QUICK GUIDE | Flow tracking kit

1.0 LOLIGO® SYSTEMS

FIRST TIME USE

1

The flow tracking kit is used with **AutoResp™ v3** or **AutoSwim v2** software. Download and install latest version from our website: loligosystems.com/downloads
Follow the installation instructions on the screen and then restart the PC.

SWIM TUNNEL SETUP

2

Set up and prepare the 170 or 1500 mL swim tunnel according to the **Quick guide for mini swim tunnel**, but skip step 3. Also, in step 6, mount the **fiber optic light guide** (2) - not the oxygen dipping probe.

Place the light guide so that its tip is aligned with the edge of the honeycomb (170 mL swim tunnel) or as far into the swim tunnel chamber as possible (1500 mL swim tunnel) (2.1). Connect the light guide to the **green laser pointer** (7).

IMPORTANT: Wear safety glasses whenever the laser is on!

Neutral density green fluorescent **microspheres** is used to visualize the water flow. Generally, a concentration of 10 mg/L (e.g., ~2 mg for the 170 mL swim tunnel) will provide an optimal density of spheres. We recommend using a plastic syringe to add the spheres to avoid introducing air bubbles into the chamber (2.2). Weigh the spheres directly in the syringe. Add 2-3 drops of detergent into a 500 mL beaker filled with water from the ambient water bath. Now, slowly fill the syringe with ~10 mL of detergent water. Turn the syringe upside-down to remove excess air or foam.

Add the spheres carefully into the swim tunnel chamber via the flush inlet. Then close off the flush outlet (e.g., by tying a knot on a small piece of tubing). The swim tunnel is ready for DPTV.

DEVICE SETUP (DPTV LIVE)

3

Power the **DAQ-BT** (using its DC adapter and USB power cable) from a wall outlet or from a USB port on your PC. Press and hold the power button (3) on the front of the DAQ-BT until the POWER and STATUS LED flash green rapidly. Pairing mode is now enabled.

4

Connect the **video camera** to a USB 3.0 port on the PC. Let the camera initialize until the LED on the back lights green.

CAMERA PLACEMENT (DPTV LIVE)

5

Connect the blue Loligo® license dongle (5) to a USB port on the PC, and then open either AutoResp™ v3 or AutoSwim v2. Follow the instructions in the quick guide for either software until you are ready to perform the water velocity calibration.

6

In AutoResp™ v3/AutoSwim v2: Go to **Calibration** > Select a **DAQ-BT tab** > Open **DPTV Live** under the Calibration panel.

7

Start by using the live preview to adjust the camera's placement.

Place the video camera so that the field of view covers a section of the swim tunnel chamber inside which the water velocity is to be measured (7). Adjust the camera lens' focus ring until the center of the chamber is in focus. The live preview should look like in figure (7.1).

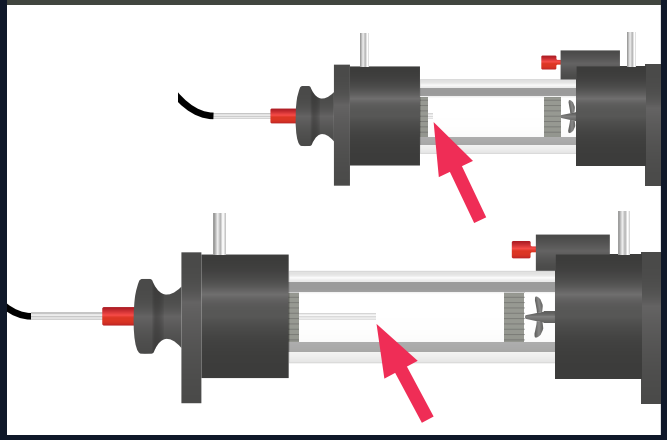
IMPORTANT: Once the camera is in place, the camera must not be moved! Otherwise, a new pixel-calibration is necessary.

We recommend setting image dimensions to 800w x 256h for optimal performance on most modern PCs. Lowering the image width/height will increase the maximum frame rate that can be achieved. Adjust the AOI-sliders to fine-tune the field of view.

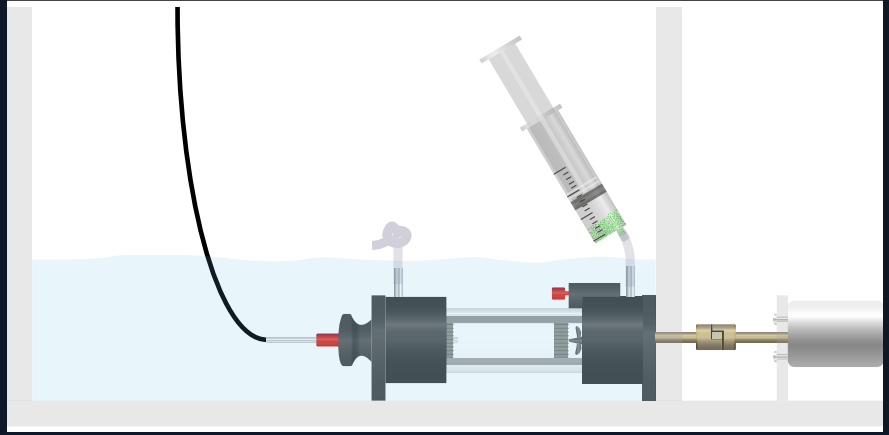
Watch the **AutoResp™ v3 - How to calibrate your swim tunnel** for a video tutorial on how to do the calibration in the software. Alternatively, continue to step 8 in this quick guide.

2

2.1



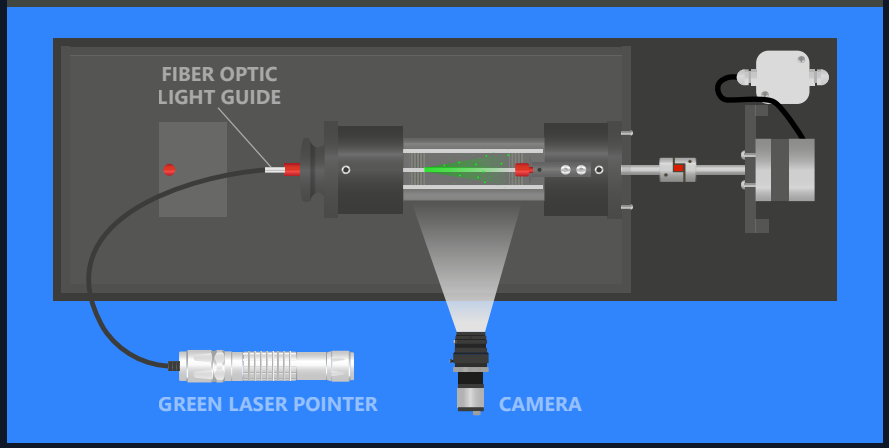
2.2



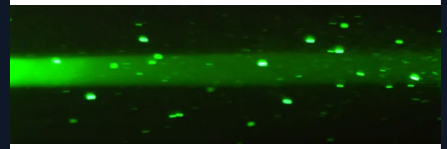
3

5

7



7.1



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1.0 LOLIGO® SYSTEMS

FLOW ANALYSIS (DPTV LIVE)

8

Start by performing a **pixel-calibration** to enable correct velocity measurements. Drag the **blue** ruler endpoints to define a known length (e.g., by placing a ruler in the background) on the live preview (8). Use mouse-scroll to zoom in/out on the image, and right-click+drag to move the image. Input the defined length in the **Ruler length** field.
The optimal **Frame rate** is 100-150 FPS. This will result in optimal tracking performance throughout the automated flow analysis. You can increase the performance by lowering the image height and width (and adjusting AOI, if needed). It is highly recommended to close all other Windows applications and not to use the PC, while the tracking analysis is running.

Start the motor by inputting 1 V in the **Control signal** field. Wait for a steady flow, and then adjust the **Filter strength**, **Minimum object size** or **Maximum object size** sliders to threshold the live preview image into tracked spheres (yellow pixels) that you want to track. An optimal number of objects is shown in figure (8.1) *.

Now click AUTO . The software will now perform an automated flow analysis. The motor will automatically increase the *Control signal* from 1.0 to 1.5, 2.0, 2.5 and to 3.0 V. At any time during the process, the flow analysis (and motor) can be stopped by pressing:

STOP AUTO or STOP MOTOR!

The flow analysis data is displayed at the bottom of the screen in a *speed histogram* (data per video) and *speed and motor unit graph* (data for all videos) (8.3). *NB: The histogram may show two peaks. This is normal and can happen if the computer skips video frames during the analysis.*

Click APPLY to save the calibration data back into the DAQ-BT tab. Alternatively, click SAVE TO EXCEL to export data as an Excel file (12). Note also that:

- **Track individual objects:** Enable to track each pixel-cluster separately rather than the overall movement resolving in a longer tracking process.
- **Show velocity vector:** Enable to show the velocity vector for overall movement or for each pixel-cluster (if *Track individual objects* is enabled).

FLOW ANALYSIS (MANUAL DPTV LIVE)

9

If you want to track the flow at chosen control signal values, follow the instructions in step (8) until the * . Now input a *Control signal* value (e.g., 1 V), and wait for steady flow. Click TRACK to track the moving spheres for some seconds. The tracked data, for the chosen control signal value, will appear in the data histogram and graph. Repeat this procedure for at least two other control signal values. Click APPLY to save the calibration data back into the DAQ-BT tab. Alternatively, click SAVE TO EXCEL to export the data as an Excel file.

FLOW ANALYSIS (DPTV FILE)

10

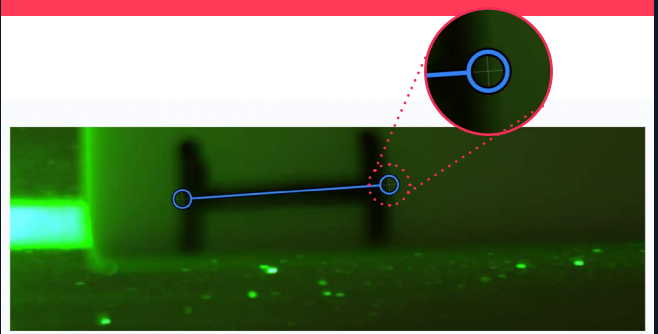
Go to **Calibration** > Select a **DAQ-BT tab** > Open **DPTV File**. Click LOAD VIDEO to add a video file. It is recommended to load your "pixel-calibration video" (see step (8)) first to input the *Ruler length* value. Load next video, i.e., the video recorded at the lowest input value. Input the voltage and RPM values that the motor ran at under *Flow calibration* (10). Click TRACK to track and analyze the entire video. Alternatively, Shift+drag on the timeline to select an interval. The tracked data will appear in the data histogram and graph. Load remaining DPTV videos and repeat the tracking procedure. *NB: You do not need to pixel-calibrate between videos.* Click APPLY to save the calibration data back into the DAQ-BT tab, or click SAVE TO EXCEL to export the calibration data as an Excel file.

VIDEO RECORDING

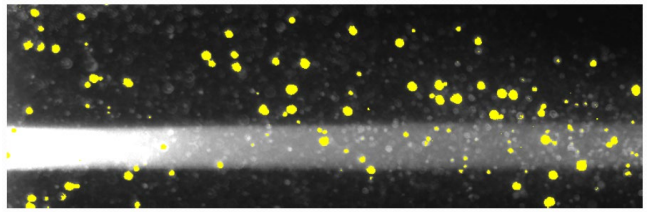
11

Videos for DPTV FILE can be recorded using our free **Video Recorder software**. Change frame rate or resolution in the *Settings panel*, if needed. For optimal settings, see step (7). *NB: The frame rate may be lower than the set value, if your PC has performance issues (i.e. many skipped frames).* Press REC to open the file prompt and start recording. During recording, four parameters are shown at the bottom of the screen: **Recorded time:** The length of the recorded file (number of captured frames / file frame rate). **Frame rate:** The actual frame rate during recording. **Captured/Skipped frames:** The number of captured/skipped frames.

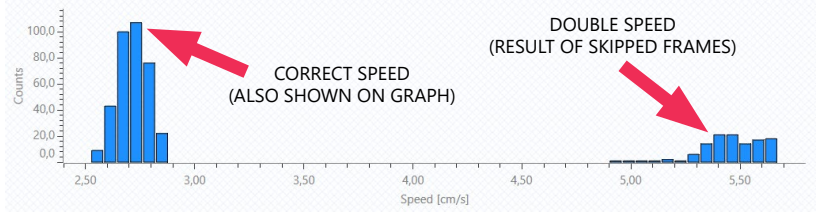
8

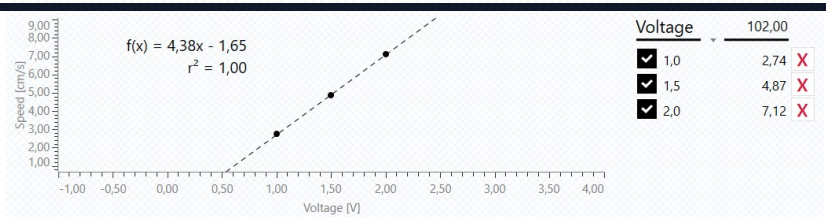


8.1

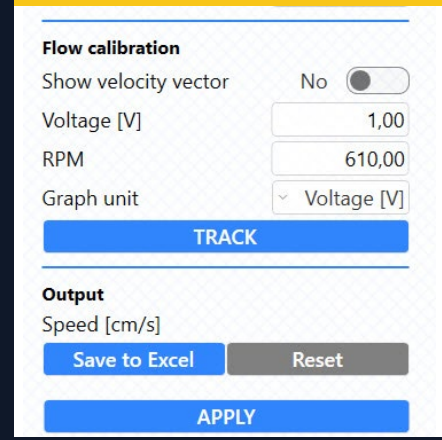


8.3





10



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EXCEL EXPORT EXAMPLE