INSTRUCTION HANDBOOK

PD12I   PD12P

(foto examples; exact model may vary)

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1 PD12 I / PD12 P important notice

There are 2 versions of the PD12.

- ➢ The PD12 I (individual)

- ➢ The PD12 P (Panelmount)

They share the same functions and programming routines.

The main difference is that the PD12 I has its own cabinet, and the PD12 P is mounted through a panel.

Besides this there are differences in the way the "I" and "P" version are connected to power supply and to the external pump controller (MC12).

In the last sections of the manual we will describe the connections and interfaces.

For the remainder of this manual the PD12 will be designated as follows:

PD12: for general descriptions covering both versions.

PD12 I: for descriptions specific to the "I" version.

PD12 P: for descriptions specific to the "P" version.

2 Caution

This manual should be read before using the PD12.

Explanations to the pictograms:
Warning against touching/Warning against opening:

CAUTION

Warning against high voltage:

CAUTION

When operating the PD12, make sure that the dispenser head is closed.

The mains switch is used for emergency stopping.

The PD12 should only be used for dosing and filling of liquid fluids.

The PD12 must be placed on a stable bed plate and in such a way, that it is not exposed to great humidity, high temperatures or other abnormal operating-environments. It is not to be used in explosion hazardous environments.

It is prohibited to maintain or clean the PD12, when it is connected to the power supply.

It is prohibited for unauthorised personnel to open the cover of the PD12's electrical parts.

Always remember that the PD12 must be earthed by way of the switch.

The pump must not run dry.

3 General information

3.1 Unpacking and inspection

PD12 is a peristaltic filler in the Flexicon Multi Filling System (FMFS). The PD12 can not do fillings by itself, but must be connected to Flexicons control unit, the MC12.

Please check that all ordered items have been received and that no items were damaged during transport. In case of any defects or omissions, please contact WM Flexicon A/S or your supplier immediately.

When ordering spare parts or accessories for the PD12, please state the serial number stamped. The serial number is stamped on the label on the bottom of the PD12.

ALWAYS REMEMBER that this machine must be earthed.

3.2 The peristaltic principle

PD12 operates with a peristaltic dispenser head (tube pump), where the liquid only comes into contact with the flexible tube, the tube connections and the filling needle. The tubes are usually made of silicone, but other materials can also be used.

The dispenser head is designed in such a way that sterilized tubes can be mounted in the head without affecting the sterility. WM Flexicons tubes fullfills biopharma requirements. The tubes are delivered in sealed packages and are provided with a batch number which makes it possible to trace the tubes all the way back to the raw material source.

For this reason the PD12 is specially suited for aseptic applications and for preventing cross-contamination among different products.

The dispenser head is self-priming, and the dispenser head itself can stand to be run dry. It is recommended not to let the dispenser head be run dry for a long period WITH MOUNTED TUBES, since this will lead to particle release.

A peristaltic dispenser head is not suitable for viscous products.

3.3 Installation

3.3.1 PD12I Installation

PD12I must be placed on a stable bedplate, and all electrical connections are on its rear.
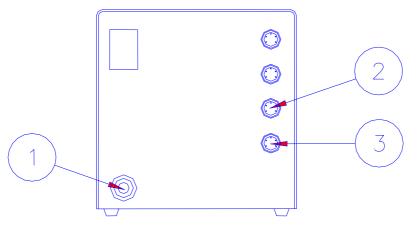

Fig. 3.1

The cable with plug (1) is connected to an earthed switch.

The communication cable from MC12 (type 3) comes fitted with two 4-pin DIN plugs. One is connected to the "net 1" socket (2) on the PD12I, and the other plug is connected to the "net" socket on MC12.
The terminator supplied with MC12 (4-pin blind DIN plug) is connected to the "net 2" (3) socket on PD12I.

Should the system be operating more than one PD12I, the "net 2" socket (3) is to be connected to the "net 1" socket (2) on the next PD12I by a communication cable (type 3). The terminator is connected to the last PD12I on the line.

Address "1" is the factory setting of PD12I. In case you want to change this setting, please consult section 3.4 in this manual.

PD12I is now ready to be switched on and to be programmed from the MC12.

3.3.2 PD12P Installation

PD12P must be placed either in frame delivered or otherwise in a suspension frame.
All electrical connections are on the rear side.

1 2 3   4 5 6   7 8 9   10 11   12 13   14 15 16

Flexnet   External 1   External 2   Prime   Safety   Mains Power
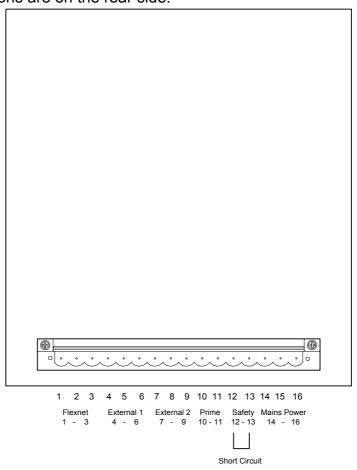1 - 3   4 - 6   7 - 9   10 - 11   12 - 13   14 - 16

Short Circuit

Fig. 3.2

The power supply is mounted with 0 in pin 14, earth in pin 15 and phase in pin 16.

The communication cable from MC12P is mounted in pin 1-3.

Should the system be operating more than one PD12P, the communication lines are connected in parallel in pin 1-3 in all units.

Address "1" is the factory setting of PD12P. In case you want to change this setting, please consult section 3.4 in this manual.

PD12P is now ready to be switched on and to be programmed from the MC12P.

3.4   *Addressing of filling station*

Address	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SW1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
SW2	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
SW3	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
SW4	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0

Fig. 3.3

Address "1" is the factory setting of PD12.

If the PD12 is one of several filling stations in a system, none of the stations may have the same address and it must therefore be changed.

Change of address is performed via a dip-switch placed at the bottom of the PD12. This change may only be carried out when the machine is turned off at the main power switch.

Addresses between 1 and 16 may be chosen, and Fig. 3.3 shows the various combinations.

4   Control

4.1   Dispenser head

The dispenser head can work with different tube diameters.

The dispenser head works with two parallel tubes which are squeezed by six rollers mounted on ball bearings. The rollers in the two sections are offset in order to eliminate pulsing.
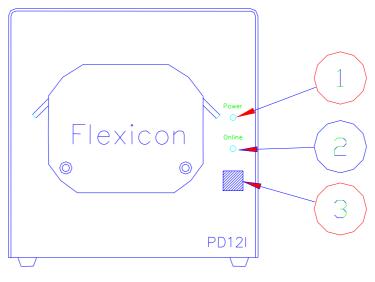

Fig. 4.1

1.   power   Lights when the machine is on.

2.   online   Lights when communicating with MC12.

3.   prime   Pushbutton for tube priming.

5 Dispensing with PD12

For optimal dispensing with the PD12, the following should be observed:

5.1 Vessel Placement

In order to build up adequate pressure and reduce friction, it is recommendable to place the vessel containing fill media at the same level as pump head or preferably above the pump head level. Placing the vessel higher than pump head level provides positive product support and may reduce the calibration interval. It is also recommended to place the vessel as close as possible to the pump on suction side.
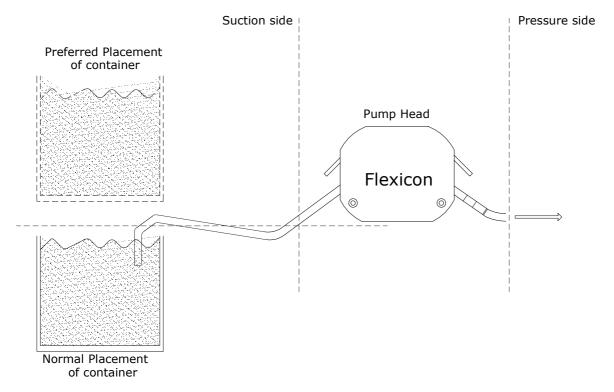
Fig. 5.1

5.2 Tube size

Tubes must be selected according to the application and volume to be filled.

PD12 can operate with different tube dimensions chosen according to the volume to be dispensed.
The tubes are designated by their internal diameters (i.d.) in millimetres. This value is always used as designation for the individual tube, and this is also the value to be entered in function 2 at the MC12 master controller.

PD12 can operate with the filling nozzles, tubing and Y-connectors listed in the table below. In order to obtain stable and good filling accuracy, the choice of tubing may be made according to the following guidelines:

Volume ml	Nozzle mm i.d.	Tubing mm i.d.	Y-Connector i.d.
< 0.50	0.6	0.5	1.2
0.50 – 1.00	1.0	0.8	1.2
1.00 – 1.70	1.0	1.2	1.8
1.70 – 7.00	1.6	1.6	1.8
7.00 – 12.0	3.2	3.2	3.6
12.0 – 22.0	4.5	4.8	4.8
22.0 – 35.0	6.0	6.0	4.8
>35.0 ml	8.0*	8.0	7.5

Fig. 5.2

* Use non-return valve

Above mentioned tubes are silicone tubes and supplied by Watson-Marlow Flexicon A/S.

These can be sterilised by autoclaving, gamma radiation or ethylene oxide.

It is recommendable that the tubes are of such length that can allow placing the vessel close to the pump head.

The tube ends must always be kept below the liquid level of the suction vessel in order to keep the tubes from sucking air.

Avoid having tubes close to the bottom of product vessel.

5.3   Nature of fill media

The peristaltic dispensers are not suitable for viscous products. For viscous product another type of dispenser from WM Flexicon can be used. In the case that the PD12 should be used and the product is of viscous nature, then heating the product before dispensing with PD12 is recommended.
Another consideration is the surface tension of liquid. Product with high surface tension tends to produce drip. Due to this fact it is difficult to have sufficient cut off after every individual dispense. When filling with small volumes and high surface tension present drips are often produced and constitute inaccuracy.

5.4   Priming tubes

In order to evacuate air from the tubes and prepare the tubes for filling, it is necessary to prime the tubes. Priming must be done adequately and continued until the tube material hysteresis disappears as well as any air bubbles.

5.5   Drip

When dispensing very small volumes, the last drop of the filling constitutes a big part of the total filling. Therefore it is necessary to take measures for avoiding the last drop.

WM Flexicon dispensers offer back-suction (reversing) after every individual dispensing.

5.6   Hard Feed

When dispensing with small tubes, counter pressure on the pressure side of pump head might constitute inaccuracy and instability in filling (hard feed). In some cases the problem can be resolved by using a larger tube on the pressure side (after Y-connector).

6   Tube assembly

6.1   Assembly of Y-connectors

Since the dispenser head of PD12 is fitted with a double rotor, two suction tubes are used all the way through the dispenser head. These two suction tubes are joined by a Y-connector just behind the dispenser head.
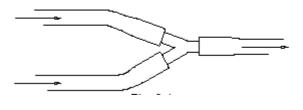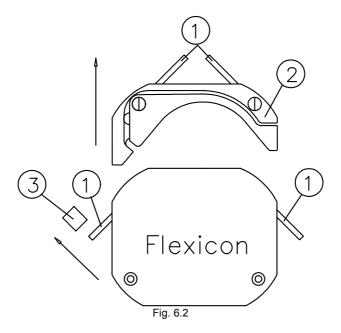

Fig. 6.1

The chosen tube is joined by a Y-connector as shown in Fig. 6.1.

6.2   Placing tubes in the pump head

After selecting a suitable tube diameter and after fitting the tubes with Y- connector and filling needle, mount the tubes in the dispenser head.

Fig. 6.2

Open the dispenser head by turning the two locking pins (1) over the tube bridge (2), after which the tube bridge can be lifted up.
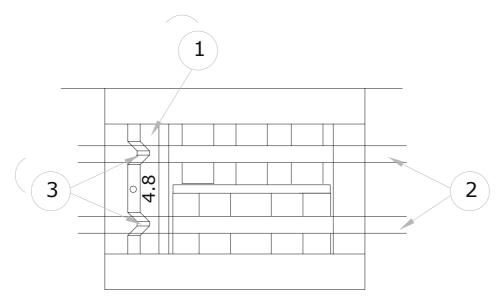It will now be possible to remove the tube lock (3) from its dowel pin.

Fig. 6.3

Mount the correct tube lock (1) on its dowel pin and place the tubes (2) in the dispenser head. The Y-connector must be situated to the right of the dispenser head.

It is important that the tubes are situated in the two notches (3).
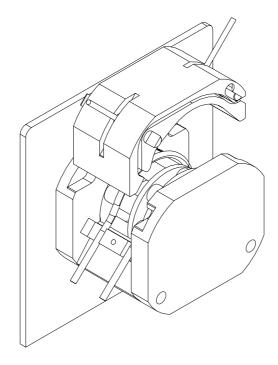Now place the tube bridge in its tracks and engage the two locking pins.

Fig. 6.4

The tube ends must always be kept below the liquid level of the suction vessel in order to keep the tubes from sucking air.
NB! Never leave the dispenser mounted with tubes overnight.
At least tip the locking pins up in order not to retain the tube in pressure.

7   Programming

7.1   Programming principle

In the following, a parameter will be the value of a single function, i.e. volume, tube diameter or velocity. A program will be a complete set of parameters which together will constitute the PD12 work instructions.

The actual programming will be made on the MC12 and reference is made to the MC12 manual.

7.2   PD12 parameters

1. Volume
Value: ml
Range: 0.01 – 9999,9 ml. ml
PD12 can dispense from 0,1 to 9999 ml, but for volumes exceeding approx. 250 ml, the capacity might not be adequate.
If the volume is changed, a recalibration should be made.

2. Tubes
Value: Inside diameter (i.d.) in mm
Range: 0.5 - 0.8 - 1.6 - 3.2 - 4.8 - 6.0 - 8.0.
If the tube is changed, a new calibration must always be made.

3. Velocity
Value: Revolutions per minute (rpm)
Range: :   30 - 400 rpm for tubing above Ø1.6 id.
            30 - 500 rpm for Ø3.2 id. tubing.
            30 - 600 rpm for tubing smaller than til Ø1.6 id.
If the velocity is changed, a recalibration should be made.

4. Acceleration/deceleration
Value: An integral number
Range: 1 – 100 for tubing larger than Ø3.2 id.
           1 – 150 for Ø3.2 id. tubing
           1 – 200 for tubing up to Ø1.6 id.
The acceleration and the deceleration will always be the same.
The lowest value (1) will give the slowest acceleration.
The highest value (200) will give the fastest acceleration.
If the acceleration is changed, a recalibration should be made.

5. Reversing (back suction)
Value: An integral number
Range: 0 - 10
If the rotor is moved a little backwards (reversing) after the completion of fillings, a minor back suction will be created. This can prevent dripping from the filling needle.
The value "0" will give no reversing, but the value "10" will give maximum reversing.

ALWAYS make a recalibration if the reversing value is altered.
For other programming possibilities, reference is made to the MC12 manual.

8   Cleaning and maintenance

8.1   Daily cleaning

As PD12 is not in direct contact with the dispensed product, daily cleaning will not be necessary except for the normal routine cleaning of production equipment.

Liquids must NOT be splashed onto the PD12. It may only be cleaned with a damp paper towel or a firmly wrung cloth.

The cabinet is made of stainless steel and anodized aluminium, and normal cleaning agents such as tepid/medium hot water, ethyl alcohol (ethanol) 70% may be used all over the machine.

8.2   Sterilization

If PD12 is placed in an aseptic environment, the sterilization may be made as described in section 5.1, or you may sterilize PD12 by gases observing the following precautions.

If you use gases that might injure and corrode contacts and other metals, air slots and sockets MUST be covered with tape.

8.3   Maintenance

As all movable parts in PD12 are maintenance-free, no maintenance is required apart from normal cleaning of the equipment.

Should service be needed, please contact WM Flexicon A/S or your supplier.

9 Interface and change of voltage

9.1 PD12 I Interface
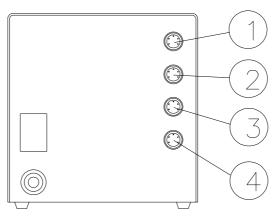

Fig. 9.1

(1) External 1:	
PIN 1:	INPUT FOR START SIGNAL +5 - 50 VDC, min. 100 msec. positive-edge-trigged.
PIN 2:	OUTPUT, +24 VDC, MAX. 500 MA.
PIN 3:	GROUND.
PIN 4:	STATUS OUTPUT, MAX. +24 VDC, 100 mA. Pin 4 is grounded via an open collector during filling.
PIN 5:	STATUS OUTPUT, MAX. +24VDC, 100 mA Pin 5 is complementary to pin 4.
(2) External 2:	
PIN 1:	INPUT FOR DISABLING. +5 - 50 VDC. if this pin is activated, the drive will be disabled (no dispensing).
PIN 2:	OUTPUT, +24 VDC, MAX. 500 MA.
PIN 3:	GROUND.
PIN 4:	STATUS OUTPUT, MAX. +24 VDC, 100 MA. Pin 4 is grounded via an open collector during filling.
PIN 5:	STATUS OUTPUT, MAX. + 24 VDC, 100 MA. Pin 5 is complementary to pin 4.
(3) Net 1	This socket is reserved for (RS-485) network communication.
(4) Net 2	This socket is reserved for (RS-485) network communication.

Tab. 9.1

9.2 PD12 P Interface

Fig. 9.2

(1) Flexnet 1-3:	
pin 1.	Flexnet /data (pin 1 on flexnet DIN connector)
pin 2.	Flexnet gnd (pin 3 on flexnet DIN connector)
pin 3.	Flexnet data. (pin 4 on flexnet DIN connector)
(2) External 4-9:	
pin 4.	Start signal. +5 to +50 Vdc. Positive edge triggered.
pin 5.	+24 Vdc output
pin 6.	Ground
pin 7.	Status output signal. Open collector. Grounded when drive is active
pin 8.	Status output signal. Open collector. Grounded when drive is not active
pin 9.	Disable signal. +5 to +50 Vdc. Dispensing disabled when active.
(3) Prime 10-11:	
pin 10.	Prime (ground)
pin 11.	/Prime (drive priming when connected to ground)
(4) Safety 12-13:	
pin 12.	Safety 1, short circuit, prepared for external safety device or safety input from pin 13.
pin 13.	Safety 2, (24 Vdc output)
(5) Main power 14-16:	
pin 14.	Main supply. Neutral
pin 15.	Main supply. Earth
pin 16.	Main supply. Line

Tab. 9.2

9.3 Connecting multiple PD12P's to Flexnet

Connection of PD12P's in Flexnet

Fig. 9.3

9.4 Change of voltage

220/240 Vac   110/120 Vac
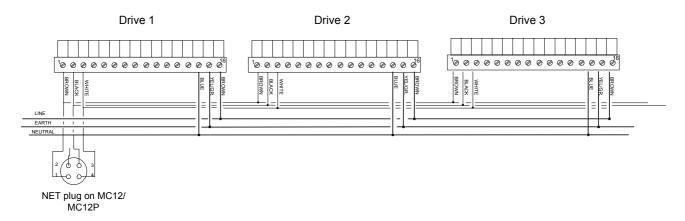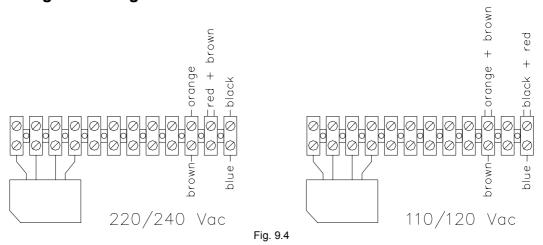
Fig. 9.4

The PD12 can be converted to accept another supply voltage.
The conversion can be made inside the machine by moving the cables of the transformer clamps.

10 Declaration of conformity

We   **Watson-Marlow Flexicon**
              Frejasvej 2-6
              DK-4100 Ringsted

Declare on our sole responsibility that the peristaltic dispensers:

Peristaltic dispenser type	Model
PF6	61-050-022
PF22	61-220-000
PD12I	61-150-022; 61-150-021
PD12IHS	61-154-014
PD12P	61-151-022;
PD12PS	61-152-014; 61-152-020
PD22I	61-250-022
PD22P	61-251-022
PD22PS	61-252-022

To which this declaration relates is in conformity with the following standard(s):

EN55022	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
EN61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN61000-6-3	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

According to the provisions in the Directives:

2006/42/EC	On the approximation of the laws of the Member States relating to machinery
2006/95/EC	On the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits
2004/108/EC	On the approximation of the laws of the Member States relating to electromagnetic compatibility

Signature:

February 2011

Ringsted, Denmark

Jørn Jeppesen, Development Manager