

Liquid Injection System (LIS) – Frequently Asked Questions

LIS Drive

1. What is the drive?

The drive is a programmable miniature pump that controls when and how much liquid is fed from the cartridge into the flask. You can either program the feeding profile in the drive manually using the knob on top of the drive or wirelessly by using the software.

2. Do I have to clean the drive?

No, the drive is never in touch with the actual liquid but separated from it by a sterile filter. Thus, the drive can simply be reused after every experiment. Since the drive contains sensitive electronics, it cannot be autoclaved.

3. What are the minimal and maximal dispensing volumes?

The minimal dispensing volume is a single drop. Depending on the type of liquid, concentration and temperature this volume can vary but is typically between 40 and 50 µl. The maximal dispensing volume is limited by the maximal flow rate of the drive, which is 1000 µl per minute.

4. Under which shaking conditions can I use LIS?

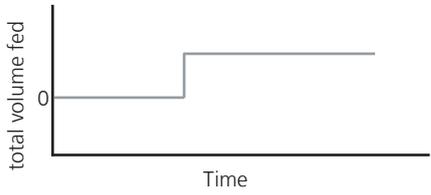
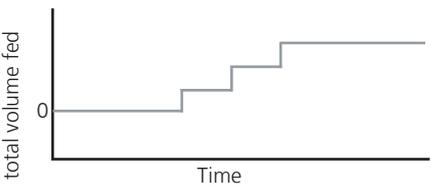
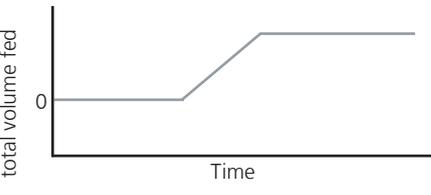
The following matrix provides an overview on the maximal shaking speeds that can be used at 10 % filling volume of the flask together with LIS. Please note that these speeds are only valid for relatively new clamps and sticky stuff. Please test individually at which speed your flasks can be shaken safely together with LIS. If you intend to use LIS at shaking speeds higher than the ones listed, please contact us directly.

Shaking diameter	Flask fixed on tray with	Set-up	Shake flask size (total volume, mL)				
			100	250	500	1000	2000
25 mm	Clamps	Shake flask only	250	300	250	250	250
		Shake flask & CGQ sensor (old)	250	300	300	300	250
		Shake flask & CGQ sensor (new)		300	300	300	250
	«Sticky Stuff»	without CGQ sensor	200	200	200	250	250
50 mm	Clamps	Shake flask only	250	250	225	225	200
		Shake flask & CGQ sensor (old)	200	250	250	225	200
		Shake flask & CGQ sensor (new)		250	225	225	200
	«Sticky Stuff»	without CGQ sensor	200	200	200	250	250

Tests were performed with a flask filling volume of 10 % and 20 mL filling volume of the LIS cartridge. All data is shown in rounds per minute (min⁻¹). Tests were performed for INFORS HT spring clamps and «Sticky Stuff». The shown data may not be applicable for clamps or adhesive mats of other manufacturers.

5. Which feeding profiles are available?

Currently the following profiles are available. Additional feeding profiles and a feeding profile generator are available in the software.

	Feeding profile	Feeding parameters	Description
Single Shot		<ul style="list-style-type: none">• Initial delay, min• Volume of feeding shot, μ	Allows you to feed a certain volume to your culture after a defined initial delay. This profile could be used for e.g. an induction with IPTG.
Multi Shot		<ul style="list-style-type: none">• Initial delay, min• Feeding period, min• Total volume that should be fed, μ• Number of feeding shots during feeding period	Allows you to feed a certain volume in a defined time period. The liquid will be distributed evenly among a defined number of shots. This profile could be used for e.g. a fed batch experiment.
Constant		<ul style="list-style-type: none">• Initial delay, min• Feeding period, min• Total volume that should be fed, μ	Allows you to feed a certain volume in a defined time period. The liquid will be distributed linearly over time. This profile could be used for e.g. a fed batch experiment.

LIS Cartridge

1. What is the cartridge?

The cartridge is a single use container with the shape of a lid for shake flasks. It fits on all shake flasks that are normally sealed with a metal cap (38 mm straight neck shake flasks without a beaded rim). The cartridge comes sterile packed and is for one time use only. It can be filled with up to 25 mL of any type of liquid and acts as a reservoir during the feeding experiment.

2. How much liquid can be filled into the cartridge?

Currently, cartridges can be filled with up to 25 mL of any liquid. If you want to feed more than 25 mL, you can simply switch cartridges during the experiment and replace the empty one with a newly prepared one.

3. Can I reuse cartridges?

No, the cartridge is a single use product that comes sterile. Sterility is not given after experimental usage. Additionally, the cartridge must be sealed air tight after filling with liquid for precise feeding in combination with the drive. aquila biolabs can only guarantee this proper fit (snap fit for air) tightness between the cartridge and the lid) for the first-time use.

4. Does the cartridge influence the oxygen transfer rate?

The cartridge has a similar design to a standard metal cap for shake flasks. It does not fully close the shake flask but has spacers that allow air to flow into the flask by convection. Hence, the cartridge and a standard metal cap seal lead to comparable oxygen transfer rates in your shake flask.

5. Which liquids can I fill into the cartridge?

The table below provides an overview of successfully tested substances. If you are interested in a certain liquid and concentration that is not listed here, please contact us directly and we will inform or test for you if you can use your intended liquid.

Substance	Compatibility of substance with LIS			
	unlimited	under most circumstances	can not be used	not tested
Sugar solutions (e.g. up to 50 % Glc)	x			
Viscous solutions (e.g. up to 75 % Glycerol)	x			
Aqueous solutions (e.g. IPTG, media, acids, bases, buffer)	x			
Phages	x			
Suspensions	x			
Alcohols (e.g. 50 % ethanol, 75 % methanol)		x*		
Antifoam		x**		
Organic solvents				x
Solid materials			x	

* Based on alcohol, concentration and temperature, evaporation may influence the accuracy.

** Accuracy can vary for different types of antifoam.