D-force 1.2

PISTON PUMP

User manual

1. Introduction:

Piston pump D-force 1.2 is one head, two actions pump for preparative chromatography. Pump has limited pulsations and wetted parts are made of inert materials. It is actuated by a low voltage DC motor with optoelectronic control. Unit is equipped with two line alphanumeric display a simple keyboard. It allows to set flow rate and pressure limit as well as to measure actual value of the flow and pressure.
Pump is equipped with flow correction seting, as real flow can slightly difer from theoretical value depending on working conditions. It is possible to control pump start and stop using external voltage. As option can be the pump equipped with seriál control line RS 232.

2.Technical parameters:

Flow rate	5 – 1200 ml/min
Correction	+/- 10 % displayed value
Piston diameter	25 mm
Piston stroke	8 mm
Stroke volume	4,9 ml
Materials in contact with liquid	316 stainless steel HMPE, PTFE
Tubes	O.D. 10 mm
Dimensions (h x w x d)	230 x 160 x 380 mm
Weight	8 kg
Voltage	220 V , 50 Hz
Imput	100 VA

3. Instrument description

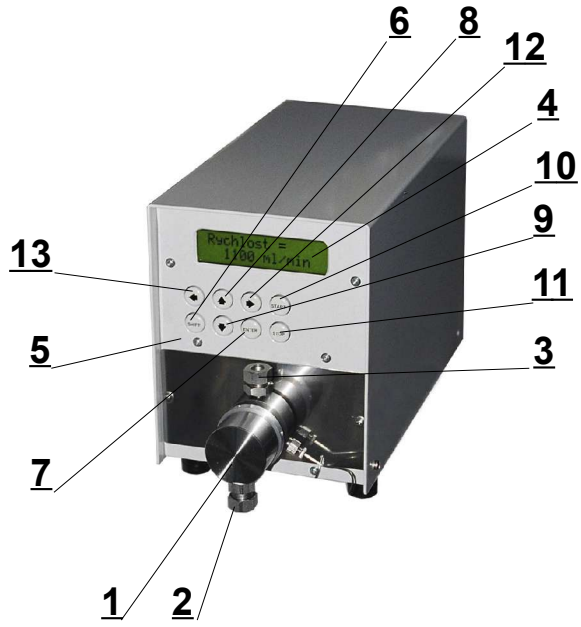

Fig. 1: View on the front part of D-force 1

Detail wiev on D-force 1.2 pump is on Fig. 1. Pumping head (1) is in bottom part of the front panel. There is an imput (2) and output (3) of the liquid in bottom panel part which is covered by a stainless steel panel (7).
In upper part of front panel (5) is a display (4) and keyboard. For mode switching is used SHIFT button (6). Listing in the menu is done by buttons ↑ (8) and ↓ (9). Buttons (13) ← and (12) → are used to set parameter values. All changes are confirmed by ENTER button (7). Finally there are START (10) and STOP (11) buttons to control pump action.
Pump D-force 1 is powered by a voltage 230 V, 50 Hz. Net socket is in upper part of back panel (Fig. 2, position 15). There is a fuse (16) and main switch (14) combined with net socket. External control 5 pin connector

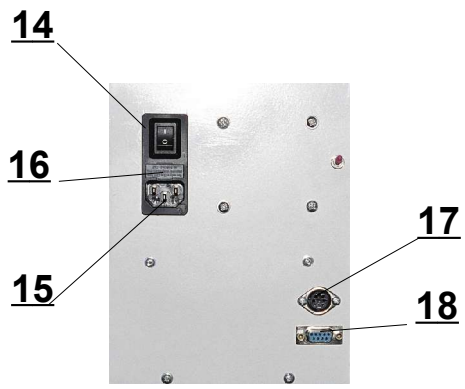

Fig. 2: View on the back part of D-force 1.2

is in right bottom side of the back panel (17). Under the connector is a seriál line RS 232 (option) connector (18).

D-force head function is shown on Fig. 3. During the first stage of piston stroke (backward movement) is the liquid sucked through imput valve to the front part of the head cylinder (A). Liquid present in back part B is in the same time expeled from cylinder back space (B) to the system.

In the second stage (piston forward movement) is the liquid from front cylinder space overpressed to the back as imput valve is closed. Back space formed between the cylinder and piston rod expands in the same time, but quantity of the liquid transported from from part is two times bigger than back side volume (due the crossections ratio). Thus in this stage is to the system displaced the same amount of the liquid as in the first one. Flow rate is changed due the change of stores frequention i.e. Due the motor rotation speed change. Mechanical part of the pump changing rotation movement to the linear, is equipped with a cam.

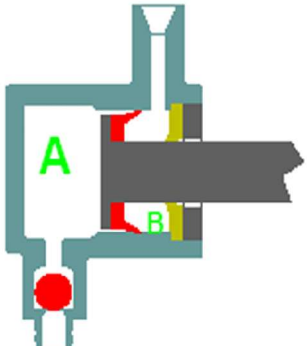

Fig. 3: D-force 1 head function

Pumping head of D-force 1.2 has one ball valve with stainless steel ball 6 mm in diameter. It is covered in a hause connected with inlet L piece. Next active sealing is a ruff on the piston, which is made of high density polyethylene with low friction and high mechanical stability.

There is also the piston sealing in the back part of pumping head which is made also from HMDPE. This sealing can be reach when whole pumpimg head is removed. It is necessary to insert into sealing back next circular insert in case of a leakage.

4. Pump control

Pump is automatically in working mode when switching on. Pump is started by pushing START button and stopped by STOP button. On the the display is a message:

```
Act. speed = R
500 ml/min
```

Pushing button ↓ an actual pressure is displayed:

```
Act. pressure =
0 kPa
```

SHIFT causes change to programing mode. There is flow rate on first place:

```
Speed =
500 ml / min
```

Flow rate value is changed using ←→ buttons and is confirmed by ENTER button. Pressure limit is next in row (pushing ↓ button):

```
Pres. limit =
  1000 kPa
```

D-force 1 allows to set also a control sensitivity for pressure limit (hysteresis):

```
Pres. hyst.  =
  150  kPa
```

It is a value of pressure decreasing which causes pump restart when stopped by a limit. Last in row is a password for service control which can be done only by a proved person.:

```
Service password
        0
```

5 Working with D-force 1.2

Pump is connected to the mobile phase reservoir. Level of the liquid in reservoir has to be above pump head. Pump has to be connected with proper I.D. tube (inner diameter cca 3 -5 mm). Output side is connected to the system but has to be fully open to atmosphere in start periode.
Air has to be removed from pump head at first. It is necessary to set flow rate to 1000 ml/min, insert imput tube to the reservoir and push START. Liquid starts to flow out after some seconds. Exeptionally is necessary to fill sucking tube with liquid before start the pump. Liquid is pumped with maximal flow rate abot 60 s to remove all bubles from pu ping head.
Now is possible to set working flow rate, pressure limit and hysteresis as described above using programing mode by SHIFT, fix pump output to the systém and start the work.

6. Manufacturing, distribution and service

Labio a.s, Heyrovského náměstí 2, 16201 Praha 6, Czech Republic
tel/fax 00420 235 360 074, tel 00420 235 358 044
e-mail: sales@labio.com