syp | Waikato Scientific Instruments

# SYP Fluid Sampler

User manual

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Contents

# Disclaimer

**Important Safety and Legal Disclaimer**
READ THIS DISCLAIMER CAREFULLY BEFORE USING THIS PRODUCT. This document contains important information regarding the use, limitations, and warranties applicable to the SYP Fluid Sampler (the "Product"). By using the Product, you acknowledge that you have read, understood, and agree to be bound by the terms set forth herein. This disclaimer is intended to apply universally across all jurisdictions and is governed by the laws of the jurisdiction in which the Product is purchased, without regard to conflict of laws principles.

**SYP Fluid Sampler**
The Product is a precision scientific tool designed and engineered for professional and research applications. It incorporates advanced features for durability, including water resistance and rugged construction, to withstand demanding field and laboratory conditions under normal use. However, it is not indestructible, nor is it rated for use in extreme environments, submersion, high-impact scenarios, or conditions beyond those specified in the technical specifications.

The Product's performance and safety depend on proper handling, maintenance, and adherence to the guidelines in this user manual.

**User Responsibilities and Reasonable Care**
To ensure safe and effective operation:
- Take all reasonable care when using, transporting, storing, or maintaining the Product. This includes avoiding exposure to excessive force, chemicals, temperatures outside the rated range (-10°C to 50°C), direct sunlight, or contaminants that could compromise seals or components.
- Inspect the Product regularly for signs of damage, wear, or degradation, and cease use immediately if any issues are detected.
- Follow all instructions, warnings, and precautions in this manual. Unauthorized modifications, repairs, or use of non-approved accessories may void all protections and warranties.- The Product is intended solely for its designated scientific purposes and should not be used for any medical, life-support, aviation, nuclear, or other critical applications where failure could result in personal injury, death, or substantial property damage.- Users assume full responsibility for compliance with applicable local, national, and international regulations, including but not limited to environmental, health, safety, and export/import controls.

**Limitation of Liability**
IN NO EVENT SHALL WE BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE, OR MULTIPLE DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, DATA, GOODWILL, USE, OR BUSINESS OPPORTUNITIES, ARISING OUT OF OR RELATED TO THE PRODUCT, ITS USE, MISUSE, OR INABILITY TO USE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Our total aggregate liability for any claim related to the Product shall not exceed the amount paid by you for the Product.

This limitation applies regardless of the legal theory (contract, tort, strict liability, or otherwise) and survives any termination or expiration of this disclaimer. Some jurisdictions do not allow the exclusion or limitation of certain warranties or damages, so the above limitations may not apply to you; in such cases, liability shall be limited to the fullest extent permitted by law.

# Warranty

We warrant that the Product will be free from defects in materials and workmanship under normal use for a period of 18 months from the date of original purchase (the "Warranty Period"). This limited warranty covers repair or replacement of defective parts and labour necessary to effect such repair or replacement, at our sole discretion, provided the Product is returned to an authorized service centre with proof of purchase and subject to inspection.

**T**HIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. It does not cover: (i) normal wear and tear; (ii) damage resulting from accident, abuse, misuse, neglect, improper installation, unauthorized repairs or modifications, or use contrary to instructions; (iii) cosmetic damage; (iv) consumable parts (e.g., batteries); or (v) issues arising from force majeure, third-party software, or compatibility problems.
To claim warranty service, contact waikatoscientific@gmail.com within the Warranty Period. Shipping costs to the service centre are your responsibility unless otherwise specified. Repaired or replaced Products carry the remainder of the original Warranty Period or a new 12-month period, whichever is longer. After the Warranty Period, all repairs and services are at your expense.

General Provisions
- Severability: If any provision of this disclaimer is held invalid or unenforceable, the remaining provisions shall remain in full force and effect.
- Entire Agreement: This disclaimer constitutes the complete and exclusive understanding between you and us regarding the Product and supersedes all prior or contemporaneous agreements.
- Assignment: You may not assign this disclaimer without our prior written consent.
- Updates: We reserve the right to modify this disclaimer at any time; continued use of the Product after changes constitutes acceptance.

For questions or support, visit `www.waikatoscientific.com or contact waikatoscientific@gmail.com. Retain this manual for your records.

WARNING: FAILURE TO COMPLY WITH THESE TERMS MAY RESULT IN SERIOUS INJURY, PROPERTY DAMAGE, OR LOSS OF PRODUCT FUNCTIONALITY. USE AT YOUR OWN RISK.

# Overview

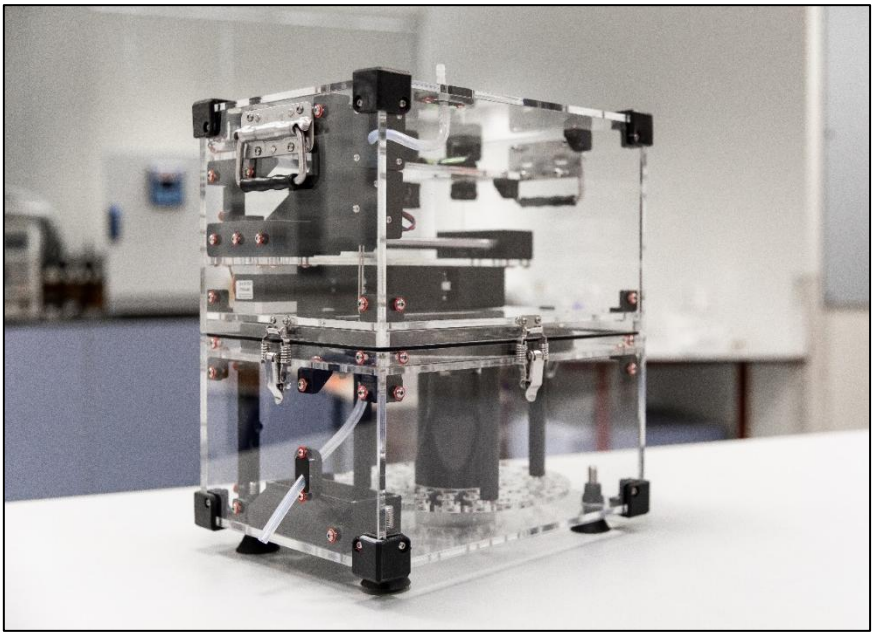
The SYP fluid sampler is an advanced automated tool capable of taking up to 58 liquid samples continuously or at a configurable interval and can run for more than a year on its supplied battery pack.

The sampler injects sample fluids to sealed vials via peristaltic pump or gravity. Sample collection is fully configurable and can be triggered via timer, sensor data, or flow rate (in gravity mode only), or via an external trigger. By default, SYP will discharge residual sample fluid between by going to the purge position to avoid cross contamination. Full samples are timestamped.

The device is carefully constructed in modular form using quality stainless fasteners, custom 3D-printed and laser-sintered components and a transparent acrylic case with carry handles for convenience. SYP is the perfect companion for scientists at universities, research institutes, regional authorities or monitoring agencies.

## Feature summary

- 58 screw-in sample vials on a rotating carousel
- Full vial detection with automatic purge
- Flow stop valve prevents leaks between samples
- Sample injection to vial with anti-coring needle via peristaltic pump or gravity
- Continuous, timed or sensor-based sampling modes with adjustable sample and purge regime
- Battery life over 12 months at 1 sample per week
- Modular design for easy transport and maintenance
- Comprehensive data logging
- Adjustable height feet and spirit level for mounting on uneven surfaces



## Operation

SYP features a fully configurable sampling regime via gravity or peristaltic pump and four sampling modalities (explained below). Both gravity and pump-based delivery support a fully configurable purge / rinse cycle between samples.

#### Sample method: Gravity & peristaltic pump

**Gravity mode** was designed for collecting fluid drips falling from a height, for example, from a cave roof or rain gauge. It requires a funnel or reservoir be set up to collect the liquid, which flows into the machine by gravity alone (without any mechanical support). Gravity mode uses full vial detection to ensure consistent sample volume and logs when samples are completed.

Gravity mode supports continuous, timed or delayed start modes (explained in detail below).

> When setting up the device in gravity mode, ensure there is sufficient hydraulic head to drive flow to vials by gravity alone. Kinks or dips in tubing will cause operating issues or missed samples.

**Pump mode** was designed for sampling surface or ground water. Here a peristaltic pump moves fluid from a reservoir into vials at user-defined intervals or triggered via an external controller (e.g., logger connected to an electronic relay). In this mode the pump runs for a pre-determined time for each sample to ensure consistent volume, which is validated by the full vial detection feature.

Pump mode supports timed or delayed start modes but not continuous mode unless via an external trigger (e.g., for flow-proportional sampling setups).

> Pump mode can be set up with a funnel or reservoir in tight or cramped settings where flow to vials by gravity alone is unreliable due to insufficient hydraulic head.

#### Sample mode: Continuous, timed, delayed start and external

**Timed** is the standard mode of operation. A schedule is set by the user dictating sample interval from 1 to 65,000 hours. By default, the system will purge before a sample is taken.

**Delayed start mode** uses either a user-defined timer or sensor data (air pressure, humidity, temperature) to trigger sample collection. Once the user-defined threshold is met, the device continues sampling according to user-defined settings.

**Continuous** mode provides an option for a flow-based sampling regime. Water is fed into the system and directly into vials. When the system detects a vial is full, it automatically timestamps sample completion and immediately begins the next sample. By analysing time stamps from each sample, flow rate can be inferred, thereby enabling flow-proportional, or 'event' sampling via gravity feed.

Continuous mode only works while using gravity as the means of collection but can be enabled via the external trigger. In **External** mode, SYP will progress to the next vial and pump for the required time when it receives a 12V pulse via the trigger cable. In this mode SYP responds passively to the sampling logic determined by the external logging device.

# Connect to SYP:

Connect to the SYP fluid sampler using a Wi-Fi enabled device, such as a smart phone or laptop with web browser (we recommend Google Chrome). The steps below apply to Android or iPhone smart phones or a Windows PC.

## Wi-Fi

**First** ensure SYP is awake by a single press of the **Sample Control** button on the top left corner of your SYP unit.

### Android OS Phones

1. Swipe down from the top of the screen.
2. Touch and hold Wi-Fi .
3. Turn on **Use Wi-Fi**.
4. Tap the "**SYP**" network in the list.

### Apple iOS Phones

1. Go to Settings.
2. Click on Wi-Fi (Make Sure it is "On").
3. Choose the "**SYP**" to connect.

### Windows PC

1. Make sure your PC has Wi-Fi available.
2. Click the icon below (or similar), usually found in the tray in the bottom right-hand corner:

3. This will show you the Wi-Fi options. Click on "**SYP**" to connect.

When you connect to SYP your device may ask if you want to **"keep the connection"** as no internet will be available. Click **"Keep Connection"** to connect to the Auto Sampler.

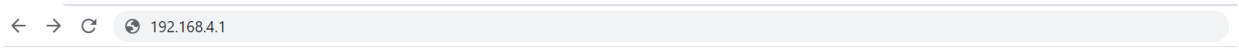
# Load the SYP interface

There are two ways to load the SYP interface:

1. Scan the QR code using your phone's camera. This works on newer versions of Android and iOS.

Figure 2

2. Open your web browser (Google Chrome is recommended), and type in **192.168.4.1** into your search bar.




While connected to SYP you won't be able to connect to the internet, as the SYP sampler itself isn't connected to the internet.

# Configuration and use

## Status page

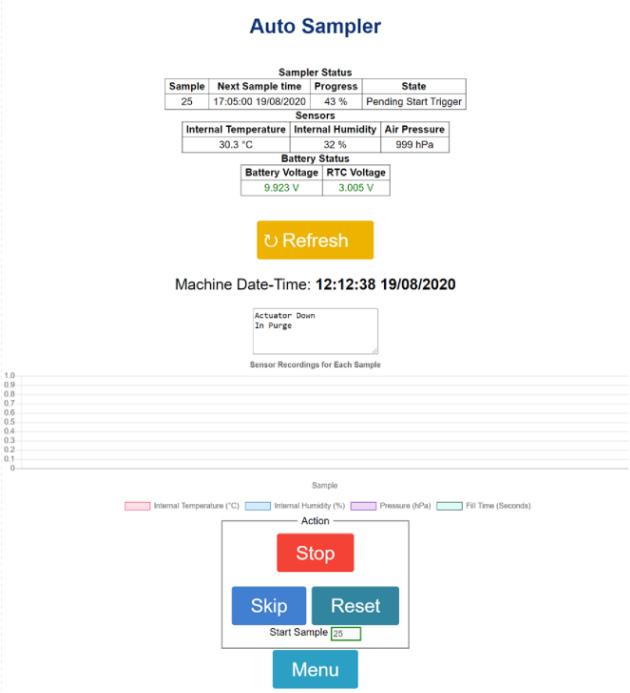



Figure 1: Ready to start sampling (1).

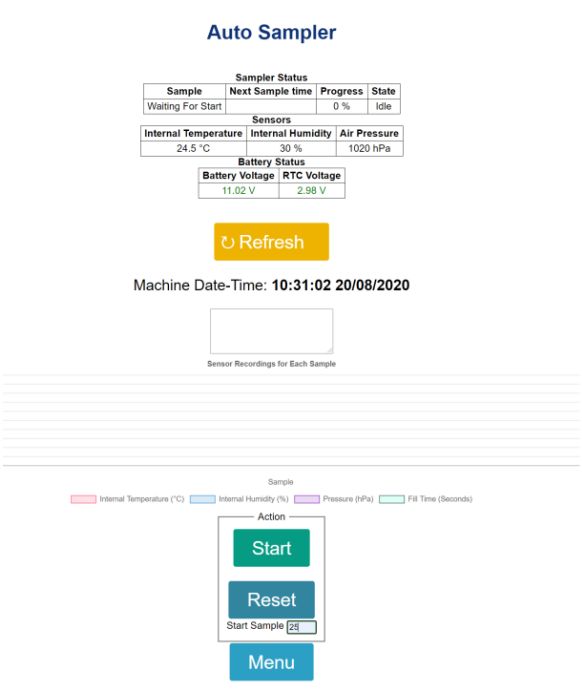



Figure 2, Waiting for a delayed start (Starting at Sample 25)

This page shows information about the current status of the SYP fluid sampler and a history of the samples taken. It also provides environmental information to assist in the setup. This page also allows the user to start at a specific sample, reset, stop, resume, skip samples, and refresh data.

### How to start

Please review our tutorial video, SYP: getting started (https://youtu.be/bt0suUGN9po). Keep an eye out for more videos on our YouTube channel and website (www.waikatoscientific.com/tutorials).

**Before starting the sampler, ensure the settings are set correctly on the Settings page.** If you want to start at a specific sample, enter the sample number in the Start Sample field before pressing Start.

To start SYP, press the Start button. The device will enter the sampling state where it will start sampling immediately or sit idle waiting for a start trigger depending on the setup (*see Settings*).

Once the Auto Sampler has started, the available buttons will change and the machine state will update when it begins to run. Once the start button is clicked the Auto Sampler will also create a new Sample file, where all the sample data for that run will be stored.

**Reset**

The reset button will cause the sample process to stop, clear the sample count, go back to purge and will wait or the start button to be pressed again.

**Skip**

This allows the user to move past samples if required. Multiple samples can be skipped by pressing the button multiple times in quick succession.

Note: The table will rotate at a higher speed if it must travel further to reach the new sample position.

**Stop**

This will stop the sampling process and change the Auto Sampler into an idle state. The needle block will move to the purge location regardless of where it currently is.

Note: While stopped, the Next Sample Time won't be updated.

**Resume**

This will move the Auto Sampler back into the sampling state. The needle block will move back to the sample that it was stopped at.
Note: When resumed the Next Sample Time won't be updated.

**Refresh**

When pressed all sensor data and battery voltage will be updated immediately.

**Graph**

The graph shows the data from the current sample file, but only loads the data when the page refreshes. To hide or show specific data, just click on the data set in the legend (*Figures 1 & 2*).

**Menu**

Click this button to navigate to the menu page.

# Downloading Data

When recovering the samples after a deployment, download the data as follows:

- Connect to the SYP
- Navigate to Menu -> Download Files -> Samples
- Select the deployment file from the drop-down list. The most recent deployment will be located at the top and will be selected by default.
- Click download to retrieve the file.


**Figure 3, Downloading sample data.**

Logs and SYP Activity files can also be downloaded with a tap of your smartphone. These files can aid in diagnosing problems. Please submit these to the support technician when requested.

**Logs** - General logging information
**Activity** - Detailed event log on mechanical movements and actions

# Software updates

We continuously work to improve the functionality of your SYP fluid sampler and periodically provide software updates via email and for download on www.waikatoscientific.com/syp-support. Software updates come as .SYP files and need to be downloaded to the device (phone or laptop) used to connect to the SYP unit's Wi-Fi. To install software updates, navigate to the menu item "Update files" and select the appropriate .SYP file via the "Choose file" button. Start the update by pressing "Upload file". The update process and any further information will be shown during the update. The currently installed software and hardware versions are displayed in the main menu, and in more detail in the menu item "Diagnostics".

Please take special note of any important information that may be provided alongside certain updates to ensure their correct installation.

# The SYP Hardware

Get to know SYP:

- **Modularity**: SYP splits into two halves for ease of transportation. The upper contains the SYP control electronics, linear gantry and actuated injection block. The lower consists of the carousel. Load your sample tubes into the carousel and attach the retention plate before your deployment.
- **Adjustable feet and Bubble level**: rotate the feet to adjust for levelling on uneven ground.
- **Carry handles**: carry your SYP and position it using the carry handles.
- **Connecting latches**: lock your two halves in place with these snap lock latches.
- **Buttons**: activate SYP and start your sample run, reset or activate transport mode. Program via the web interface.
- **Inlet**: attach the supplied tygon tubing for gravity feed or your peristaltic pump outlet to the SYP inlet to deliver fluid to the sample tubes.
- **Air release tube**: the air release tube allows air to exchange between the sample tube and external atmosphere as fluid is delivered to the tube.
- **Purge receptacle and tube**: the needle block will move to the purge port between samples.
- **Carousel**: holds 58 polypropylene sample tubes. Screw in place using the tube’s thread.
- **Carousel retention plate**: position the plate paying attention to the orientation to ensure the holes align with the tube bungs.
- **Guard plate** (bottom plate on top half, with slot): the guard plate seals the upper half of SYP and isolates the needle block for safety.
- **Needle block**: this unit integrates the needles for fluid delivery and air exchange, stop-flow valve and vial full detection electronics. Replacement needle blocks are available by special order.
- **Gantry**: the linear gantry allows the needle block to move between the purge port and sample tubes in conjunction with the carousel.
- **Pump/Trigger connector**: attach your pump and external trigger cable (if purchased) via the circular 4 pin port on the rear of SYP.
- **Battery compartment**: connect and insert your rechargeable battery.
- **Battery and charger**: an 8-amp hour rechargeable LiPo battery and charger is provided. Replacements or extra batteries are available upon request.

Before powering the SYP for the first time, make sure both of the red packing inserts are removed!

# Battery

**Installing the battery**
Just unscrew the thumbscrews and pull out the battery pack, then pull apart the push connectors.

**Charging the battery**
Fully charge the battery before first use.
Connect the supplied battery charger to the battery. Plug In the charger. The charger status LED will Illuminate as follows:

Red = Charging
Orange - Final Charging Stage
Green = Charged

# Maintenance

It's good practice to air-out and clean your SYP to ensure best functionality and long life. While SYP is engineered for water resistance, as with any electronic product, prolonged exposure to humidity will induce corrosion and component failure. Keep an eye out for future video tutorials on our channels.

**Replacing the needles:**

- Remove the bottom guard plate (acrylic plate with slot)
- Remove the 3x needle block screws
- Unplug the needles connector
- Disconnect the air release tube
- Remove the needle block cover
- Remove the needle cartridge
- Install the replacement needle cartridge in the reverse order

**Cleaning the Bottom half:**

- Remove the vial retention plate
- Remove the 4 carousel screws
- Lift the carousel out
- Clean the carousel
- Clean the bottom half
- Re-install the carousel and retention plate

**Cleaning the tubes**

- Clean the tubes using the method best-suited to your research application, e.g. dilute acid wash followed by rinsing with deionised water.