



D-FORCE 8

PISTON PUMP



User manual

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1. Introduction:

Piston pump D-force 8 is two heads, four actions pump for preparative chromatography. Pump has limited pulsations and wetted parts are made of inert materials. It is actuated by a asynchronous AC motor with frequency changer. 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 setting, 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 serial control line RS 232.

2. Technical parameters:

Flow rate	600 – 8000 ml/min
Correction	+/- 10 % displayed value
Piston diameter	42 mm
Piston stroke	8 mm
Materials in contact with liquid	316 stainless steel HMPE, PTFE
Input tubes	O.D. 16 mm
Output tubes	O.D. 10 mm
Dimensions (h x w x d)	250 x 350 x 590 mm
Weight	25 kg
Voltage	220 V , 50 Hz
Input	600 VA

3. Instrument description



Fig. 1: View on the front part of D-force 8

Detail view on D-force 8 pump front panel is on Fig. 1. Pumping heads are in bottom part of the front panel. There are independent inputs and outputs of the liquid for each head which can be connected together via a T pieces. Heads in bottom panel part are covered by a stainless steel panel.

On the right side of front panel is a display and keyboard. For mode switching is used SHIFT button. Listing in the menu is done by buttons \uparrow and \downarrow . Buttons \leftarrow and \rightarrow are used to set parameter values. All changes are confirmed by ENTER button. Finally there are START and STOP buttons to control pump action.

Pump D-force 8 is powered by a voltage 230 V, 50 Hz. Net socket is in upper part of back panel. There is a fuse and main switch combined with net socket. External control 5 pin connector is in right bottom side of the back panel. Under the connector is a serial line RS 232 connector (option).

D-force head function is shown on Fig. 2. During the first stage of piston stroke (backward movement) is the liquid sucked through input valve to the front part of the head cylinder (A). Liquid present in back part B is in the same time expelled from cylinder back space (B) to the system.

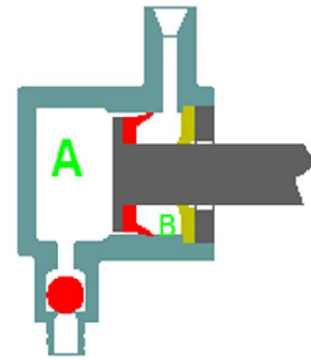


Fig. 2: D-force 8 head function

In the second stage (piston forward movement) is the liquid from front cylinder space overpressed to the back as input valve is closed. Back space formed between the cylinder and piston rod expands in the same time, but quantity of the liquid transported from part is two times bigger than back side volume (due the crosssections 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 frequection i.e. Due the motor rotation speed change. Mechanical part of the pump changing rotation movement to the linear is equipped with a cam.

Pumping heads of D-force 8 have one ball valve with stainless steel ball 10 mm in diameter. It is covered in a house 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 head is removed. When is necessary to tighten this sealing, four screws fixing head flange to front panel of mechanical transmission box has to be tightened properly.

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 =
0,00 l/min.

Pushing button ↓ an actual pressure is displayed:

Act. pressure =
0.0 bar

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

Speed =
0.10 l / min

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

Pres. limit =
10.0 bar

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

Pres. hyst. =
1.0 bar

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 8

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 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 input tube to the reservoir and push START. Liquid starts to flow out after some seconds. Expectionally 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 bubbles 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 system and start the work.

Pump sealings are to be tightened or changed when the pump is longer time in use. The tightening is done for each cylinder separately using four screws on cylinder back (see Fig. 3). A segment with output fitting has to be removed before.

The front pump moving sealing (a ruff) is changed when front part of th pump (head with input fitting) is removed (see left cylinder on the Fig. 3). The M10x1 bolt in the central part of the cylinder is to be removed together with the ruff. Ruff is replaced and the whole is assembled.

Piston sealing can be changed when the whole cylinder is deassembled. It is necessary to remove piston ruff, release bolts for sealing tightening and then screw out the cylinder. The sealing is replaced and the whole is assembled.

Input valve cleaning is necessary when the pump is used for pumping



Fig. 3 Front panel with removed cylinder

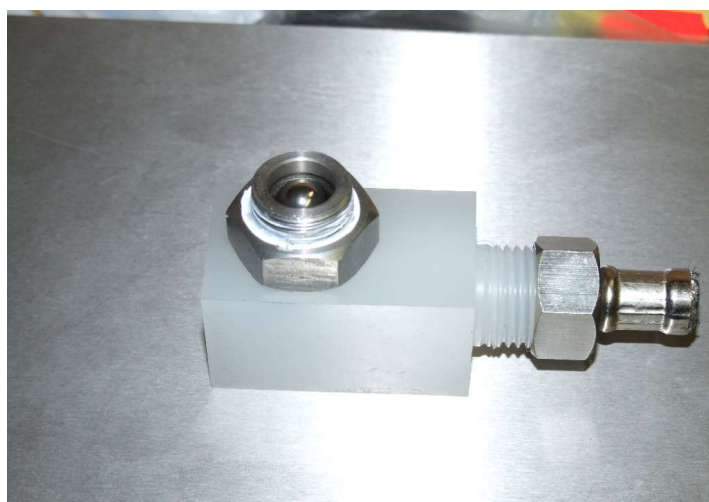


Fig. 4 Input valve

of dirty suspensions. The valve is located in the input fitting (see Fig. 4) which can be released from the systém and mechanically cleaned.

6. Manufacturing, distribution and service

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