

Flowmeter-Display

PD 4000 / 340

Manual

PROCES-DATA A/S

NAVERVEJ 8 • DK-8600 SILKEBORG
TEL. +45-87 200 300 pd@post4.tele.dk
FAX +45-87 200 301 www.proces-data.dk

GB
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1 General information

1.1 Introduction

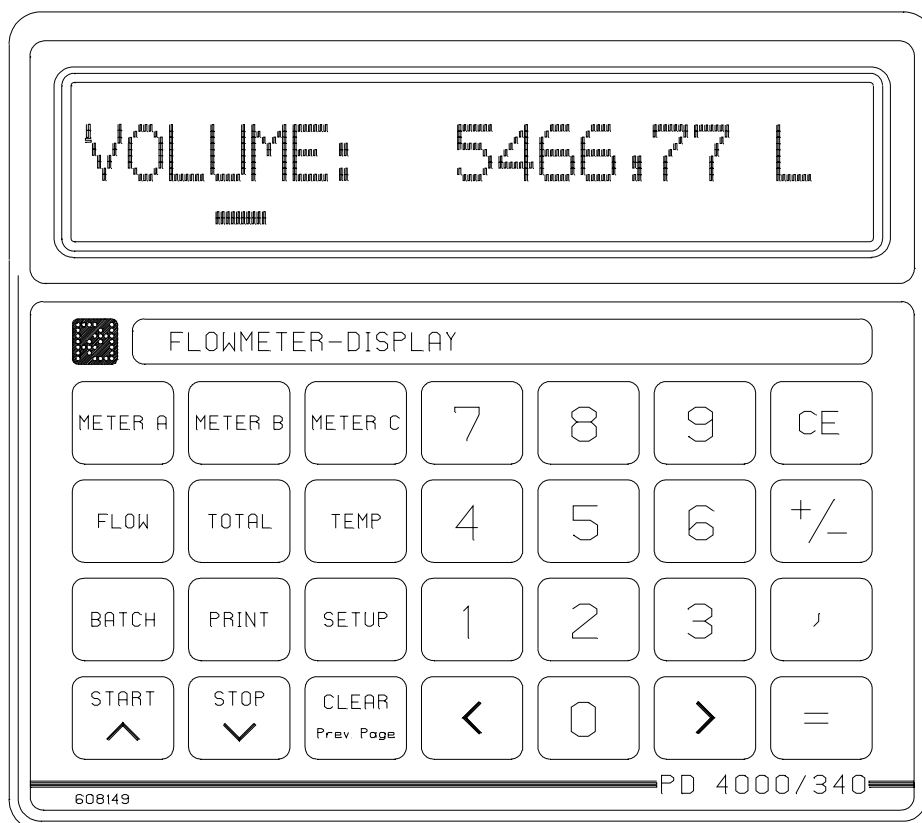
The Flowmeter-Display is designed to collect and display data from three PD 340 Flowmeters. Furthermore, it is possible to modify data and to select various functions within the Flowmeters.

The Flowmeter-Display can be used as a stationary system or it can be installed on trucks which collect or delivers liquid products.

As an option, a printer interface can be connected to the system. A printet ticket showing the measurement result, together with related customer data, can then be printed.

The keys on the Flowmeter-Display consist of both number keys and function keys. The primary data from a Flowmeter, e.g. actual flow rate or measured volume, may be selected and displayed by pressing a single function key.

The configuration of the Flowmeter-Display, calibration of the Flowmeter modules and configuration of the printer interface are all performed via the SETUP menu.



Keyboard layout

490 042 02

A total customized configuration of a PD 340 Flowmeter may be performed via the SETUP menu, simply by pressing 2 keys.

The actual configuration for each of the selected Flowmeters may be listed in clear text on the display, or printed out.

Two design tools have been developed for the Flowmeter system. The first is a database program, for setting up a customer database (manual ref. no. 502 092), and the second is a design program for the easy creation of printer tickets layouts, (manual ref. no. 502 091). Both programs are installed on a standard PC running Windows 95/98/NT. A particular ticket layout or a customer database, are downloaded to the PD 4000/340 Flowmeter-Display via a P-NET interface. The facilities offered by these programs provide the system with a high degree of flexibility in choosing the type of printer that is appropriate for the system.

The Flowmeter-Display includes all the facilities offered by the PD 210 Display Unit. For further information about the PD 210 Display Unit, consult the "Flowmeter PD 340 Manual" (ref. no. 502 010).

1.2 Features

- Suitable for mobile applications
- Multi language support
- Simultaneous supervision of up to three Flowmeters
- Automatic configuration of a connected Flowmeter
- Type approved system, certified as legal for trade in Denmark, system ID is "IV-302".
- Option for connecting a printer through a PD 3940 P-NET/RS232 Converter module
- PC based Printer Ticket Design tool, Windows 95/98/NT
- PD 4000 based Customer/Delivery Database with 1200 customers
- PC based Customer/Delivery Database, Windows 95/98/NT
- Printout of daily totals
- Battery back-up on the displayed volume counter values.
- Comprehensive error detector and alarm function
- Menu based display selection
- Easy set up of connected Flowmeters
- Built in Batch Control
- Calculation of an Average Temperature
- Creation of a NodeList of the modules connected to the Fieldbus
- Completely sealed construction
- Membrane click-switch keyboard
- Back lit graphical LCD display
- P-NET Fieldbus communication, EN50170 vol. 1, IEC 61158 type 4
- Real time clock
- EMC approved (89/336/EEC)
- Vibration approved (IEC 68-2-6 Test Fc)

1.3 Customer database

The Customer Database program (manual ref. no. 502 092) is based on a standard database using the Access file format. The program is a tool for generating a database table with an unlimited number of customers.

The Customer Database program makes it possible to build up relationships between a specific PD 4000/340 Flowmeter-Display and customers placed on a specific route.

A selection of customers based on this relationship can be downloaded to the PD 4000/340 Flowmeter-Display.

The Customer Database program has a database table in which measurement data associated with the individual measurements performed from the PD 4000/340 Flowmeter-Display can be uploaded. It is possible to make queries on the delivery data, specifying the customer, route number and a data interval. The queries can be printed on the windows default printer.

1.4 Printer Ticket Design

The Printer Ticket Design program (manual ref. no. 502 091) is a tool for designing printer tickets for the PD 4000/340 Flowmeter-Display system. This program makes it possible to create a ticket layout on a PC monitor, and then download this design to the PD 4000/340 Flowmeter-Display.

The ticket may be printed by the Flowmeter-Display after a delivery.

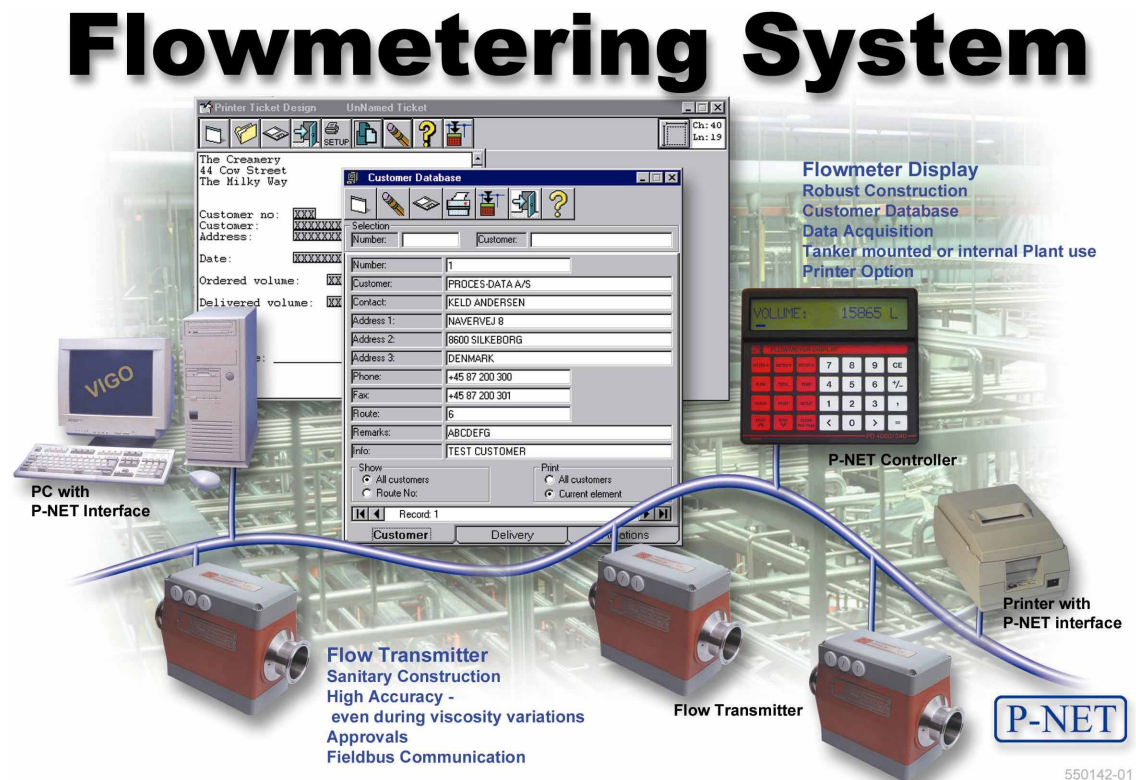
The Ticket Design program can be regarded as a normal text editor, where static text and variables from the internal database in the Flowmeter-Display can be positioned as it is required to be presented on an actual printout.

2 System description

The Flowmeter-Display is connected to the Flowmeters in a P-NET Fieldbus system.

Communication between the Flowmeter modules and the Flowmeter-Display is performed via P-NET. Up to 125 modules may be connected to the bus, where a unit may be a PD 340 Flowmeter, a PD 4000/340 Flowmeter-Display or another P-NET module.

A maximum of three Flowmeters may be selected and supervised simultaneously. The following picture shows a complete system with three Flowmeters and a printer.



3 Flowmeter-Display

3.1 Main functions

The primary data available from a Flowmeter consists of: actual flow, total volume, batched volume, temperature and setpoint. This data may be displayed by pressing a single function key.

A description of the main functions is given on the following pages.

3.1.1 METER A, METER B and METER C



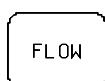
Pressing one of these function keys selects the corresponding Flowmeter data to be displayed. An indicator bar above the key pressed shows which meter has been chosen.

If the <METER A> key is pressed, a Volume counter for Flowmeter A is shown. The Volume counter is an internal counter in the Flowmeter-Display and has a range of 9 digits. The Volume counter is calculated from the contents of the Volume2 register within the Flowmeter, which has only a 6 digit range.

The Volume counter for Flowmeter A may be cleared, by simply pressing the <CLEAR> key, but only if no flow has been detected for a specified time. The Volume counter is also cleared following a Batch start, selected by means of the Batch "START" function key. The Batch start configuration can be selected in the SETUP menu.

The message "Flowmeter A not connected" is shown on the display, if no Flowmeter with the node address selected for Flowmeter A exists within the P-NET system.

3.1.2 FLOW



Pressing the <FLOW> key, displays the current flow rate for the liquid in the selected Flowmeter. The flow rate is an averaged value, where the time constant for the filter and the flow rate unit for the read-out, may be selected in the SETUP menu.

```
FLOW: 2500,17 L/h
```

If temperature compensated flow is chosen in the SETUP menu, "TC_FLOW" is written on the display, and the flow rate, which is now multiplied by a temperature dependant factor, is shown (TCFlow register). For further information, consult the "Flowmeter PD 340 Manual" (ref. no. 502 010).

"PI-FLOW"

If PI-function is chosen for Output3, a display, similar to that shown below, is shown. SETP (Setpoint value), OUT3 (current output in % of FullScale) and MODE can be changed, by moving the cursor to the update field using the cursor keys, keying in the desired value and then pressing the <=> key.

Placing the cursor in the MODE update field and then pressing the cursor up key (START) will change the mode of the PI regulator: A (automatic), M (manual) and I (Input control, manual if input1 is ON). The mode is stored in the Flowmeter by pressing the "ENTER" key, <=>.

```

                SETP:100000.00L/h
PI_FLOW: FLOW: 5002.96L/h
                OUT3:100  MODE:A
  
```

The PI-function is set up in the <MANUAL | CONFIG | OUT3> menu. For further information about setting the Flowmeter PI-function, consult the "Flowmeter Manual PD 340" (ref. no. 502 010).

3.1.3 TOTAL

TOTAL

If the <TOTAL> key is pressed, a Total volume counter for the selected Flowmeter is shown. The Total volume counter is an internal counter in the Flowmeter-Display, and has a range of 9 digits. The Total volume counter value is calculated using the Volume1 register in the Flowmeter, which has only a 6 digit range.

The counter increments when the flow direction is positive and decrements when the flow direction is negative.

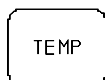
```

TOTAL: 18869.63 L
        CODE: ****
  
```

The TOTAL register may be cleared by pressing and holding the <TOTAL> key and then pressing the <CLEAR> key.

The Total volume can be protected by a 4 digit security code, this code has to be set from the <SYSTEM | PARAMETER | SECURITY> menu. As default, the TOTAL register is not protected.

3.1.4 TEMP



When pressing the <TEMP> key, the temperature register of the selected Flowmeter is shown. Additionally, an internally calculated average temperature is also shown. Temperatures are displayed as values in °C or in °F, depending of the configuration of the Flowmeter.

```
TEMP. : 22.4°C
Average TEMP. : 21.8°C
```

The *Average Temp* value shows the average temperature of a measured volume. The value is calculated when the Volume counter for the corresponding Flowmeter, is anything other than zero.

The calculation of the average temperature will continue until the volume-counter is reset. When *Volume counter = 0*, then *Average Temp = Temp*.

Calculation of the average temperature is carried out using the following formula:

$$AverageTemp = \frac{\sum Temp + Temp(Volume - OldVolume)}{Volume}$$

3.1.5 BATCH



The PD 340 Flowmeter has built in Batch Control, where a digital output is switched ON while the volume counter is below a user defined Setpoint value. The use of Output2 for Batch Control, is selected in the SETUP menu.

```
BATCH:  SETP: 100.00L
        VOL: 4.58L
        OUT2: ON
```

When digital Output2, is selected to be used for Batch Control, a Setpoint value may be keyed in. The Setpoint value is entered by moving the cursor to any position in the update field, keying in the new value and pressing the ENTER key, <=>.

The Setpoint on the Flowmeter Display can include a Tail value. This Tail value represents the volume by which the required amount (Setpoint value) was exceeded, due perhaps to a delay in valve closure.

The Tail value is automatically subtracted from the original setpoint value next time the Setpoint is transmitted to the selected Flowmeter. When a Batch has been completed, a

new Tail value is calculated, as the sum of 75% of the old Tail-value and 25% of the error (Volume - Setpoint). This means that the error in dosing will be reduced to an absolute minimum, during the next few Batch runs.

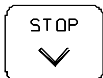
The current Tail and Setpoint values may be displayed-/changed in the <SYSTEM | PARAMETER | BATCH> menu. It is also possible to enable or disable the automatic Tail correction using this menu. Batching can be started either by means of the <START> key or by activating the digital input.

START BATCH



Batching is started by pressing the <START> key. It is only possible to start batching when the BATCH menu is displayed, and no flow has been detected for a specified time.

STOP BATCH



Batching can be stopped from all menus except the SETUP menu, by pressing the <STOP> key.

3.1.6 PRINT



If a printer is connected to the system, it is possible to produce various kinds of printouts. These include a printed ticket showing the measured result together with matching customer data, a printout of the NodeList, showing all the connected modules, or a printout of the actual meter setup for a connected Flowmeter.

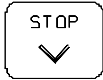
The same printout design is used for printing from all three Flowmeters: METER A, METER B and METER C.

To printout the results of the last measurement, the Flowmeter-Display should be in one of the main function menus, and no flow must have been detected for a specified time. Pressing the <PRINT> key will open the window, as shown below.

```
Name: PROCES-DATA A/S
Number: 1 ^ v
Press "PRINT"
```

From this window, it is possible to select a customer, either by scrolling the customer database by means of the <^> and <v> keys, or by keying in the customer number followed by <=>. If the customer already has been chosen on the same day, "used to day" will flash on the bottom display line.

3.1.8 STOP

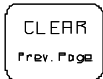


The <STOP> key has various functions, depending on the particular screen or menu in which it is activated.

Pressing the <STOP> key when batch control is active, will stop batching for the selected Flowmeter, except when the key is pressed in the SETUP menu.

If the <STOP> key is pressed while in the SETUP menu, the cursor moves downwards.

3.1.9 CLEAR



The <CLEAR> key has various functions, depending on the particular screen or menu in which it is activated.

The Volume counter is cleared, if the <CLEAR> key is pressed when the Volume menu (selecting keys <METER A>, <METER B> or <METER C>), or the Batch menu is shown in the display, and no flow has been detected for a specified time. This action will also clear the error buffer.

To clear the error buffer without clearing the Volume register, press and hold the <CE> key and then press the <CLEAR> key. In the approved system, it is not possible to clear the error buffer without clearing the VOLUME register.

The Total counter is cleared, by holding down the <TOTAL> key while pressing the <CLEAR> key. This will only occur if no flow has been detected in the Flowmeter for a specified period of time. If the <CLEAR> key is pressed when in the SETUP menu, the previously used menu will be selected.

3.2 Key functions for user input

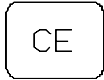
A number of keys act as standard function keys, which are used when entering data in connection with configuration and calibration. The number keys, the sign key and the comma key, are all standard keys. The remaining standard keys are described below.

CURSOR left, CURSOR right



The cursor keys are used within menus to move the cursor in the left direction and in the right direction.

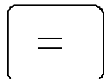
Press and hold the <+/-> key and then press the arrow keys result in an adjustment in Flowmeter-Display contrast.

CLEAR ENTER

The <CE> key has various functions, depending on the key combination in which it is activated.

When used as a single key, the <CE> key will clear the last user input value entered using the number keys. Pressing the <CE> key immediately before the <ENTER> key, will clear all input data, and the display will revert to showing the previous data.

To clear the error buffer without clearing the Volume register, press and hold the <CE> key and then press the <CLEAR> key. In the approved system, it is not possible to clear the error buffer without clearing the VOLUME register.

ENTER

The <=> key is used for entering user data into the Flowmeter-Display or the selected Flowmeter. The <=> key is also used to select a sub-menu, by first placing the cursor in the square field positioned after the menu name, and then pressing the <=> key.

In some sub-menus in the SETUP section, it is possible to scroll between various configuration parameters by means of the <START> and <STOP> keys. The <=> key is used to select the displayed configuration parameter.

To enter new data, e.g. a new Setpoint, the following must be done:

- 1 Place the cursor in the data field,
- 2 Key-in the data,
- 3 Press the <=> key.

When keying in the new data, each character will appear in order within the data field and the remaining part of the data field will be filled with "*". If the input data is not confirmed by means of the ENTER key within 15 seconds, then it will be cleared, and the previous data will be displayed again.

4 Setup menu

SETUP



4.1 Introduction

The configuration of the optional functions in a Flowmeter, together with configuration of a PD 3940 P-NET/RS232 Converter module for a possible printer connection, and setting of time and date in the Flowmeter-Display, are all performed in the SETUP menu.

To configure and calibrate the Flowmeter, the **program enable** switch, "SW1", located in the upper left corner of the Flowmeter terminal box, must be set in the ON position. After configuration and calibration, the switch must be reset to the OFF position.

The SETUP menu includes a number of sub-menus, which provide guidance through the setup procedure.

To select a sub-menu, the cursor should be placed within the square field adjacent to the menu name, and then press <=>.

To select one of the available configuration parameters, the "arrow up" and "arrow down" keys can be used to scroll through the possibilities. To select the displayed value, the <=> key should be pressed.

In the following a menu path is specified as <menuname1 | menuname2 | menunamex>

To find the specified menu, press the <SETUP> key, select menuname1, select menu name2, repeat until no more names are specified in the path.

Example:

<SYSTEM | SETCLOCK>

Press the <SETUP> key

```
PD 340 SERVICE MENU
AUTO SETUP:  □  SYSTEM:  □
PRINTER    :  □  MANUAL:  □
```

Select SYSTEM

```
SYSTEM SET MENU
COMMUNIC.  :  □  SET CLOCK:  □
Std.CONFIG:  □  PARAMETER:  □
```

Select SET CLOCK

```
Move cursor to Time/Date
Time  :  00:46:03  ■
Date  :  00:01:01
```

Now the SET CLOCK menu is displayed

The Flowmeter-Display contains an internal copy of all the configuration registers in a Flowmeter. It is possible to configure these internal registers, and in this way, perform a customized configuration of a Flowmeter. Configuration of the internal registers is done in the submenus to <SYSTEM | STD.CONFIG>

The submenus under <MANUAL | CONFIG> appears in the same manner as the submenus under <SYSTEM | STD.CONFIG>. When a parameter is changed in a submenu to <MANUAL | CONFIG> direct communication with the registers within a connected Flowmeter occurs. When a parameter is changed in a submenu to <SYSTEM | STD.CONFIG> a change is made to the customized Flowmeter configuration in the Flowmeter-Display.

The customized configuration is copied to the selected Flowmeter (e.g. METER A), if <AUTO SETUP> is chosen.

Default values for the configuration of the customized Flowmeter are set up by PROCES-DATA. After a master reset the PROCES-DATA configuration is copied to the customised Flowmeter. The PROCES-DATA configuration is shown below, in both clear text, as would be displayed on the PD 4000 Flowmeter-Display, and in the format of the PD 210 Display for registers E1-E8.

PD 4000 format:		PD 210 format:	
Ti:	0,000000	E2 Value:	0,000000
PI Function:	Auto	E3 Value:	000000
PI Input:	Setp-Data	E5 Value:	
PI Output:	0% => 4 mA	E6 Value:	222222
Scale:	40,0000	E7 Value:	211100
Flow ReadOu:	2 Decimals	E8 Value:	3024xx
Vol1 ReadOu:	2 Decimals		
Vol2 ReadOu:	2 Decimals		
Setp ReadOu:	2 Decimals		
Out3 Functi:	CurrOutput		
Out3 Data:	Flow		
Out2 Functi:	PulsOutput		
Volume Data:	Flow		
Flow Mode:	NormalMode		
Batch Data:	No Bat/Lim		
TimeConst:	1 sec		
Time/Unit:	Units/hour		
FlowDirect:	UniDirecti		
0.2%Limit:	0.2% ignor		
Temp Unit:	Celcius		

The following pages list the menus included in the Flowmeter-Display, together with a short description and path to each menu.

4.2 P-NET Fieldbus configuration

Setting node address

<SYSTEM | COMMUNIC | PD 4000/340 SETUP>

```

Meta MetB MetC Print
Node:017 034 035 043
4000Node: 02 Master: 06

```

The Flowmeter-Display operates as a master in a P-NET communication system. Therefore, it is important that the rules for node addresses and number of masters are respected. This requires that all units connected to the P-NET must have a unique node address, and all masters must have the same value for "number of masters". If the Flowmeter-Display is connected to systems with existing masters, then the Flowmeter-Display must be assigned an unused node address, which is reserved for a master.

Example:

If a system already exists, which includes 2 masters having node address 2 and 4, and the value for "number of masters" in each of them is 5, then the Flowmeter-Display must use one of the node addresses 1, 3 or 5 and *Master* must be set to 5.

If no master node address is free for the Flowmeter-Display, then the other masters in the system must have their value for "number of masters" increased, otherwise communication errors will occur.

In other words, *4000Node* and *Master* must be set to match the actual system application, as described above.

NOTE: In the Flowmeter-Display, *number of masters* and the *node address* of the display unit, the P-NET/RS232 Converter and the Flowmeter modules, are keyed in and displayed as decimal numbers. In some other PD-modules, e.g. the PD 210 Display, these values are displayed as hexadecimal numbers, which have to be translated into a decimal number, to attain conformity.

4.2.1 Node address

<PRINTER | COMM3940>

```

3940 SerialNo: 9A21001FD
3940 NodeNo: 43
3940 DevID: 3940

```

This menu shows the serial number, node address and devicetype of the connected PD 3940 module.

If no PD 3940 module answers to a selected node address, it is possible to assign the node address to a printer, by keying in the serial number of the converter.

To key in the serial number, move the cursor to the "3940 SerialNo" update field, and key in the serial number. If a PD 3940 module with this number has been connected to the system, the node address will be assigned to it, and the devicetype ("3940") will be displayed on the bottom line.

If no printer is available for the system, key in 0 in the NodeNo field.

4.2.2 Nodelist

<SYSTEM | COMMUNIC | CREATE NODELIST>

```

^ NodeNo      :      17
  DeviceType  :      340
v SerialNo    :     123456
  
```

This menu, perform a scan of the P-NET Fieldbus, for all node addresses in the range from 0 to 125. When a module answers a request having a specific node address, the Flowmeter-Display will generate an element in the NodeList. This element consists of the node address, the DeviceType and the SerialNumber of this module.

Scanning and generating the NodeList takes about 5 seconds. While scanning is being undertaken, the picture below is shown on the display.

```

PD4000/340 SYSTEM LIST
Creating NodeList  *
  
```

If two modules exist with the same node address, transmission errors can occur. Any occurrence of transmission errors will cancel the generation of the NodeList, and an errorcode will be written on the display.

When scanning has concluded, it is possible to scroll through the NodeList by means of the cursor-up/down keys (START and STOP).

If a PD 3940 P-NET/RS232 Converter module and a printer are connected to the system, a printout of the NodeList will be made when the <PRINT> key is pressed when in this menu.

4.3 Flowmeter-Display Setup

Trucknumber

<SYSTEM | COMMUNIC | VERS /TRUCKNO>

```

Program vers: Large 4.3
Truck number:      ■  0
  
```

On the top line of this menu, the current version of the Flowmeter-Display program can be seen.

The numerical part indicates the program version. In this example it is 4.3 "Large" means that this PD 4000/340 Display has the memory capacity to contain up to 1200 customers in the internal customer database.

On the bottom line of this menu, it is possible to key in a display identification number "Truck number". This number is used to identify the PD 4000/340 that is currently connected, when a download is to be performed from a PC running the Customer Database program.

Time/Date

<SYSTEM | SET CLOCK>

```

Move cursor to Time/Date
Time  : 01:19:01  ■
Date  : 00:01:02
  
```

The Real Time Clock and the Date stored in the Flowmeter-Display, may be displayed and set in this menu. The Time and Date may be used on printed tickets.

The format for Time is Hour:Minute:Second and the format for Date is Year:Month:Day.

Language

<SYSTEM | PARAMETER | NEXT | LANGUAGE>

```

Language: English
^ v For New Setting
Press "=" To Select

```

Select the language to be used in the Flowmeter-Display. The selection of language has no influence on how the ticket is printed. The Flowmeter-Display can be configured to the following languages: English, Danish, Polish, German and Icelandic.

Security

<SYSTEM | PARAMETER | NEXT | SECURITY>

```

SECURITY CODE SETUP
Actual Code: 0
No Security Code

```

In the Security menu it is possible to key in a four-digit security code. This code is used to prevent non-authorized people clearing the total volume register. As default, this code is set to be zero, which means that there is no protection of this register. If a new code is entered this code has to be keyed in each time TOTAL needs to be cleared. To enable an entered code to be changed, it is necessary to master reset the PD 4000/340 Flowmeter-Display, which will delete ALL data and customers.

4.4 Printer Setup**Mode for PD 3940**

<PRINTER | CONF3940 | FUNC>

```

Function : DatamodeInOut
^ v For New Setting
Press "=" To Select

```

This parameter must be set to either "DatamodeOut" or "DatamodeInOut", otherwise the system will not work.

PD 3940 baudrate

<PRINTER | CONF3940 | BAUD>

```

BaudRate: 9600
^ v For New Setting
Press "=" To Select

```

This menu selects the baudrate for the PD 3940 on the RS232 interface
Possible baudrates: 76800, 38400, 19200, 9600, 4800, 2400, 1200, 600, 300 bit/s

PD 3940 Parity

<PRINTER | CONF3940 | PARITY>

```

Parity : Odd
^ v For New Setting
Press "=" To Select

```

This menu selects the parity for the data on the RS232 interface. The possible values for parity are: odd, mark, space, none and even.

PD 3940 reservetimer

<PRINTER | CONF3940 | TIME>

```

ReserveTimer: 10.00

```

The reservetimer is the time the printer is reserved to a specific Flowmeter-Display, after a line is written on the printer. This parameter is used in the situation where more than one Flowmeter-Displays uses the same printer. The value for the reservetimer is entered in seconds.

Number of tickets

<PRINTER | SET_PRINT>

```

PRINTER SYSTEM SETUP
Ticket Prints: 1
Setup Of Day TOTAL: 

```

Enter the number of tickets to be printed each time the "PRINT" key is pressed.
Setup and printing out of a daily total is selected from this menu.

Day TOTAL

<PRINTER | SET_PRINT | SETUP OF DAY TOTAL>

```

NUMB:  CUST:  DATE: 
TIME:  VOLU:  TEMP: 
TOTAL:  SETP:  ERRO: 

```

Select what to include on the ticket "day total"

Select or deselect the different variables on the ticket, by placing the cursor in the square field adjacent to variable and then pressing the ENTER key.

PRINTOUT OF DAY TOTAL

<PRINTER | PRINT_ALL>

```

PRINTOUT OF DAY TOTAL
Date: 00:01:05 Chron: 
Press "PRINT"

```

Each time a ticket is printed as a recipe to a customer, the customer data, the related measurement data and the date of the printout, are saved to the internal customer database in the Flowmeter-Display. To printout all the measurements performed on a particular day, key in the date in the update field of the PRINT_ALL menu, and press the "PRINT" key. A list, with all measurements recorded on this date, will now be printed.

If the [Chron] field is checked the Flowmeter-Display generates the print out in chronological order, if the [Chron] field is unchecked the print is generated in customer number order.

```

NUMBER : 1

CUSTOMER: PROCES-DATA A/S
DATE : 00:12:01
TIME : 11:12:00
VOLUME : 40,70
AV_TEMP : 27,3
TOTAL : 926,19

NUMBER : 2

CUSTOMER: Farmer Jensen
DATE : 00:12:01
TIME : 12:21:30
VOLUME : 58,36
AV_TEMP : 27,4
TOTAL : 943,85

NUMBER : 3

CUSTOMER: Farmer Hansen
DATE : 00:12:01
TIME : 13:22:08
VOLUME : 70,74
AV_TEMP : 27,4
TOTAL : 956,23

```

4.5 Flowmeter Setup

PD 340 identity

<MANUAL | IDENT>

```
DeviceType : 340
Prs Version: 8701
SerialNo : 123456
```

This Flowmeter-Display shows the type of device, program version and the serial number of the selected Flowmeter.

PD 340 input and outputs

<MANUAL | STATUS | INPUT/OUTPUT PORTS>

```
Output2:OFF Output3:OFF
Input1 :OFF
```

This menu displays the current status of the digital input and the digital outputs signals.

Flowmeter Registers

<MANUAL | STATUS | INPUT/REGISTER E1- E8>

```
^ v For Next Register
E8 Value: 102201
NewValue: 102201
```

This menu shows a short form code read-out of all the configuration registers. The registers are displayed in the same format as that shown on a PD 210 Display unit. It is possible to scroll through the list by means of the cursor up/down keys (START and STOP).

To change the current configuration of the Flowmeter, move the cursor to the "NewValue" update field, key in the new value and press the ENTER (<=>) key.

Actual Setup

<MANUAL | STATUS | ACTUAL METER SETUP>

```
^ Metersize : 39999.9
Ti : 0.001000
v PI Function: Auto
```

This menu produces a list, showing the complete configuration of the selected Flowmeter written in clear text.

It is possible to scroll through the list by means of the cursor up/down keys (START and STOP keys).

Flowmeter calibration

<MANUAL | DEVICE>

```
SerialNo: 123456
NodeNo: 017
M.Size: 39999.9 Reset : 0
```

In this menu, it is possible to calibrate the selected Flowmeter by entering a new Metersize. This is performed by changing the value in the Metersize register, by moving the cursor to the update field, and keying in the new value. Please note that re-calibrating an approved Flowmeter requires a new verification procedure.

Pressing the <=> key while the cursor is placed in the RESET box, will reset the Flowmeter and clear the internal counter registers.

Timeunit

<SYSTEM | STD.CONFIG | FLOW | TIMEUNIT>

```
Flow in vol: Units/HOUR
^ v For New Setting
Press "=" To Select
```

Select the time unit for the flow, [hour] or [minute].

Decimals on flow

<SYSTEM | STD.CONFIG | FLOW | DECIMALS>

```

Decimal Places: 2
^ v For New Settings
Press "=" To Select

```

Select how many decimals used on the PD 210 and Flowmeter-Display for flow, TCflow and Instant Flow when shown.

Time constant

<SYSTEM | STD.CONFIG | FLOW | FILTERCONST>

```

Time constan: 1 sec.
^ v For New Settings
Press "=" To Select

```

Select the time constant the Flowmeter uses to average the flow. A high value for the filterconstant will delay the readout of any change in the flowrate and will also delay the increase of the volume counters.

Flow direction

<SYSTEM | STD.CONFIG | FLOW | FLOWDIR>

```

Flow direction: Unidirec.
^ v For New Settings
Press "=" To Select

```

An arrow on the meterhead indicates the positive flow direction. When measuring in two directions, flow in the direction of the arrow is registered as positive flow, and flow in the opposite direction of the arrow is registered as negative flow. When set to measure in one direction only, flow in the opposite direction of the arrow is ignored.

0,2 % limit

<SYSTEM | STD.CONFIG | FLOW | 0,2 % LIMIT>

```

0.2 % Limit: < 0.2% Ignor
^ v For New Settings
Press "=" To Select

```

The flow rate may be filtered to stabilize the readout of an unstable flow. Flow rates below 0.2 % may be ignored. This may be useful to avoid totalising the volume during long periods with no flow. Toggle the selection with the arrow keys, select with the enter key.

Mode

<<SYSTEM | STD.CONFIG | FLOW | MODE>

```

Mode: Normal Mode
^ v For New Settings
Press "=" To Select

```

The Flowmeter may be set in test mode. During installation and service, the test mode may be used to simulate that liquid is flowing in the pipe system. All output signals, pulse signals as well as current signal will act as if the liquid flow was present. This way, all internal functions, external signals and cable connections may be checked.

Unit for temperature

<SYSTEM | STD.CONFIG | TEMP>

```

Temperature Unit: °C
^ v For New Settings
Press "=" To Select

```

The Flowmeter can measure temperature by connecting an external temperature detector, type Pt-100. The temperature may be read as °C or °F.

Function for Input1

<SYSTEM | STD.CONFIG | INPUT1>

```

InP1 Func:Start Batch
^ v For New Setting
Press "=" To Select

```

The Flowmeter has a digital input, Input1, which can be selected for one of several functions:

- Stop counters. The signal may come from an air detector, and is then used to make the Flowmeter stop counting, when there is air in the liquid.
- Stop counters and generate error code 05
- The input can be used in batch control, to start the Batch function and clear the batch volume counter.
- Manual/Automatic mode for PI controller. The input can be used to set the operation mode for the PI controller, from automatic to manual by activating the input.

Decimals on Volume1

<SYSTEM | STD.CONFIG | VOL1>

```

Decimal Places: 2
^ v For New Setting
Press "=" To Select

```

Decimals on Volume2

<SYSTEM | STD.CONFIG | VOL2>

The Flowmeter utilizes two independent totalizers, Volume1 and Volume2, which indicate the measured volume since they were cleared. The counters increments when the flow is positive and may decrement when the flow is negative. Each volume counter may independently be cleared or preset to a specific value.

The read-out resolution (number of digits after the decimal point) on the PD 210 and Flowmeter-Display for the counters is chosen in this menu.

This read-out resolution also determines the overflow value for the counter. The counter value uses a total of 6 significant digits including the digits after the decimal point.

When the counters have reached their maximum, an error code is generated, and the counters start from 0 again. The maximum values for the counters are reached when all 6 significant digits show the value **9**. The corresponding volume depends on the counter resolution. If the resolution is 3 digits after the decimal point and the meter size is inserted in m³, maximum will be 999.999 m³ - even if there is no display unit connected to the meter. The volume registers in the Flowmeter-Display have 9 significant digits.

Input source to Volume1+ 2

<SYSTEM | STD.CONFIG | Vol1+2>

```

Volume Input: Flow
^ v For New Setting
Press "=" To Select

```

Select the data source for the two volume counters. The data source may be: Flow, Instant Flow or Temperature Compensated flow.

Function for Output2

<SYSTEM | STD.CONFIG | OUT2>

```
Function: Pulse Output
^ v   For New Settings
Press "=" To Select.
```

Output2 can be selected for one of several functions:

- Pulse signal, 0-10 Hz. The signal may be taken to a counter, electronic or electro-mechanical, for indication of the total volume, e.g. in litres.
- Sign for Output3. The signal indicates the flow direction. The output is switched off, when the flow is positive. By means of an UP/DOWN-counter this signal may be used for the totalising of the volume flowing with a sign.
- Control signal from the Batch control function.
- Control signal from the Limit function.
- Error free measurement signal. The output signal is ON if no error is present.
- The output may be controlled directly via P-NET.

Function for Output3

<SYSTEM | STD.CONFIG | OUT3 | FUNCTION>

```
Function: PI-Regulator
^ v   For New Settings
Press "=" To Select.
```

Output3 may be used as a digital signal output or as an analogue 4-20 mA current output. When used as a digital signal, it may be used as a fast pulse signal (0 - 1000 Hz) for external counter circuits or it may be controlled directly via P-NET.

Output3 may also be used as output for the Flowmeter's PI-regulator.

InData for Output3

< SYSTEM | STD.CONFIG | OUT3 | IN DATA>

```
Input Data: Inst. Flow
^ v   For New Settings
Press "=" To Select.
```

Select the data source the Flowmeter uses as inputdata for the Output3 function.

The input data can be Flow, TC flow, Temperature, Instant Flow, and Available register.

PI signal< SYSTEM | STD.CONFIG | OUT3 | PI-CONSTANT |
PI-FUNCTION>

```
PI Input: Data-Setpoint
^ v   For New Settings
Press "=" To Select.
```

Selects the regulator function for the PI regulator. "Data-Setpoint" means cooling function where the regulator output is increased if the "Data" is larger than the "Setpoint". "Setpoint-Data" corresponds to a heating function.

PI mode< SYSTEM | STD.CONFIG | OUT3 | PI-CONSTANT |
PI-MODE>

```
PI Mode: Auto
^ v   For New Settings
Press "=" To Select.
```

Select mode for the PI-regulator

Auto:	Output3 is calculated using the PI regulator
Manual:	Output3 is set from the PD 210 display
Manual if Input1=ON:	if Input1=OFF then mode is auto else mode is manual.

PI output

< SYSTEM | STD.CONFIG | OUT3 | PI-CONSTANT |
PI-OUTPUT>

```
PI Output: Out=0% => 4mA
^ v For New Setting
Press "=" To Select
```

Select current output value, on Output3, when the output of the PI regulator is calculated to 0%.

PI parameters

< SYSTEM | STD.CONFIG | OUT3 | PI-CONSTANT |
P/TI>

```
P-Band : 0.000000 L /h ■
TI      : 10.0000 sec
```

P-Band: If the function of Output3 is **PI-regulator**, P-Band will indicate the proportional band of the regulator. The proportional band for a regulator is the change required in the input signal to give a change from 0 to 100% in the output signal (without I). The proportional band is defined in the same unit, as the input signal to the regulator - e.g. m³/h. TI: Ti is the integration time constant for the PI-regulator, which is the time it takes for the I-component of the regulator to give the same change in the output signal as that made by the P-component, following a permanent change of the input signal.

Fullscale for Output3

< SYSTEM | STD.CONFIG | OUT3 | FULLSCALE>

```
Fullscale at Cur.Output
Fullscale: 0.000000 ■
```

Enter the value, which should result in Fullscale (20 mA) on Output3. This is possible when the function for Output3 is selected as current output.

Example: Fullscale (20 mA) is desired on the current output at 15000 litres per hour. The number 15000 is inserted in Fullscale. 4 mA always equals a measuring result of 0.

Resolution for Output3

< SYSTEM | STD.CONFIG | OUT3 | RESOLUTION>

```
Resolution at PulseOutput
Resolution: 0.000000 ■
```

When the Output3 function is **pulse output**, 0 to 1000 Hz, the number of volume units per pulse is stated in resolution.

Example: The meter size is 20000 litres per hour. The requirement is 0.01 litres per pulse on Output3 (equal to 100 pulses per litre). The figure **0.01** is then inserted in resolution. In this example a flow of 20000 litres per hour will give a Output3 frequency of

$$\frac{20000 \text{ l/h}}{0.01 \text{ l/pulse} \times 3600 \text{ sec/h}} = 555,5 \text{ pulses/sec}$$

Be sure that the frequency on the output does not exceed 1000 Hz.

Decimals on Setpoint

< SYSTEM | STD.CONFIG | SETP>

```

Decimal Places: 2
^ v For New Settings
Press "=" To Select.

```

The read-out resolution (number of digits after the decimal point) on the PD 210 and Flowmeter-display for the Setpoint is selected in this menu.

This read-out resolution also determines the maximum value for the Setpoint. The Setpoint value uses a total of 6 significant digits including the digits after the decimal point.

Auto Setup

<AUTO SETUP>

```

Press "=" For Auto Setup
Any Other Key to Cancel

```

Selecting <AUTO SETUP> will configure the selected flow transmitter with the customised configuration, which is stored internally in the Flowmeter-Display. The customised configuration is set up in the <SETUP | SYSTEM | Std.CONFIG> menu.

To protect the current configuration of the registers in the Flowmeter, the AUTO SETUP is required to be confirmed by pressing the <=> key. Pressing any other key will cancel the AUTO SETUP and return the display to the SETUP menu.

Flow delay time

<SYSTEM | PARAMETER | NOFLOW>

```

CLEAR Delay: 2 sec
^ v For New Settings
Press "=" To Select.

```

The system has a built in "no flow detector", which inhibits the clearing of the VOLUME register and the TOTAL register, when product is actually flowing through the meter. The delay time between the flow having stopped and enabling the registers to be cleared, can be set between 0 and 5 seconds, using this sub-menu. If the delay timer is set to 0 sec. VOLUME and TOTAL can be cleared at any time. In the approved system the delay timer is set to 2 seconds and cannot be changed.

Batch Setup

< SYSTEM | PARAMETER | BATCH SET>

```

BATCH SETUP
SETP: 10.00 TAIL: 0.00
Enab. Tail:  Auto Batch: 

```

In BATCH Setup, the Setpoint and the Tail for the batch function, can be set. The Tail-value represents the actual measured amount by which the required amount (setpoint value) was exceeded. A new tail value can be automatically calculated after each run of the Batch function to ensure that the required setpoint value is eventually achieved. This will take place if the Batch function is started by pressing the <START> key. It is possible to enable or disable the automatic calculation of the Tail-value, by placing the cursor in the square field adjacent to Enab Tail and then pressing the ENTER key.

If Auto batch is activated, it prevents the user starting a batch before a customer is selected from the Flowmeter-Displays customer database.

If Auto batch is activated, a ticket is automatically printed after a batch.

If Output 2 is used as a Limit Switch, the setpoint for the switch has to be keyed in from this menu.

Unit for volume

< SYSTEM | PARAMETER | UNIT SET >

Vol. UNIT: L (liter) ^ v For New Setting Press "=" To Select

In UNIT Setup, the volume unit shown in display can be set to: "L" (litre), "g" (gallon) or "m" (m³). When the volume unit has been changed, the input field M.Size in <Manual | Device> also has to be changed.

On the meter head the meter size is stated in m³/h. If another volumetric unit is desired, the value in M.Size is converted to this unit and stored as the calibration factor. This value must always be stated in **volume units per hour** - even if the desired Flow read out is volume per minute.

Example: On the meterhead the meter size is stated as 80 m³/h. The desired volume unit is litres. Insert 80000 in M.Size.

5 Error detection

The system includes a comprehensive error detection and alarm function.

The Flowmeter will register possible internal errors. If an error occurs, an error code is generated within the Flowmeter. When reading data from the Flowmeter the response message will contain the actual error status. Any error code present in the Flowmeter will cause an error message to be written in clear text on the bottom line of the display.



```
VOLUME: 1,15 L
Power Fail:F0
```

Only errors from the Flowmeter that is currently selected will appear on the display. If an error occurs in a meter, which is not currently selected, the error will be stored locally within the Flowmeter-Display, but the error text will not be displayed until that meter is selected.

If an error occurs in a Flowmeter, the error text will be indicated in clear text on the bottom line.

5.1 Displayed errors in the Flowmeter system

5.1.1 Errors generated by the Flowmeter

'Power Fail: F0'

The Flowmeter has been reset due to a power cut.

'Softw.Reset: F2'

The Flowmeter has been reset from the Flowmeter-Display or another controller.

'Internal Err: xx'

The errorcode 'xx' can be one of the following numbers F4, F3, F1, 83, 82, 81, 80, 76, 75, 54, 52, 44, 43 and 42. If the Flowmeter continues to indicate one of these error codes, following a reset and a clear of the error register, the Flowmeter is likely to require repair. For further information about these errors, consult the "Flowmeter PD 340 Manual" (ref. no.502 010).

'TempDisconn.: xx'

The errorcode 'xx' can be one of the numbers: 24, 62, 63 and 64. The error codes 63 and 64 appear if the temperature detector is incorrectly connected. Numbers 24 or 62 appear if the detector is disconnected.

'Temp.> 130°C: 23'

The temperature is above 130 °C.

'Overrun Volu: 8'

There has been an overrun on the Volume counter and counting has restarted from zero.

'Overrun Tota: 7'

There has been an overrun on the Total counter and counting has restarted from zero.

'Flow Disable: 5'

Input1 has been activated and the volume counters have been inhibited.

'Pipe Empty: 4'

The metering pipe in the Flowmeter is empty.

'Flow > Max: 3'

The flow through the Flowmeter has exceeded the maximum allowable limit.

'Overfl. Out2: 2'

The frequency of the pulses on Output2 has exceeded 10 Hz.

'Overfl. Out3: 1'

The frequency of the pulses on Output3 has exceeded 1000 Hz.

5.1.2 Communication errors on P-NET

The Flowmeter-Display supervises the P-NET connection between the Flowmeter-Display and the Flowmeters. Occurrence of possible transmission errors results in the display of error text, followed by a four-digit code describing the type of error.

'TransError: 0020'

The P-NET is short-circuited.

'TransError: 0040'

There is a controller module connected having a Node Number set to a higher value than the Number Of Masters.

'TransError: 0800'

There has been a synchronisation error on the P-NET. This error will occur if additional masters, having a different "Number Of Masters" setting, are connected to the P-NET.

'TransError: 4000'

The answering module is not a PD 340 Flowmeter.

If more than one error occurs at the same time, only the error with the highest error code will be saved and displayed. Communication errors have the highest priority.

5.2 Clear error

When clearing the VOLUME register by pressing the <CLEAR> key, the error buffer will also be cleared for the selected Flowmeter. To clear the error buffer without clearing the Volume register, press and hold the <CE> key and then press the <CLEAR> key. In the type approved system it is only possible to clear an error when NoFlow has been detected for a period of 2 sec. Clearing the error buffer will also clear the VOLUME register.

6 Connecting a Flowmeter to the system.

The installation of a Flowmeter can be carried out using two alternative methods. The first method (a), is to connect the meter to the system, ensuring it has the correct node address, and subsequently, performing an autoseup of the meter. With the second method (b), the meter is connected to the system, but without changing the actual configuration of the Flowmeter.

6.1 Installation procedure

The procedure described below should be followed during the installation of a new system, or when a new Flowmeter is added to the system. The first step must always be carried out. The later steps will vary, depending on whether autoseup is required.

- 1 Select the <System | Communic | PD 4000/340 setup> menu

```

      Meta MetB MetC Print
Node:017  034  035  043
4000Node: 002  Master: 06

```

In this menu, it is possible to set up the P-NET node address of the three Flowmeters.

To see whether the selected Flowmeter responds to the keyed in P-NET node address, the install procedure can be interrupted at this stage. To check the response from the Flowmeter, press the <FLOW> key. If there is no response, the text "Flowmeter X not Connected" is written in the display. Continue with step b of the installation procedure to connect the Flowmeter to the system.

- a Install with AutoSetup.

Select the <Auto Setup> menu, will perform an automatic set up of the selected Flowmeter, using the customised configuration.

If the Flowmeter does not respond to the communication from the Flowmeter-Display, the picture below will be shown.

```

SerialNO: 0001000
NodeNo:    017
Key in SerialNO of PD340

```

Keying in the Serial number of the Flowmeter and pressing "=" will assign the node address to the Flowmeter. An AUTO SETUP can now be automatically performed.

```

Press "=" For Auto Setup
Any Other Key to Cancel

```

- b Install without AutoSetup.

To connect a Flowmeter by changing the node address in the Meter, select the following menu <Manual | Device>

If the Flowmeter does not respond to the communication from the Flowmeter-Display, the picture below will be shown.

```
SerialNo: 000100  
NodeNo: 017  
Key in SerialNo of PD340
```

Keying in the Serial number of the Flowmeter and pressing <=> will assign the node address to the Flowmeter, and the Flowmeter will now be connected to the system.

A display showing SerialNumber, NodeNumber and MeterSize is shown when the Flowmeter has been correctly connected.

```
SerialNo: 123450  
NodeNo: 017  
M. Size: 10000.0 Reset :0
```

7 Master reset

Performing a master reset on the Flowmeter-Display will clear the RAM memory. All the user defined data that will have been keyed in, will be erased. The printer ticket layout and the customer data are lost at master reset and will have to be downloaded again. The customised flow transmitter, will be set to the default PROCES-DATA configuration.

A master reset of the Flowmeter-Display is performed by separating the "Interface unit for RS-485" from the display/keyboard unit. The interface unit is the square box attached to the back of the controller. The 4 screws must be removed before the units can be separated. The power supply unit must be dismantled for at least 15 seconds before mounting again.

NOTE: the power supply must be switched OFF before the units are separated.

When the power supply is restored after a master reset, the following text will appear on the display.

```
Press here for flash
↓ Any other key for demo
```

The Flowmeter-Display program is stored in flash memory, and the "**MeterA**" key must be pressed to select this program. Any other key will select a demo-program. If, by accident, the demo-program is selected, then another master reset must be performed.

After selecting the Flowmeter-Display program by pressing the "**MeterA**" key, the following text will be displayed.

```
Now reset the controller
```

Reset the Flowmeter-Display by switching off the power supply. When power is switched on again, the Flowmeter-Display is ready for use.

8 Type approved Flowmeter system

The Flowmeter system is available as a type approved system, which is certified as legal for trade in Denmark. The system is approved for the measurement of milk, and other products having the same characteristics as water. The type-approved system complies with the specifications in OIML 4th preliminary Draft - "Measuring systems for liquids other than water". The system ID is "**IV-302**".

The system can be installed as a stationary system, or as a mobile system mounted on a tanker.

Before the system is approved for use in trade, the connected meters (a maximum of three) and the display unit, have to be verified and sealed by the authorities.

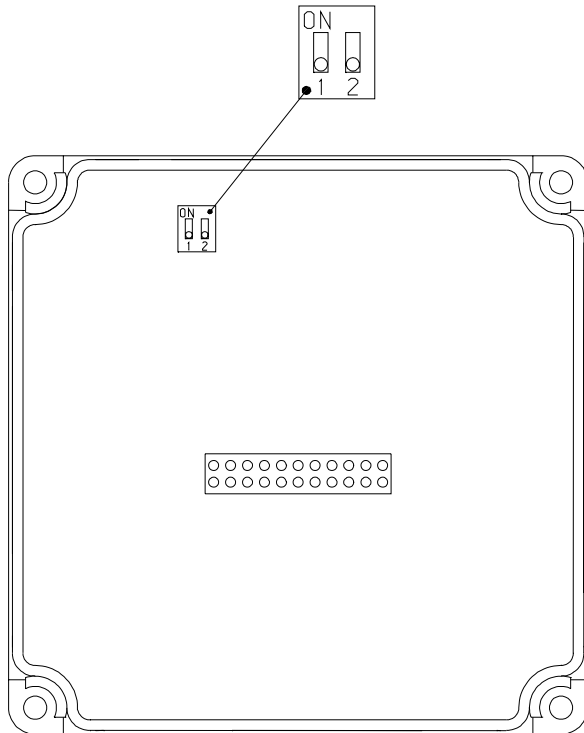
Some of the main functions of the type-approved system are described below. For further information, consult the "Typegodkendelsesattest" number 1993-4163-0378.

8.1 Timer functions in the approved system mode

The approved system has the same abilities as the non-approved system, for displaying FLOW, TOTAL, TEMPERATURE etc, but a built-in timer function will always switch to display the VOLUME register on MeterA. The display change will be performed if there has been no keyboard activity for 15 sec.

The timer value for the NoFlow detector in the approved system is fixed. This means that no flow will have to have been detected for a period of 2 sec., before the clearing of the Volume counters is possible.

8.2 Setting the display unit in the approved system mode



490 149 01

Switch 1 on the PD 4090 (Interface unit for RS-485) must always be set to the "OFF" position. This will prevent the FLASH memory being overwritten.

When the system is used as an approved system, switch 2 on the PD 4090 "Interface unit for RS-485" must be set in position "OFF".

To change the switch 1 or 2 ON/OFF position, disconnect the 24 V power supply and separate the interface unit and the controller unit. Now change the switch position and re-assemble the two units.

If the two units have been separated for more than 15 sec. a master reset will be performed.

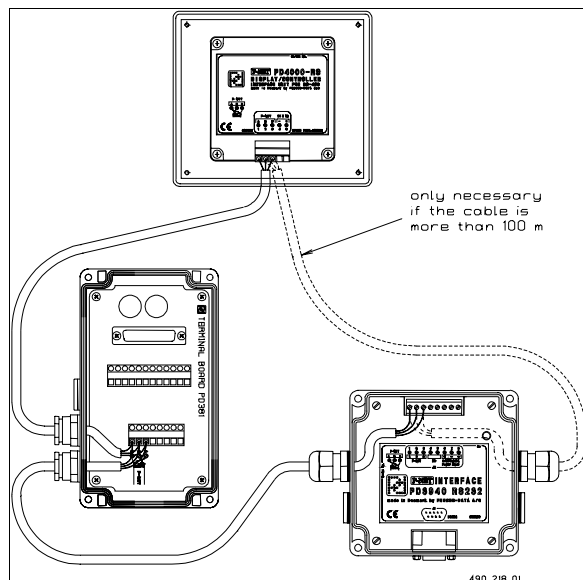
9 Installation

PD 340 Flowmeters utilising P-NET communication, require the "Extended Version".

P-NET is a multi-drop fieldbus, which is connected in a physical ring. Up to 125 units can be connected to the bus, where a unit may be a PD 340 Flowmeter, a PD 4000/340 Flowmeter-Display or any other P-NET interface module. The P-NET interface is galvanically isolated. The bus cable is a twisted pair with shield. The shield is used as a potential equalizer between the driver/receiver circuits in the nodes connected to the bus.

A P-NET unit is connected to the bus by means of 3 terminal-connections. The A terminal, the B terminal and the S terminal.

The connection from one unit to the next unit is performed by connecting A to A, B to B and S to S. If the length of the cable is more than 100 m, the bus cable will have to be connected from field device to field device, forming a physical ring.



All modules, PD 340 Flowmeters and PD 4000/340 Flowmeter-Displays, must be powered from a 24 V DC power supply. The connection of the power supply is shown clearly on the modules.

Electrical specification for P-NET:

Bus structure:	A physical ring without termination.
Medium:	Shielded twisted pair cable with minimum .22 mm ² area conductors and characteristic impedance of 100-120 ohm. For example TWINAX IBM part No. 7362211 with 105+/-5 ohm, 51 pF/m.
Bus length:	Max 1200 m (EIA RS 485).

NOTE: The Flowmeter-Display must be configured with a suitable node address and number of masters, following electrical installation.

10 Construction - mechanical.

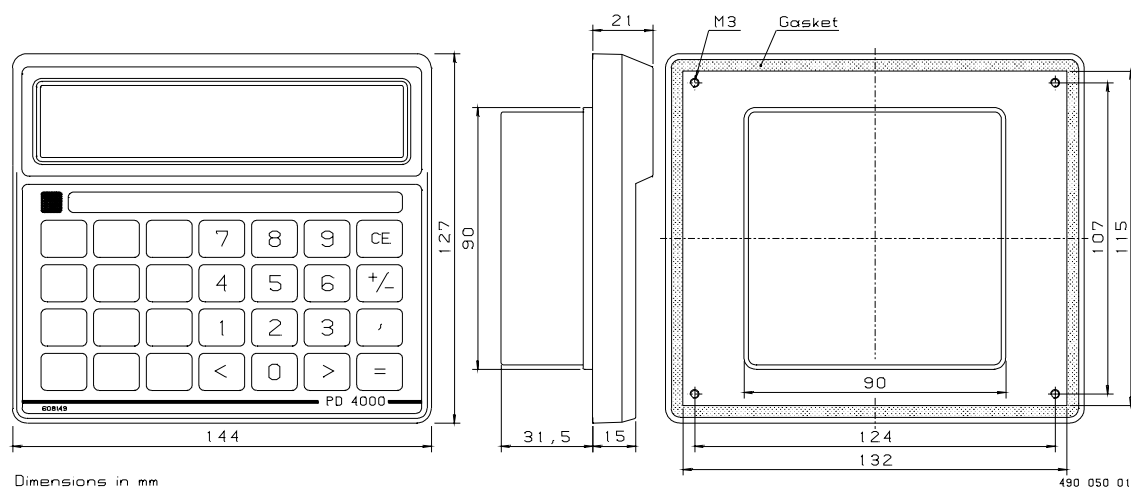
The PD 4000 Controller is housed in a black injection moulded plastic enclosure. The entire Controller is completely filled with silicone. This construction makes it extremely resistant to water, dust and vibrations.

The case measures $W \times H \times D = 144.0 \times 127.0 \times 52.5 \text{ mm}$ (tolerance to DIN 16901).

The module is designed for panel mounting. The module incorporates one snap connector, which provide the terminals for power and communications.

The module may be removed for service, without interfering with operational activities on the rest of the network.

Scale drawing (in mm):



Materials

Case: Black NORYL GFN (injection moulded)
 Front foil: Polycarbonate.

11 Specifications

All electrical characteristics are valid at an ambient temperature of -25 °C to +70 °C, unless otherwise stated.

All specifications apply within the range of approved EMI conditions. EMC test specifications for PD 4000 are available in a separate document, PD no. **506 022**.

11.1 Power supply.

Power supply DC:	nom. 24.0 V
	min. 20.0 V
	max. 28.0 V
Ripple:	max. 5 %
Power consumption:	max. 2 W
Current at power up:	max. 250 mA

11.2 Ambient Temperature.

Operating temperature:	-25 °C - 70 °C
Storage temperature:	-40 °C - 85 °C

11.3 Humidity.

Relative humidity:	max. 95 %
--------------------	-----------

11.4 Approvals.

Compliance with EMC-directive no.:	89/336/ECC
Generic standards for emission:	
Residential, commercial and light industry	EN 50081-1
Industry	EN 50081-2
Generic standards for immunity:	
Residential, commercial and light industry	EN 50082-1
Industry	EN 50082-2
Vibration (sinusoidal):	IEC 68-2-6 Test Fc

Type approved system, certified as legal for trade in Denmark, complies with:
OIML 4th preliminary Draft - "Measuring systems for liquids other than water".

11.5 Software

Number of customer in the Flowmeter-Display:	1200
Language:	English, Danish, Polish, German, Icelandic
Ticket size	79 char. , 65 lines
Number of update fields on ticket	30