

OPERATION MANUAL

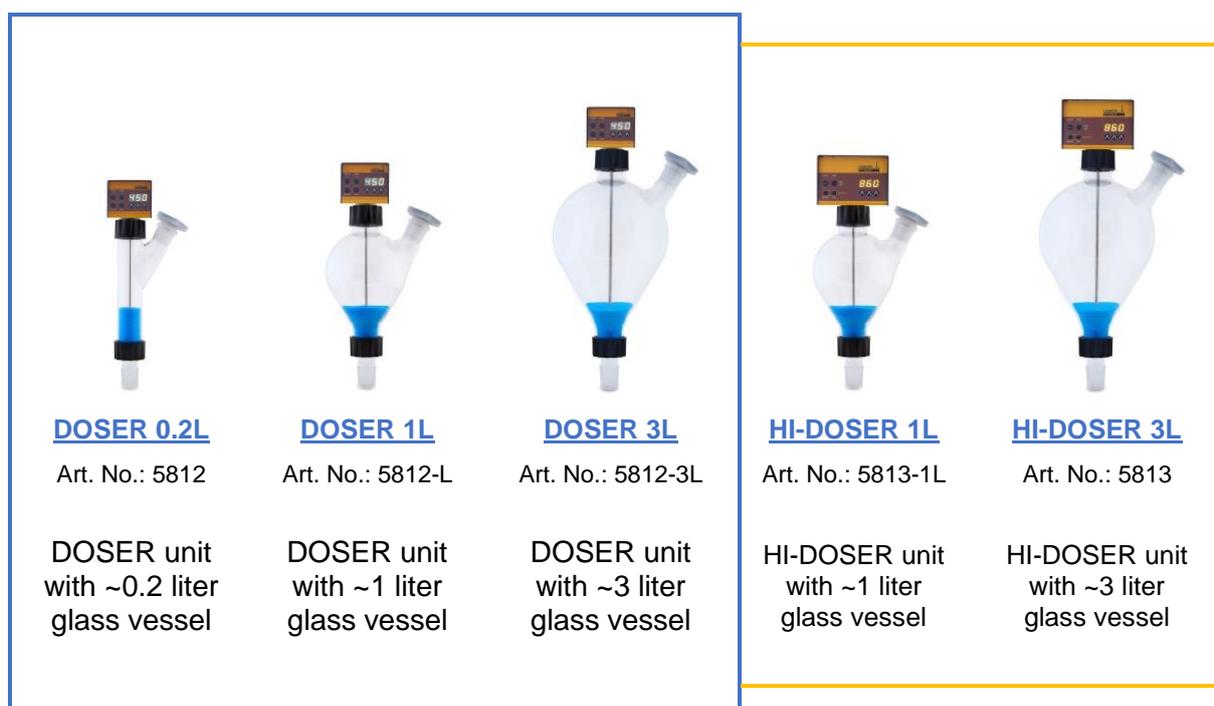
LAMBDA DOSER and HI-DOSER Powder Dosing Instrument



LAMBDA DOSER & HI-DOSER Powder Dosing Instrument

LAMBDA DOSER and HI-DOSER, unique programmable pump for free-flowing solid substances.

LAMBDA powder dosing instrument offers safe, controlled and reproducible dosing or feeding of crystalline or powdery substances at laboratory scale. It allows the automatic or continuous addition of powders, powdery and crystalline substances without a spoon.



LAMBDA DOSER and HI-DOSER will modernize your laboratory:

- Dosing speed range from 0 to 999
- Reproducible flow rate
(e.g.: dosing range of NaCl in DOSER: 50 mg/min to 50 g/min and HI-DOSER: 60 mg/min to 60 g/min and 250 mg/min to 250 g/min)
- Programmable
- Simple and quick assembly / cleaning
- Comply with GLP and conform to modern safety rules
- Hermetic construction allows operation in controlled atmospheres (Ar, N₂...)
- Safe handling of dangerous and toxic substances
- Remote controls
- RS-485 interface or RS-232 interface (optional)
- Control software PNet (optional)

More information could be found at www.powderdosing.info

LAMBDA Laboratory Instruments

LAMBDA Laboratory Instruments develops innovative, high quality lab-scale instruments with an excellent price to performance ratio for biotechnology, microbiology, food and agricultural, chemical and pharmaceutical industries, research and development as well as for general laboratory and research applications.



MINIFOR laboratory Fermentor and Bioreactor

Highly innovative and compact fermenter - bioreactor system for laboratory scale for all types of fermentation and cell cultures.

OMNICOLL fraction collector and sampler

Fraction collector and auto-sampler for chromatographic techniques and automatic liquid dispensing.

PRECIFLOW, MULTIFLOW, HIFLOW, MAXIFLOW and MEGAFLOW pumps

High quality and reliable laboratory peristaltic pumps with stable and reproducible flow rates for long continuous experiments.

Safety POWDER DOSER and HI-DOSER

Safe, controlled and reproducible dispensing or feeding of crystalline or powdery substances without spoon. Safe operation with hazardous material (GLP).

VIT-FIT and VIT-FIT HP syringe pump

Polyvalent syringe pump with extremely robust mechanics – programmable infusion and filling from micro syringes to large volume syringes of 150 ml without an adapter.

MASSFLOW gas flow measurement and control

Precise gas flow measurement and control with data acquisition option.

PUMP-FLOW INTEGRATOR

LAMBDA pumps and dosing unit with the electronic pump-flow integrator allows the visualization and recording of the pumped volume as a function of time.

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1 SETTING UP THE POWDER DOSER AND HI-DOSER

1.1 Pre-treatment of the dosing powder

The dosing sample (powders, crystals, solids, etc.) has to be homogenous and free flowing. If this is not the case, they should be recrystallized, dried and sieved to remove the fines.

The free flow of difficult solids can be achieved by the addition of AEROSIL 200 or 974 at a concentration of 0.1 to 2 %.

AEROSIL is super finely dispersed pure SiO₂. Its particles cover the surface of the crystals and make it free flowing. AEROSIL is non-toxic, chemically inert and can be removed by filtration. It can be obtained at a low price from us.

1.2 Assembly of the LAMBDA DOSER and HI-DOSER

The picture below depicts the parts of the powder feeding instrument, DOSER 0.2 L:



S. No.	Name of the parts	Art. No.
1.	Blind plug	5808-b
2.	Rubber sealing disc	5806
3.	Teflon disc	5803
4.	DOSER control unit	5809
5.	Centering part	5807
6. & 7.	Screw cap SVL 42	5802
8.	Distributor (standard)	5804
9.	Plug-in power supply (12 V / 12 W) [Plug type: AU, CH, EU, UK, US]	4820
10.	Glass adaptor with ground NS 29/32 fitting	5801
11.	Glass vessel with side arm (approx. 0.2 l)	5810

The setup of the powder dispensing system, LAMBDA DOSER and HI-DOSER is very easy - a short video of the installation of DOSER 0.2 L could be found at <http://www.lambda-instruments.com/?pages=video>



Figure 1-1: Insert the ground glass piece through the threaded screw cap SVL 42.



Figure 1-2: Place the teflon disc inside the screw cap on the top of ground glass piece (NS 29/32).



Figure 1-3: Screw and secure the ~0.2 l glass vessel to the screw cap with the teflon disc and ground glass piece.



Figure 1-4: Insert the distributor (standard) inside the ~0.2 l glass vessel with its opening directed downwards so that it will not be damaged.



Figure 1-5: A silicon baffle/scraper can be found on the lowest part of the glass vessel. The distributor must be turned with its opening towards the baffle/scraper.



Figure 1-6: Place the tefflon treated rubber seal on the centering part with the tefflon layer facing outside (towards the glass vessel).



Figure 1-7: Place the centering part with the rubber seal on the axis of the distributor.



Figure 1-8: Secure the centering part with the rubber seal through the axis of the distributor with the screw cap to the glass vessel.



Figure 1-9: Axis of the motor unit with metal pins and the centering part with six holes.



Figure 1-10: Press the axis of the motor unit completely inside the centering part. So that, the metal pin of the motor unit will fit into one of the six corresponding holes in the centering unit. This assures a perfect seal of the DOSER and a sufficient pressure of the distributor against the teflon disc in the bottom of the Doser vessel.

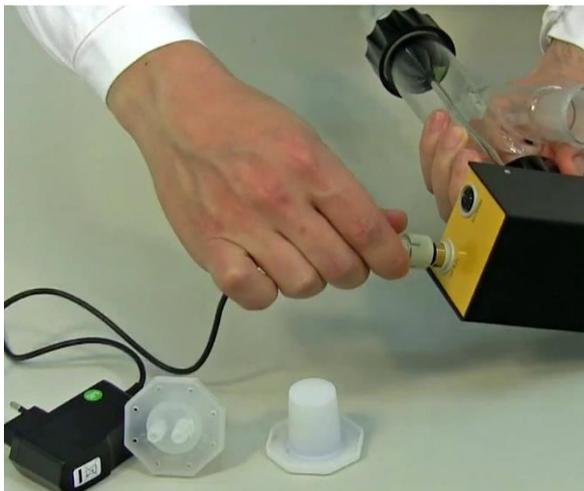


Figure 1-11: The 12 V connector of the power supply is plugged into the 12 V DC socket of the motor unit and the power supply is connected to the mains.

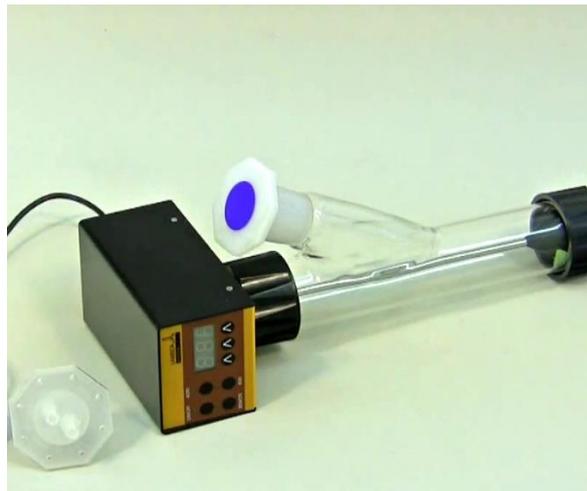


Figure 1-12: The solid is added through the filling side arm of the glass vessel. The filling side arm can be closed with a ground glass or plastic stopper.

1.3 ON/OFF button

By pressing the **ON/OFF** button, the powder feeding instrument (DOSER / HI-DOSER) is switched ON or OFF. The internal memory will show the last used speed and flow direction setting.

1.4 Setting of the dosing speed

The powder dosing rates depend on the powder properties and the DOSER or HI-DOSER motor rotation speed.

The speed of powder addition is selected by the control buttons **^ ^ ^** under the LED display. The digital selection allows good reproducibility of the selected dosing rate.



Figure 1-13: Choosing the speed of powder addition with the help of control buttons **^ ^ ^**.



Figure 1-14: Pressing ON/OFF button on the DOSER motor unit after choosing the dosing speed.

Since specific densities of solid substances vary considerably, it is important to calibrate the DOSER or HI-DOSER before starting the powder dosing.

For this, the amount of substance delivered during a certain time period is measured (e.g. for 1 minute with speed setting 500). The speed of rotation of the distributor increases progressively with the speed setting value. Using this information, the speed setting corresponding to the desired flow rate of the solid substance can be calculated easily (rule of three).

The dosing of the powdery substance is started by pressing the **ON/OFF** button. The corresponding LED indicates that powder dosing is in progress.

1.5 Fast filling function

If the **ADRS** button is pressed continuously for about 2 seconds, the distributor will rotate at its maximum speed.

After releasing the **ADRS** button, the powder dispensing is stopped. This function is useful for fast filling of a recipient or emptying of the glass vessel of the LAMBDA DOSER or HI-DOSER at the end of powder dosing operation.

The **ADRS (“HOLD=MAX”)** function can also be used, even if the **ON/OFF** button has not been pressed.

1.6 Use of the DOSER and HI-DOSER during reflux or under controlled atmosphere

Vapours of boiling solvents can penetrate into the lower part of the DOSER or HI-DOSER and condense. The condensation disturbs the flow of the solid, which can be prevented by purging a light stream of air or other convenient gas through the glass vessel of DOSER or HI-DOSER. The vapours are displaced and cannot disturb the dosing.

The gas can be introduced into the vessel by a special stopper fitted with tubing. We deliver a polyethylene stopper for this purpose. However, any fitting, compatible with NS 29/32 ground fittings (e.g. SVL threaded fittings which can be adapted to several tubing diameters are excellent).

The slight gas stream passes through the hollow axis of the distributor and the lower part of the DOSER or HI-DOSER vessel. The stream and pressure of the gas must be carefully controlled to prevent compression of the solid substance during the dosing process.

Since the DOSER and HI-DOSER are airtight, it can also be used to work under controlled atmosphere (N₂, Ar, etc.). The DOSER and HI-DOSER withstands a pressure of ± 0.05 MPa. The airtight dosing unit is particularly useful while working with oxygen sensitive or hygroscopic substances. In this case, manual dosing is very difficult.

1.7 FAS / SLO mode of HI-DOSER

The HI-DOSER powder dosing instrument allows to dose the powders at two speed settings: **SLO.** = slow and **FAS** = fast.

In the standard mode (**FAS**), the flow rate of the speed setting 0 to 999 ranges from approx. 250 mg/min to 250 g/min for NaCl.

In the slow mode (**SLO.**), the flow rate of the speed setting 0 to 999 ranges from approx. 60 mg/min to 60 g/min for NaCl. The slow mode is indicated by the dot in the last position on the digital display.

The fast filling function **ADRS (HOLD = MAX)** is the same for both speed ranges.



Figure 1-15 Plug-in the power supply and at the same time press the **RUN** button on the control panel. The display will show the last used mode (**FAS / SLO**).



Figure 1-16 Press the **RUN** button, to select the desired speed mode (**FAS / SLO**). Confirm and save the chosen speed mode by pressing the **ON/OFF** button on the control panel.

Remark: During the RS-communication, only the value shown on the display is transferred, but not the speed range (mode). If the PUMP-FLOW INTEGRATOR is activated (optional), a single integrator step is independent of the set speed range (mode).

2 PROGRAMMING OF THE POWDER DOSER / HI-DOSER

Up to 27 pairs of speed and time settings (flow rates) can be programmed in DOSER and up to 99 steps of speed and time can be programmed in HI-DOSER.

The programming mode is accessed by simultaneously pressing the buttons **REMOTE** and **RUN** until the indication "**PGM**" appears on display and the REMOTE and RUN LEDs are switched on.



Figure 2-1: Pressing Remote and Run buttons simultaneously and the "**PGM**" indication appears.



Figure 2-2: Continuous pressing of Remote and Run button even after the indication of "**PGM**" ends up with the "**cLE**" indication.

Remark: If you repeat this simultaneous pressing of the **REMOTE** and **RUN** buttons, the memory will be cleared and the indication "**cLE**" will appear on the display. To enter the programming mode again, press the **REMOTE** and **RUN** buttons again until "**PGM**" appears.



Figure 2-3: Press the **ON/OFF** button. The indication "**F01**" will appear for a short time on the display indicating that you can select the first flow rate (speed setting) value.



Figure 2-4: Set the desired flow rate value for the first program step by pressing the buttons **AAA** below the display (from 0 to 999, corresponding to 0 to 100% of the motor rotation speed).



Figure 2-5: Press the **ON/OFF** button. The indication “t01” will appear for a few seconds on the display indicating that you can program the time period of the first step in minutes or 0.1 minute steps.



Figure 2-6: Select the desired time period for the first program step by pressing the buttons **▲▲▲** below the display (from 0 to 999 minutes or 00.0 to 99.9 minutes). By pressing the **ADRS** button, the time resolution can be set in minutes or 0.1 minutes. In the 0.1 minute time resolution a dot is displayed, e.g. “00.1”.



Figure 2-7: Press the **ON/OFF** button. The indication “F02” will briefly appear on the display.



Figure 2-8: Enter the desired flow rate for the second program step.



Figure 2-9: Press the **ON/OFF** button again. The symbol “t02” will briefly appear on the display.



Figure 2-10: Set the time of the second program step.

In a similar way up, to **27 program steps** can be entered in DOSER and up to **99 program steps** can be entered in HI-DOSER.



Figure 2-11: After having entered the time of the last step, press the **ON/OFF** button. The flow rate (000) of the next step which will not be programmed appears on the display. For example: “F05”



Figure 2-12: Do not change the flow rate (000).

Remark: It is not possible to end the program after programming the time data.



Figure 2-13: Press both **REMOTE** and **RUN** buttons simultaneously and the indication “**c01**” will appear on the display. This indicates that the program will be executed only once and the powder dosing instrument will stop afterwards.



Figure 2-14: If the same program has to be repeated twice, increase the cycle number to “**c02**” by pressing the buttons $\wedge \wedge \wedge$ below the display (from 0 to 99 cycles). The program can be repeated up to 99 times, indicated by “**c99**”. If 0 is entered for the cycle number “**c00**”, the program will run continuously (**infinite loop**).



Figure 2-15: Press the **ON/OFF** button again until the indication “**End**” appears on the display to confirm and save the program.



Figure 2-16: To **START** the program, press the **RUN** button. The **RUN** and **ON/OFF** LEDs are on.

To **stop** the running program definitively, press the **RUN** button. The **RUN** and **ON/OFF** LEDs are switched OFF.

It is possible to **stop** the pump by pressing the **ON/OFF** button, to change the rotation speed during any running program step. This allows the reaction in emergency situations.

Remark: Do not forget to switch ON the powder DOSER or HI-DOSER again (by pressing the ON/OFF button), after finishing the intervention.

3 REMOTE CONTROLS

3.1 ON/OFF remote control

By interlinking the contacts no. 4 and 5 of the socket at the rear of the pump (see *figure 6-1* and section 6.2), the powder dosing instrument will be blocked and the ON/OFF LED is switched OFF.

The same effect will be obtained by applying a voltage of 3 to 12 V DC to the contact no. 5 (0 line must be connected to contact no. 3). The remote control cable (Art. no. 4810) is used for the transmission of the remote control signals.

Remark: In some cases, a reversed logic for the remote control might be desired. In such cases, please contact us (support@lambda-instruments.com).

3.2 Remote control of the dosing pump

The LAMBDA DOSER and HI-DOSER can be controlled over the whole speed range by an external signal (0 - 10 V DC, option 0-20 or 4-20 mA). The plus pole of the signal is connected to the contact no.1, 0 line to the contact no.3.

Press the button **REMOTE** on the front panel. The corresponding LED diode will go ON and the display will indicate the approximate voltage of the external signal. This indication may become unstable when no external connection is made and indicates the high sensitivity of the electronics.



For safety reasons the voltage of the external signal must **not exceed 48 V** to earth!

3.3 PC control

If the instrument has been equipped with the optional RS-232 or RS-485 interface, it can be controlled digitally, e.g. from a PC by **PNet control software**.

To look up/modify the instrument address; disconnect the DOSER or HI-DOSER from mains.

Press the **ADRS** button continuously and at the same time connect the DOSER or HI-DOSER to the mains again.

The message **"A"** and two numbers will appear on the display. This number from 00 to 99 is the current address of the powder dosing instrument.

To change the address, press the buttons **▲ ▲ ▲** under the display until the desired number is obtained.

To confirm and save the address, press the **ON/OFF** button.

4 CLEANING THE POWDER DOSER AND HI-DOSER

After use, the motor unit has to be pulled out of the centering part of DOSER or HI-DOSER glass vessel, until both separate. Do not be afraid to pull hard, as the blocking mechanism requires it and at the same time care should be taken to remove it axially and not at any other angle.

Loosen both threaded caps and separate all components inside the glass vessel. Care should be taken not to damage the distributor while dismantling the unit (pull it out axially).

The parts can now be washed by common laboratory methods (for example, with ethanol, acetone, diluted acids or bases). It is however not recommended to expose parts to these reagents for long periods of time.

The motor and control unit can be cleaned only with a piece of cloth soaked in water containing a mild detergent, diluted ethanol or with more care iso-propanol. Use of other solvents could damage the surface of the control unit.

5 FOR YOUR SAFETY

Thanks to the use of a plug-in power supply giving only a low voltage of 12 V DC. The danger of electrical shock during the use of the DOSER or HI-DOSER powder feeding system has been virtually eliminated, even when an electro conductive solution penetrates the DOSER or HI-DOSER.

If the powder dispensing pump is not used for an extended period of time, disconnect it from the mains.

A modern miniaturized switching power supply is used, which has only a negligible consumption of electric current when the powder DOSER or HI-DOSER is not in use.

6 TECHNICAL SPECIFICATIONS

6.1 General specification

6.1.1 LAMBDA DOSER

<i>Type:</i>	LAMBDA DOSER – microprocessor-controlled programmable powder dosing instrument
<i>Programming:</i>	up to 27 steps of speed and time
<i>Time resolution:</i>	0 to 999 minutes in 1 minute steps or 0 to 99.9 minutes in 0.1 minute steps; time resolution can be selected individually for each program step
<i>Non-volatile memory:</i>	storage of all settings
<i>Motor:</i>	microprocessor controlled stepping motor
<i>Speed control range:</i>	0 to 999
<i>Interface:</i>	RS-485 or RS-232 (optional)
<i>Power supply:</i>	95–240 V/60–50 Hz AC plug-in power supply with DC 12V/12W output (AU, CH, EU, UK, US); possible field operation on 12 V accumulator
<i>Volume:</i>	approx. 0.2 l, 1 l and 3 l glass vessel
<i>Dimensions:</i>	motor unit: 6 (H) x 7 (W) x 13 (D) cm glass vessel approx. 0.2 l: 30 (H) x 12 (W) x 5 (D) cm glass vessel approx. 1 l: 30 (H) x 18 (W) x 14 (D) cm glass vessel approx.. 3 l: 38 (H) x 21 (W) x 17.5 (D) cm
<i>Safety:</i>	CE, meets IEC 1010/1 norm for laboratory instruments
<i>Operation temperature:</i>	0-40 °C
<i>Operation humidity:</i>	0-90% RH, not condensing
<i>Remote control:</i>	0-10 V; (option 0-20 or 4-20 mA); foot switch



For safety reasons the voltage of the external signal must **not exceed** 48 V to earth!

6.1.2 LAMBDA HI-DOSER

Type:	LAMBDA HI-DOSER – microprocessor-controlled programmable powder dosing instrument
Programming:	up to 99 steps of speed and time
Time resolution:	0 to 999 minutes in 1 minute steps or 0 to 99.9 minutes in 0.1 minute steps; time resolution can be selected individually for each program step
Non-volatile memory:	storage of all settings
Motor:	microprocessor controlled brushless long life BLDC motor with neodymium magnets
Speed control range:	0 to 999
Interface:	RS-485 or RS-232 (optional)
Power supply:	95–240 V/60–50 Hz AC plug-in power supply with DC 12V/50W output (AU, CH, EU, UK, US); possible field operation on 12 V accumulator
Volume:	approx. 1 l and 3 l glass vessel
Dimensions:	motor unit: 6 (H) x 7 (W) x 13 (D) cm glass vessel approx. 1 l: 30 (H) x 18 (W) x 14 (D) cm glass vessel approx.. 3 l: 38 (H) x 21 (W) x 17.5 (D) cm
Safety:	CE, meets IEC 1010/1 norm for laboratory instruments
Operation temperature:	0-40 °C
Operation humidity:	0-90% RH, not condensing
Remote control:	0-10 V; (option 0-20 or 4-20 mA); foot switch



For safety reasons the voltage of the external signal must **not exceed** 48 V to earth!

6.2 Remote control (Inputs/outputs)

No.	Colour	Description
1	yellow	(+) input remote speed control 0-10V *)
2	grey	step signal from stepping motor (0 and 12V)
3	green	earth, 0 V
4	brown	+ 12 V
5	white	(+) input remote ON/OFF; 0V = ON, 3–12 V = OFF (this logic can be inverted on demand)
6	pink	earth, ground (GND)
7	red	RS 485 B (-)
8	blue	RS 485 A (+)

*) (zero line connected to the contact no. 3)

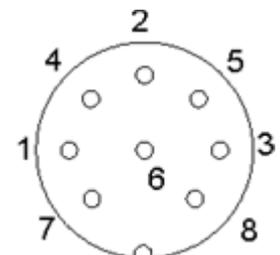


Figure 6-1: 8-pole connector

6.3 Input (12 V DC)

Contact No.	Description
1	+ 12 V DC
2	0 V
3	not connected

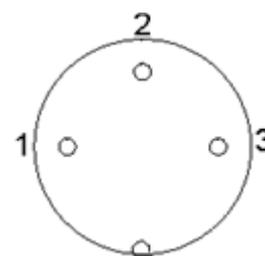


Figure 6-2: 3-pole connector

7 ACCESSORIES AND SPARE PARTS

7.1 Pump flow integrator (Art. No. 4803)

The DOSER and HI-DOSER powder feeding pump and the other LAMBDA pumps are the only pumps on the market, which allow **a simple and precise integration of the amount of liquid, solid or gas that has been delivered by the pump.**

The electrical impulses, which move the pump motor, are registered and transformed into a direct voltage. This voltage can be measured or recorded by common recorders or voltmeters.

In processes where the pump is controlled e.g. by a pH-stat during a fermentation or cell culture to keep the pH of the medium constant, it is often important to know when and how much acid or base were added. **This data yields important information about the process, its kinetics and time of completion, etc.**

Another use of the INTEGRATOR is for the **measurement of enzyme activities** (e.g. amidases, esterases, lactamases, lipases, proteases and other enzymes).

The pump-flow INTEGRATOR can now be electronically implemented inside the DOSER powder dosing instrument and therefore, does not require any additional valuable laboratory bench space.

The activated INTEGRATOR within the LAMBDA pumps allows **new and unusual pump applications** (e.g. gradient making, counter flow elution, liquid chromatography, electronic burette, etc.).

7.2 PNet control software for peristaltic and syringe pumps, HI-DOSER, DOSER or MASSFLOW (Art. No. 6600)

PNet is PC control software for the remote control of LAMBDA laboratory instruments: peristaltic pumps PRECIFLOW, MULTIFLOW, HIFLOW, MAXIFLOW and MEGAFLOW; syringe pumps VIT-FIT and VIT-FIT HP; powder dosing instruments DOSER and HI-DOSER; gas flow controller and measurement unit MASSFLOW.

The pumps are connected to the computer through a RS-232 or RS-485 interface.

Up to 6 instruments of LAMBDA and 12 PUMP-FLOW INTEGRATORS can be connected and controlled simultaneously.

7.3 List of accessories and spare parts

Art. No.	Accessories
4803	<i>PUMP-FLOW INTEGRATOR (for LAMBDA pumps, DOSER, HI-DOSER and MASSFLOW)</i>
4810	<i>Pump remote control (analog and digital) cable, 8 poles (open ends)</i>
4802	<i>Pump ON/OFF remote control cable, 2 poles (open ends)</i>
4823	<i>Foot switch for ON/OFF control, 8 poles</i>
4824	<i>Cable for inverted analog ON/OFF control, 8 poles</i>
Interface and Control software	
4822	<i>RS232 interface (for connection of the instruments to the serial port)</i>
4816	<i>RS485 interface (for connection of the instruments to the serial port)</i>
4817	<i>RS232/485 converter</i>
4818	<i>Power supply for RS232/485 converter (5V/1W)</i>
4819	<i>RS-line connection cable (serial)</i>
6600	<i>PNet control software for peristaltic and syringe pumps, DOSER, HI-DOSER or MASSFLOW</i>
800202	<i>Quadruple plug box (Power and RS-connection for up to 4 LAMBDA laboratory instruments)</i>
Spare parts	
4820	<i>Plug-in power supply (12V/12W) for DOSER, PRECIFLOW, MULTIFLOW</i>
4821	<i>Plug-in power supply (12V/50W) for HI-DOSER, HIFLOW, MAXIFLOW, VIT-FIT, MASSFLOW</i>
5801	<i>Glass adaptor with ground NS 29/32 fitting</i>
5802	<i>Screw cap SVL 42</i>
5803	<i>Teflon disc</i>
5804	<i>Distributor (normal)</i>
5805	<i>Distributor for very fluid powders</i>
5806	<i>Rubber/Teflon sealing disc</i>
5807	<i>Centering part</i>
5808-b	<i>Blind plug</i>
5808-g	<i>Gassing plug</i>
5809	<i>DOSER control unit</i>
5809-L	<i>Control unit HI-DOSER</i>
5810	<i>Glass vessel with side arm (approx. 0.2 l)</i>
5811	<i>Glass vessel with side arm (approx. 1 l)</i>
5811-L	<i>Glass vessel with side arm (approx. 3 l)</i>
5810-s	<i>Silicone coated glass vessel with side arm (approx.. 0.2 l)</i>
5811-s	<i>Silicone coated glass vessel with side arm (approx. 1 l)</i>
5811-L-s	<i>Silicone coated glass vessel with side arm (approx. 3 l)</i>

8 GUARANTEE

LAMBDA provides a two-year guarantee on material and manufacturing defects, if the instrument was used according to the operation manual.

Conditions of guarantee:

- The instrument must be returned with a complete description of the defect or problem. In order to send back the equipment for repair, you will need a returns authorization number from LAMBDA.
- The customer will send the instrument to our service office.
- Damage or loss of items during transport will not be compensated for by LAMBDA.
- Failure to fulfil these requirements will disqualify the customer from compensation.

Serial Number: _____

Guarantee from: _____

9 APPENDIX

9.1 RS communication protocol for DOSER & HI-DOSER, VIT-FIT (HP) syringe pumps, PRECIFLOW, MULTIFLOW, HIFLOW, MAXIFLOW and MEGALOW peristaltic pumps

9.1.1 Format of data sent by the PC to the pump and back

Data sent by the PC: #ss mm a ddd qs c

Data sent back by the pump: <mm ss a ddd qs c

where,

- #** is the first sign of a command sent by PC
- <** is the first sign of a message sent by pump
- ss** is the address of the pump
- mm** is the address of the PC
- a** is the command for the sense of rotation:
- r** for clockwise (cw) rotation (to the right)
- l** for counter-clockwise (ccw) rotation (to the left)
(not for DOSER, HI-DOSER and MASSFLOW)
- ddd** is the speed of rotation (3 ASCII numbers from 0 to 9; sent from the highest order digit to the lowest order digit)
- qs** is the control sum in HEX format (2 ASCII signs of the type 0...9ABCDEF)
- c** is the end sign cr (carriage return)
The pump will fulfil the task and block any manual command on the pump front panel.

9.1.2 Commands not containing data

- # ss mm **g** qs c activates the local command of the pump
- # ss mm **s** qs c the pump is stopped
- # ss mm **G** qs c to send pump data to the PC

9.1.3 Checksum control

The PC sends: #0201r123EEcr

The control sum (checksum) qs is made in the following way (only the **last byte** (2 ASCII characters of the type 0...9ABCDEF) is taken):

#	0	2	0	1	r	1	2	3	EE (last byte)	cr
23h	+30h	+32h	+30h	+31h	+72h	+31h	+32h	+33h	=1EEh	0Dh

9.1.4 Format of the data transmission

Speed: 2400 Bd (Baud)
8 data bits, odd parity, 1 stop bit

9.2 Examples

Address of the PC: 01
Address of the pump: 02

The PC sends: #0201r123EEcr
The pump will rotate cw at the speed of 123

The PC sends: #0201G2Dcr
The answer of the pump: <0102r12307cr

The PC sends: #0201l123E8cr
The pump will rotate ccw at the speed of 123. (not for DOSER, HI-DOSER and MASSFLOW)

The PC sends: #0201s59cr
The pump stops.

The PC sends: #0201g4Dcr
The pump will go to the local command (pump front panel is activated).

9.3 How to set the DOSER or HI-DOSER address?

To look up/modify the instrument address; disconnect the DOSER or HI-DOSER from mains.

Press the **ADRS** button continuously and at the same time connect the DOSER or HI-DOSER to the mains again.

The message “**A**” and two numbers will appear on the display. This number from 00 to 99 is the current address of the powder dosing instrument.

To change the address press the buttons **▲ ▲ ▲** under the display until the desired number is obtained.

To confirm and save the address, press the **ON/OFF** button.

9.4 RS-connection scheme

The 8-pole DIN connector “REMOTE” is used for the remote control and RS-485 connection. When the optional RS-485 interface is available the pins are used as follows:

No.	Colour	Description
1	yellow	(+) input remote speed control 0-10V *)
2	grey	step signal from stepping motor (0 and 12V)
3	green	earth, 0 V
4	brown	+ 12 V
5	white	(+) input remote ON/OFF; 0V = ON, 3–12 V = OFF (this logic can be inverted on demand)
6	pink	earth, ground (GND)
7	red	RS 485 B (-)
8	blue	RS 485 A (+)

*) (zero line connected to the contact no. 3)

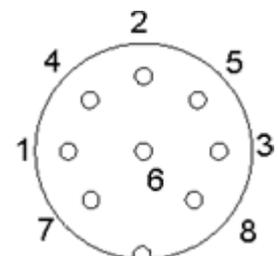


Figure 9-1: 8 pole connector

9.5 RS communication protocol for the on-board INTEGRATOR (optional)

9.5.1 Communication between the PC and INTEGRATOR of the LAMBDA instrument

From the PC to the INTEGRATOR:

#ss mm z qs c

From the INTEGRATOR to the PC:

<mm ss = qs c confirmation of the reception of a command
<mm ss dddd qs c sending of the requested data

where,

- #** is the first sign of a command sent by the MASTER (PC)
- <** is the first sign of a message sent by the SLAVE (INTEGRATOR)
- ss** is the address of the subordinate station (address of the instrument with integrated INTEGRATOR)
- mm** is the address of the commanding station (PC)
- z** is a command (see below): small letters indicate a command, capital letters request data transfer from the subordinate station
- =** confirmation of reception
- aa** new address of the subordinate station (ss) (two numbers and possibly other ASCII characters A B C D E F)
- dddd** transferred data (values are two bytes in hexadecimal form. Single bytes are transformed into two ASCII characters 0,...,9,A,B,C,D,E,F)
- qs** is the control sum (obtained by the addition modulo 256 of binary values of all preceding characters including the leading sign) in HEX format (2 ASCII signs of the type 0...9ABCDEF)
- c** is the end sign cr (carriage return)

9.5.2 Commands for the INTEGRATOR

- n** reset (sets the INTEGRATOR to zero)
- i** start of integration
- e** stop of integration
- I** sends the integrated value
- N** sends the integrated value and sets the integrator to zero
- L** sends the integrated value ccw rotation (to the left) (not for DOSER and HI-DOSER)
- R** sends the integrated value of cw rotation (to the right)

9.5.3 Examples

Address of the PC: 01
 Address of the instrument with on-board INTEGRATOR: 02

The PC sends: #0201I2Fcr

The control sum (checksum) qs is made in the following way (only the **last byte** (2 ASCII characters of the type 0...9ABCDEF) is taken):

#	0	2	0	1	I	2F (last byte)	cr
23h	+30h	+32h	+30h	+31h	+49h	=12Fh	0Dh

The PC sends: #0201i4Fcr
 i.e. in hexadecimal form: 23h 30h 32h 30h 31h 69h 34h 46h 0Dh
 This means: For a subordinate station (SLAVE) with address 02 from commanding station (MASTER) with address 01
 Start of integration
 The control sum is 14Fh (last byte: **4F**); end of message cr (carriage return)
 The INTEGRATOR answers: <0102=3Ccr

The PC sends: #0201N34cr
 The INTEGRATOR answers: <0102N03C225cr (integrated value is 03C2h)
 and resets to zero

The PC sends: #0201e4Bcr
 The integration will be stopped and the command will be confirmed.
 The INTEGRATOR answers: <0102=3Ccr



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