unit must be properly installed according to your liquid diagram.

Requirement

The Otrera unit must be properly installed and connected in accordance with the specifications and previous information. Operator must also have gained familiarity with the Safety Instructions to be found separately on www.cronus-pcs.com/support/Safety_Instruction .

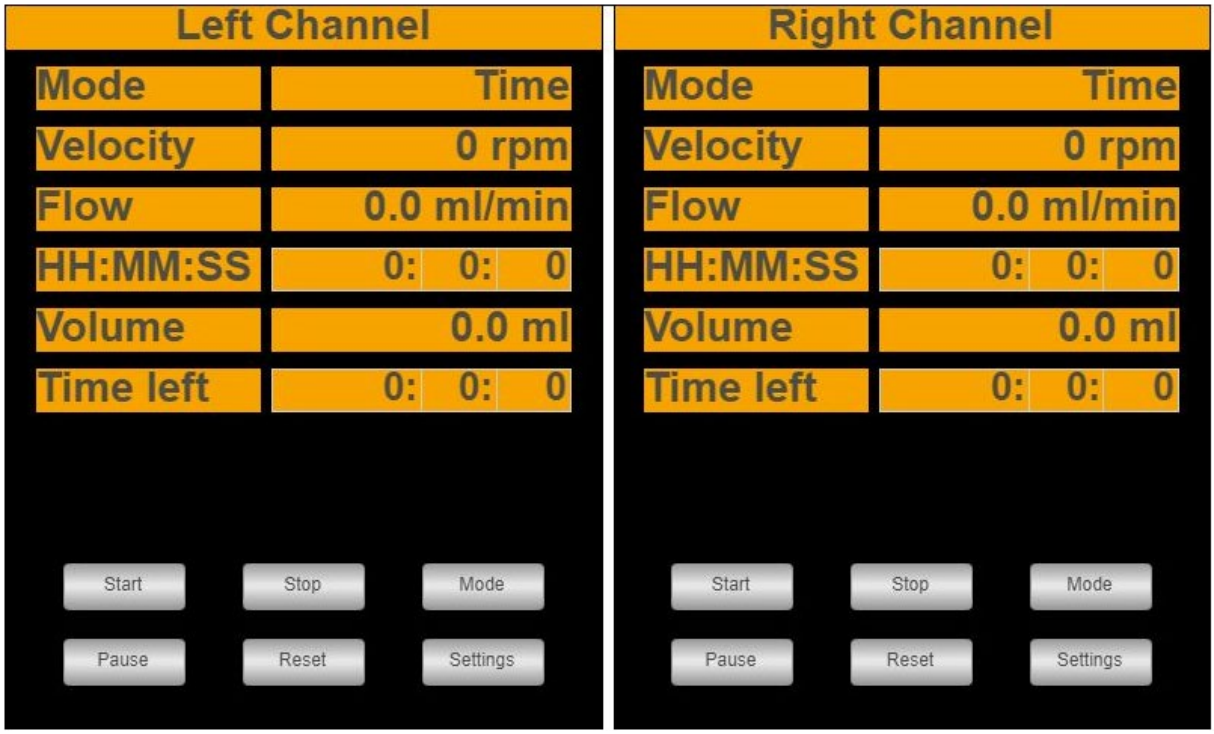
Make in particular sure that the 110 or 230 VAC wall power socket have a ground connection fully functional.

4.1 – Otrera how-to-use



4.2 – Otrera Main Window

The Otrera Main Window split screen for Left and Right channels.

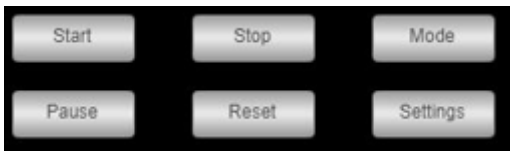


Otrera Main Window *show all the values from left and right channel.*

Below find a screen-shot of the area for values that are set for both channels. Read only table when Otrera is operating. Meaning that you have to enter Mode Window and Settings Window to set the values.

Info table.

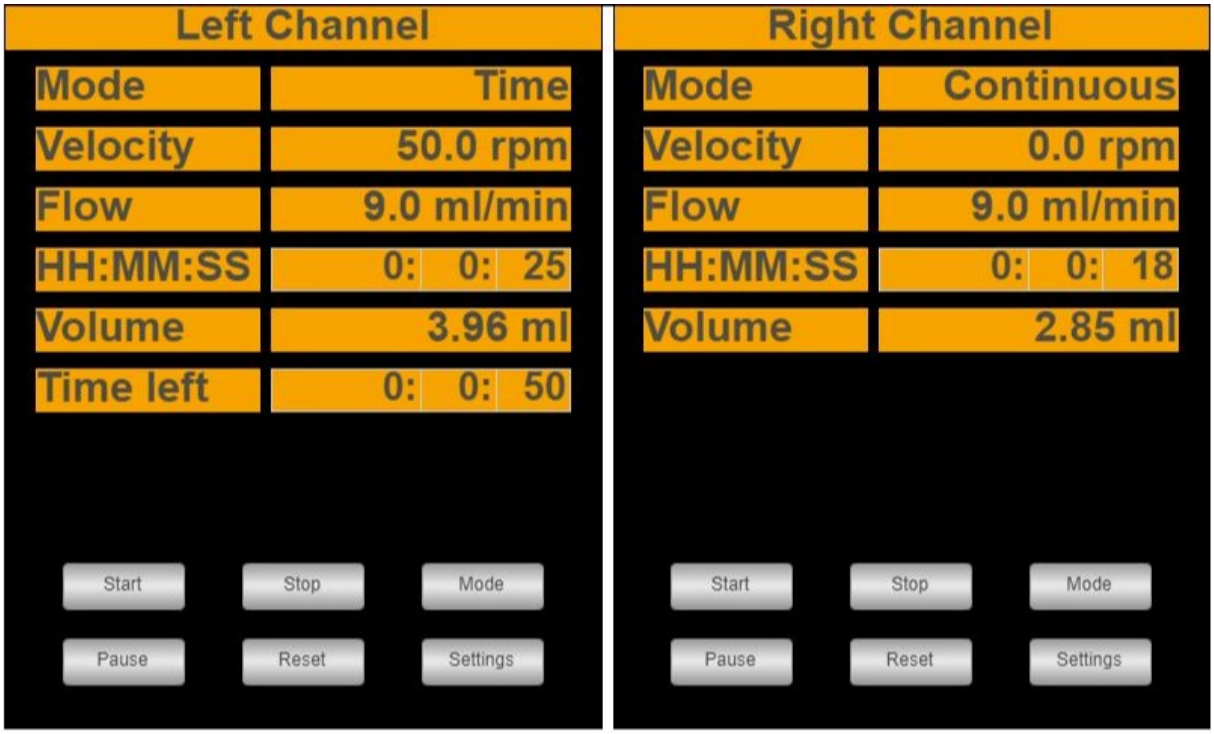
Main Window push buttons to navigate and control the Otrera pumps.



Main Window push buttons.

Start: this button will start the pump after you have set all the parameters.
Stop: this button will stop the current run.
Pause: this button will pause the current run.
Reset: this button will reset the current run.
Mode: this button will navigate you to the Mode Window.
Settings: this button will navigate you to the Settings Window.

Below is an example of how the Main Window can look like when all the values are set.



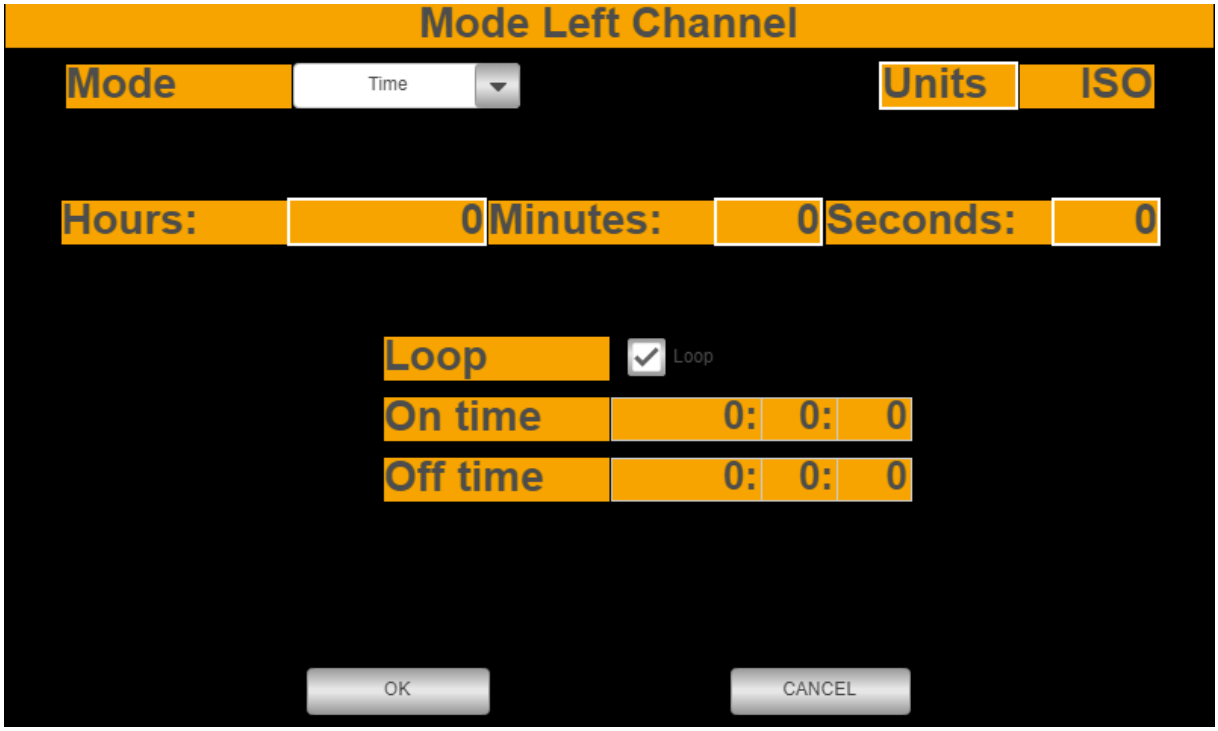
Otrera Main Window show all selected values - ready to run.

4.3 – Otrera Mode Window

Otrera Mode Window seen below and identical for both left and right side. Its indicated in the top which channel is modified.

For information, all the orange bar that is surrounded by a white edge is push buttons to either insert a value or change what is written.

Time Mode:



Otrera Mode Window (Time) shown for the Left Channel.

The Mode selection bar where it is possible to change what mode you wish to use.

Time: the time mode will allow you to let the time be the determent of when the pump run is finished.
Volume: the volume mode will allow you to let the volume be the determent of when the pump run is finished.
Continuous: the continuous mode will let you run the pump at a certain speed until you manually stop it.

Mode selection bar.

The Unit bar where you can choose if you want to use by clicking on the Units bar it will change between ISO (metric) and ANSI (imperial) Units.

Units bar.

The time bar where you can set the time of how long you wish your tun to last.

Time bar.

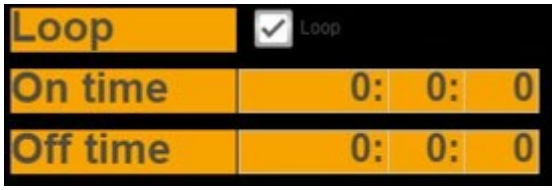
When you need to set a numeric value like in the Time bar, a numpad will pop up on top of the Window and will allow you to set a value within the minimum and maximum value.

Otrera numpad.

Back: Back will erase 1 character, the far right one if more.
Clear: Clear will erase everything.
ESC: ESC will shut down the numpad with no changes/no new values set.
OK: OK will set the new value and close down the numpad.

The Loop bar will give you the opportunities to select a certain loop that you would like to run in every mode, where you can select a loop:

Loop bar.



Loop bar ticked off.

On time: how long time the pump should run before stopping.
Off time: how long time the pump should have a break before starting.

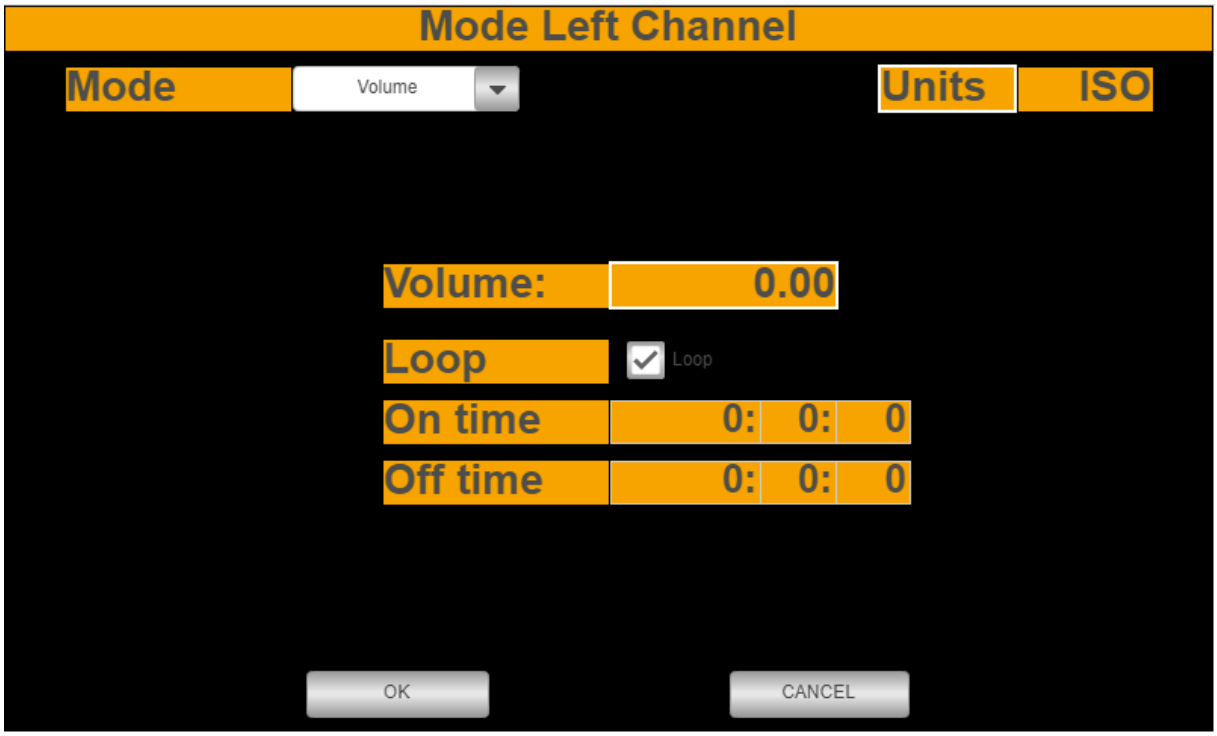
Then the pump will run in that loop until the goal is reached.

Below are the Exit Window push buttons.

Exit Mode Window push buttons.

OK: when you have set the values you like then press OK to save the values and return to Main Window.
CANCEL: you can also return to Main Window without any changes by clicking on CANCEL.

Volume Mode:

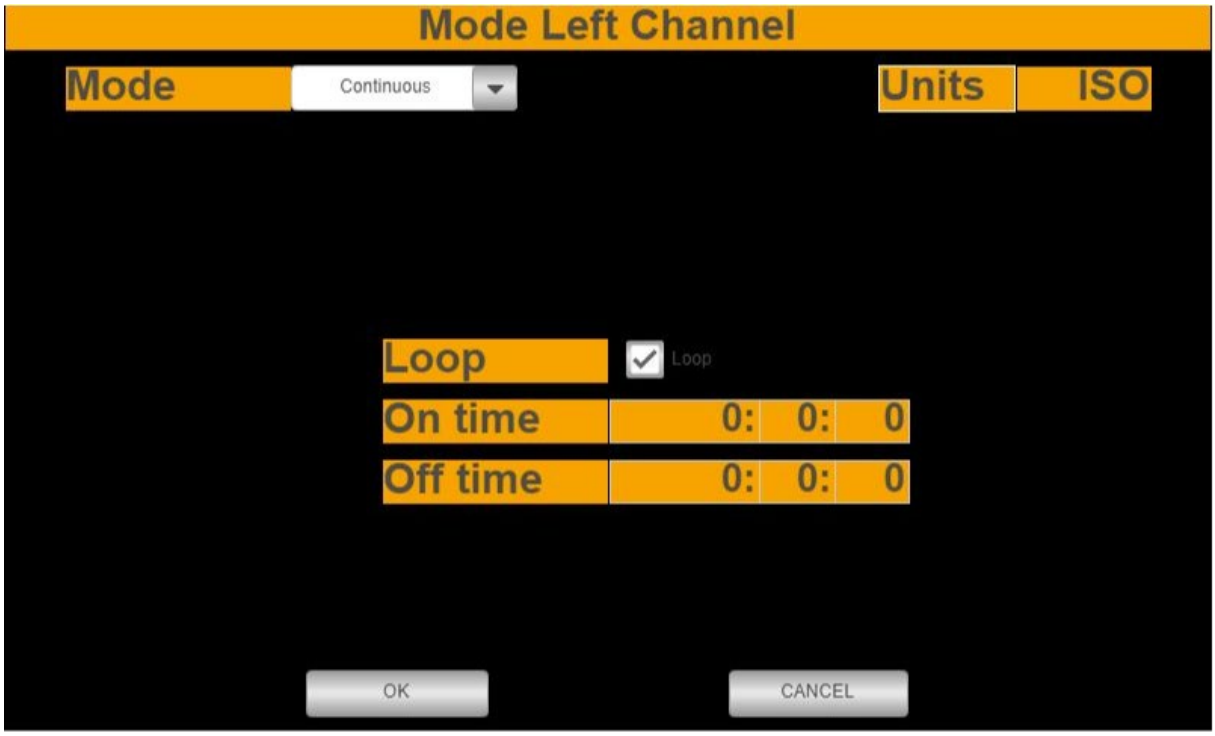


Otrera Mode Window (Volume) shown for the Left Channel.

When the Mode bar is selected as Volume then a new Volume bar appears where you can enter the volume you wish to convey, and when the desired volume is reached the run will stop automatically.

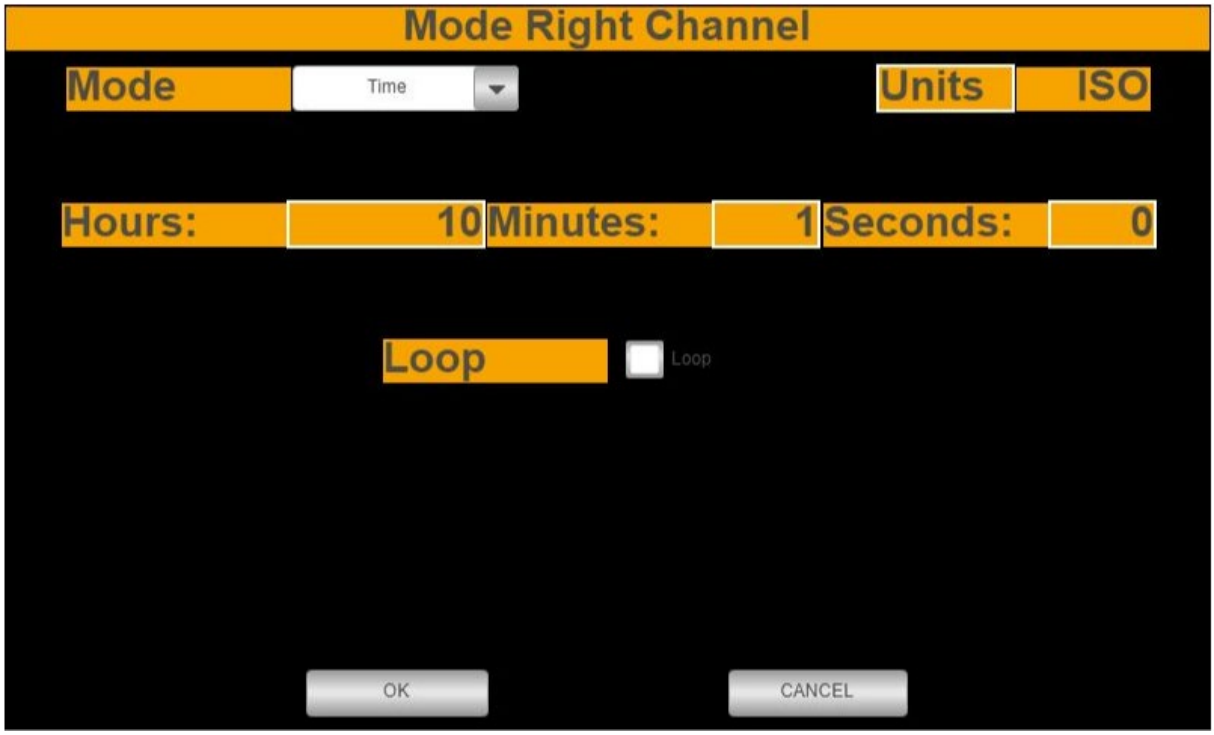
Volume bar.

Continuous Mode:



Otrera Mode Window (Continuous) shown for the Left Channel.

Only in continuous mode you can choose whether to run in a loop with breaks or not in a loop without breaks.

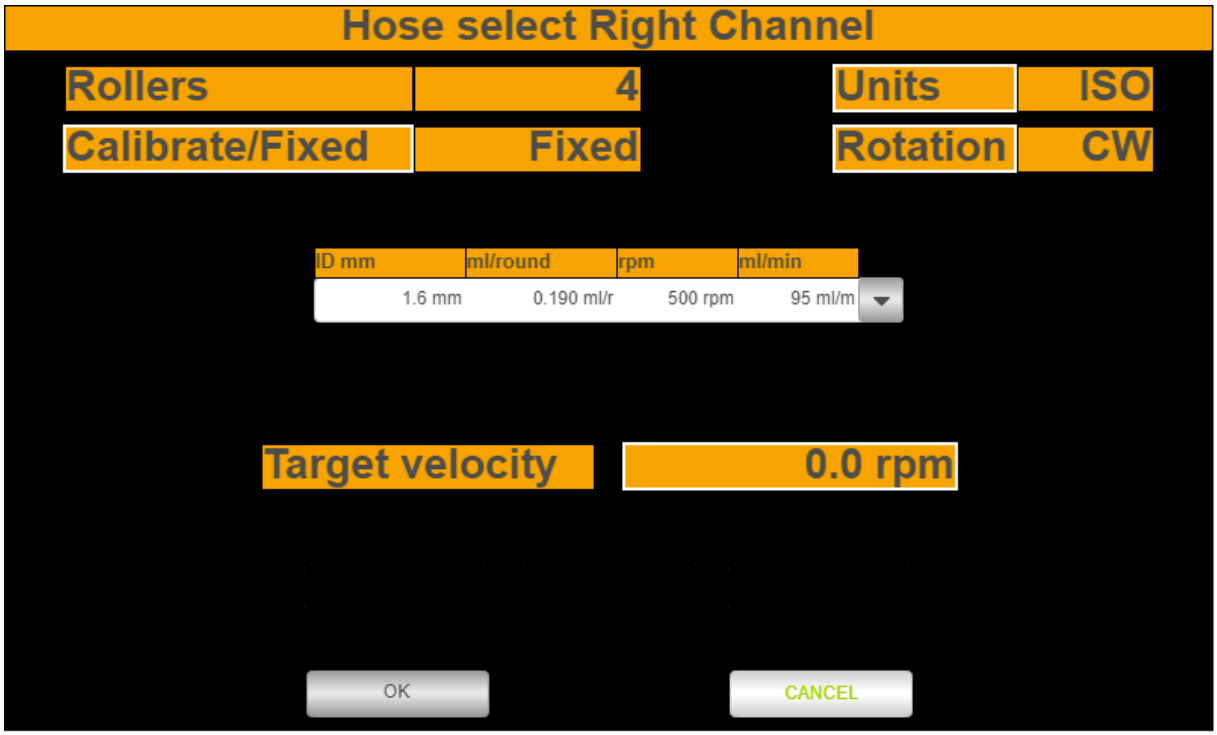


Otrera Mode Window (Time) with time values set, shown for the Left Channel.

4.4 – Otrera Settings Window

When you are in the Setting Window you can use the green push buttons found under each pump to manually fill your hose. Only when Otrera is in Setting Window and only as long as the green button is pressed in.

Fixed:



Otrera Settings Window (Fixed) shown for the Left Channel.

The Otrera Settings Window let you set the hose values, so the software know how many ml is pumped for each round.

The 3 or 4 rollers inside the pump head are fixed and cannot be changed.

Rollers bar informing about the numbers of rollers.

Calibration/Fixed bar you can change whether to choose approximate values from the table or you wish to calibrate the hose yourself.

Calibrate / Fixed bar.

Rotation bar allows you to make the pump to run in the direction you like - either clockwise (CW) or counter-clockwise (CCW).

Rotation direction bar informing about the direction chosen.

In Fixed mode you can choose from different hose sizes that will show some estimates like millilitre per round. See section 3.1.

Fixed custom-made hose values bar.

Target speed of rotation is where you enter the fixed speed you want to use.

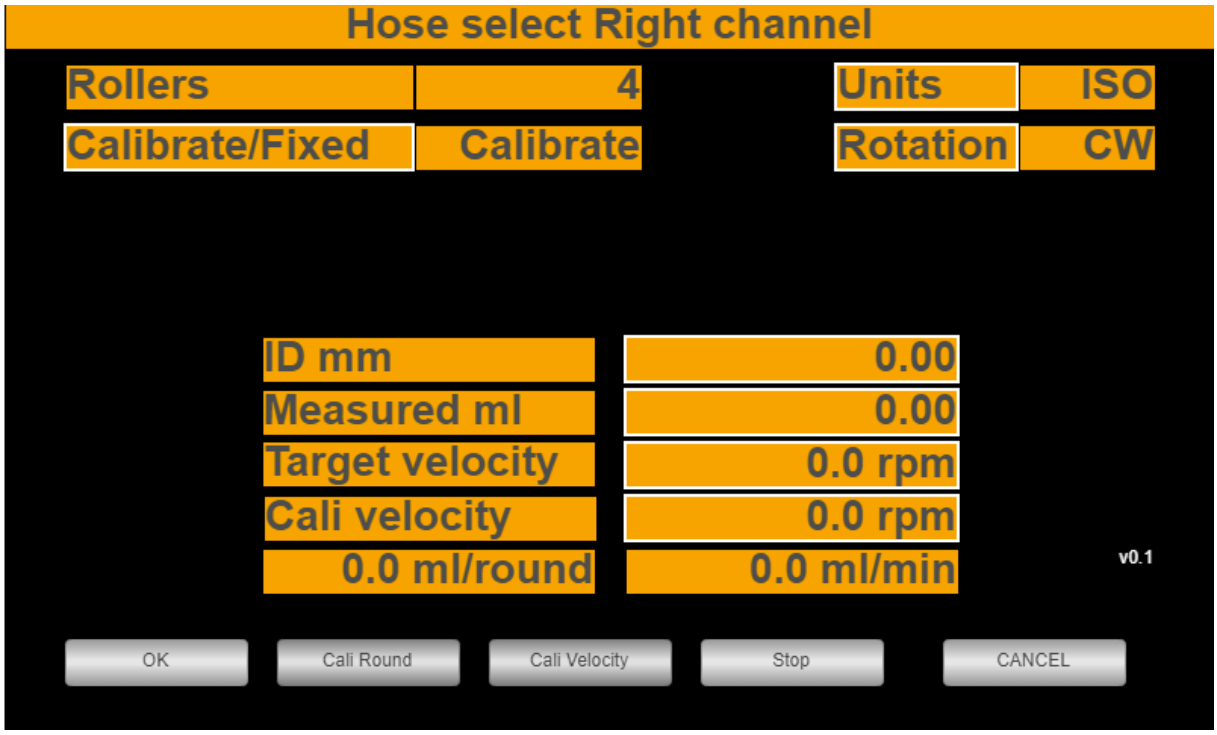
Target show the speed of rotation bar.

The Exit Window push buttons.

Exit Mode Window push buttons.

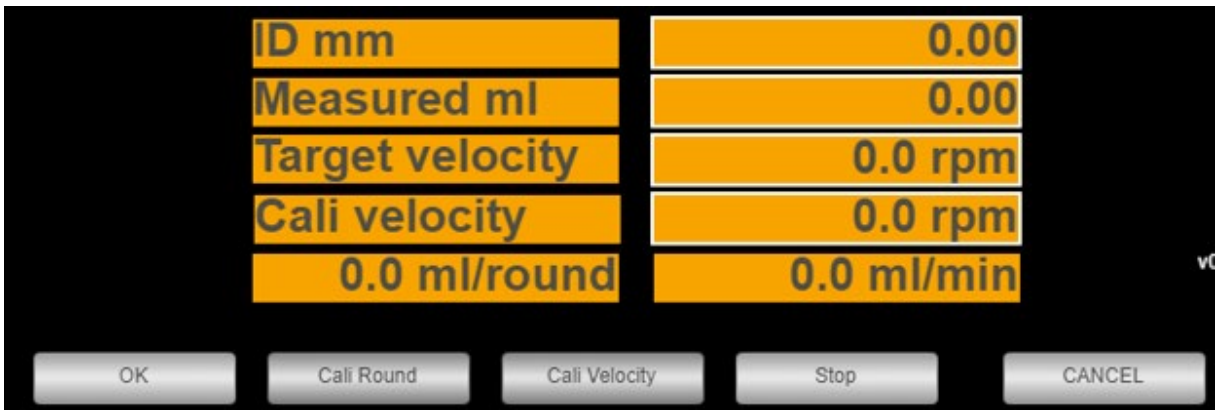
OK: when you have set the values you like then press OK to save the values and return to Main Window.
CANCEL: you can also return to Main Window without any changes by clicking on CANCEL.

Calibrate:



Otrera Settings Window (Calibrate) shown for the Right Channel.

When you choose to calibrate the hose, there are some helping tools



Hose values table.

To manually calibrate the selected hose you need to:

Insert the hose **ID** (inner diameter), the **Target velocity** (the velocity you wish to use with your run after calibration) and **Cali velocity** (the velocity you want to use doing calibration).

Measured ml:

1- Make sure you have filled the hose with liquid (use green button).
2- Take 2 vessels, 1 empty (Vessel A) and 1 filled with liquid (Vessel B).
3- Measure the weight of the empty vessel.

4- Then start **Cali Round** or **Cali Velocity** so the pump is pumping the liquid from the Vessel B to the Vessel A.
5- After the calibration is done measure Vessel A with the pumped liquid in it.
6- Subtract the Vessel A with liquid weight from the Vessel A without liquid weight, and put in the measured ml into the table and you will receive the ml/round and ml/min.

Button functions:

OK: accept all changes and go back to Main Window.
Cali Round: this function will take 60 sec and afterwards let you insert the measured ml to get the ml/round and ml/min.
Cali Velocity: this function will go for 10 min with the target rpm that you have inserted, and afterwards let you insert the measured ml to get the ml/round and ml/min.
Stop: stop calibrating.
CANCEL: do not accept the changes and go back to Main Window.

5. Communication

- External connection to PC, PADs or smart-Phones via Wi-Fi for programming and info from the built-in webserver
- USB port for USB adapter with software upgrades / Wi-Fi antenna connection
- RJ45 port for LAN, ModBus, OPC via IP/TCP and for firmware upgrades, data acquisition, external management control like from Lucullus (or DeltaV).

5.1 - Operation principles

Assuming a correct assembly of all systems, connections, etc. according to your Fluid Diagram – check all connections are tight.

5.2 - Wi-Fi connection

Otrera is delivered with one NetGear Wi-Fi access point. The Apache webhost will be accessible from a browser. Go into “Settings”/ Wi-Fi NETWORKS” and check if you can see Otrera and select. Return to a browser and write anything in the address line for access to Apollon and Apache.

Otrera can be controlled via an USB Wi-Fi communication device:

- SSID: otreraXX-cronus
- Phrase: cronus-otrera

5.3 – LAN IP/TCP connection

Check present development status on https://cronus-pcs.com/support/

5.4 – Software upgrade

Check out www.cronus-pcs.com/support/communication/software-upgrade

5.5 – Power supply

CE marked Otrera operate on 24 VDC with minimum 6 amp capacity.

6. Safety precautions

Various components require individual attention. Operator must also have gained familiarity with the Safety Instructions to be found separately on www.cronus-pcs.com/support/Safety_Instruction .

6.2 - Documentation

Harmonia functionality must be checked on a regular basis and data of such testing kept recorded.

6.3 Glossary

- Otrera -
- GUI – Graphical-User-Interphase
- OPC -
- LAN – Local-Area-Network
- Apollon -
- Apache -
- RPH -
- RPM -

6.4 - Declaration of Conformity

CE

CE Declaration of Conformity

Company: Cronus-PCS
Malmmosevej 19C
DK-2840 Holte
www.cronus-pcs.com

We hereby declare that based on the design, construction and product placed on the market, the product designated below fulfils the relevant fundamental safety requirements and health regulations specified by the pertinent EC Directive.

The declaration shall become legally invalid if any modifications are made to the product, which have not been certified by Cronus-PCS.

Designation of the product: Otrera - p/n 5040

Relevant directives of the EC:

- 2006/42/EC Machinery
- 2004/108/EC Electromagnetic Compatibility
- 2006/95/EC Electrical equipment designed for use within certain voltage limits
- 97/23/EC Pressure Equipment

Date of signature: 2020-04-20

Function of Signature
Per Stobbe
CEO and Director of R&D