LAMBDA
LABORATORY INSTRUMENTS

LAMBDA DOSER

Powder Dosing Instrument

OPERATION MANUAL

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LAMBDA DOSER powder dosing instrument

The LAMBDA DOSER is a unique programmable pump for free-flowing solid substances. It allows the automatic or continuous addition of powders, powdery and crystalline substances without a spoon.

The LAMBDA DOSER will modernize your laboratory:

- Dosing speed range from 0 to 999
- Reproducible flow rate (e.g. from 50 mg/min to 50 g/min for NaCl)
- Programmable
- Easy assembly
- Necessary to comply with GLP requirements and safety standards
- Hermetic construction allows operation in controlled atmospheres (Ar, N_2,…)
- Safe handling of dangerous and toxic substances
- Remote controls
- RS-485 or RS-232 interface (optional)
- Control software PNet (optional)

LAMBDA Laboratory Instruments

is developer and producer of special laboratory instruments mainly for biotechnology, microbiology, food and agricultural, chemical and pharmaceutical research and development as well as for general laboratory and research applications.

LAMBDA MINIFOR - innovative and compact laboratory fermenter / bioreactor

LAMBDA OMNICOLL - fraction collector with new concept for unlimited number of fractions

LAMBDA PRECIFLOW, MULTIFLOW, HIFLOW and MAXIFLOW peristaltic pumps - practical, precise and extremely compact

LAMBDA SAFETY POWDER DOSER - allows automatic addition of powder without spoon. Safe operation with hazardous material (GLP)

LAMBDA VIT-FIT polyvalent syringe pump with extremely robust mechanics - programmable infusion and filling from micro syringes to large volume syringes of 150 ml without adapter

LAMBDA MASSFLOW is precise gas flow measurement and control with recording option

LAMBDA PUMP-FLOW INTEGRATOR - with LAMBDA pumps and doser allows the visualization and recording of the pumped volume

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1. SETTING UP THE POWDER DOSER

1.1 Pre-treatment of the solids

Solids have 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 SiO_2. 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 or from DEGUSSA AG, Oberdorfstrasse 11, CH-6340 Baar.

1.2 Assembly of the LAMBDA DOSER

The setup of the LAMBDA DOSER is very easy - a short video of the installation is on: http://www.lambda-instruments.com/?pages=video:

- The ground glass piece (b) is put through the threaded cap (a) (figure 1). The Teflon disc (c) is put inside the cap and placed on the ground surface of piece (b) and the cap is screwed to the glass tube (d). The distributor (e) is put inside the glass tube with its opening directed downwards so that it will not be damaged (figure 2).

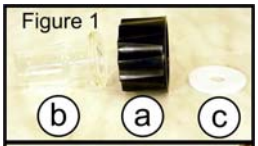
- There is a silicon baffle on the lowest part of the tube. The distributor must be turned with its opening towards this baffle. The Teflon treated rubber seal is placed on the head (f) with the Teflon layer facing outside (towards the glass tube). Put the axis of the distributor through the centre of the head (figure 3) and tighten it with the threaded cap (a) to the glass tube.

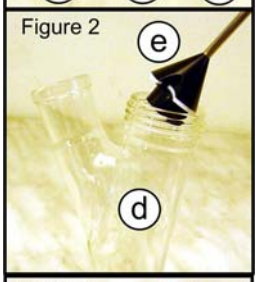
- Press the axis of the motor unit completely inside the head so that the metal pin will fit into one of the six corresponding holes in the head (figure 4). This assures a perfect seal of the DOSER and a sufficient pressure of the distributor against the Teflon disc in the bottom of the DOSER tube.

- By loosening the upper threaded cap you can put the filling tube into the desired position then tighten the cap again.

- The solid is added through the filling arm of the tube. The filling arm can be closed with a ground glass or plastic stopper NS 29/32.

- The 12 V connector of the power supply is plugged into the 12 V DC socket of the motor unit (figure 5) and the power supply is connected to the mains.





1.3 ON/OFF button

By pressing the **ON/OFF** button the powder dosing instrument 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 motor rotation speed.

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

Since specific densities of solid substances vary considerably, it is important to calibrate the 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 maximum speed. After releasing this button the powder dosing is stopped. This is useful for fast filling of a recipient or emptying of the glass vessel of the LAMBDA DOSER at the end of operation. This “HOLD=MAX” function can be used even though the **ON/OFF** button has not been pressed.

1.6 Use of the DOSER during reflux or under controlled atmosphere

Vapours of boiling solvents can penetrate into the lower part of the DOSER and condense. The condensation disturbs the flow of the solid. This can be prevented by blowing a light stream of air or another convenient gas through the DOSER tube. The vapours are displaced and cannot disturb the dosing.

The gas is introduced by a special stopper fitted with tubing. For this purpose we deliver a polyethylene stopper. 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 tube. 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 is airtight, it can also be used for work under controlled atmosphere (nitrogen, argon etc). The DOSER withstands a pressure of ± 0.05 MPa. The airtight DOSER is particularly useful during work with oxygen sensitive or hygroscopic substances. In this case manual dosing is very difficult.

2. PROGRAMMING OF THE POWDER DOSER

Up to 27 pairs of time and speed settings (flow rates) may be programmed in a simple way. 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.

*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.*

- 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.
- Set the desired flow rate value for the first program step by pressing the buttons **Λ Λ Λ** below the display (from 0 to 999, corresponding to 0 to 100% of the motor rotation speed).
- 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. Select the desired time period for the first program step by pressing the buttons **Λ Λ Λ** 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"***. The time resolution can be set individually for each program step.
- Press the **ON/OFF** button. The indication ***"F02"*** will briefly appear on the display. You can now enter the desired flow rate for the second program step. After this press the **ON/OFF** button again. The symbol ***"t02"*** will briefly appear on the display. You can now set the time of the second program step.
- In a similar way up to 27 program steps can be entered.
- 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. Press both **REMOTE** and **RUN** buttons simultaneously until the indication ***"End"*** appears on the display. The REMOTE and RUN LEDs will be switched off.

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

- Press the **ON/OFF** button again. You will see the indication ***"c01"*** on the display. This indicates that the program will be executed only once and the powder dosing instrument will stop afterwards. If you wish to repeat the same program 3 times, increase the cycle number to ***"c03"*** by pressing the buttons **Λ Λ Λ** 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).
- Press the **ON/OFF** button again to confirm the number of desired cycles.

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 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 reaction in emergency situations.

*Remark: Do not forget to switch the powder DOSER on again (by pressing the **ON/OFF** button) after you have finished your intervention.*

The **time basis** in the microprocessor is **not stopped** during this intervention, so that the total time of the running steps and of the whole program will not be affected. When the program step time has elapsed, the LAMBDA DOSER will automatically go on with the next program step. Thus, the program is not modified by this emergency intervention.

It is possible to review the program by proceeding in the same way as during programming but without modifying it.

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 fig. 5 and section 7.2), the powder dosing instrument will be blocked and the ON/OFF LED is 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. Please contact us in this case.

3.2 Remote control of the dosing speed

The LAMBDA DOSER powder dosing instrument 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.

To look up/modify the instrument address, disconnect the DOSER from mains. Press the **ADRS** button continuously and at the same time connect the 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 **Λ Λ Λ** 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

After use, the motor unit is pulled out of the DOSER head until both separate. (Do not be afraid to pull hard, as the blocking mechanism requires it). Loosen both threaded caps and separate all components inside the tube. 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 unit.

If you have any difficulties or questions concerning your DOSER powder dosing instrument, please contact our service office.

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 powder dosing instrument has been virtually eliminated, even when an electro conductive solution penetrates the DOSER.

If the dosing 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 is not in use.

6. ACCESSORIES AND SPARE PARTS

6.1 Pump-Flow Integrator (Art. no. 4803)

The DOSER powder 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 the RS-interface allows the control from a PC.

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

6.2 List of accessories and spare parts

Art. No.	Accessories
4803	PUMP-FLOW INTEGRATOR (for LAMBDA pumps, DOSER and MASSFLOW)
4810	Pump remote control (analog and digital) cable (8 poles)
4802	Pump ON/OFF remote control cable (2 poles)
4823	Footswitch for ON/OFF switching
4824	Cable for inverted analog ON/OFF control (8 poles)
	Interface and Control software
4822	RS232 interface
4816	RS485 interface
4817	RS232/485 converter
4818	Power supply for RS232/485 converter (5V/1W)
4819	RS-line connection cable
6600	PNet control software for peristaltic and syringe pumps, DOSER or MASSFLOW
800202	Quadruple plug box (Power and RS-connection for up to 4 LAMBDA laboratory instruments)
	Spare parts
4820	Plug-in power supply (12V/6W) for PRECIFLOW, MULTIFLOW, DOSER
5801	Glass adaptor with ground NS 29/32 fitting
5802	Screw cap SVL 42
5803	Teflon disc
5804	Distributor (normal)
5805	Distributor for very fluid powders
5806	Rubber sealing disc
5807	Centering part
5808-b	Blind plug
5808-g	Gassing plug
5809	Control unit
5810	Glass vessel with side arm (approx. 0.2l)
5810-s	Silicone coated glass vessel with side arm (approx. 0.2l)
5811	Glass vessel with side arm (approx. 1l)
5811-s	Silicone coated glass vessel with side arm (approx. 1l)

7. TECHNICAL SPECIFICATIONS

7.1 General specifications

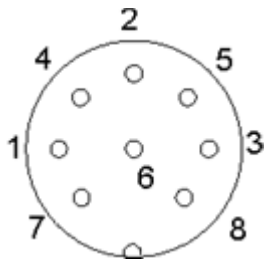
Type:	LAMBDA DOSER – microprocessor-controlled programmable powder dosing instrument
Programming:	up to 27 steps of speed and time
Time resolution:	0 to 999 minutes in 1 minute steps or 0 to 99.9 minutes in 0.1 minute steps: time resolution can be selected individually for each program step
Non-volatile memory:	storage of all settings
Motor:	microprocessor controlled stepping motor
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/6W output; possible field operation on 12 V accumulator
Dimensions:	motor unit: 6 (H) x 7 (W) x 13 (D) cm tube: 30 (H) x 12 (W) x 5 (D) cm
Weight:	950 g
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)

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

7.2 Remote control (Inputs/Outputs)

No.	Color	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 inversed on demand)
6	pink	earth, ground (GND)
7	red	RS 485 B (-)
8	blue	RS 485 A (+)

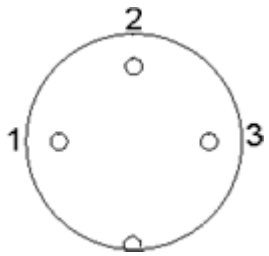
*) (zero line connected to the contact no. 3)



8-pole connector

7.3 Input (12 V DC)

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



3-pole connector

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 fulfill these requirements will disqualify the customer from compensation.

Serial Number:.....

Guarantee from:.....

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