Pump Management System 2000

PMU 2000

Pump Management Unit 2000

Operating Instructions

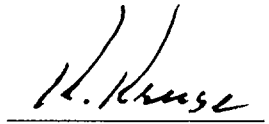
GRUNDFOS

Declaration of Conformity

We **GRUNDFOS** declare under our sole responsibility that the product **Pump Management Unit 2000 (PMU 2000)**, to which this declaration relates, is in conformity with the Council Directives on the approximation of the laws of the EC Member States relating to:

- Machinery (89/392/EEC).
  Standard used: EN 292.
- Electromagnetic compatibility (89/336/EEC).
  Standards used: EN 50 081-1 and EN 50 082-1.
- Electrical equipment designed for use within certain voltage limits (73/23/EEC).
  Standard used: EN 60 335-1.

Bjerringbro, 1st February 1995



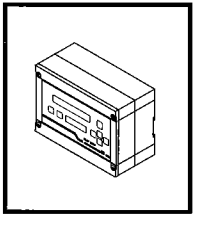
Kaj Kruse
Vice President

Before beginning installation procedures for PMU 2000, sections 2, 3, 4 and 11 of these Operating Instructions should be studied carefully.
Installation and operation should also be in accordance with local regulations and accepted codes of good practice.
The other sections of these instructions relate to operation and fault finding.

1. General Information

1.1 PMU 2000

Pump Management Unit



The Pump Management Unit 2000 is designed for the operation, monitoring and remote control of pumps in large heating, air-conditioning and ventilating systems, as well as water supply and pressure boosting systems.

PMU 2000 offers a wide range of possibilities of optimum control of the pumps in the individual systems:

- Central control of one to eight pumps.
- The pumps can be divided into zones. Each zone can have several pumps connected. The pump performance in each zone is automatically adjusted to the actual demand.
- Clock function with ten switching times for change of setpoint.

Pump Management System

PMU 2000 forms part of the GRUNDFOS Pump Management System 2000 which may consist of the following units:

- PMU 2000 (Pump Management Unit 2000)
- UPE Series 2000 circulator pump
- PFU 2000 (Pump Functional Unit 2000)
- PCU 2000 (Pump Communication Unit 2000)

Zones which consist of one or several UPE Series 2000 pumps or zones incorporating PFU 2000 can be operated, monitored and remote-controlled by means of PMU 2000 and/or PCU 2000..

Systems may also be designed with PMU 2000 alone, PCU 2000 alone or PMU 2000 together with PCU 2000.

The pumps or PFU 2000, which are connected to PMU 2000, may be divided into zones.
A zone is a closed hydraulic system where the pumps have common suction and discharge pipes.

In a zone with UPE Series 2000 pumps, all pumps must be of the same type.

A system (common BUS) can consist of one to eight pumps and of one or several PFU 2000 with up to eight pumps connected.
One PMU 2000 can operate, monitor and control pumps or PFU 2000 divided into one to eight zones.

A zone with one PFU 2000 can consist of up to four pumps. If a zone is to consist of more than four pumps, two PFU 2000 are required.

The system can also be designed as a combination of UPE Series 2000 pumps and PFU 2000 controlled pumps.

In zones of more than one pump, the pumps can be cascade-controlled and/or function as stand-by pumps.
In cascade control the performance is automatically adjusted to the system requirement by switching on/off the required number of pumps.

A stand-by pump will start only if one of the duty pumps is faulty.

PMU 2000 offers the possibility of serial communication via an RS-485 input. Communication is performed in accordance with the GRUNDFOS BUS protocol thus enabling the direct connection to a building management system or the like.

System Configuration

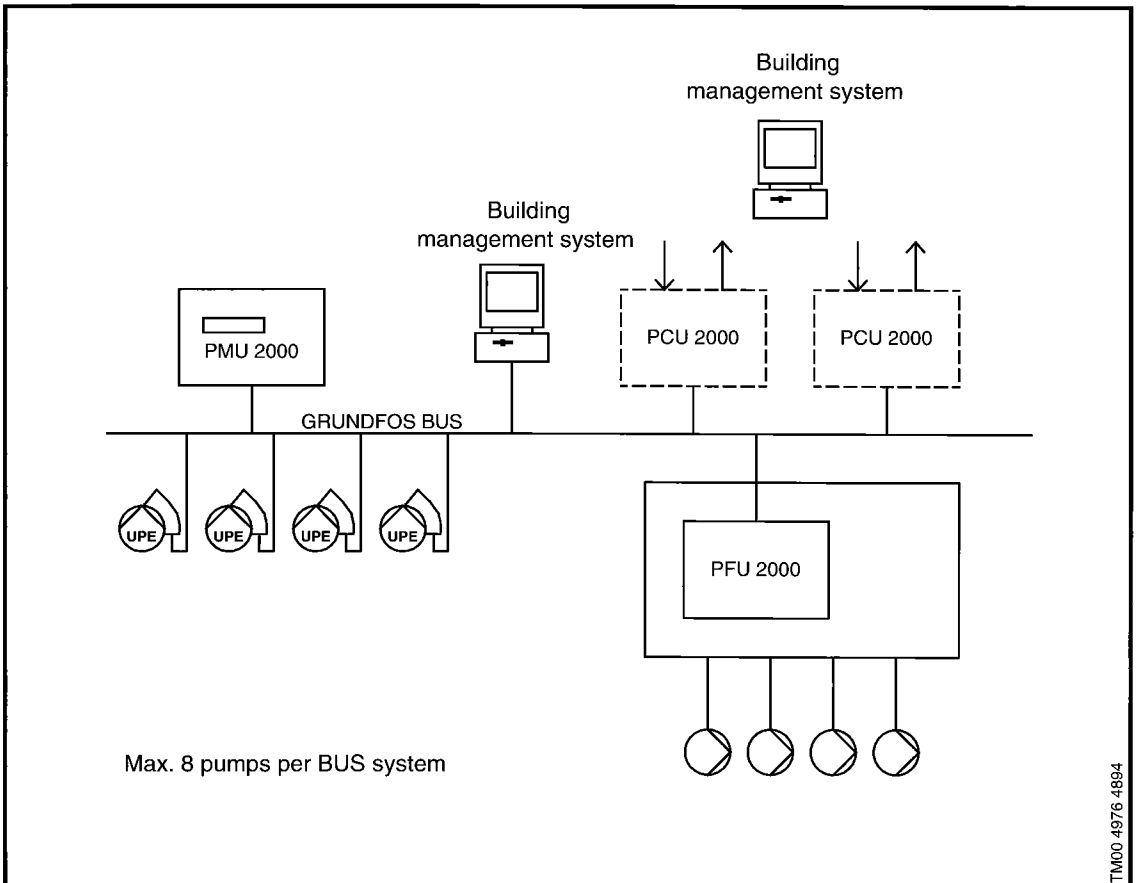


Fig. 1. System configuration

1.2 UPE Series 2000

The below table presents an overview of the various types of UPE Series 2000 pumps which can be connected to the GRUNDFOS Pump Management System 2000.

The UPE Series 2000 is a complete range of circulator pumps with integrated control of the differential pressure across the pump.

Type	Voltage	Maximum Head	BUS Module
UPE 25-60	1 x 230 - 240	6 m	MB 60
UPE 25-60 A	1 x 230 - 240	6 m	MB 60
UPE 32-60	1 x 230 - 240	6 m	MB 60
UPE 25-80	1 x 230 - 240	8 m	MB 80
UPE 32-80	1 x 230 - 240	8 m	MB 80
UPE 40-80	1 x 230 - 240	8 m	MB 80
UPE 32-120	1 x 230 - 240	12 m	
UPE 40-120	1 x 230 - 240	12 m	
UPE 50-60	1 x 230 - 240	6 m	
UPE 65-60	1 x 230 - 240	6 m	
UPE 50-120	3 x 400 - 415	12 m	
UPE 65-120	3 x 400 - 415	12 m	
UPE 80-120	3 x 400 - 415	12 m	
UPE 100-60	3 x 400 - 415	6 m	

Please note: Pump types UPE 25-60, UPE 25-60A, UPE 32-60, UPE 25-80, UPE 32-80 and UPE 40-80 should be fitted with a BUS module in order to be able to communicate with GRUNDFOS Pump Management System 2000.

It is possible to choose between different functions (control modes, operating modes and indications). The optimum combination of functions depends on the actual system.
The pump will automatically adapt its performance to the system via adjustment of the differential pressure. This results in considerable economies in pump energy consumption.

UPE Series 2000 can be controlled/operated:

- via the pump control panel,
- by means of R100,
- via BUS (PMU 2000, PCU 2000),
- via external signals.

Functions	Settings/Readings on/via				
	Pump	R100	BUS		External Signal to Pump
			PMU 2000	PCU 2000	
Constant pressure	+	+	+		
Proportional pressure*	+	+	+		
Head	+	+	+	+	
Start/stop	+	+	+	+	+
Max. curve*	+	+	+		+
Min. curve*	+	+	+	+	+
Temperature influence*		+	+		
Constant curve		+	+		
Parallel operation			+		
Clock program			+		
Operating indication	+	+	+	+	
Fault indication	+	+	+	+	+

Please note: For the pump types UPE 32-120, UPE 40-120, UPE 50-60 and UPE 65-60 setting of the *-marked functions will not be possible until early 1995.
See also Installation and Operating Instructions for the relevant pump.

Setting by means of R100

In order to identify the individual pumps in PMU 2000, the pumps should be numbered continuously from 1 through 8. This is done by means of R100.

Priority of Settings

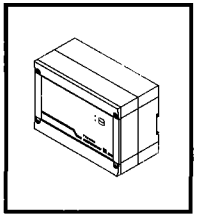
The forced-control signals will influence the settings available on the pump.
The pump can always be set to operation according to max. curve or to stop by means of the pump control panel or R100.
If several functions are activated simultaneously, the pump will run in accordance with the highest ranking function.
The priority assigned to the different settings in the different operating modes appears from the following table.

Priority	Possible Settings		
	Control Panel on Pump or R100	External Signals	BUS-Signal
1	Stop		
2	Max. curve		
3		Stop	Stop
4		Max. curve	Max. curve
5		Min. curve	Min. curve
6			Head

Example: If, via an external signal, the pump has been forced to max. curve operation, the control panel or R100 can only set the pump to stop.

If, via PMU 2000, the pump is set to "local" operation, the pump will run in accordance with the values set on the pump or the values set by means of R100. In case of "local" operation, the pump is not controlled via PMU 2000.

1.3 PFU 2000



PFU 2000 is used for the control and monitoring of pump systems consisting of one to eight pumps. PFU 2000 controls the performance of the system on the basis of the selected control parameter (e.g. pressure) by switching the pumps on/off and/or by adjusting the speed of one or more of the pumps.

PFU 2000 is not sold as a separate product. Together with other components it forms a complete pump management system.

PFU 2000 is primarily used for pump systems within:

- Water supply and pressure boosting.
- Heating, air-conditioning and ventilation.

In systems incorporating PFU 2000 and PMU 2000, control can be performed on the basis of the following control parameters:

- Pressure
- Differential pressure
- Flow
- Level
- Differential temperature
- Flow-pipe temperature
- Return-pipe temperature
- Open Loop

The following applies to all control parameters:

- Only one control zone per PFU 2000
- One PFU 2000 can control up to four pumps.

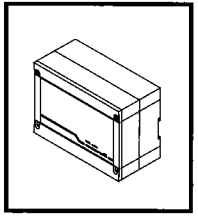
If two PFU 2000 in the same zone are connected to the GRUNDFOS BUS, up to eight pumps can be controlled.

Systems incorporating PFU 2000 can be operated, monitored and remote-controlled via PMU 2000 allowing night-time duty, start/stop of pumps, setting of setpoints and a number of other operating parameters to be set via PMU 2000.
At the same time, the operating condition of the system can be read in the PMU 2000 display.

Setting of PFU 2000

Please refer to the enclosed description of the system.

1.4 PCU 2000



PCU 2000 is used as the communication unit between the units in the GRUNDFOS Pump Management System 2000 and an external control and monitoring system.

PCU 2000 has three potential-free relay outputs for each pump for "Operation", "Alarm" and "Local", respectively.
PCU 2000 also has a digital output for external start/stop and an analog DC 0-10 V input for the remote-control of setpoints and/or the activation of the night-time duty function.

Two pumps can be connected to PCU 2000. If more than two pumps have to be connected, an expansion module can be fitted to enable the connection of two additional pumps. In systems with more than four pumps, two PCU 2000 are required.

2. Installation

No special tools are required for the installation of PMU 2000.

PMU 2000 is available in two designs.

IP 42: Enclosed version with cabinet for wall-mounting on DIN-rail.

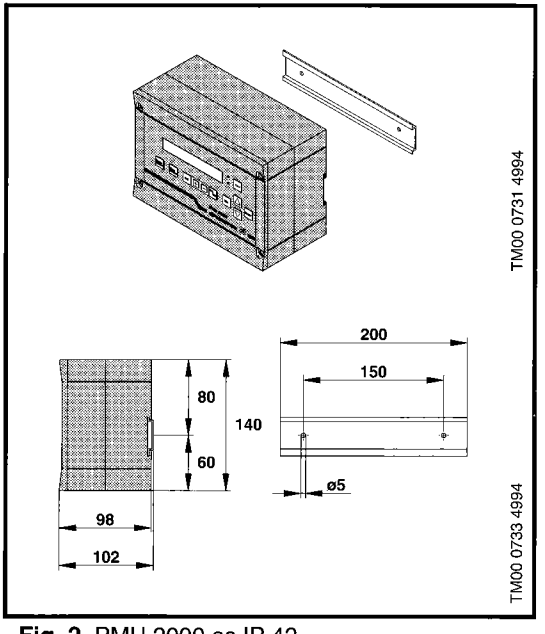


Fig. 2. PMU 2000 as IP 42

IP 00: Built-in version for panel-mounting. Enclosure class of front panel: IP 54.

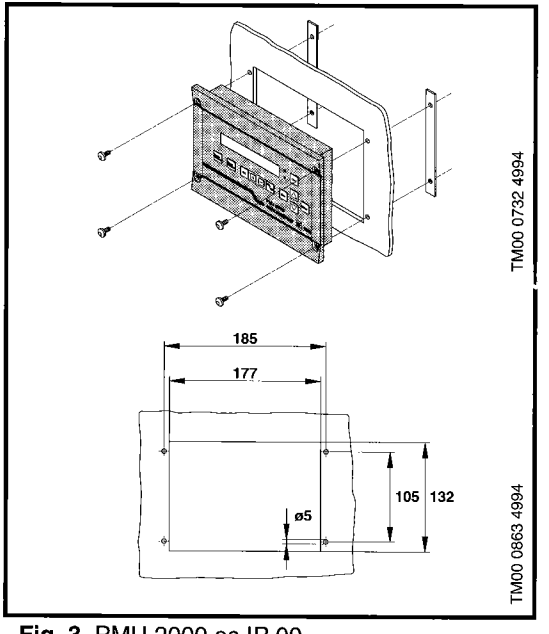


Fig. 3. PMU 2000 as IP 00

3. Electrical Connection

The electrical connection should be carried out in accordance with local regulations.

Before making any connections in PMU 2000 make sure the electricity supply has been switched off.

Make sure also to switch off any electricity supplied from external systems.

Check that the supply voltage and the frequency correspond to the specifications on the nameplate.

All cables should be connected via plug terminal blocks.

4. Wiring Diagrams

4.1 Power Supply

Connect the power supply, 1 x 230-240 V + 6 %/–10%, 50Hz, PE as shown in fig. 4.

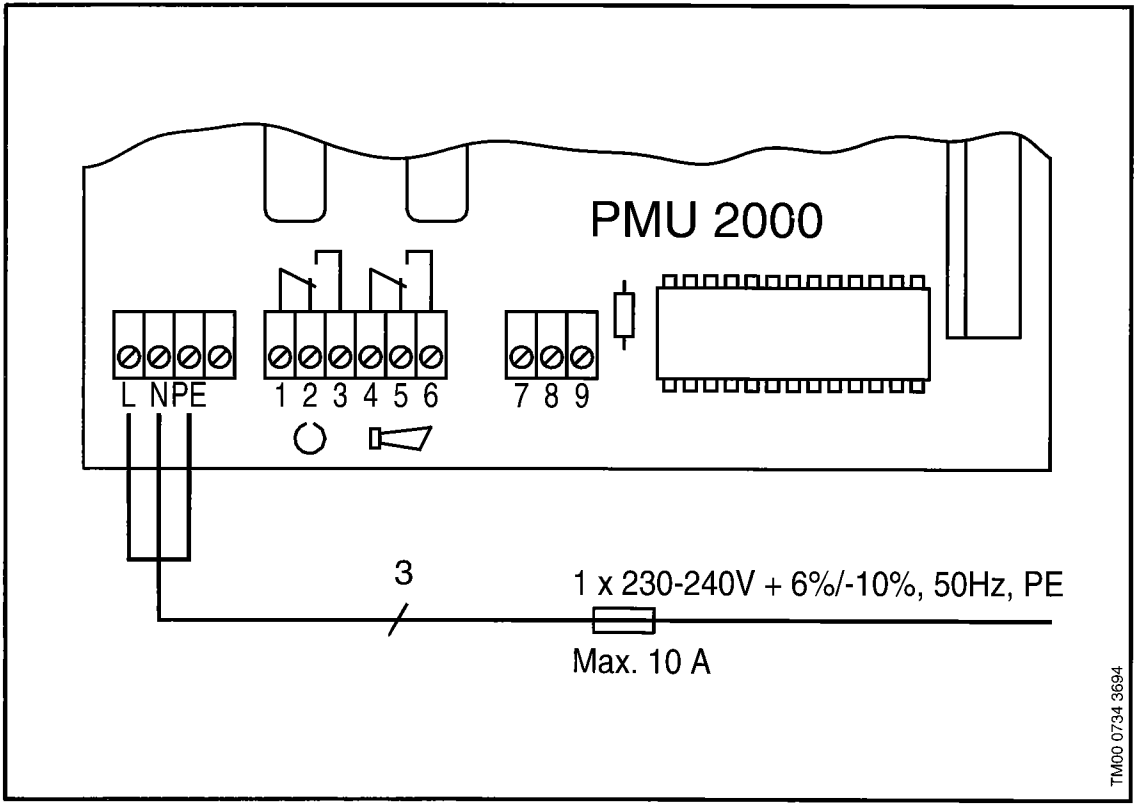


Fig. 4. Power supply

4.2 Operating and Fault Signal Outputs

Connect an external signal transmitter/building management system to the potential-free change-over contacts as shown in fig. 5.

Max. contact load:
250 V/2 A. AC1.

Min. contact load:
DC 5 V/1 mA.

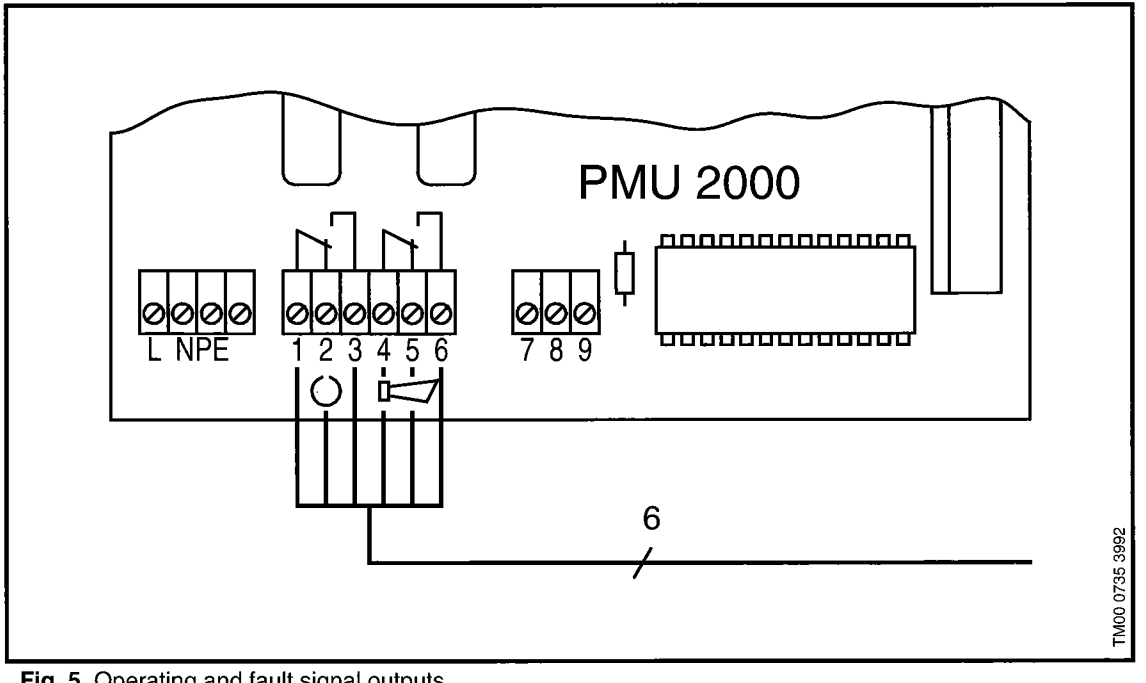


Fig. 5. Operating and fault signal outputs

4.3 Pump Management System 2000

Communication Cable

Connect the communication cable (BUS) to the other units of Pump Management System 2000 as indicated in fig. 6 or 7.

Use a screened cable.

Cross section: Min. 0.25 mm^2
Max. 1.0 mm^2

Total length within the entire Pump Management System 2000: max. 500 m.

The communication cable to the different units can be connected as follows:

- Connect the communication cable from unit to unit.
- Connect the communication cable via a junction box.

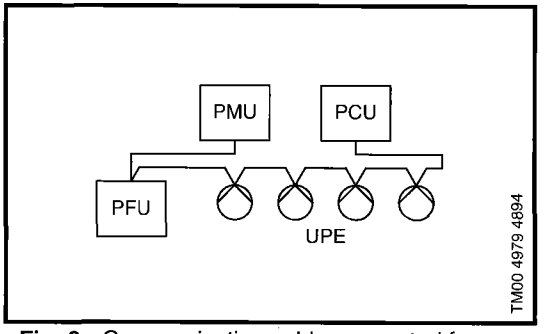


Fig. 6. Communication cable connected from unit to unit

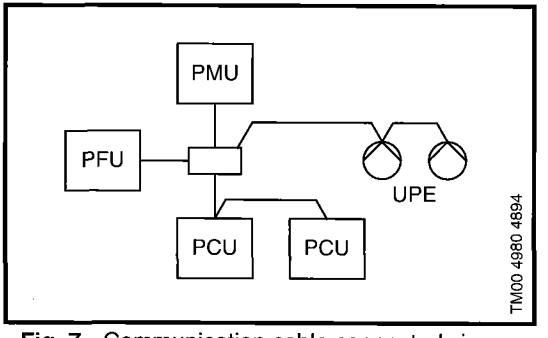


Fig. 7. Communication cable connected via a junction box

Communication Cable

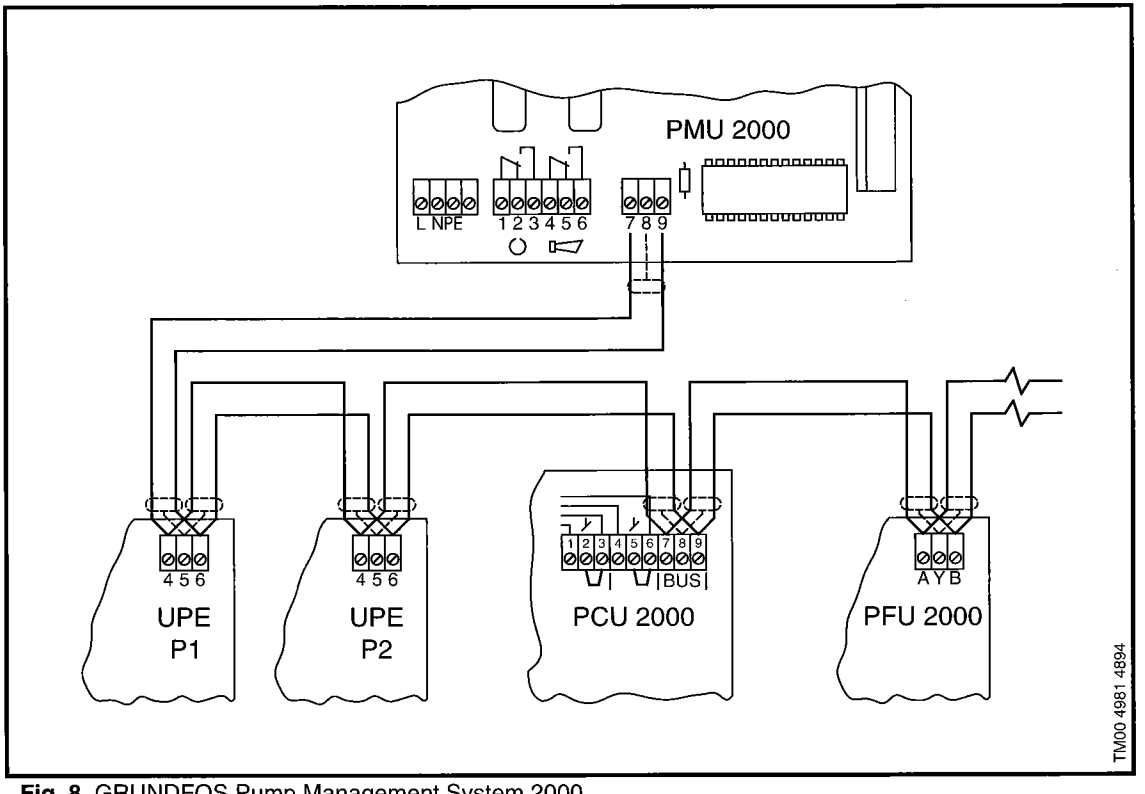


Fig. 8. GRUNDFOS Pump Management System 2000

5. Operation

5.1 Front Cover

The PMU 2000 front cover incorporates the following:

- 2 x 24 character LCD-display.
- Indicator lights for operating and fault indications (green and red light-emitting diodes).
- Operating buttons enabling the operator to
  - go direct to the desired menu,
  - move around in the menu,
  - set the operating parameters of the system,
  - store settings and reset indications.

For additional information, see figs. 9 and 10.

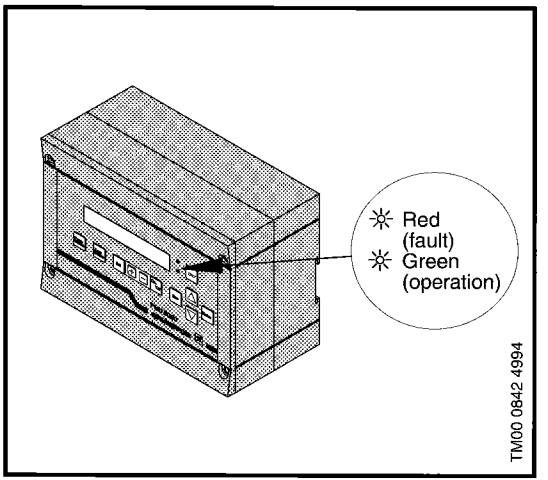


Fig. 9. PMU 2000 with indicator lights for operating and fault indications

5.2 Explanation to the Front Cover Operating Buttons

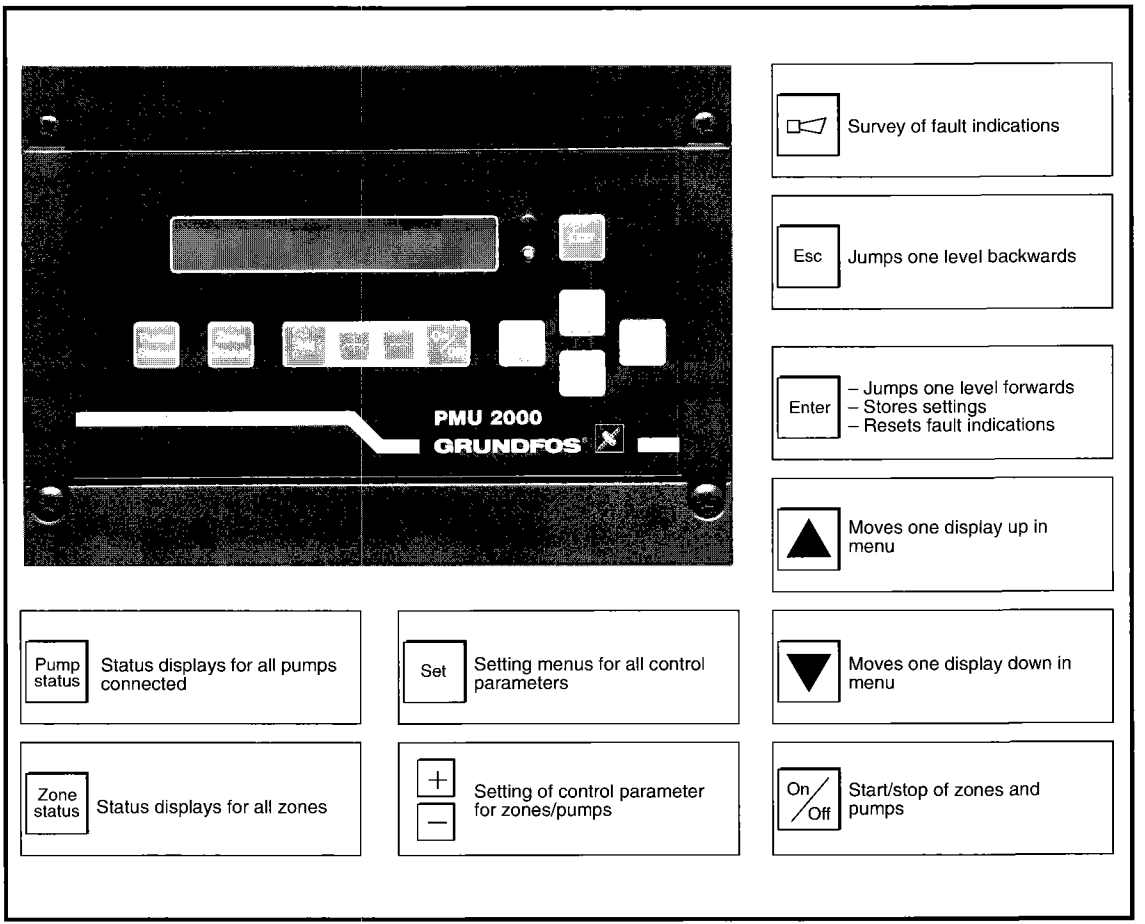


Fig. 10. Front cover operating buttons

5.3 Menu Structure

"Menu"

PMU 2000 is operated via a number of "menus": Basic Menu, Setting Menu, Start/Stop Menu, Zone Status Menu, Pump Status Menu and Fault Indication Menu.

The individual menu is selected by means of the relevant operating button. Fig. 10.

The displays which can be called up under the individual menus depend on:

- the units incorporated in the system,
- the presetting selected in the Basic Menu.

Each menu can have displays at up to three levels.

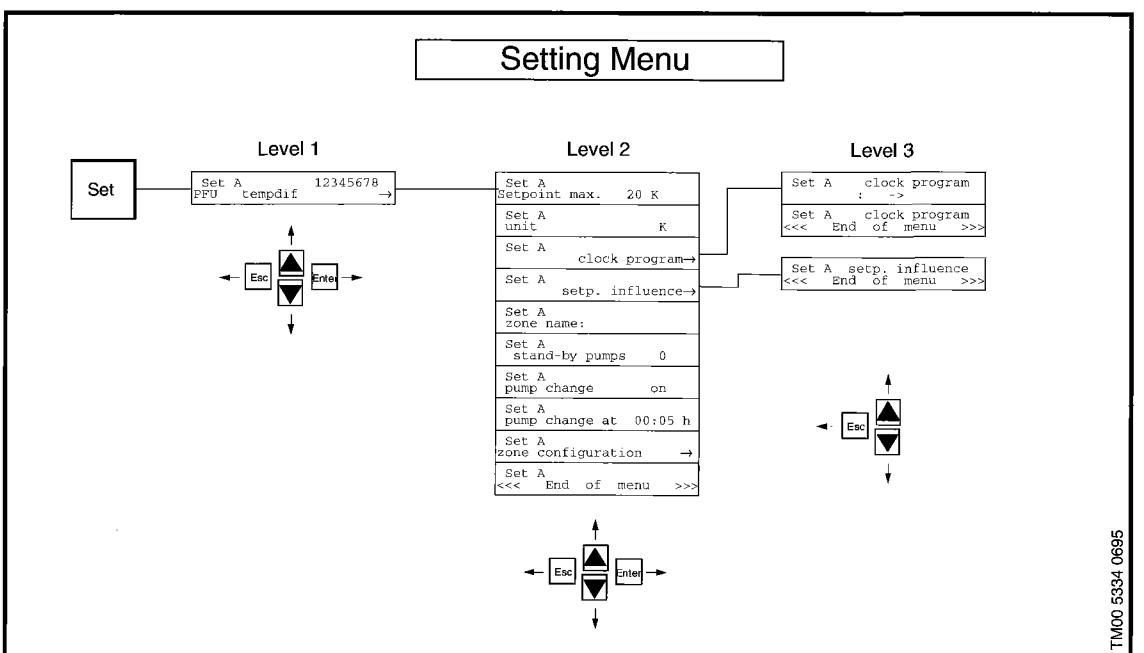


Fig. 11. Example of Setting Menu

5.4 Operating Buttons

The operating buttons of PMU 2000 have the following functions:

Setting Menu

At level 1 select the required zone.
At levels 2 and 3 set the values or parameters for the zone selected.

Start/Stop Menu

This is where a zone or pump is switched on/off.

It is also possible to select "**local**" or "**MAX**".

Zone Status Menu

Only the status displays for the current operating condition of the zone are displayed.

The zone for which the status is required is selected at level 1.
All data for that zone can be viewed at levels 2 and 3.

Pump Status Menu

Only the status displays for the current operating condition of the pump are displayed.

The pump for which the status is required is selected at level 1.
All data for that pump can be viewed at levels 2 and 3.

Fault Indication Menu

The last 10, non-reset fault indications can be viewed here, distributed by time of occurrence. The latest fault indication appears first.

Once the fault has been remedied, reset by pressing "**Enter**".

Remember: Pressing a "menu" button will take you straight to the relevant menu no matter which menu you are in.

Up or down in the menus

It is possible to move up or down within the menus by pressing "▲" or " ▼ ".

Example:

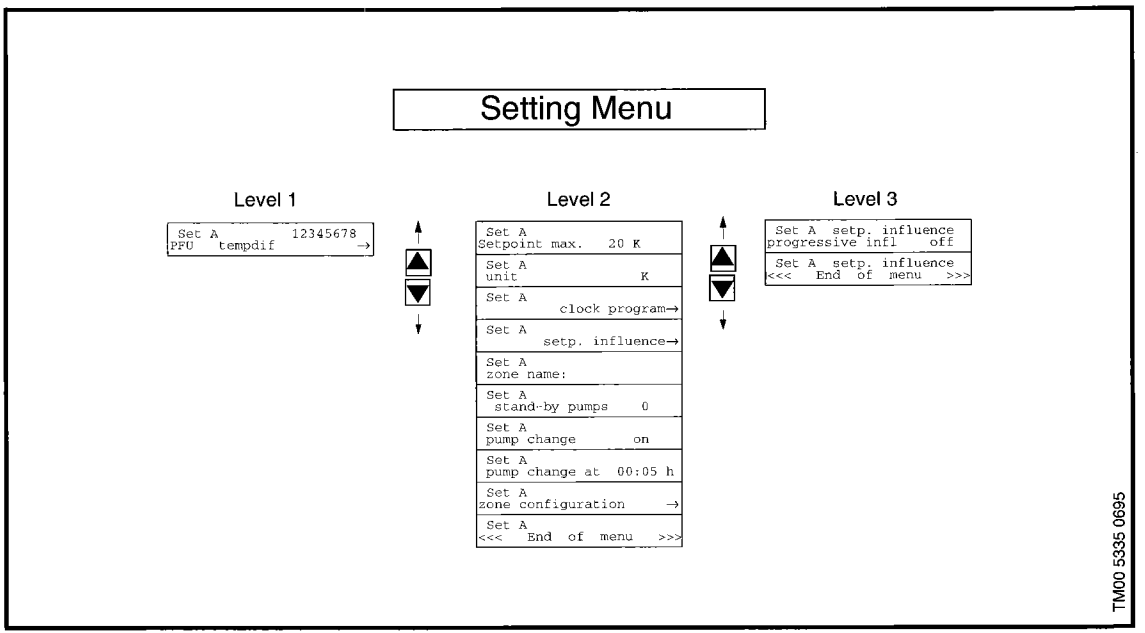


Fig. 12. Moving up or down

Enter

Enter

An → appears to the right in some of the displays. This means that levels 2 or 3 can be reached by pressing "**Enter**".
Please note: The Enter-button is also used to store values which have been set and to reset fault indications. Please see the following examples.

Example:

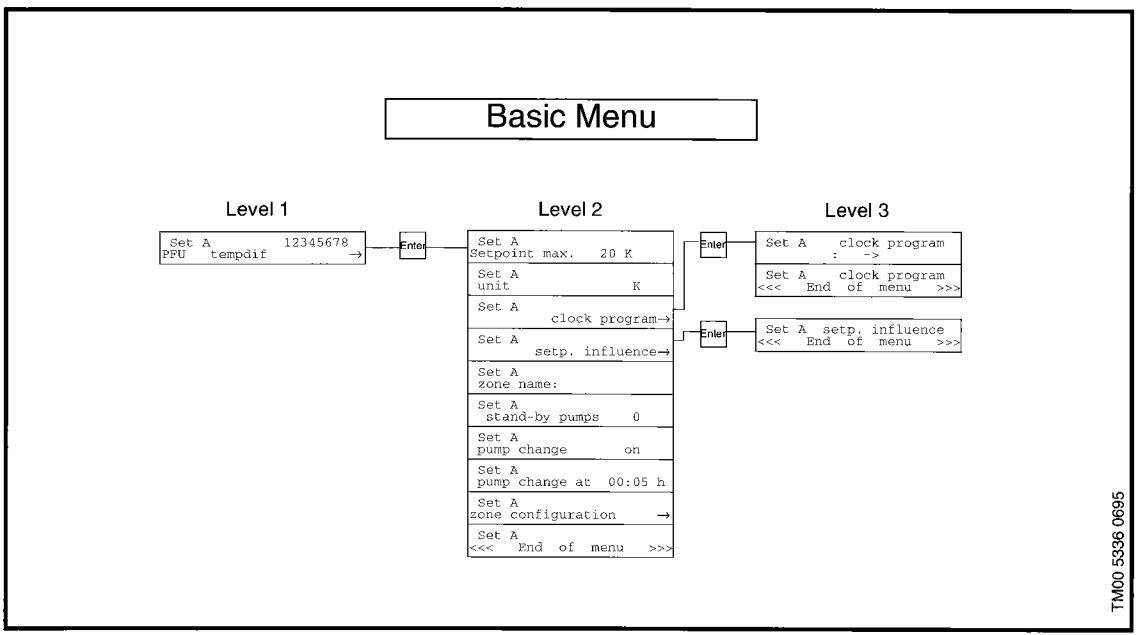


Fig. 13. Function of Enter-button

Esc Press “Esc” and jump back to levels 2, 1 or right back to status display no. 100 in the Basic Menu.

Example:

Esc

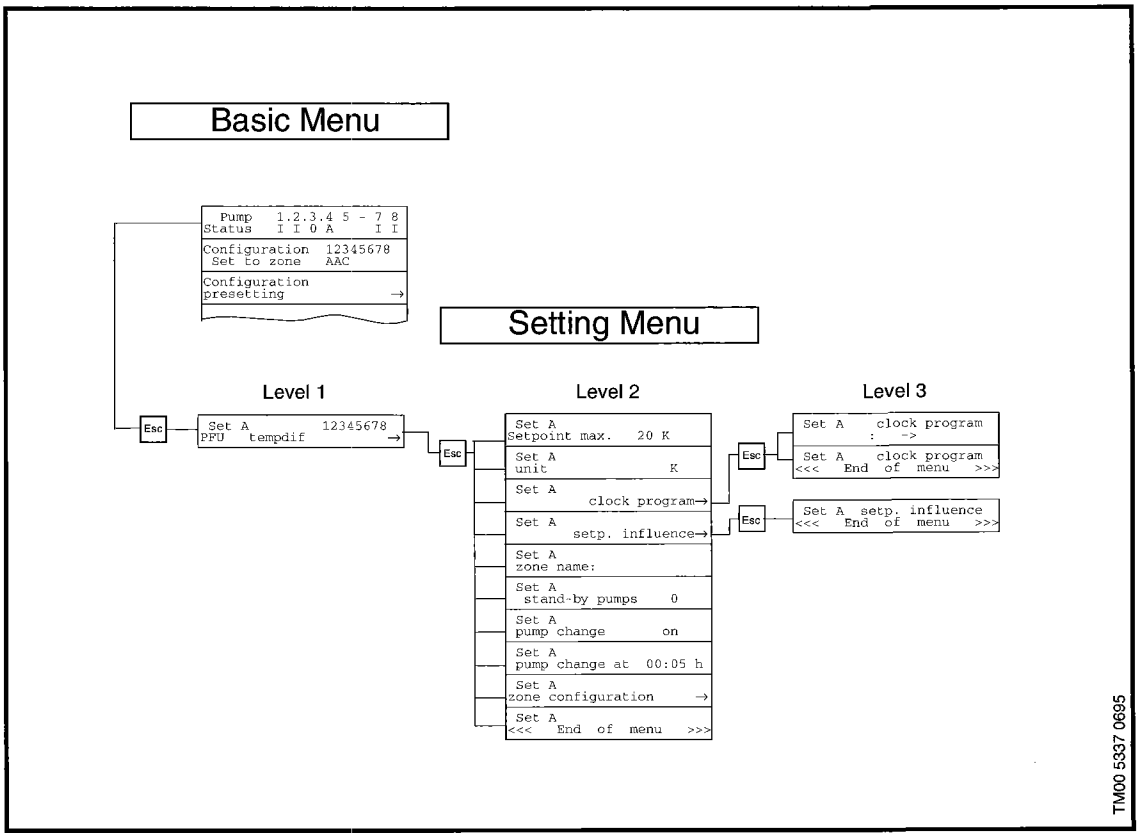


Fig. 14. Function of Esc-button

Plus and Minus

In the displays with a flashing cursor, a value or parameter may be changed. Press "**+**" or "**–**" to set, and then "**Enter**" to store.

Example:

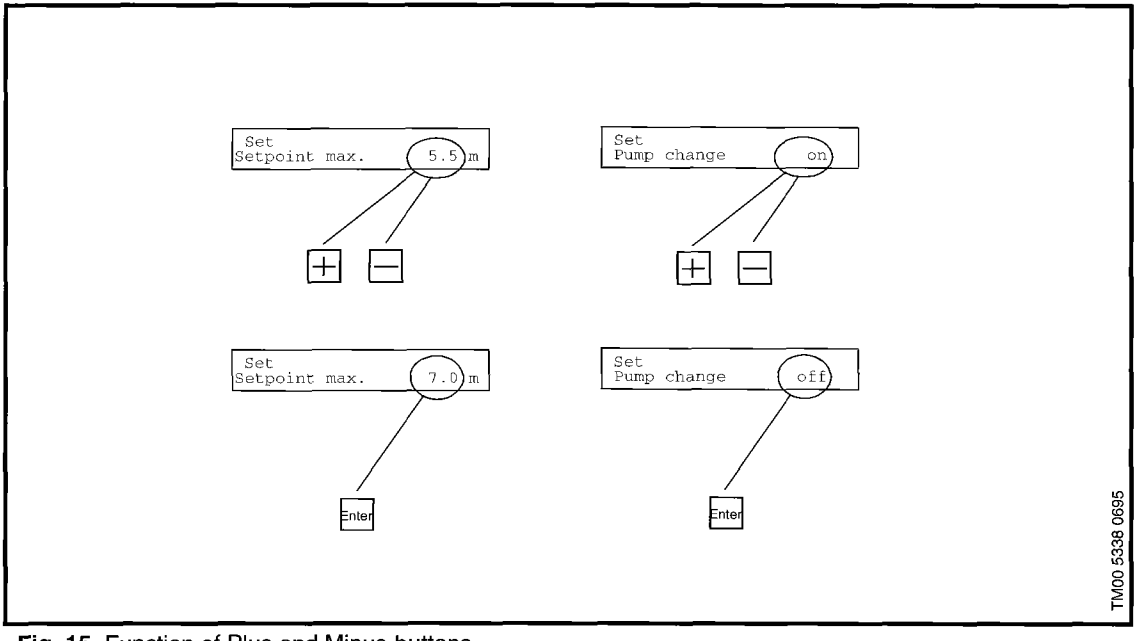


Fig. 15. Function of Plus and Minus-buttons

Plus and Minus

In the displays where more than one value or parameter can be changed, press "**+**" or "**–**" once. The first adjustable value or parameter will then flash. If this setting is to be changed, press "**+**" or "**–**" to change and "**Enter**" to store.
If no setting is required, press "**Enter**" to store and jump to the next adjustable value or parameter.

Example:

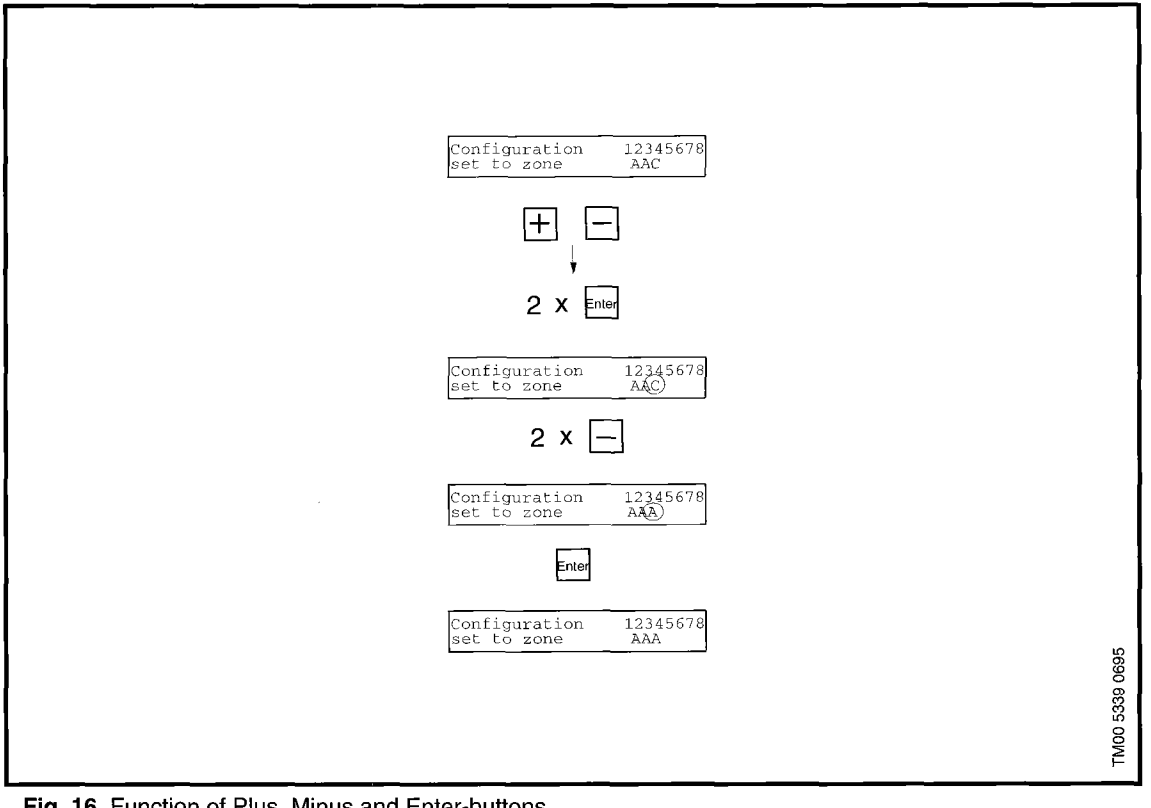
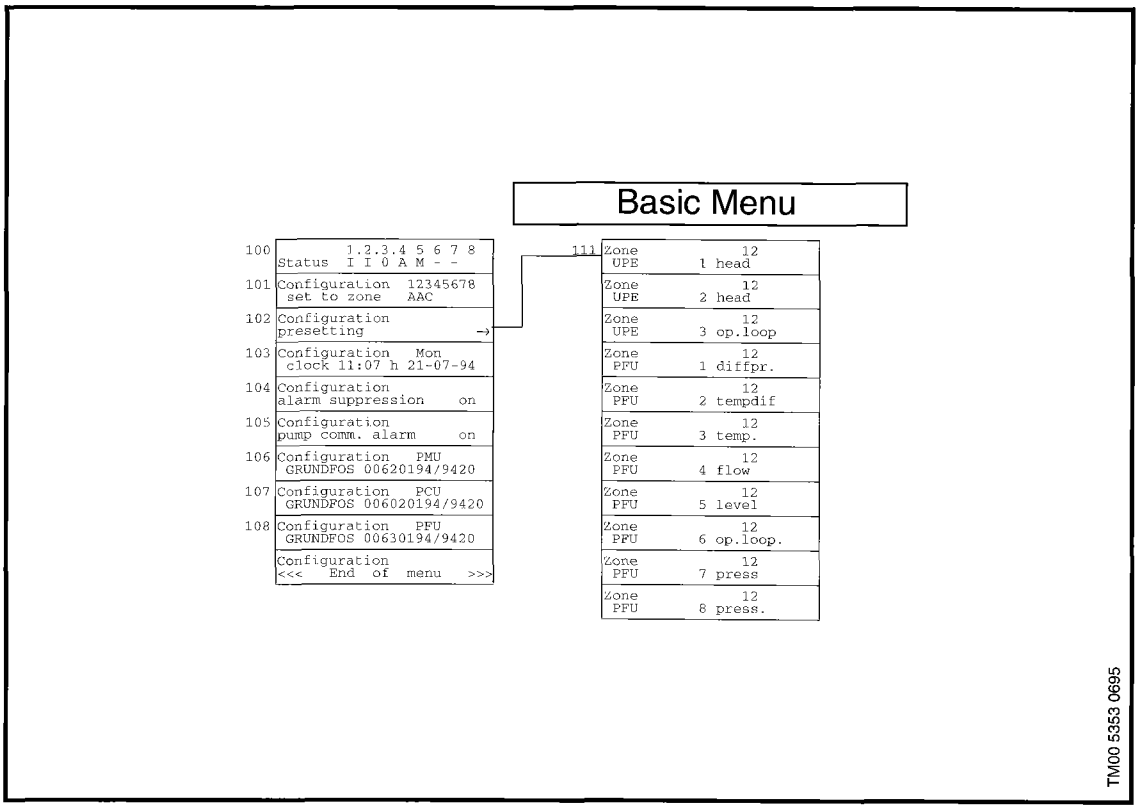


Fig. 16. Function of Plus, Minus and Enter-buttons

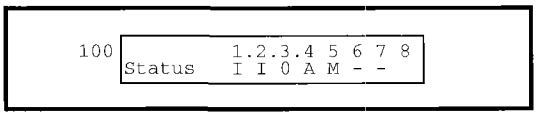
6. Basic Menu

6.1 Structure of Basic Menu



100

Status display



This is the first display that appears when PMU 2000 is switched on.

The display indicates:

- which pumps are connected to PMU 2000,
- which pumps are running, switched off, or whether any of the pumps are faulty.

By pressing "**Esc**" repeatedly, you can always return to this display.
If PMU 2000 is not operated for 15 min., it will automatically return to this display.

The display indicates the following:

Pumps 1 and 2 are running **[I]**.

Pump 3 is not running **[O]**.

Fault indication **[A]** on pump 4.
The fault can be identified under "Fault Indication Menu".

Pump 5 is set to "MAX".

Pumps 6 and 7 are allocated to a zone **[–];** but they have not yet been connected to PMU 2000 or the electricity supply to the pump was never switched on.

Pump 8 has not been allocated to any zone **[ ]**.

A point . between two pump numbers indicates that these pumps have been connected to a PCU 2000.

The display indicates that pumps 1, 2, 3, and 4 have been connected to a PCU 2000.

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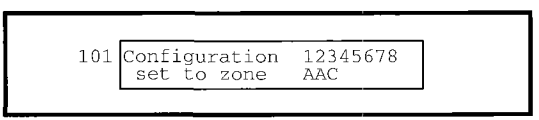
Allocation to zone



All pumps controlled by PMU 2000 must be allocated to a zone.

For each individual pump, make sure that the correct zone has been set. Pumps within the same zone should carry the same zone letter.
Pumps not used in the system should be set to "–".

Press "**+**" or "–" until the required zone letter or **[–]** appears.
Press "**Enter**" to store and to continue to the next setting.

Repeat this procedure for all eight fields.

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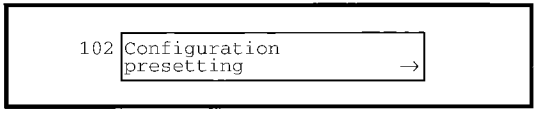
Presetting



The PMU 2000 default value is zone type UPE with control parameter head (control mode proportional pressure) without preset clock program.

If a different presetting is required, press "**Enter**" to jump to display no. 111.

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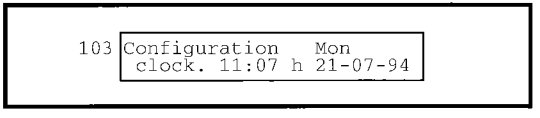
Day, time and date (day-month-year)



This is where the day of the week, time and date are set.

Press "**+**" or "**–**" to set, and "**Enter**" to store, until the day, time and date are correct.

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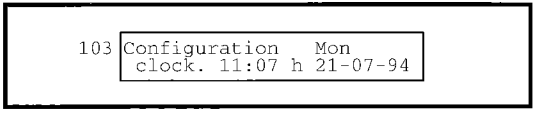
Suppression of alarm



The alarm output of PMU 2000 will normally be active when the red indicator light is on.

If alarm suppression is selected, the alarm output can be put out of operation for 15 min. by pressing one of the keys on PMU 2000.

If the fault has not been remedied, the alarm output will again become active after 15 min.

[on] The alarm output is suppressed for 15 min. by pressing one of the keys on PMU 2000.
[off] The alarm output is active when the red indicator light is on.

Press "**+**" or "**–**" to set and "**Enter**" to store.

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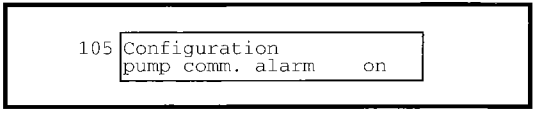
Pump communication



In certain cases, it may be expedient to stop some of the pumps by switching off the electricity supply. This will normally - as is the case for communication faults between PMU 2000 and the pump - cause a fault indication.

If "**off**" is selected in "pump comm. alarm", PMU 2000 will not indicate any communication faults.

[on] PMU 2000 will indicate a communication fault.
[off] PMU 2000 will not indicate a communication fault.

Press "**+**" or "**–**" to set and "**Enter**" to store.

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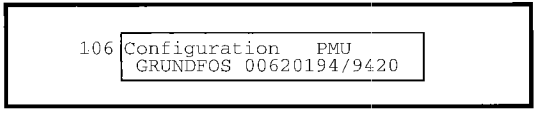
PMU identification



The display indicates the software identification number of the specific PMU 2000.

Please state this number if GRUNDFOS is contacted for service.

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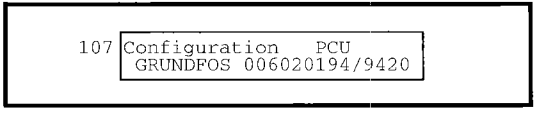
PCU identification



If a PCU 2000 has been connected, this display indicates the software identification number of the PCU 2000 to which pumps 1, 2, 3 and 4 are connected.

Please state this number if GRUNDFOS is contacted for service.

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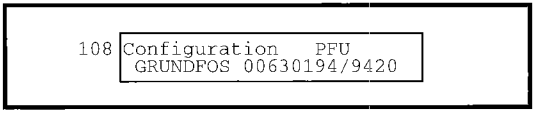
PFU identification

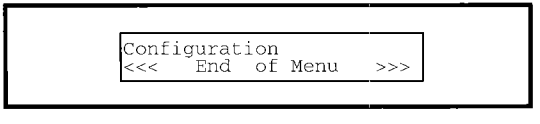


If a PFU 2000 has been connected, this display indicates the software identification number of the PFU 2000.

Please state this number if GRUNDFOS is contacted for service.

End of menu

End of menu



All possible settings for the zone have now been made.

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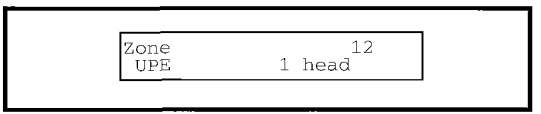
Presetting

Only to be used for other zone types than UPE, control parameter head without preset clock program.



The zone types and control parameters with relevant default values are selected via the presetting. The default values can subsequently be adapted in the "Setting Menu".

The top line indicates the zone in question and the pump number connected to it.

The zone type to which the system belongs and the control parameter according to which it is to operate are set in the bottom line.

The following pages give an overview of possible control parameters and examples of their relevant default values.

The display overview belonging to the selected presetting also gives a full overview of all the possible displays.

If the zone type is UPE, control can be performed in accordance with the following parameters:

1. Head without preset clock program
2. Head with preset clock program
3. Open loop without preset clock program

If the zone type is PFU, control can be performed in accordance with the following parameters:

1. Differential pressure
2. Differential temperature
3. Flow-pipe and return-pipe temperatures
4. Flow
5. Level
6. Open loop
7. Pressure
8. Pressure with pre-pressure measuring

Head without preset clock program

Typical application: Heating system.

Control parameter	Head 0 - Hmax. *
Setpoint max.	50% of Hmax.*
Proportional influence	50%

*Hmax. is max. head of the individual UPE Series 2000 pump.

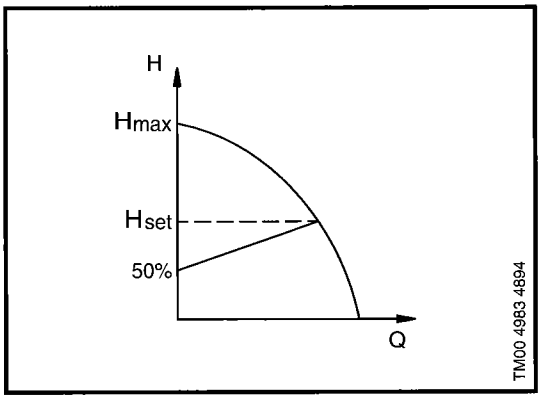


Fig. 17. Proportional influence

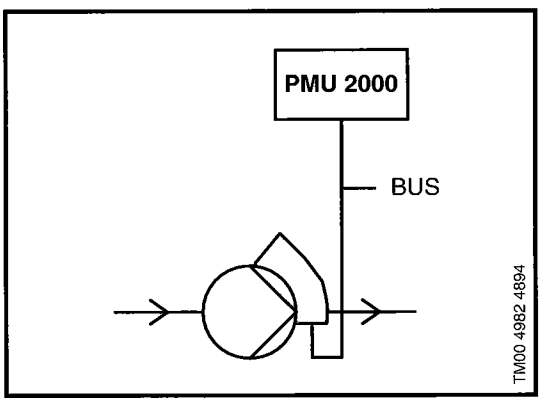


Fig. 18. UPE head

Head with preset clock program

Typical application: Heating system.

Control parameter	Head 0 - Hmax.*
Setpoint max.	50% of Hmax.*
Proportional influence	50%
Clock program set to	• 06.00 = switch to setpoint max. for the zone. • 22.00 = switch to min. curve for the zone.

*Hmax. is max. head of the individual UPE Series 2000 pump.

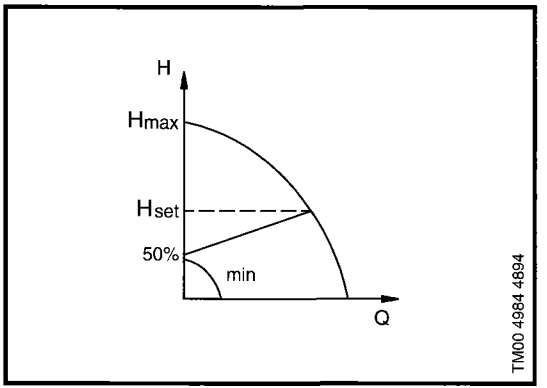


Fig. 19. Proportional influence

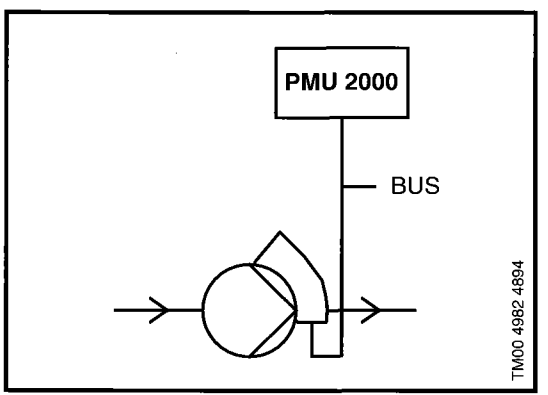


Fig. 20. UPE head

Open loop without preset clock program

Typical application: Heating system.

Control parameter	Open loop 0 - 100%
Setpoint max.	100%

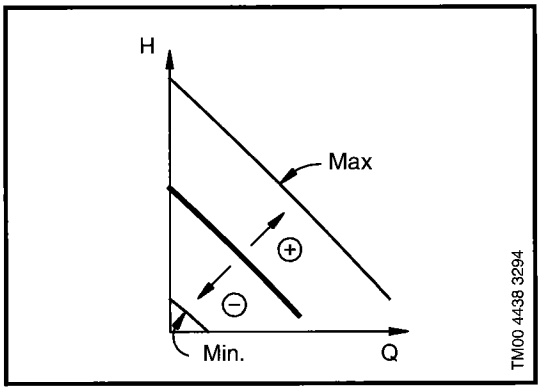


Fig. 21. Constant curve duty

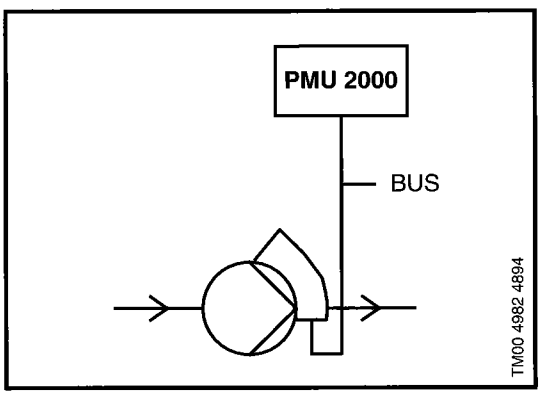


Fig. 22. UPE open loop

PFU 1

Differential pressure

Typical application: Large heating, air-conditioning and ventilating systems in which a constant differential pressure is required.

Control parameter	Differential pressure 0 - 25 m
Setpoint max.	12.5 m
System time constant	2 sec.
Min. switching time	5 sec.
Signal transmitter setting (input 1)	0-20 mA/0-25 m
Max. limit	25 m
Min. limit	0 m

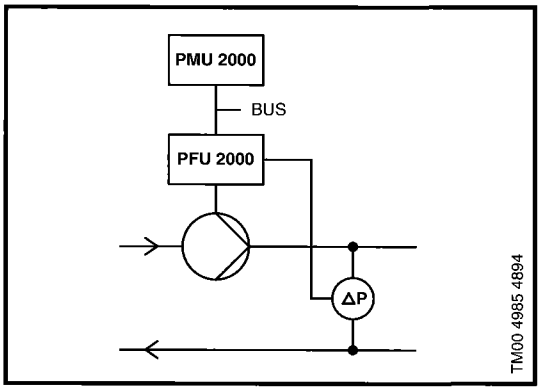


Fig. 23. Differential pressure

PFU 2

Differential temperature

Typical application: Large heating, air-conditioning and ventilating systems in which a constant differential temperature is required.

Control parameter	Differential temperature 0 - 100 K (100°C)
Setpoint max.	20 K (20°C)
System time constant	50 sec.
Min. switching time	10.0 sec.
Control function	Inverted
Signal transmitter setting, flow pipe (input 1))	NTC 150 / 0-150°C
Signal transmitter setting, return pipe (input 2)	NTC 150 / 0-150°C
Max. limit	100 K (100°C)
Min. limit	0 K (0°C)

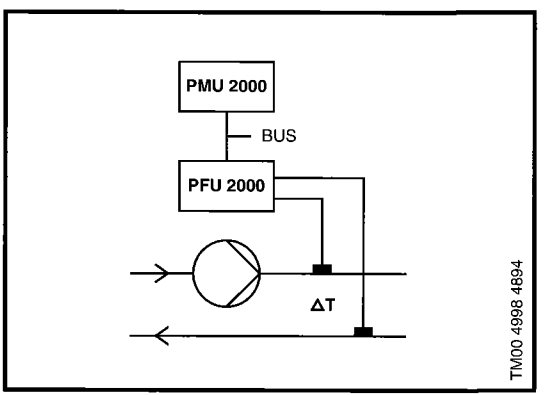


Fig. 24. Differential temperature

Temperature

Typical application: Large heating, air-conditioning and ventilating systems in which constant flow-pipe and return-pipe temperatures are required.

Control parameter	Temperature 0 - 100°C
Setpoint max.	50°C
System time constant	50 sec.
Min. switching time	10,0 sec.
P-band	10 K (10°C)
Control function	Normal
Signal transmitter setting, flow or return pipe (input 1)	NTC 150 / 0-150°C
Max. limit	100°C
Min. limit	0°C

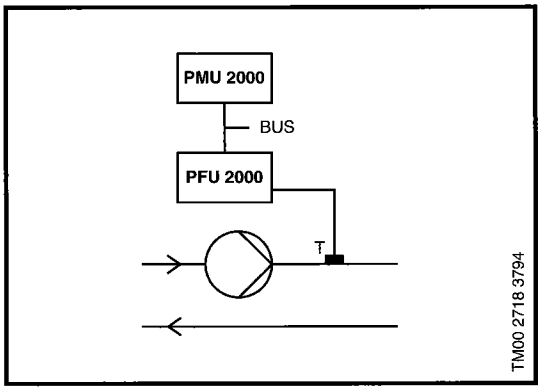


Fig. 25. Flow-pipe temperature

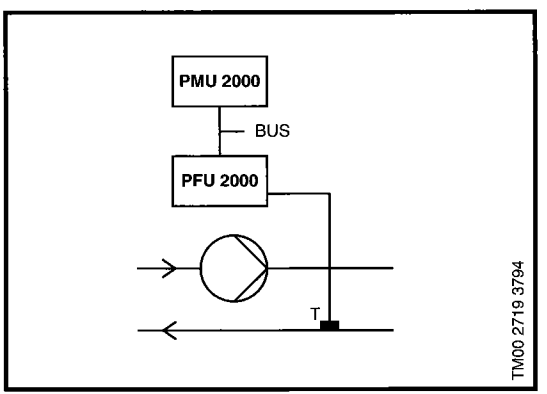


Fig. 26. Return-pipe temperature

PFU 4

Flow

Typical application: Systems for the processing industry where a constant flow is required.

Control parameter	Flow 0 - 100 m^3/h
Setpoint max.	50 m^3/h
System time constant	2 sec.
Min. switching time	5 sec.
Signal transmitter setting (input 1)	0-20 mA/ 0-100 m^3/h
Max. limit	100 m^3/h
Min. limit	0 m^3/h

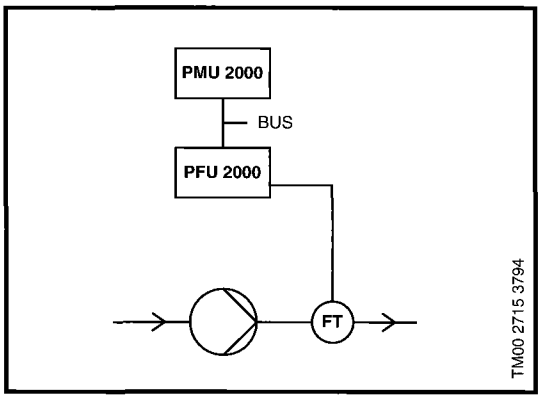


Fig. 27. Flow

PFU 5

Level

Typical application: Pump system for the filling of a container in which a constant water level is required.

Control parameter	Level, 0 - 10 m
Setpoint max.	10 m
System time constant	2 sec.
Min. switching time	5 sec.
Control function	Normal
Signal transmitter setting (input 1)	0-20 mA/ 0-10 m
Max. limit	10 m
Min. limit	0 m

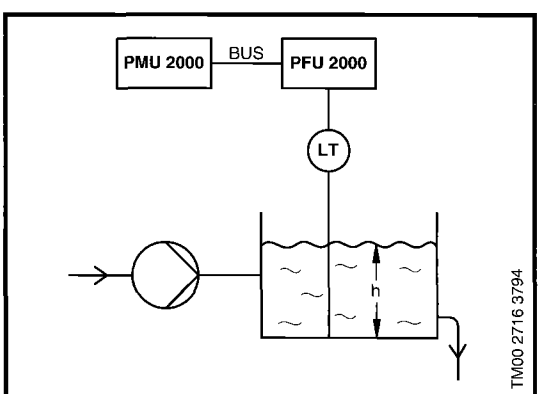


Fig. 28. Level

PFU 6

Open loop

Typical application: System requiring a simple pump performance control.

Control parameter	Open loop 0 - 100%
Setpoint max.	100%
System time constant	2 sec.
Min. switching time	5 sec.

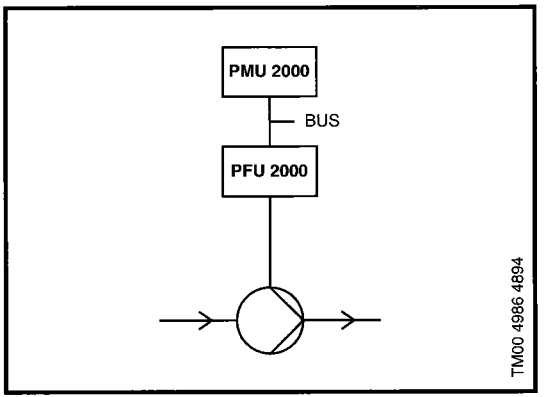


Fig. 29. Open loop

PFU 7

Pressure

Typical application: Water supply and pressure boosting systems in which a constant pressure is required.

Control parameter	Pressure 0 - 10 bar
Setpoint max.	5 bar
System time constant	2 sec.
Min. switching time	5 sec.
Signal transmitter setting (input 1)	4-20 mA / 0-10 bar
Max. limit	10 bar
Min. limit	0 bar

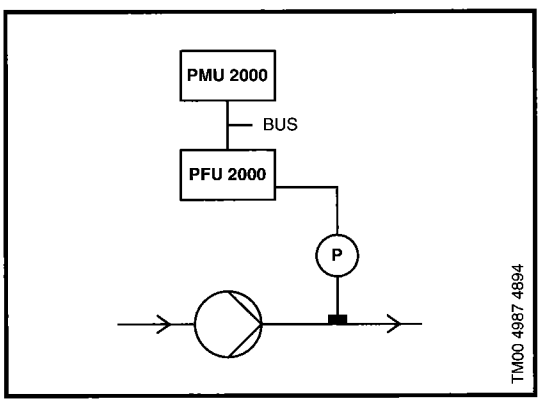


Fig. 30. Pressure

Pressure with pre-pressure measuring

Typical application: Water supply and pressure boosting systems - typically with pre-pressure/inlet pressure - in which a constant pressure is required.

Control parameter	Pressure with pre-pressure measuring 0 - 10 bar
Setpoint max.	5 bar
System time constant	2 sec.
Min. switching time	5 sec.
Signal transmitter setting (input 1)	4-20 mA / 0-10 bar
Signal transmitter setting (input 2)	4-20 mA / 0-10 bar
Max. limit	10 bar
Min. limit	0 bar
Min. pre-pressure	0 bar

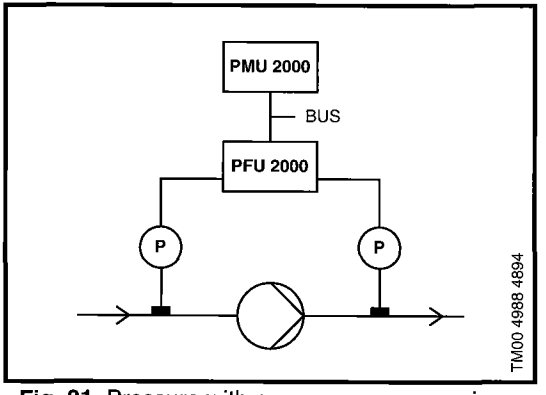
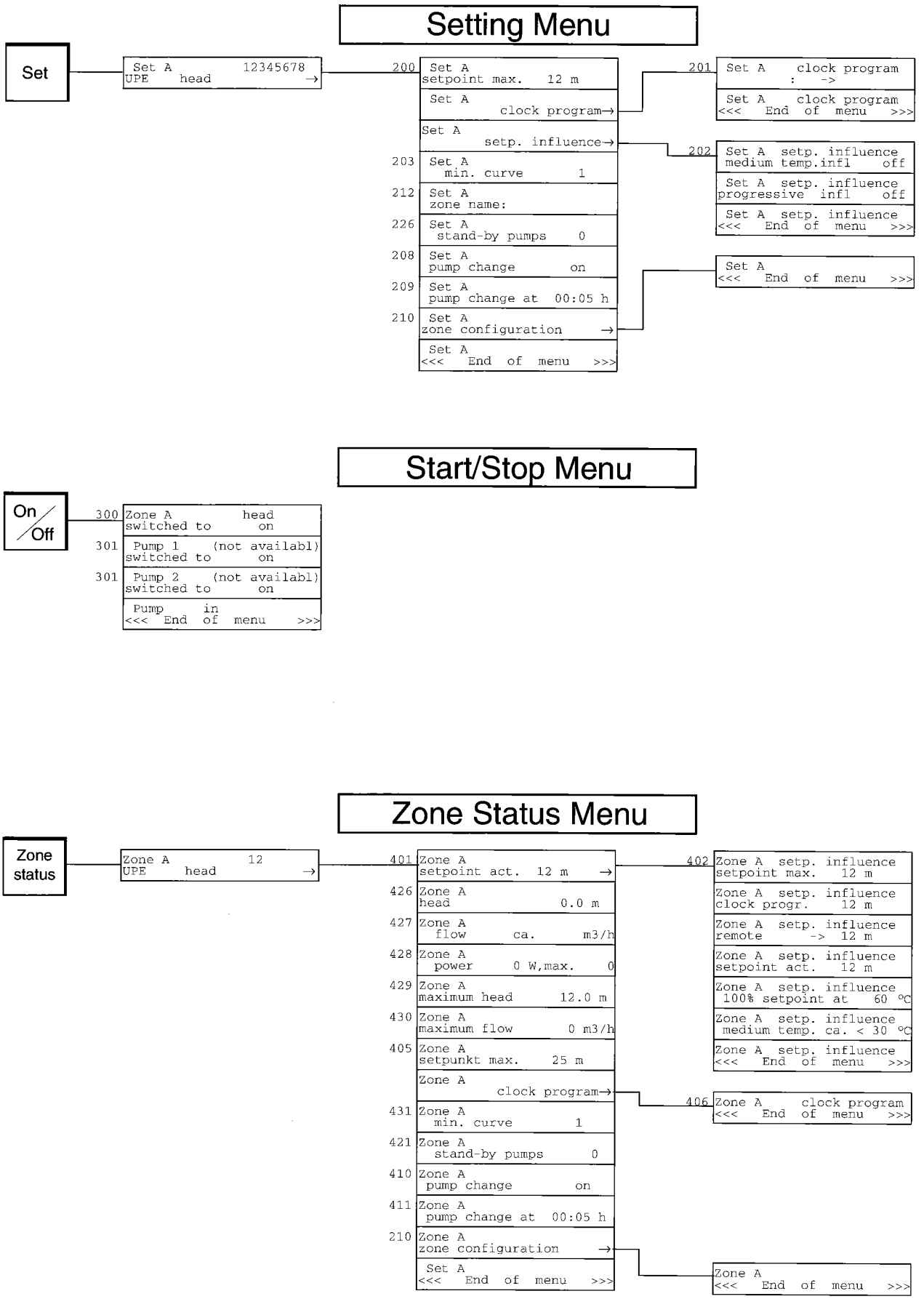


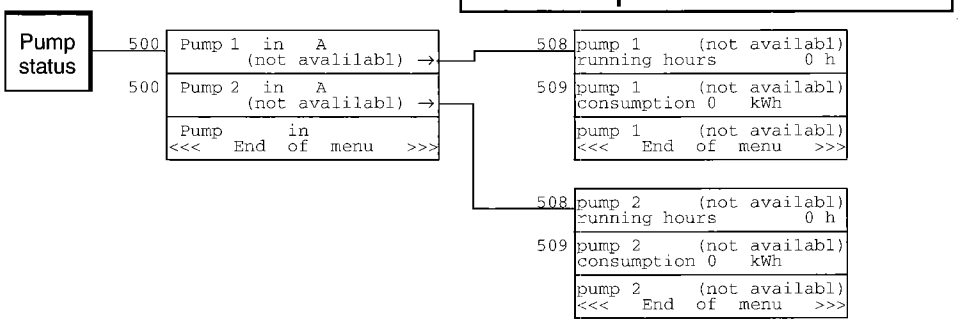
Fig. 31. Pressure with pre-pressure measuring

7. Display Overview

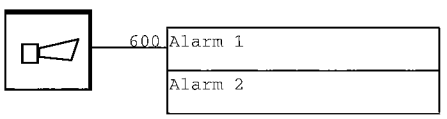
7.1 UPE 1: Head without Preset Clock Program



Pump Status Menu

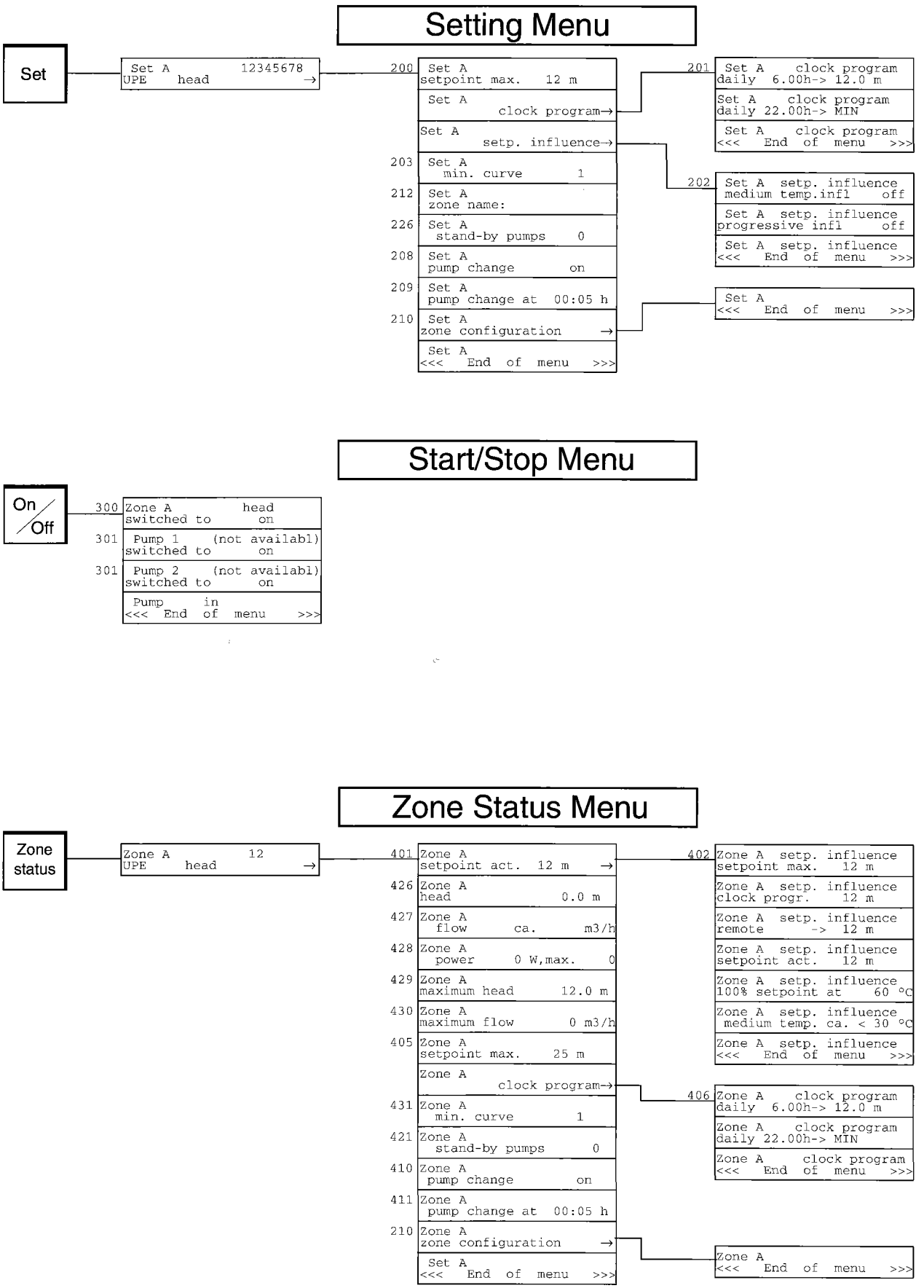


Fault Indication Menu

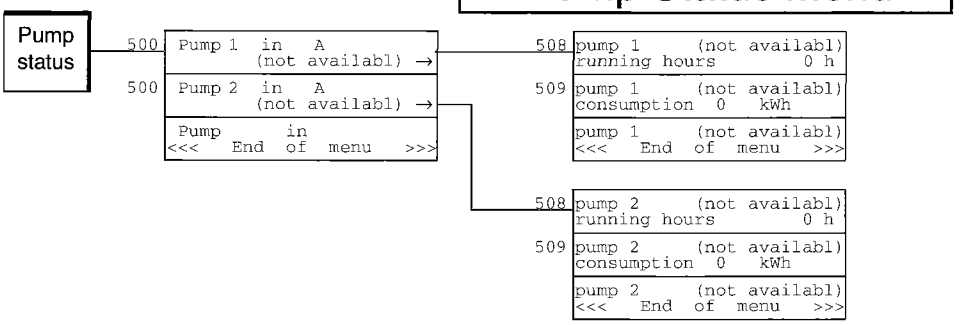


TM00 5342 0695

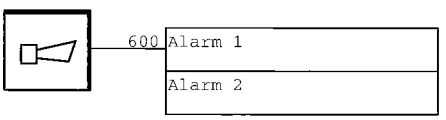
7.2 UPE 2: Head with Preset Clock Program



Pump Status Menu

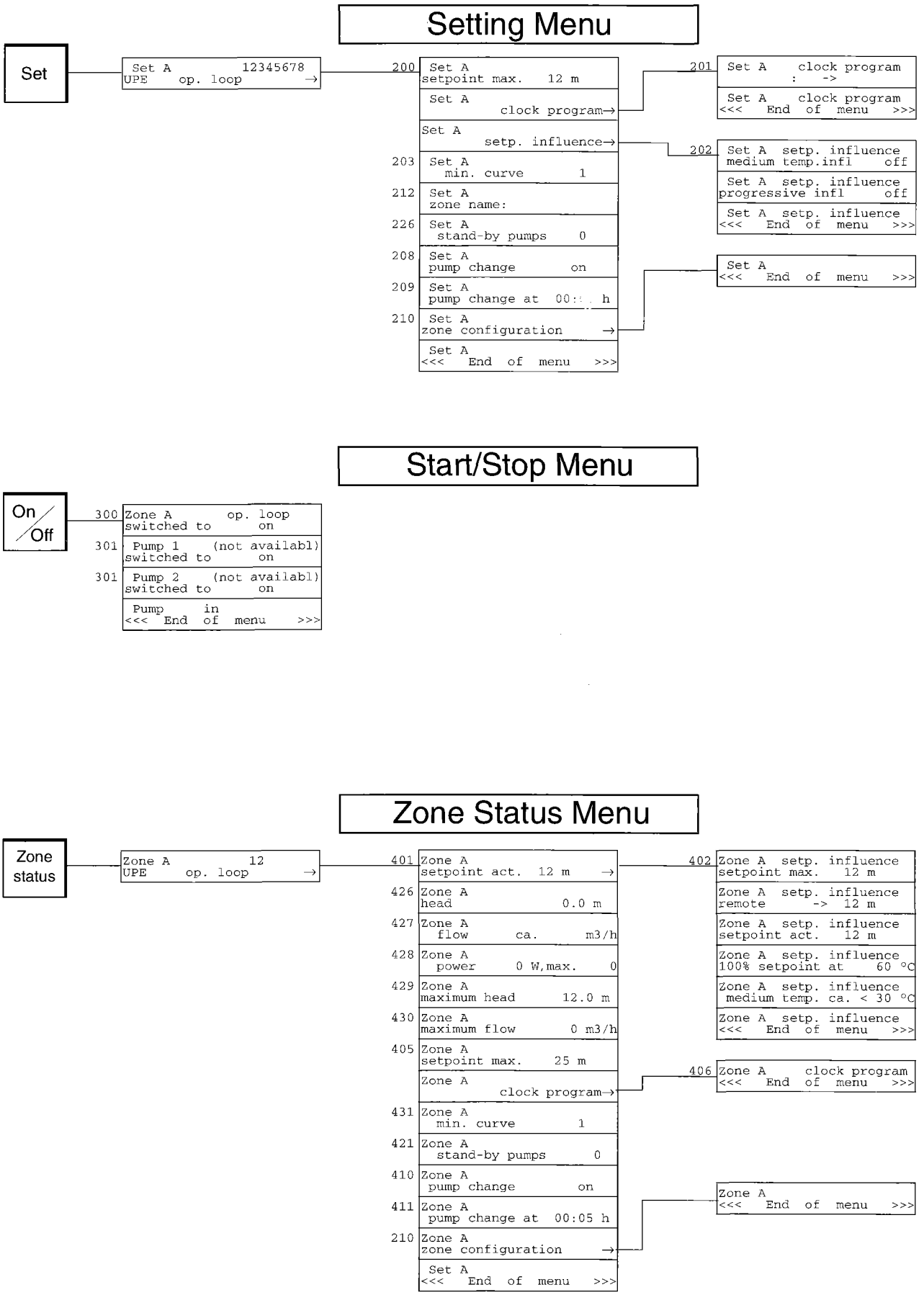


Fault Indication Menu

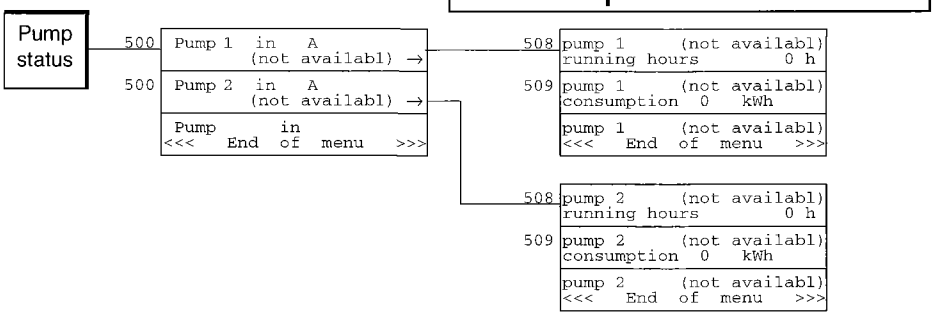


TM00 5343 0695

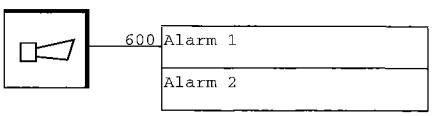
7.3 UPE 3: Open Loop without Preset Clock Program



Pump Status Menu

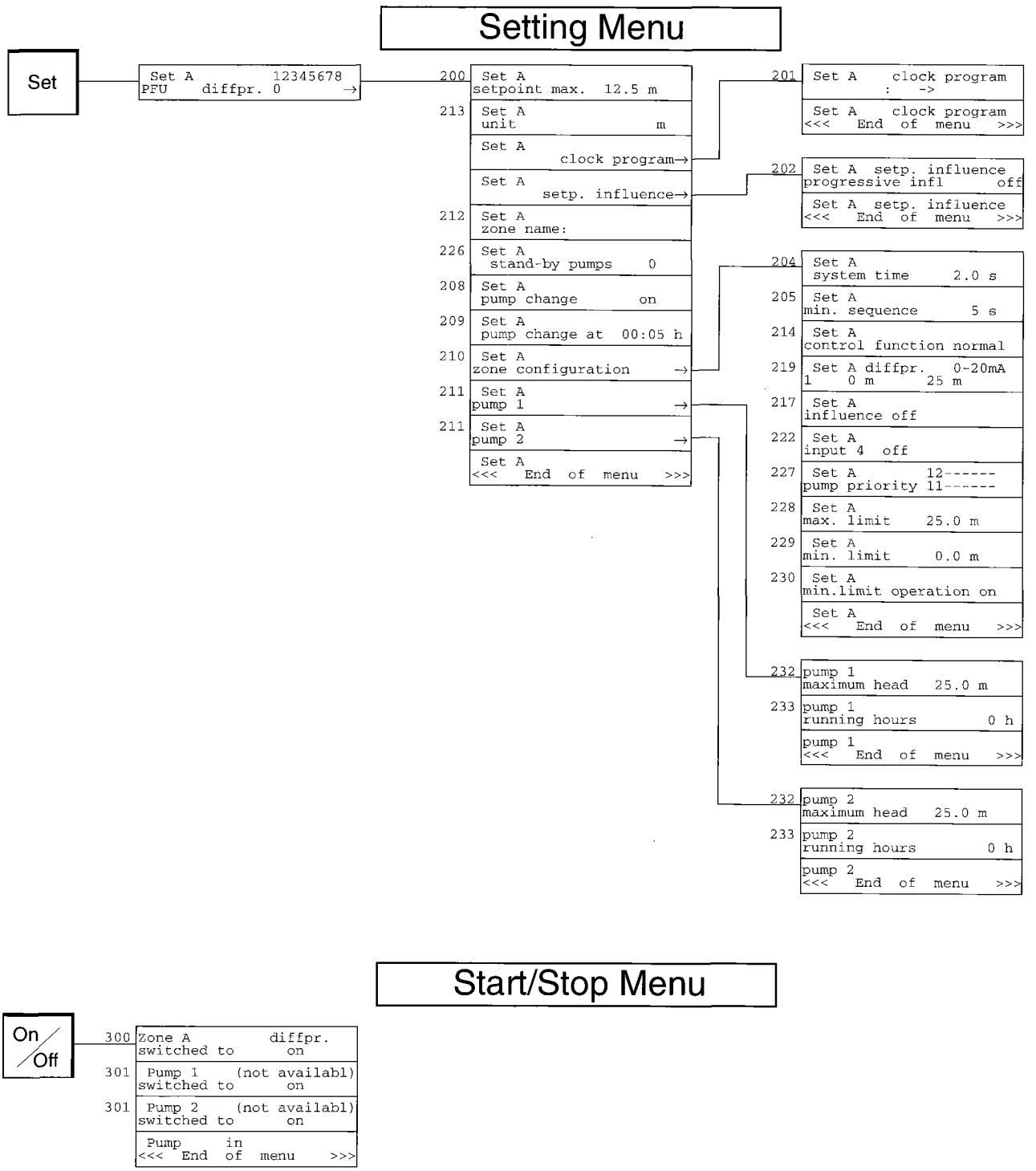


Fault Indication Menu



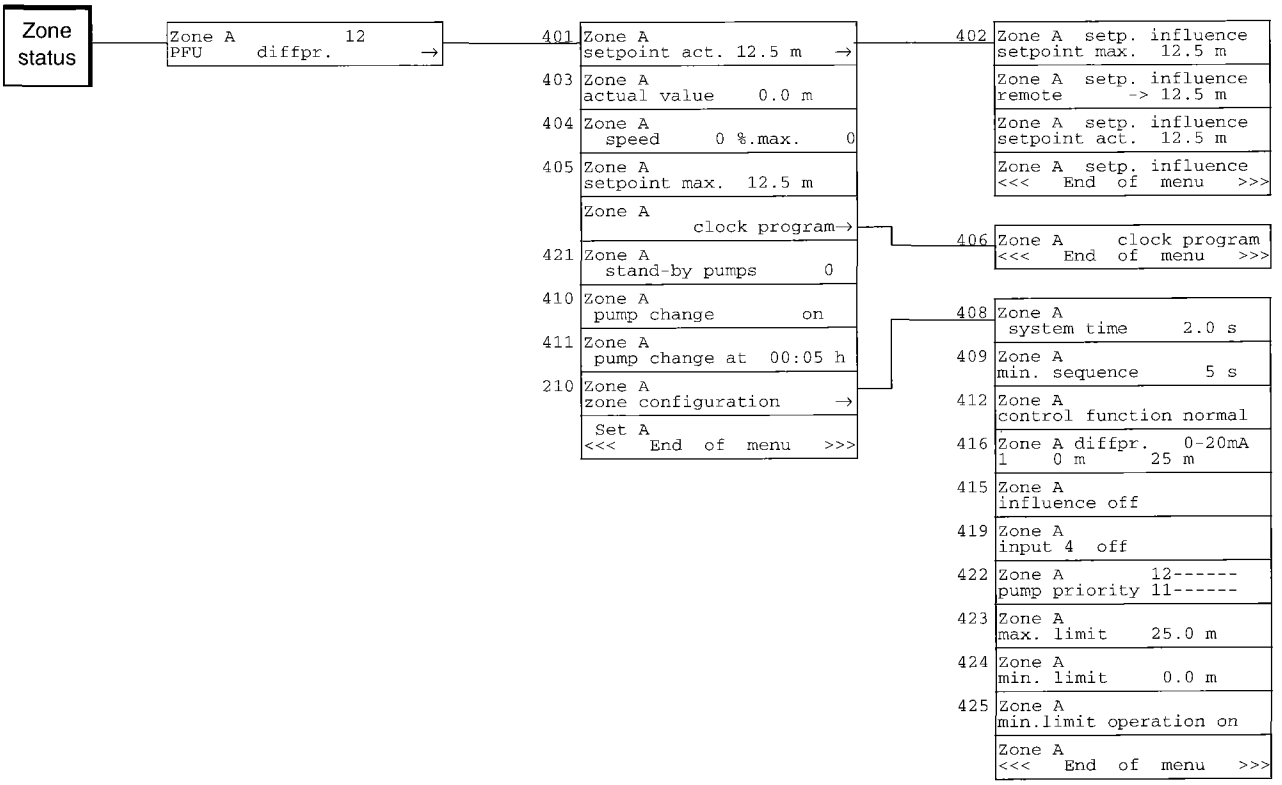
TM00 5344 0695

7.4 PFU 1: Differential Pressure

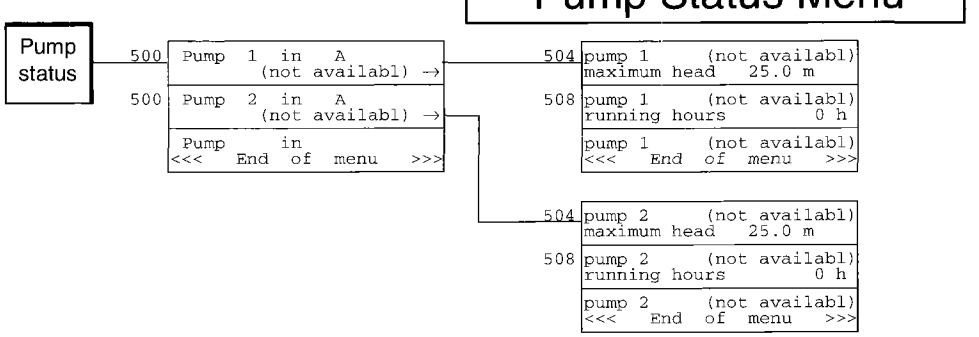


TM00 5345 0695

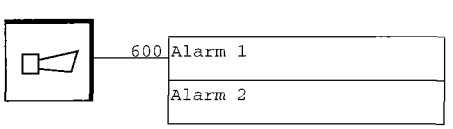
Zone Status Menu



Pump Status Menu

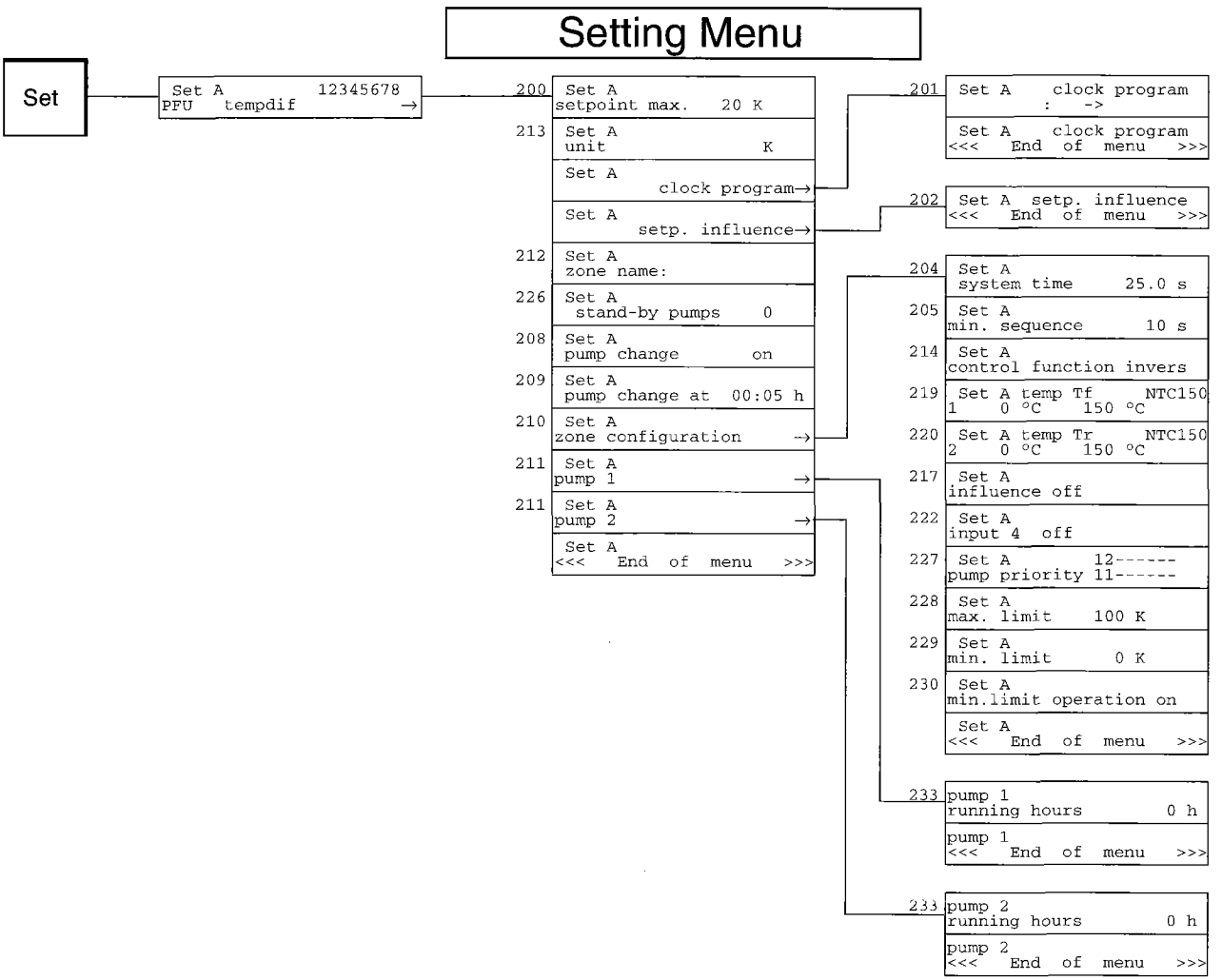


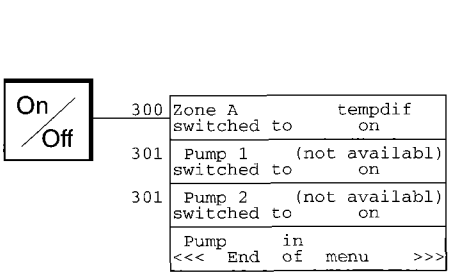
Fault Indication Menu



TM00 5345 0695

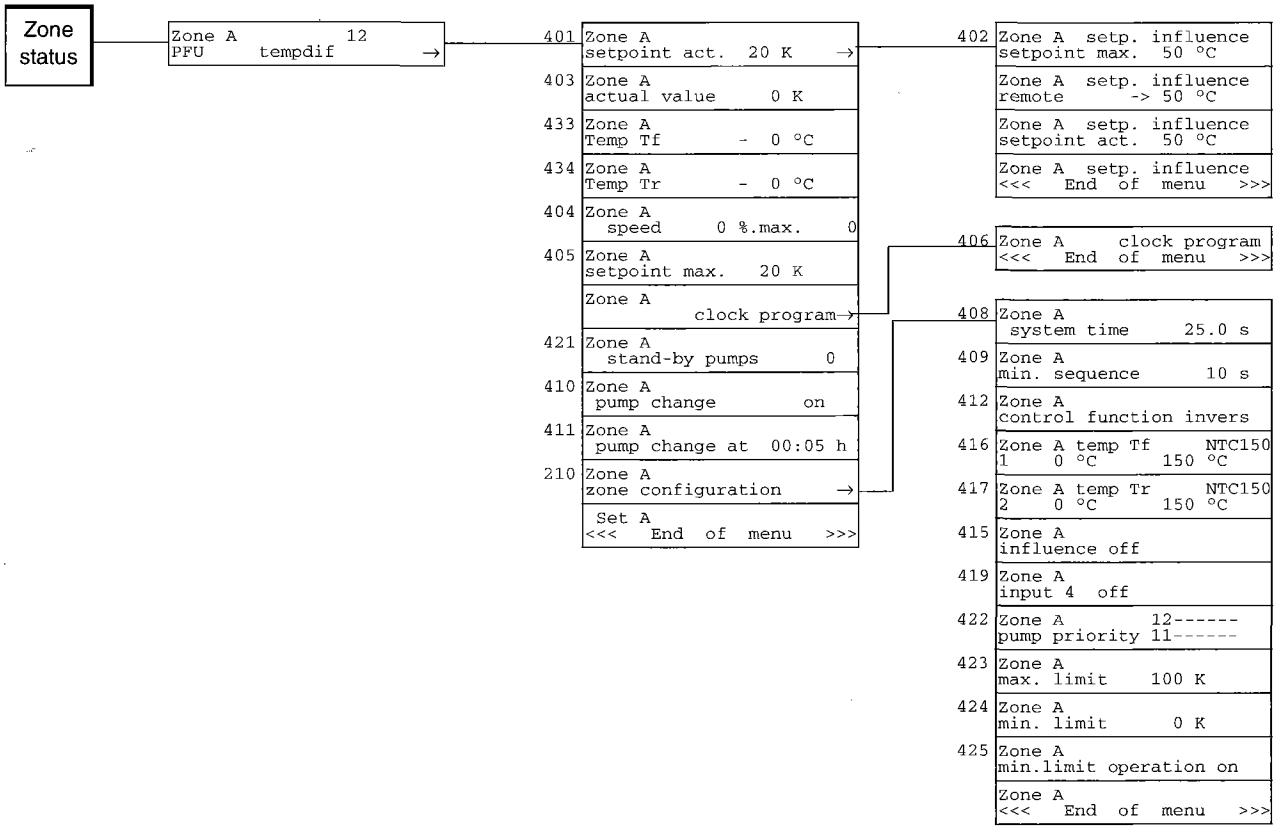
7.5 PFU 2: Differential Temperature



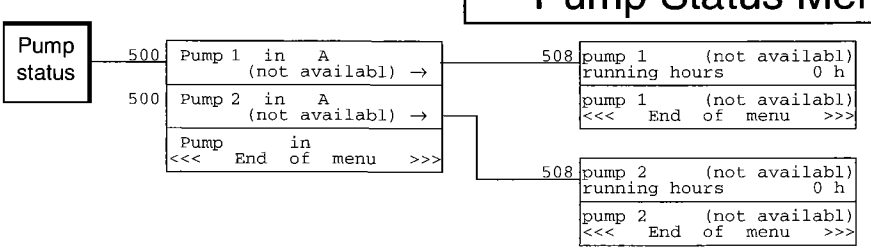


TM00 5346 0695

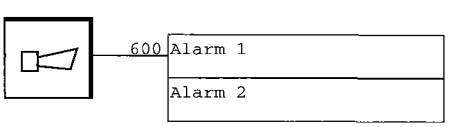
Zone Status Menu



Pump Status Menu

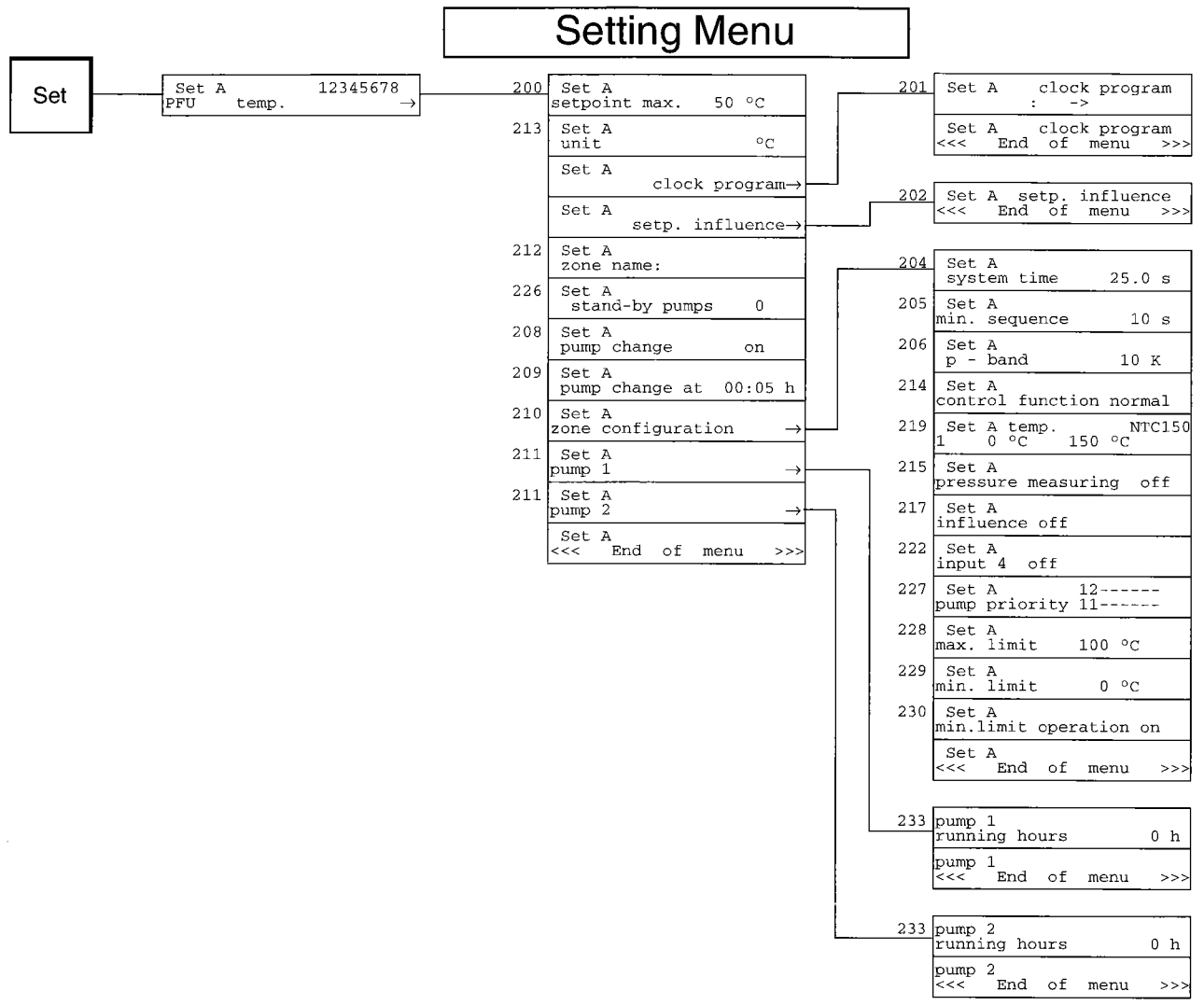


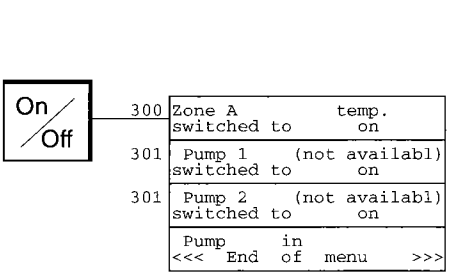
Fault Indication Menu



TM00 5346 0695

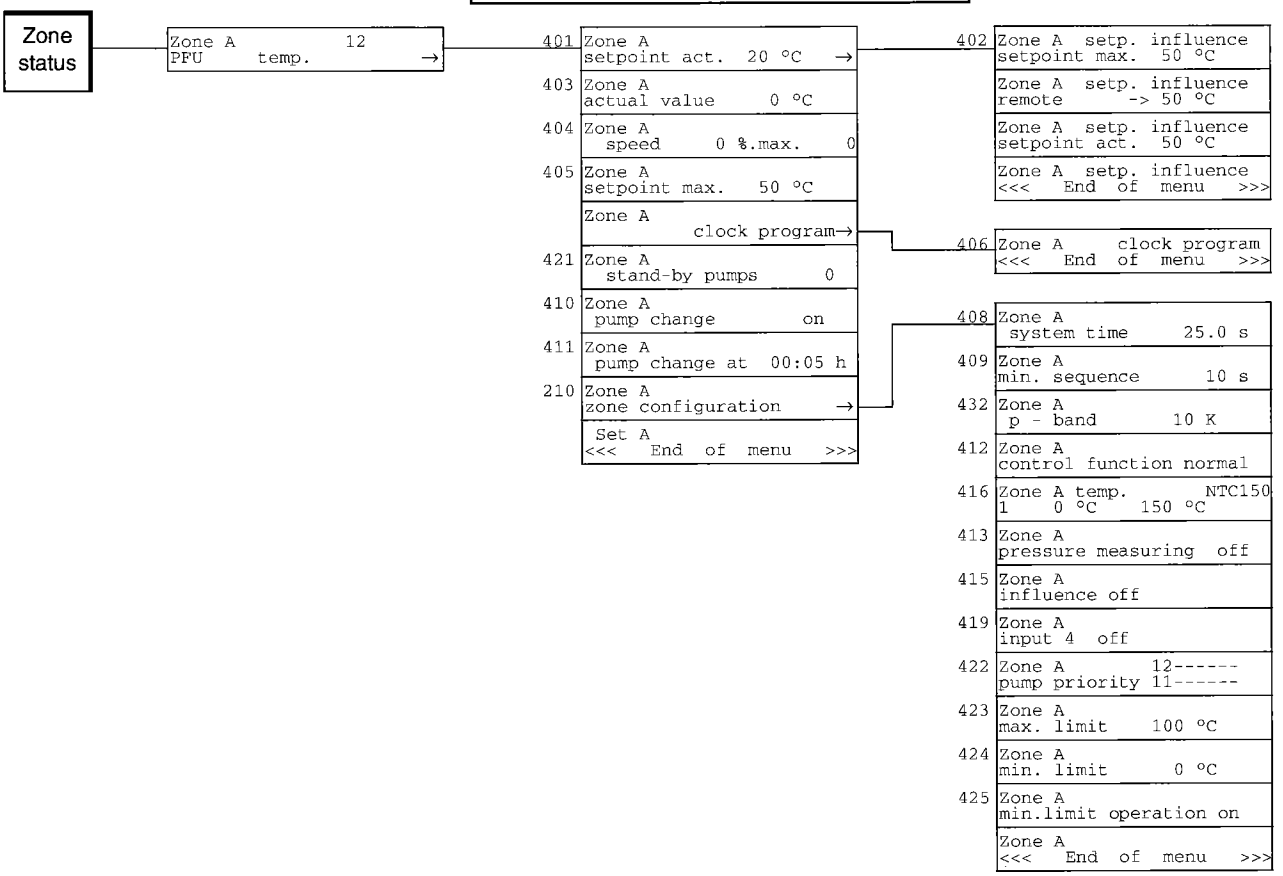
7.6 PFU 3: Flow or Return Pipe-Temperature



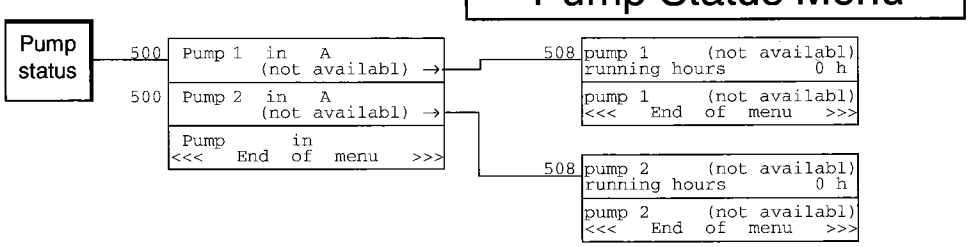


TM00 5347 0695

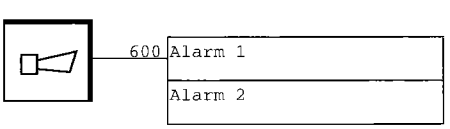
Zone Status Menu



Pump Status Menu

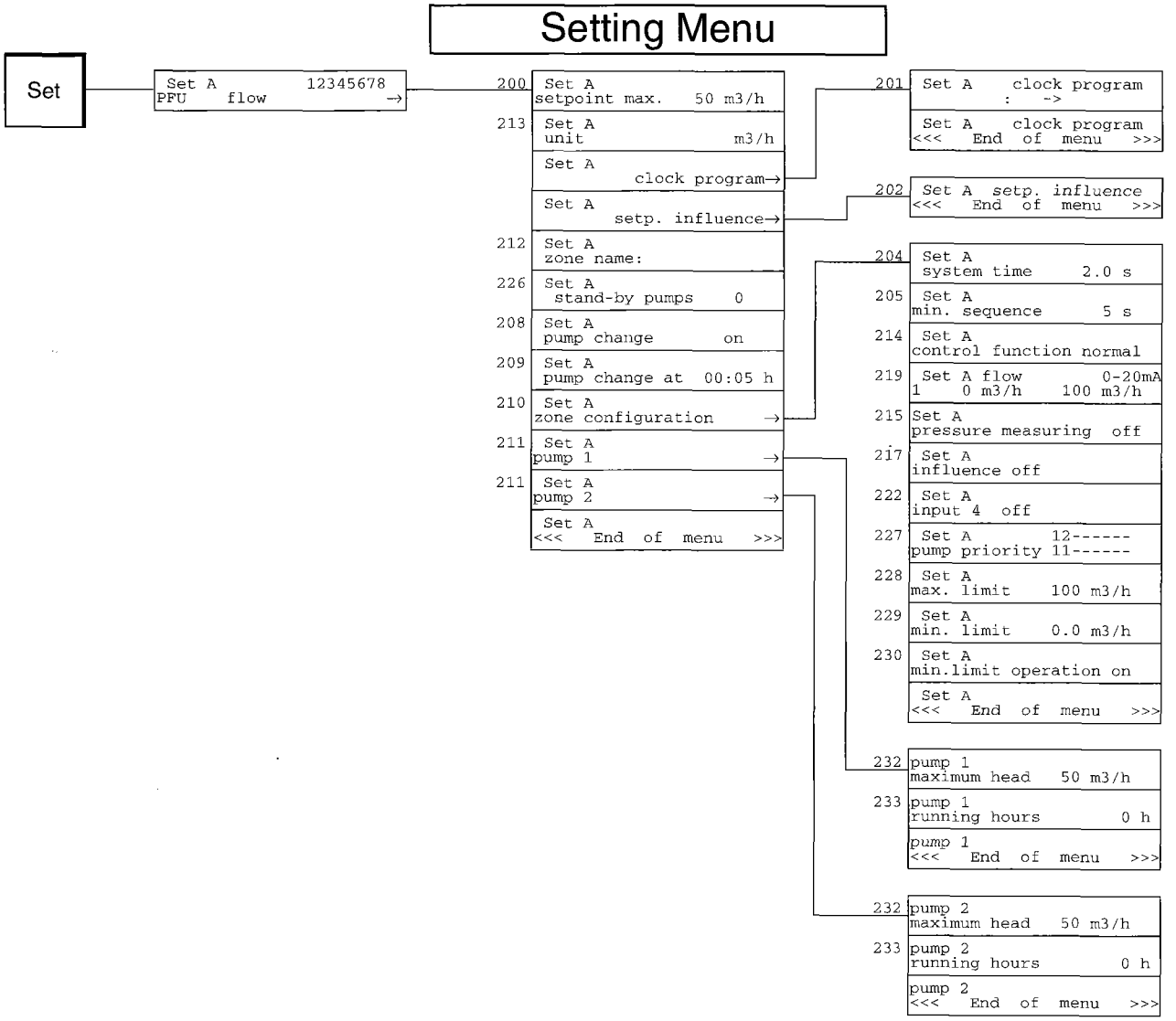


Fault Indication Menu



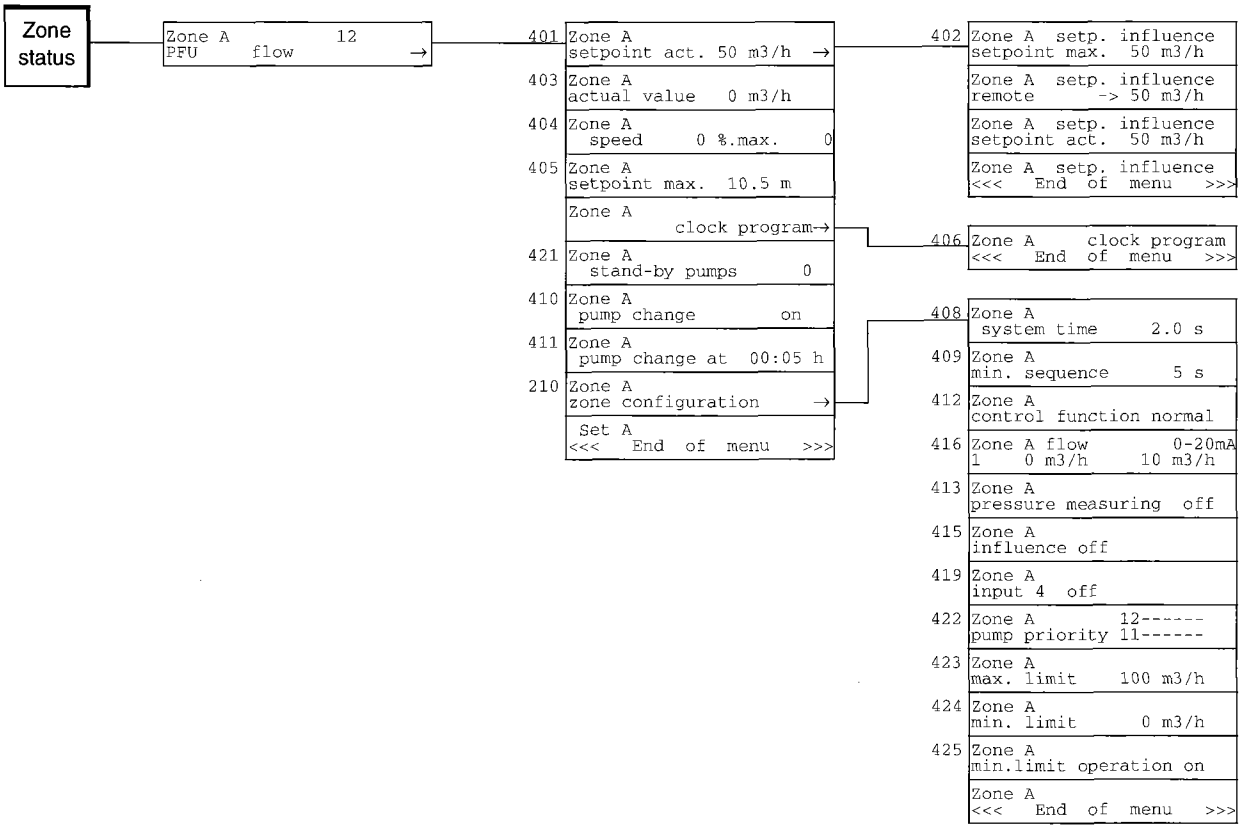
TM00 5347 0695

7.7 PFU 4: Flow

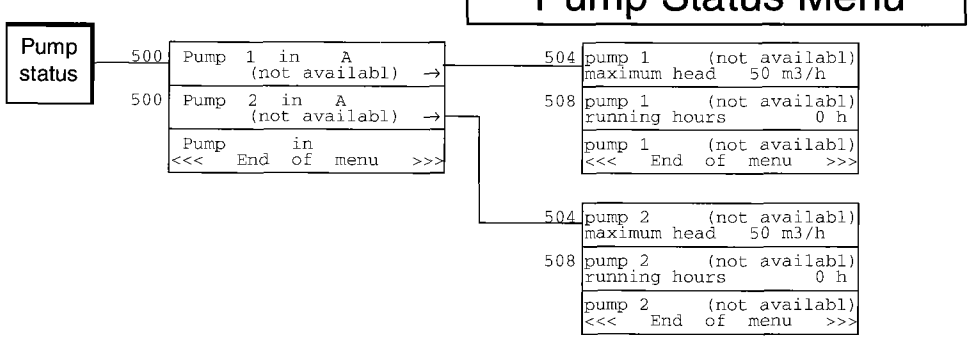


TM00 5348 0695

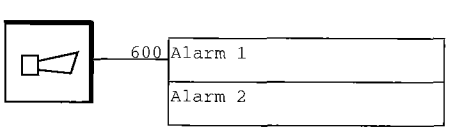
Zone Status Menu



Pump Status Menu

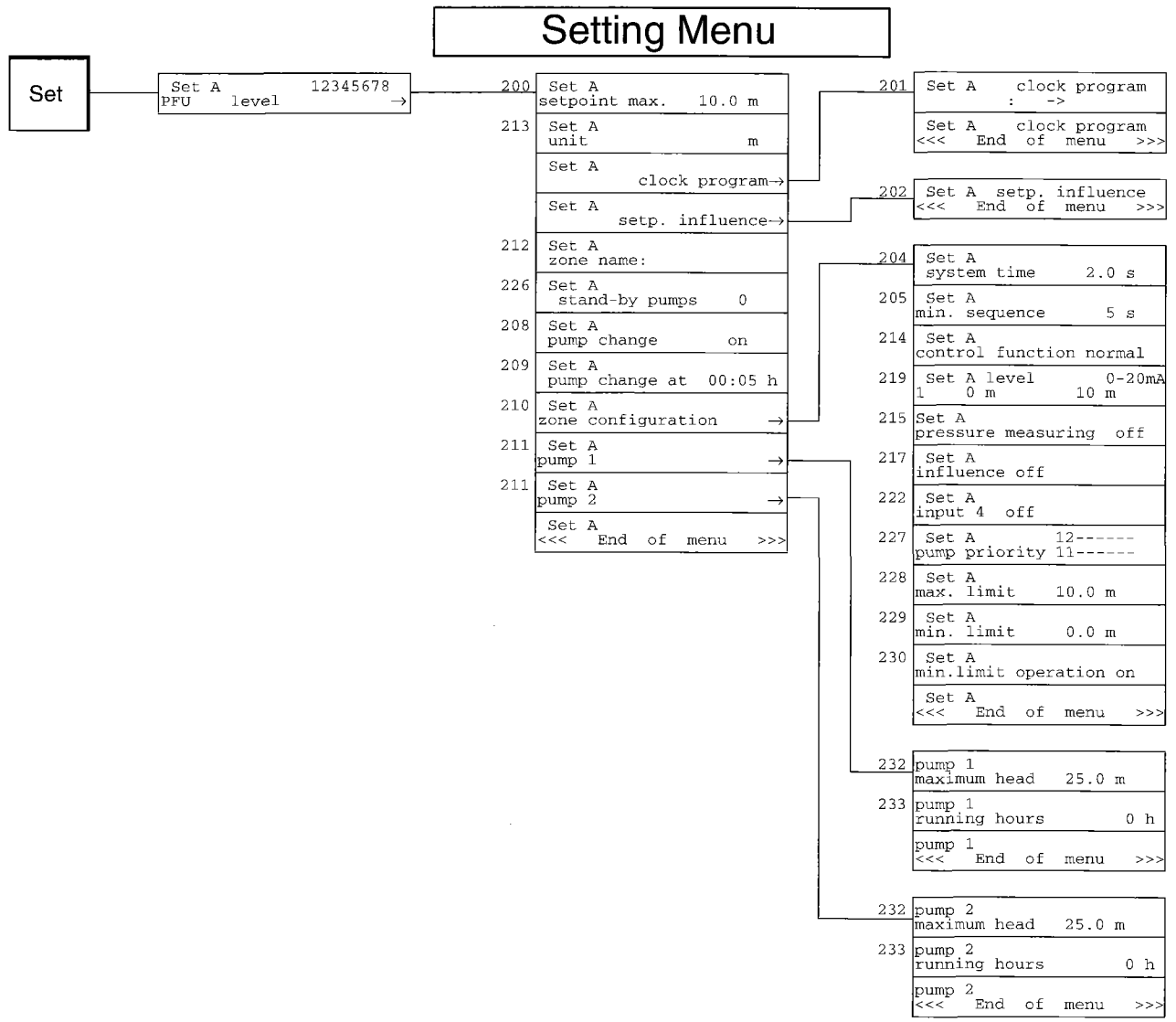


Fault Indication Menu



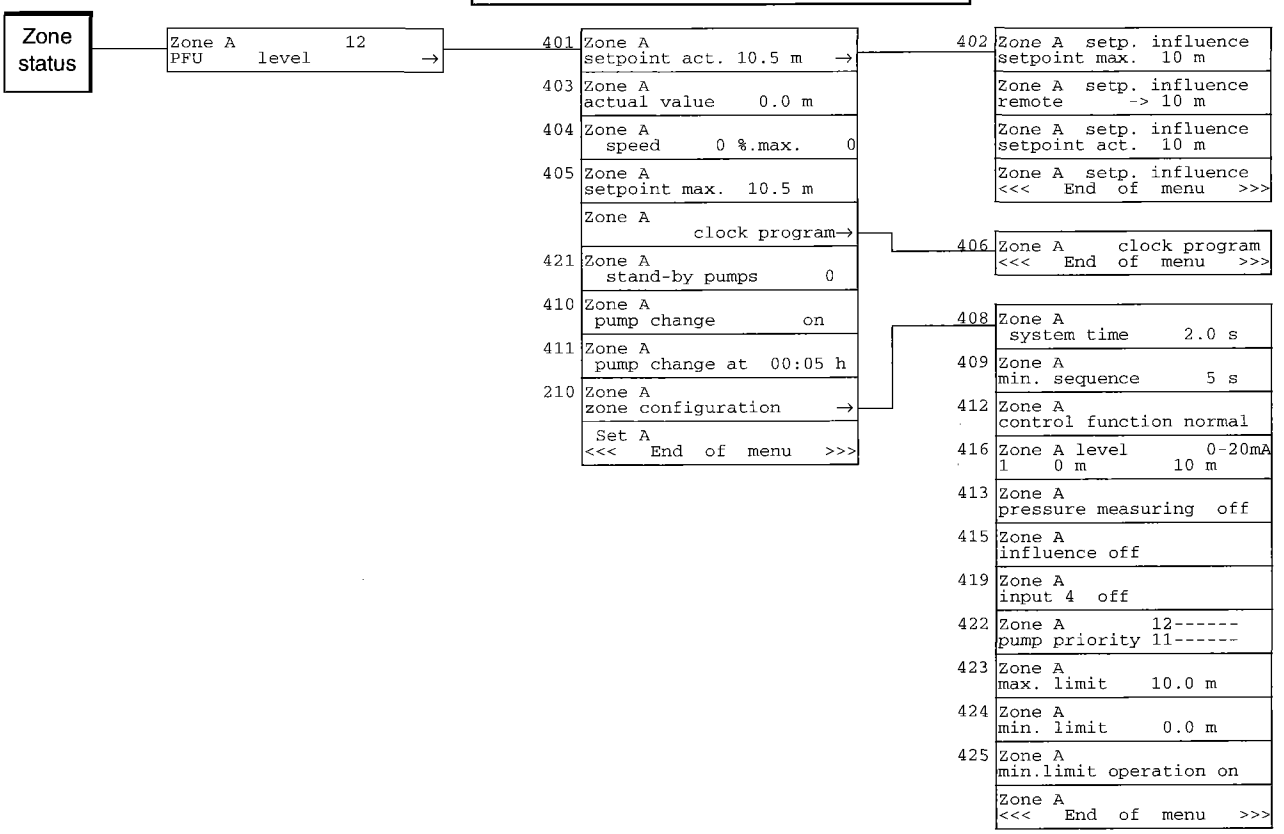
TM00 5348 0695

7.8 PFU 5: Level

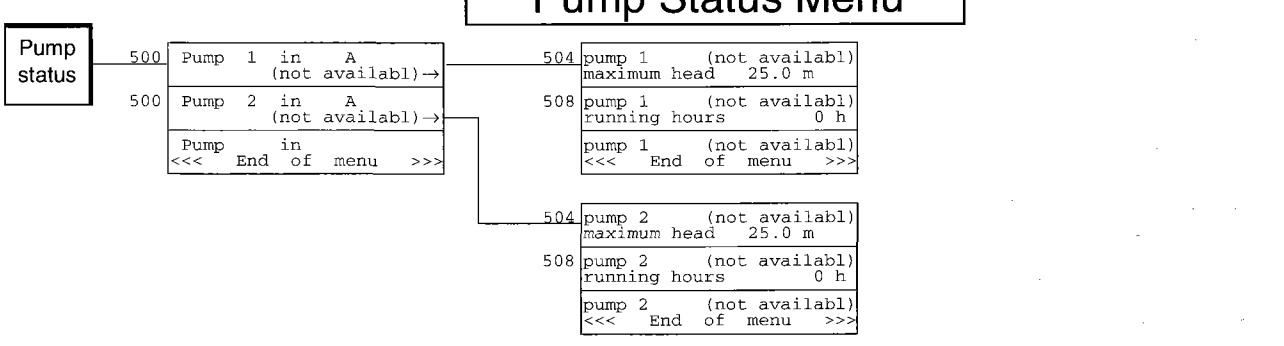


TM00 5349 0695

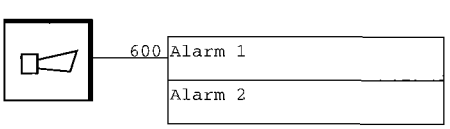
Zone Status Menu



Pump Status Menu

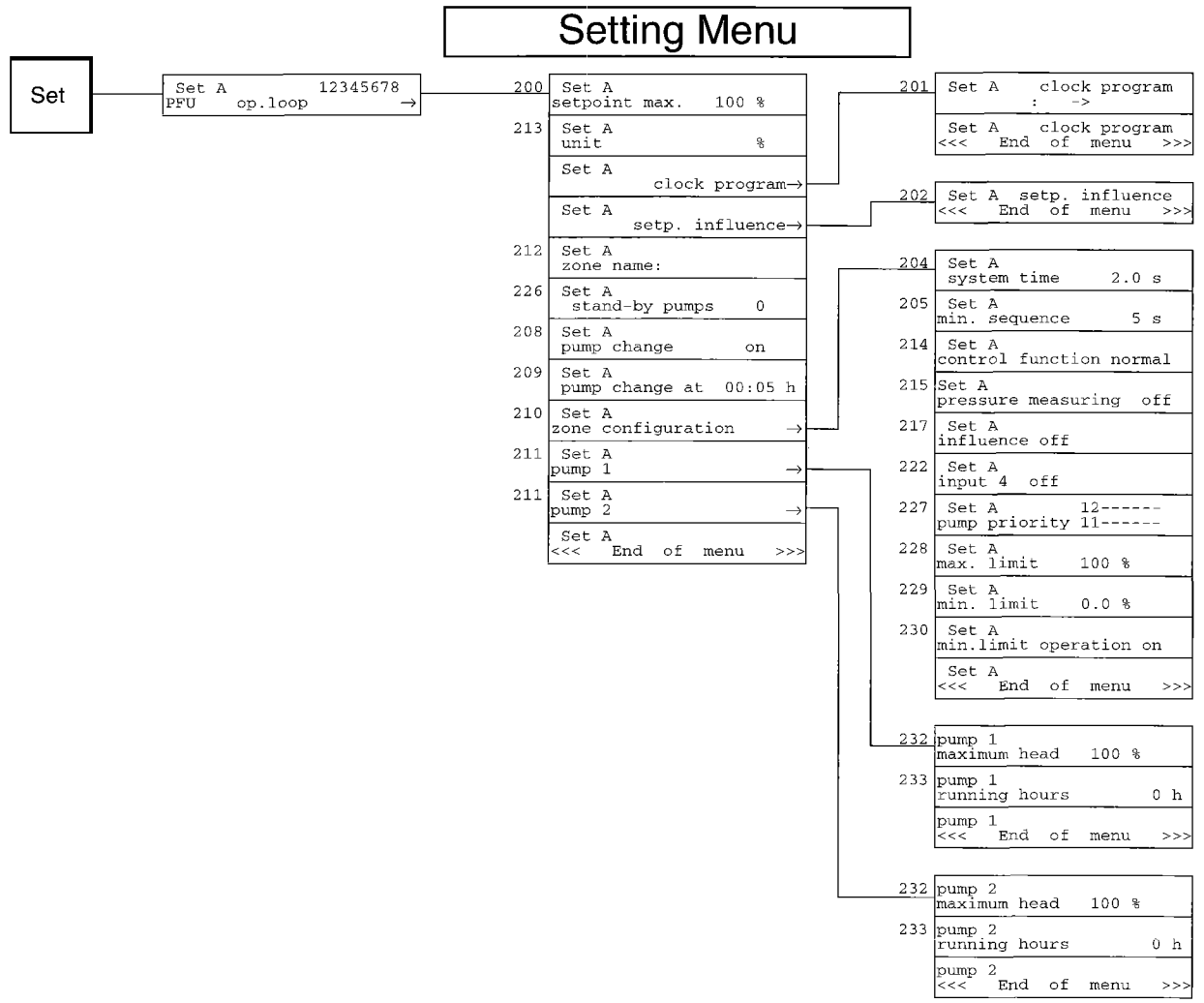


Fault Indication Menu



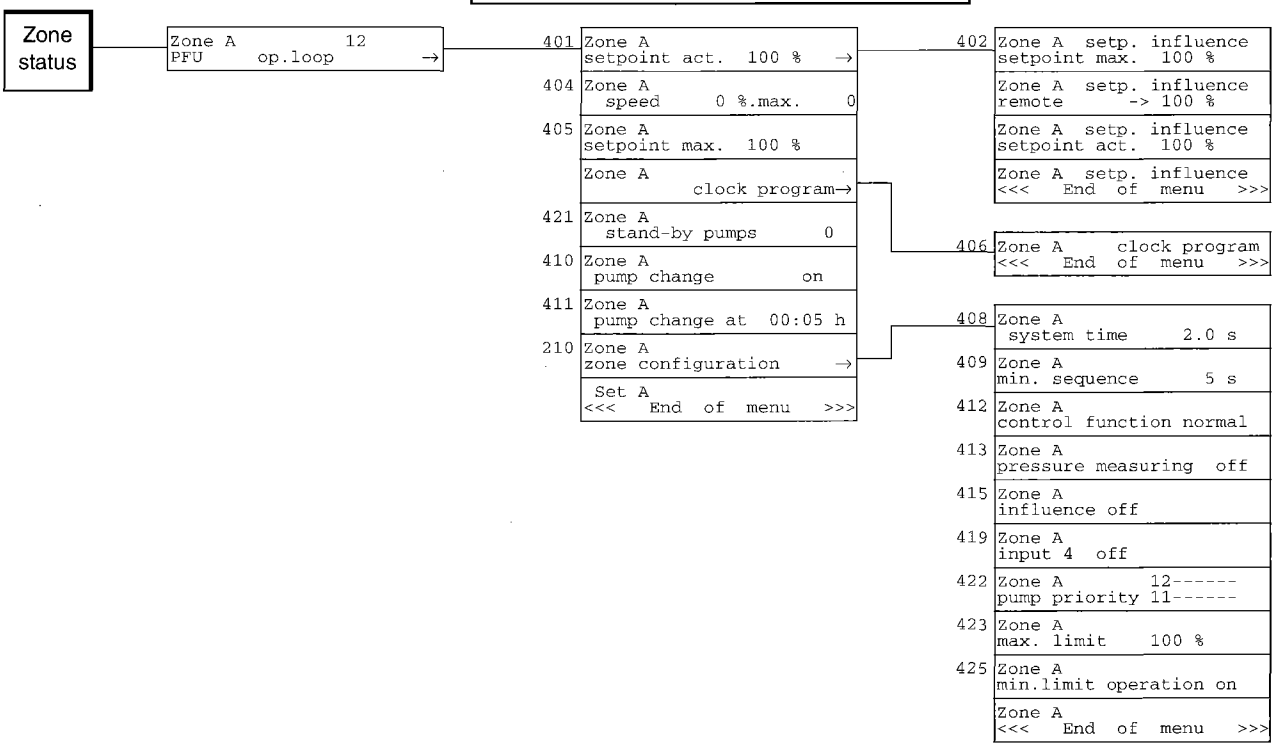
TM00 5349 0695

7.9 PFU 6: Open Loop

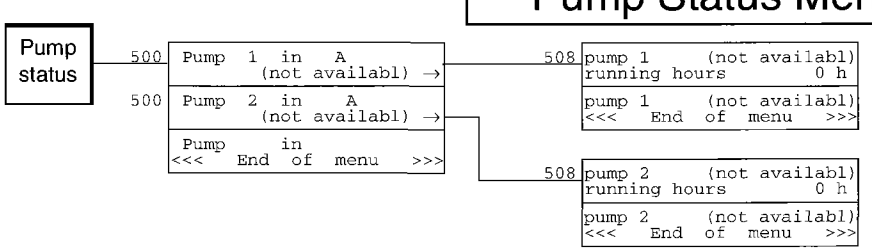


TM00 5350 0695

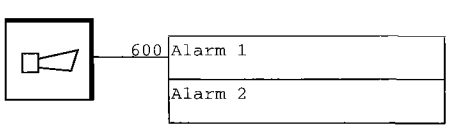
Zone Status Menu



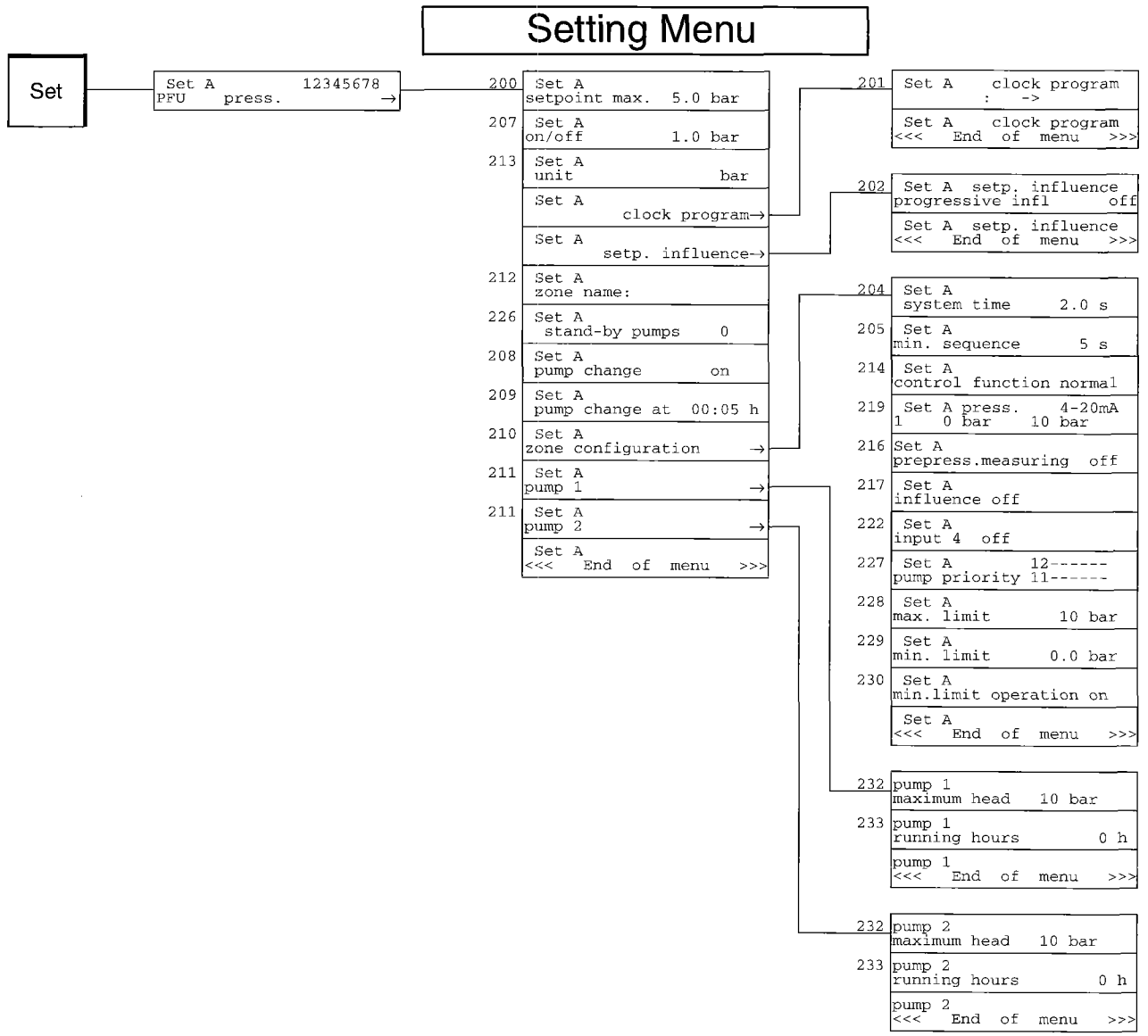
Pump Status Menu



Fault Indication Menu

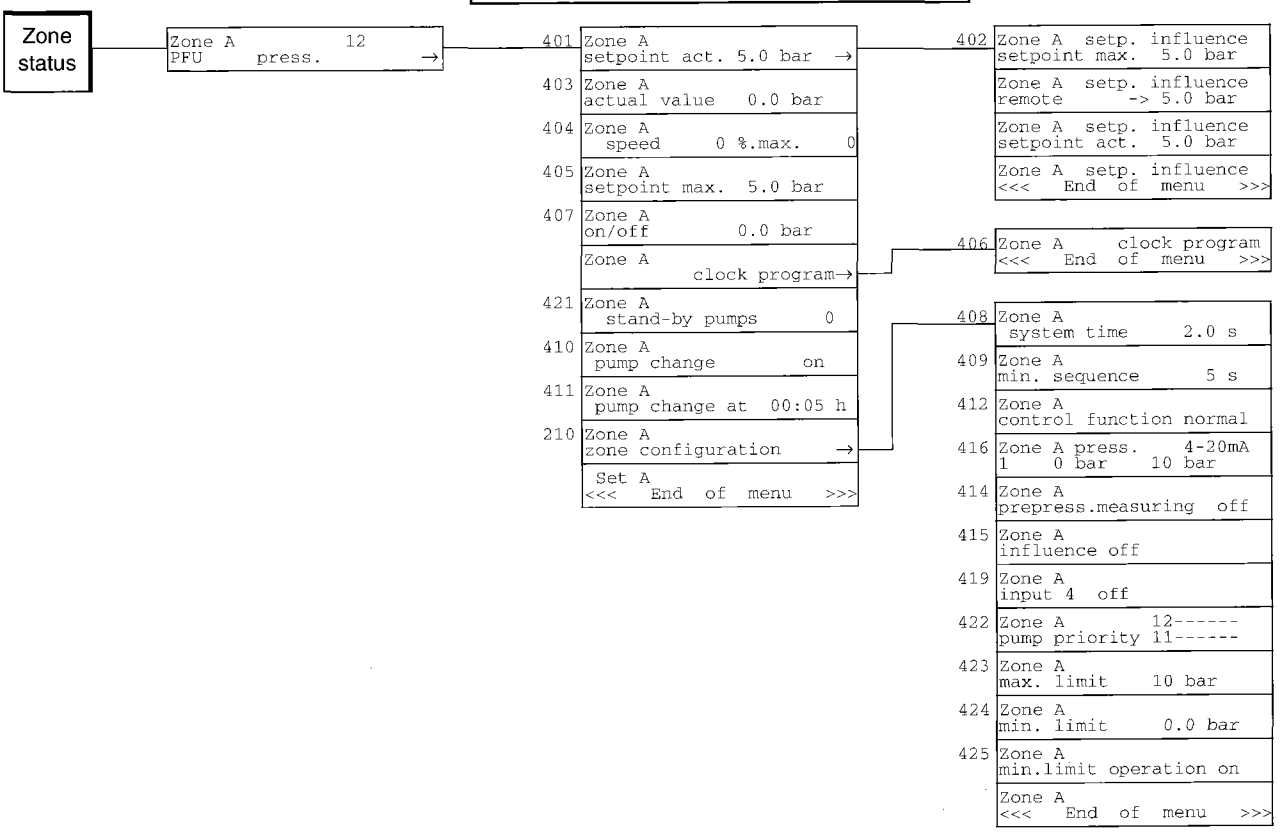


7.10 PFU 7: Pressure

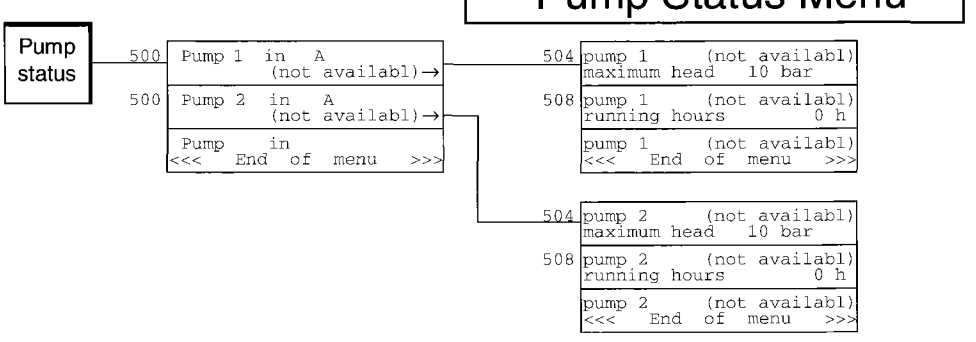


TM00 5351 0695

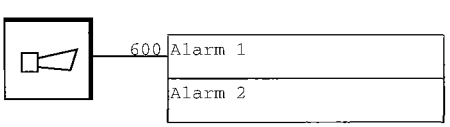
Zone Status Menu



Pump Status Menu

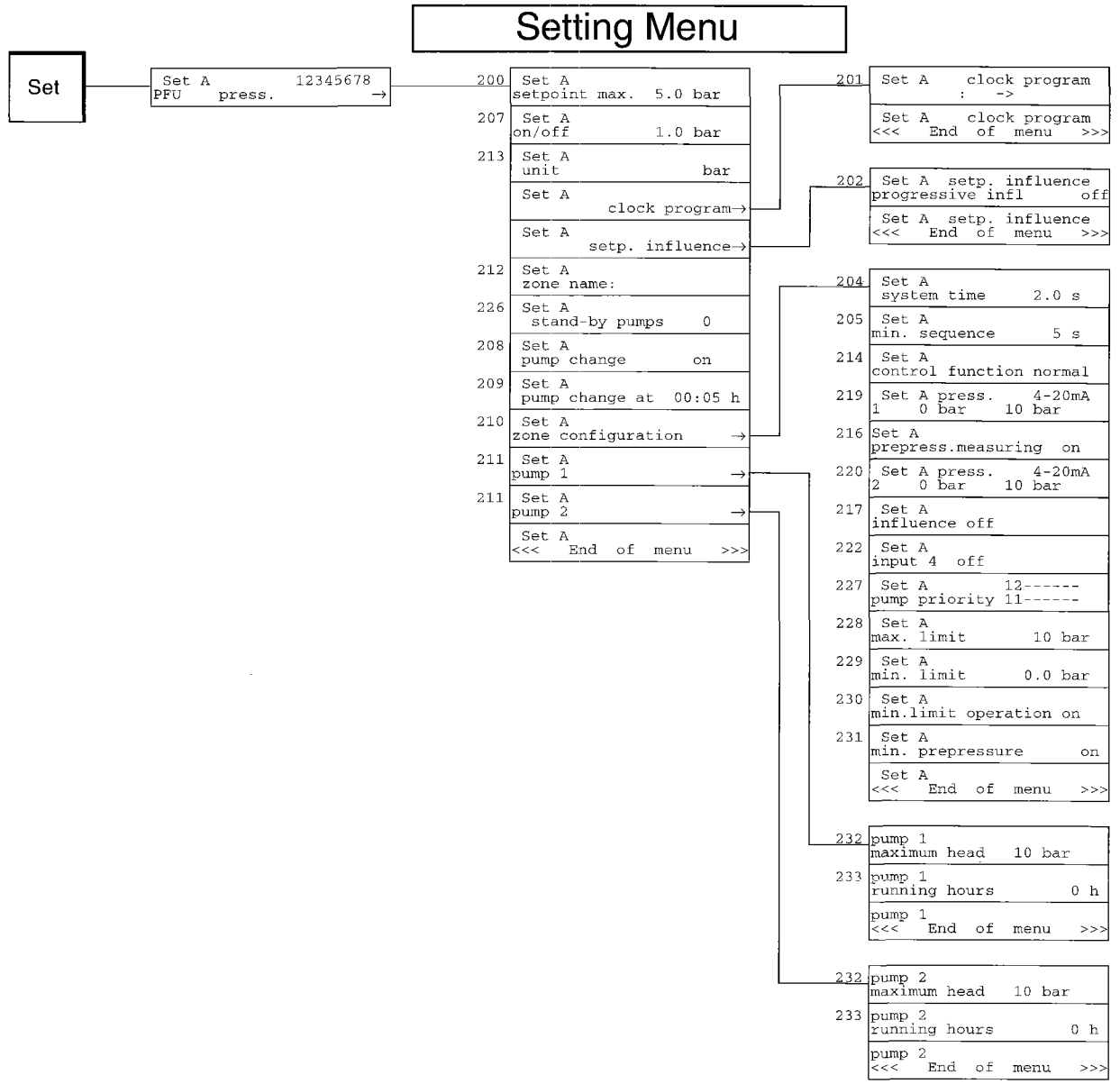


Fault Indication Menu



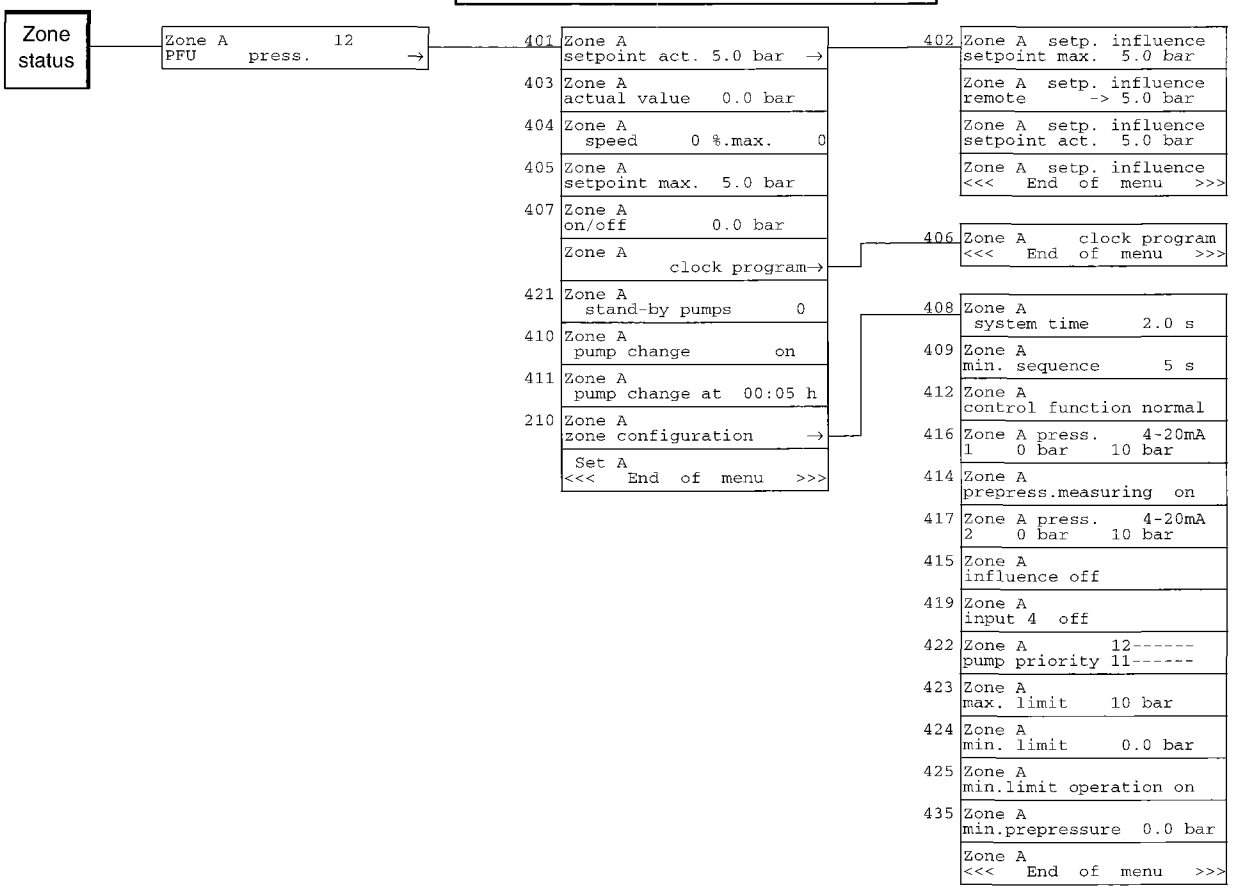
TM00 5351 0695

7.11 PFU 8: Pressure with Pre-Pressure Measuring

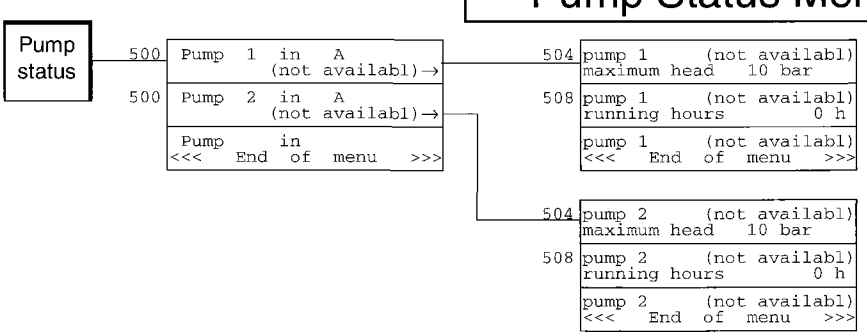


TM00 5352 0695

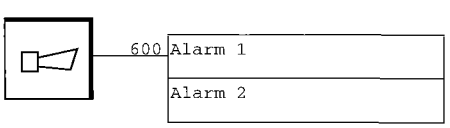
Zone Status Menu



Pump Status Menu



Fault Indication Menu



8. Explanation of Displays

8.1 Setting Menu

200

Setting of setpoint max.

This is where the required "setpoint max." for the zone is set.

This value can be reduced to "setpoint act." through settings in the clock program, setpoint influence and/or via PCU 2000.

The setpoint can be set within different ranges depending on the zone type selected and the pump type connected.

UPE:

- The setpoint can be set in the range "MIN" up to a value corresponding to the max. head of the specific pump.
- **[MIN.]** The zone is controlled in accordance with the min. curve (night-time duty curve) selected.
- **[STOP]** The pumps in the zone are switched off.

PFU:

- The setpoint can be set in the range 0 - max. value of the signal transmitter selected (e.g. 0-10 bar).
- **[STOP]** The pumps in the zone are switched off.

Clock program for change of setpoint

Reduces "setpoint max."

If no setting of the clock program is required, proceed to the next display.

If the heating demand varies during the day and/or during the week, the performance required from the pump will also vary. In this case a clock program can be set in order to achieve optimum performance of the pump.

In the clock program, one switching time is set at a time. If three daily switching times are required, three displays must be set.

It is possible to set a total of 10 switching times.

In the field **[program]**, one of four different functions can be selected:

1 **[insert]** A new switching time can be inserted. Switching times already set will remain unchanged.

2 **[change]** The switching time displayed can now be changed.

3 **[delete]** The switching time displayed can now be deleted.

4 **[copy]** Switching times from another zone are copied into the current zone and the existing clock program is deleted.

Possible UPE and PFU 2000 settings:

- **[daily]** The same switching times apply to all the days of the week.
- **[Mon, Tue, Wed, Thu, Fri, Sat, Sun]** Different switching times for each day.
- **[Mo-Fr]** The same switching times from Monday to Friday.
- **[Sa-Su]** The same switching times for Saturday and Sunday.

Example:

Clock program with three switching times:

Switch to setpoint A at time 1.
Switch to setpoint B at time 2.
Switch to setpoint C at time 3.

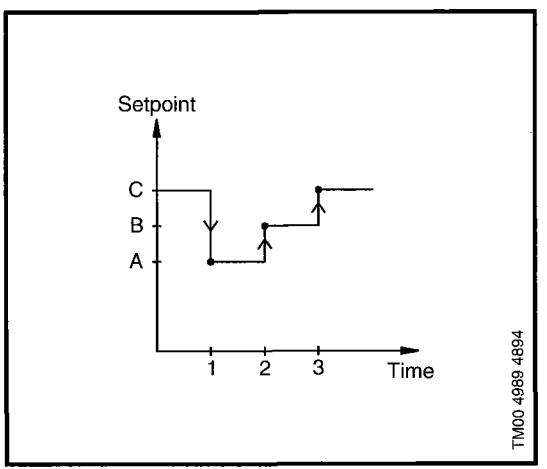


Fig. 32. Clock program

Setpoint influence

Several different displays may appear under "setp. influence" depending on the influence type selected.

Please note: It is possible to have more than one setpoint influence.
If "setp.influence" is required, set to "**on**" and select the value required in the next display.

[medium temp. infl]

Applies only to **UPE**.

In the display the temperature of the pumped liquid is set to the setpoint max. required. Between this temperature and 20°C, the setpoint is changed linearly between "setpoint max." and "min.curve".

The setting range is 40°C to 90°C.

The default value is 40°C.

The below example indicates:

Pumped liquid temperature "setpoint max." is set to 60°C.

Actual temperature of pumped liquid = 30°C.

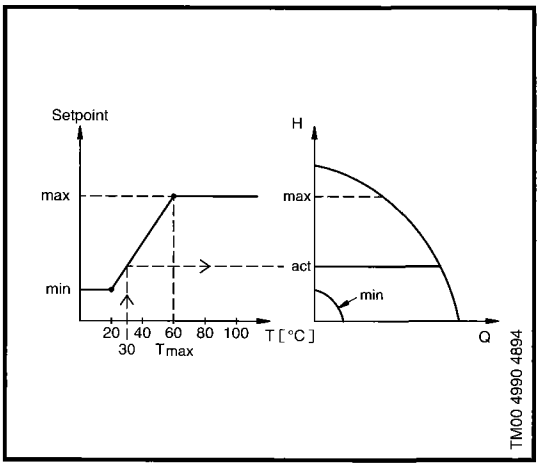


Fig. 33. Temperature influence

Setpoint influence

[Progressive infl]

Applies only to

- **UPE**
- **PFU 2000** control parameter "differential pressure", "pressure" and "pressure with pre-pressure measuring".

If the system is to compensate for friction loss, this is possible by selecting proportional influence.

Once this function is activated, the pressure will rise with an increasing flow.

Set the % of "setpoint max." pressure at flow = 0 m^3/h in this display.

The setting range is 50 - 100%.

The default value is "off".

If **[on]** is selected, proceed to the next display and set a value.

The below example shows a set value of 60%.

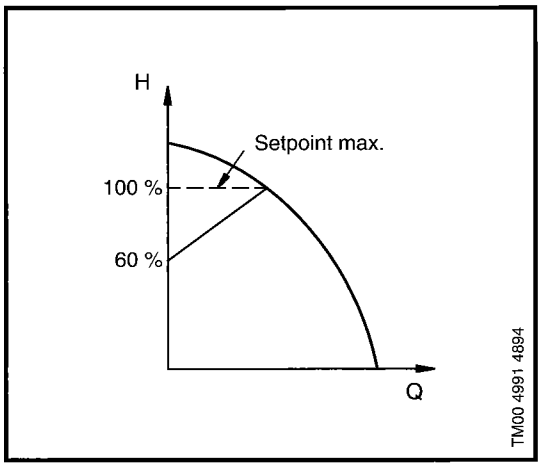


Fig. 34. Proportional influence

203

Min. Curve

Applies only to **UPE.**

For night-time duty, select one of the min. curve values available for the specific pump.

The min. curves are activated by the clock program or via external signals connected to the pump or PCU 2000.

The default setting is min. curve 1 (night-time duty curve 1).

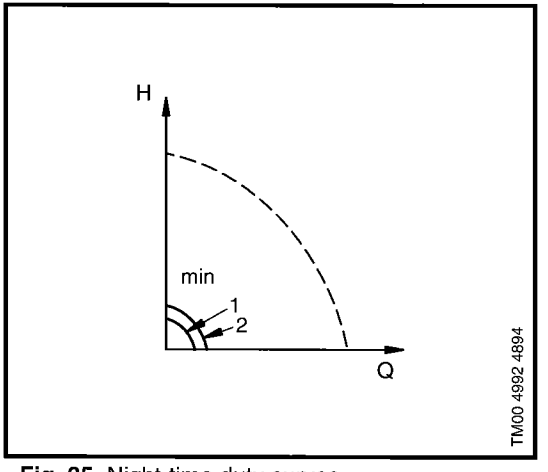


Fig. 35. Night-time duty curves

204

System time constant (reaction time)

Applies only to **PFU 2000.**

The time constant determines the reaction time of the system to changing demands and changed set-points. The time constant is defined as the time that passes from an adjustment is made until the adjusted value reaches approx. 70% of the corresponding final change.
The time constant thus results in transmission of the signal at a certain delay.

High value means slow system (slow reaction).

Low value means fast system (quick reaction).

Setting range is 0.4 - 800 sec.

The default value is displayed for each of the individual presettings.

205

Min. sequence (minimum switching time)

Applies only to **PFU 2000**.

In order to prevent hunting in the system and to limit pressure and current surges, the minimum time between switching the individual pumps on/off can be set.

The setting range is 2 - 300 sec.

The default value is 5 sec.

206

P-band

Applies only to **PFU 2000**, control parameter "temperature".

When the flow-pipe or the return-pipe temperature is used as the control basis, a value can be set for the "P-band" parameter (proportionality band).

The P-band is defined as the temperature difference that changes the pump performance from 0 - 100% or vice versa.

Broad P-band: Large continuous control deviation. Slow-acting system.
Narrow P-band: Small continuous control deviation. Risk of hunting.
Control deviation is the difference between the required and the actual value.

The default value is 10 K (10°C).

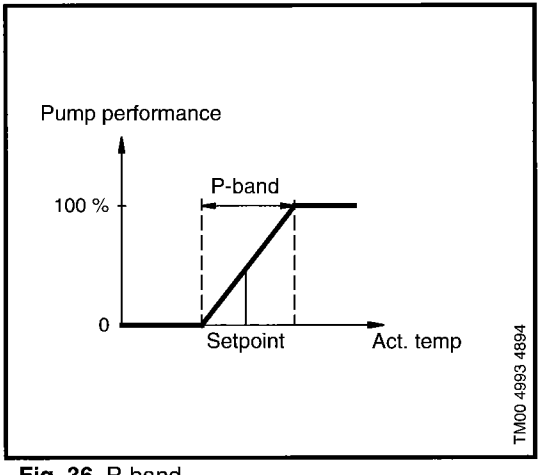


Fig. 36. P-band

On/off-band

Applies only to **PFU 2000**, control parameter "pressure".

The on/off-band is the difference between the required discharge pressure (setpoint) and the stop pressure. It can be set between 0 and the max. value of the signal transmitter range.

In systems fitted with PFU 2000 MS, the pumps will start and stop to maintain the pressure.

In systems fitted with PFU 2000 MF and ME, the speed and consequently the pump performance are varied continuously to keep the set pressure constant.

When the flow computed by PMU 2000 is lower than Q_{min}, the discharge pressure will be raised to the stop pressure and the pump will stop.
The stop pressure is the set setpoint + the set on/off-band. The pump will start again when the pressure has dropped below the set setpoint.

Approx. every 30 seconds or when the operating point changes (consumption changes), PMU 2000 will compute the flow by reducing the speed for a short while.
The rate at which the pressure drops thus becomes an indication of the flow.

The default value for the on/off-band is 0.1 x the measuring range of the signal transmitter.

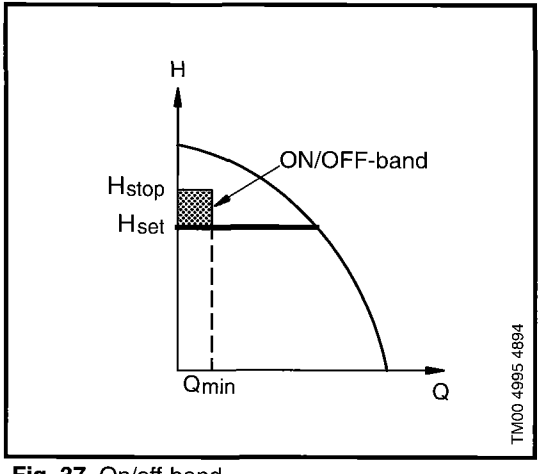


Fig. 37. On/off-band

The example shows:

- Setpoint (full line).
- On/off-band (hatched field).
- Q_{min} computed by PMU 2000 (dotted line).

208

Pump change

After each start or stop of a pump, PMU 2000 will change the order in which the pumps are started.

If set, time-dependent pump change will be carried out provided the starting order has not been changed for 24 hours.
This means that running hours will be evenly distributed across the pumps in the zone.

[on] Time-dependent pump change is carried out.

[off] Time-dependent pump change is not carried out.

209

Time for pump change

This display is for the selection of the time of the pump change-over.

210

Zone operating parameters

Press "Enter" to move to other zone settings.

211

Pump operating parameters

Press "Enter" to move to other pump settings for the pump in question.

212

Zone name

For entry of a seven-character zone name.

213

Measuring unit

Applies only to **PFU 2000.**

If the signal transmitter used features a measuring unit different from the one in the presetting, alternative measuring units can be selected in this display.

If a measuring unit different from the one in presetting is selected, the measuring unit will automatically be changed in the actual displays, but the measuring range of the signal transmitter will not be converted automatically.

Example:

If the measuring value "**m**" was selected in the presetting and the signal transmitter is working in "**ft**", the measuring unit has to be changed.
It is also **important** to convert and set the output signal as well as min. and max. working field of the signal transmitter in displays 219, 220 and 221.

The following measuring units can be selected:

Differential pressure:	m, Pa, ft, kPa.
Differential temperature:	K, °F.
Temperature:	°C, °F.
Flow:	m^3/h, l/h, l/s, gpm.
Level:	m, cm, ft, in.
Open loop:	%.
Pressure:	bar, mbar, p1si, kPa.
Pressure with pre-pressure measuring	bar, mbar, psi, kPa.

214

Control function

Applies only to **PFU 2000.**

This display is for the setting of how the system is to react to any deviations in relation to the setpoint.

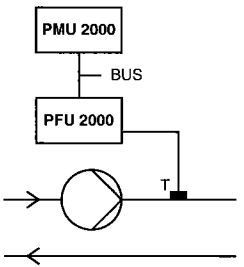
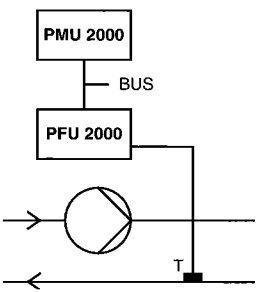
[normal] If the actual value, e.g. pressure is lower than the setpoint, the pump performance will be increased.

[invers] If the actual value is lower than the setpoint, the pump performance will be reduced.

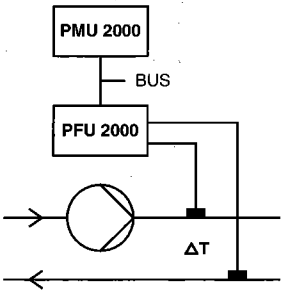
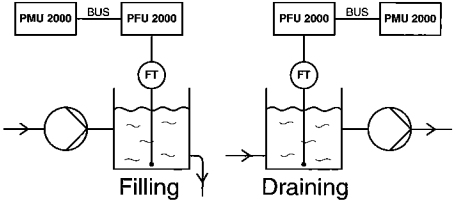
The default value is "normal". In case of differential temperature it is "invers", however.

Some examples of systems with their relevant control functions are shown on the following pages:

Control function

Control Parameter	Application	Control Function	
		Normal	Inverted
Constant flow-pipe temperature  TM00 2718 3794	Heating system	X	
	Air-conditioning system		X
Constant return-pipe temperature  TM00 2719 3794	Heating system	X	
	Air-conditioning system		X

Control function

Control Parameter	Application	Control Function	
		Normal	Inverted
Differential temperature  TM00 4998 4894	Heating system		X
	Air-conditioning system		X
Level  TM00 4997 0295	Filling system	X	
	Draining system		X

215

Pressure measuring

Applies only to **PFU 2000** control parameter "temperature", "flow", "level" and "open loop". In some systems it is desirable to know the discharge pressure of the pump. This is possible by fitting a pressure transmitter and selecting this function.

Set as follows:
[on] Pressure measuring is carried out.
[off] Pressure measuring is not carried out.

216

Pre-pressure measuring

Applies only to **PFU 2000** control parameter "pressure" and "pressure with pre-pressure measuring."

Set as follows:

[on] Pre-pressure measuring is carried out.
[off] Pre-pressure measuring is not carried out.

Pre-pressure measuring should be used if the system is running at a pre-pressure higher than 50% of the setpoint and 10% of the pump max. pressure.

217

External set-point influence

Applies only to **PFU 2000**.

This display is used if external influence is to be active.

External influence on the setpoint is effected via PFU 2000 analog/digital input 3.

If "influence" is selected, it is important to set the required table value in display 218.

The following external setpoint influences are possible:

[off] External influence on the setpoint via PFU 2000 is not possible.

[extern] An external analog signal reduces the setpoint.

[timer] An internal timer program in PMU 2000 controls the setpoint in accordance with a table.

This internal timer is started when the contact on the analog/digital input 3 is closed.

Setting range is 0 - 200 min.

[Temp Tf] The flow-pipe temperature is measured and the setpoint is controlled in accordance with a table.

[Temp Tr] The return-pipe temperature is measured and the setpoint is controlled in accordance with a table.

[Temp To] The ambient temperature is measured and the setpoint is controlled in accordance with a table.

[level] The level is measured and the setpoint is controlled in accordance with a table.

[flow] The flow is measured and the setpoint is controlled in accordance with a table.

[flow/I] The flow is measured indirectly and the setpoint is controlled in accordance with a table.

Remote control table

Applies only to **PFU 2000**.

This display is used for the setting of the table to be followed by the external setpoint influences.

If external setpoint influence is selected in display 217, up to four points can be set. The points set will then control the setpoint.
The four possible settings come in a row which means that the values can be set in the four next displays.

The setting range, which is limited by the signal-transmitter working range, is set in display no. 221.

Set A 0 min ->STOP bar
Set A 1 min -> 2.0 bar
Set A 5 min -> 3.5 bar
Set A 100 min -> 6.0 bar

Remote control table

Figs. 38 and 39 show setpoint curves as a function of the values set.
The examples show the external influence on the setpoint via:

- Timer: Influence on the setpoint (performance) as a function of time.
- Temperature: Influence on the setpoint (differential temperature) as a function of the outdoor temperature.

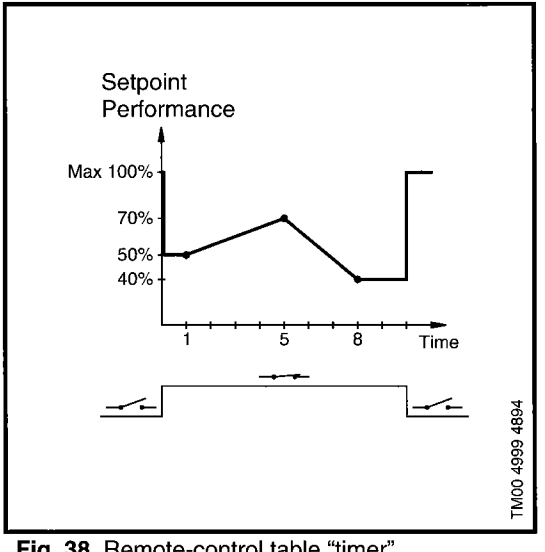


Fig. 38. Remote-control table "timer"

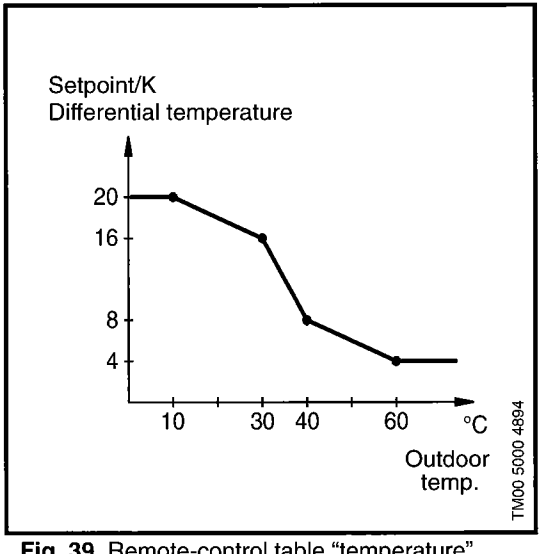


Fig. 39. Remote-control table "temperature"

Signal transmitter measuring range. Input 1

Measures the actual value in the system.

Applies only to **PFU 2000**.

Please note: The display does not appear if control parameter "open loop" has been selected.

In this display the output signal type of the signal transmitter (transducer, sensor, transmitter or the like) are to be set.
The min. and max. values of the signal transmitter working range are also set.

The following output signals can be selected:

- 0-10 V.
- 0-20 mA.
- 4-20 mA.

The following temperature signal transmitters can be selected:

- NTC 150, automatically gives working range 0°C to 150°C.
- NTC 50 automatically gives working range –25°C to 50°C.

The default value appears under the presetting.

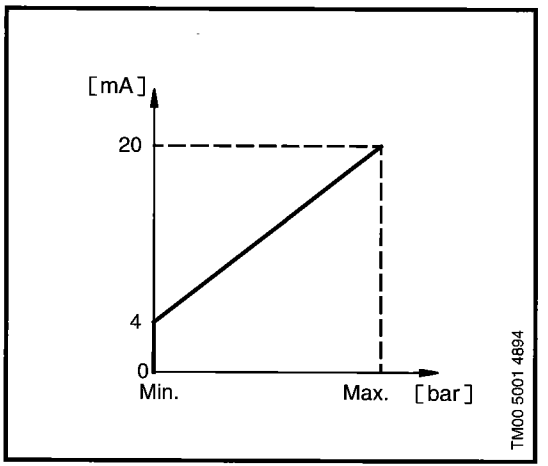


Fig. 40. Ex.: Input 1 (4-20 mA)

Signal transmitter measuring range. Input 2

Pressure, prepressure measuring and differential temperature.

Applies only to **PFU 2000**.

Please note: The display does not appear if control parameter "open loop" has been selected.

In this display the output signal type of the signal transmitter (transducer, sensor, transmitter or the like) are to be set.
The min. and max. values of the signal transmitter working range are also set.

The following output signals can be selected:

- 0-10 V.
- 0-20 mA.
- 4-20 mA.

The following temperature signal transmitters can be selected:

- NTC 150, automatically gives working range 0°C to 150°C.
- NTC 50 automatically gives working range –25°C to 50°C.

The default value appears under the presetting.

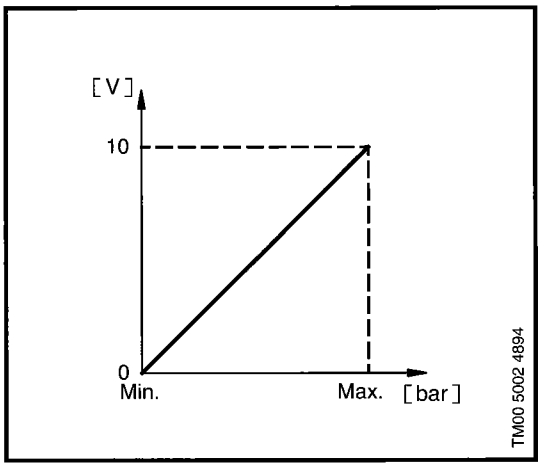


Fig. 41. Ex.: Input 2 (0-10 V)

221

Signal transmitter measuring range. Input 3

Temperature measuring and remote control.

Applies only to **PFU 2000**.

Please note: The display does not appear if control parameter "open loop" has been selected.

In this display the output signal type of the signal transmitter (transducer, sensor, transmitter or the like) are to be set.
The min. and max. values of the signal transmitter working range are also set.

The following output signals can be selected:

- 0-10 V.
- 0-20 mA.
- 4-20 mA.

The following temperature signal transmitters can be selected:

- NTC 150, automatically gives working range 0°C to 150°C.
- NTC 50 automatically gives working range –25°C to 50°C.

The default value appears under the presetting.

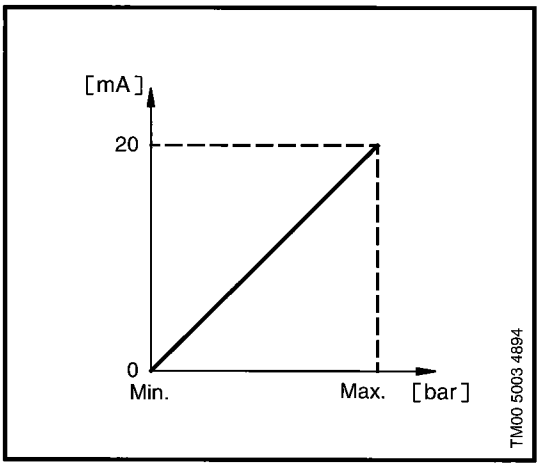


Fig. 42. Ex.: Input 3 (0-20 mA)

222

Input 4

Applies only to **PFU 2000.**

Digital input 4 can be used for external control of the zone.
This display is used for the selection of the function to be assigned to digital input 4 of the PFU 2000.
Only one function per zone can be selected.

The default value is off.

[off] Input 4 has no function.

[remote] Remote control on/off.
When the PFU 2000 input 4 contact is closed, all pumps are switched off.

Input 4

[ramp 2 pt] 2-point control of the setpoint.

When the PFU 2000 input 4 contact is closed, the setpoint will drop linearly in accordance with the set "ramp time" (display no. 223).
When the PFU 2000 input 4 contact is opened, the setpoint will rise linearly in accordance with the set "ramp time" (display no. 223).
If ramp 2 is selected, the ramp time is set in display no. 223.

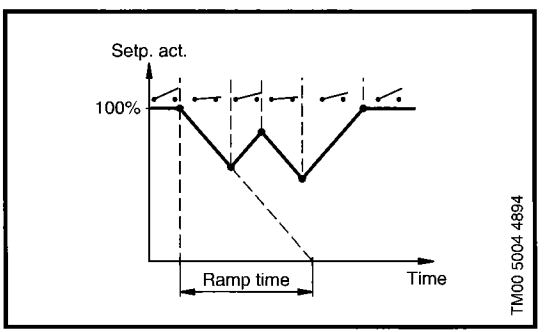


Fig. 43. 2-point control of the setpoint

[ramp 3 pt] 3-point control of the setpoint.

Input 2 is used for this function together with input 4.

When the PFU 2000 input 4 contact is closed, the setpoint will drop linearly in accordance with the set "ramp time" (display no. 223).

When the PFU 2000 input 2 contact is closed, the setpoint will rise linearly in accordance with the set "ramp time" (display no. 223).

When PFU 2000 input 2 and input 4 contacts are opened, the setpoint will be kept constant.

Please note: If PFU 2000 input 2 is used for pre-pressure measuring, "ramp 3" **is not** possible.

If ramp 3 is selected, the ramp time is set in display no. 223.

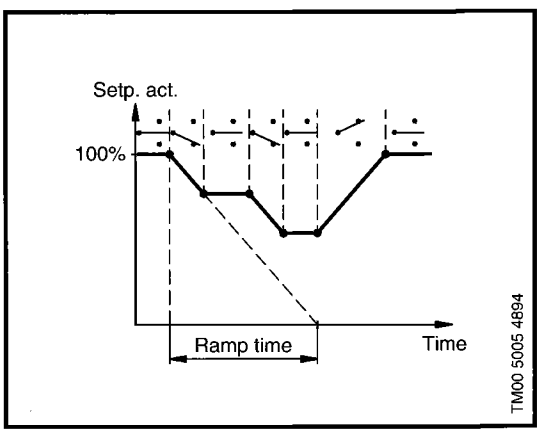


Fig. 44. 3-point control of the setpoint

Input 4

[reduced op] Reduced operation.

When the PFU 2000 input 4 contact is closed, the pumps which have not been set to reduced operation will be switched off.

The number of pumps required to run when "reduced op" appears is set in display 224.

[setpoint max1] "Setpoint max1" functions as setpoint max., but it cannot be influenced externally nor by the clock program.

When the PFU 2000 input 4 contact is closed, "setpoint max1" will be activated.

The value required for "setpoint max1" is set in display no. 225.

The setting range is STOP - "setpoint max." which is set in display no. 200.

The default value is "setpoint max.".

[fire fight] Is only available with control parameter "pressure" and "pressure with pre-pressure measuring".

When PFU 2000 input 4 contact is opened, "setpoint max1" will be activated. At least one pump is started. The pre-pressure measuring is de-activated. Cannot be influenced externally nor by the clock program.

The value required for "setpoint max1" is set in display no. 225.

[flowswitch] Is only available with control parameter "pressure" and "pressure with pre-pressure measuring".

If only one pump is in operation at low flow, it will be stopped when the PFU 2000 input 4 contact is opened and the actual pressure at the same time is higher than the setpoint set.

223

Ramp time

Applies only to **PFU 2000.**

If ramp 2 or ramp 3 has been selected under input 4, display no. 222, the required ramp time is set in this display.

The ramp time is the time that passes for a setpoint change from "setpoint max." to 0 or vice versa.

The setting range is 1 - 99 min.

The default value is 10 min.

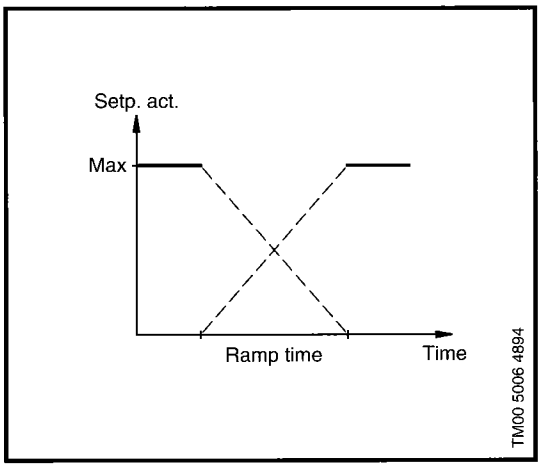


Fig. 45. Ramp time

224

Number of pumps on reduced operation

Applies only to **PFU 2000**.

Appears only if "reduced op" was selected under input 4.

The number of pumps to run when function "reduced op" appears is selected in this display.

The setting range is from no pumps to one pump less than the number of pumps connected to the zone.

The default value is 0.

225

Setpoint max.1

Applies only to **PFU 2000**.

Appears only if "reduced op" or "fire fight" was selected under input 4.

The value required for "setpoint max1" is set in this display.

The setting range is from STOP to the "setpoint max" set in display no. 200.

The default value is "setpoint max.".

226

Stand-by pumps

In zones with more than one pump the number of stand-by pumps can be selected.

Setting range is from one pump to one pump less than the number of pumps connected to the zone.

Example:

One stand-by pump in a 3-pump system has been selected.

All three pumps will start/stop in full alternation depending on the performance required, but only two pumps can run simultaneously.

227

Pump priority

Applies only to **PFU 2000**.

The operating priority of the pumps is set in this display.

The settings possible are from 1 (highest priority) to 8 (lowest priority).

Pumps with the highest priority are switched on first. Pumps with the lowest priority are switched off first. Pumps of equal priority are subject to: First in, first out.

The default value for all pumps is 1.

228

Max. limit

Applies only to **PFU 2000**.

This display is used for the setting of the maximum limit (e.g. pressure) at which the system is to indicate a fault. This limit depends on the control parameter under which the zone is being controlled.

If the max. pressure for the system is exceeded for more than 0.5 sec., all pumps are switched off and a fault indication is given.

If the pressure drops to a value below the max. limit for more than 5 sec., the pump/pumps is/are switched on automatically.

The fault indication is reset manually.

The setting range is from 0 to the max. value of the signal-transmitter measuring range.

229

Min. limit

Applies only to **PFU 2000**.

This display is used for the setting of the minimum limit (e.g. pressure) at which the system is to indicate a fault. This limit depends on the control parameter under which the zone is being controlled.

If the pressure falls below the min. pressure for the system and **[on]** was selected in display no. 230, all pumps are switched off and a fault indication is given.

If the pressure falls below the min. pressure for the system and **[off]** was selected in display no. 230, only a fault indication is given.

If the pressure rises above the min. limit, the fault indication will disappear and the pump/pumps is/are automatically switched on again.

The setting range is from 0 to the min. value of the signal-transmitter measuring range.

230

Min. limit operation

Applies only to **PFU 2000**.

[on] No pumps are switched off at "min.limit operation" but a fault is indicated.

[off] The pump/pumps is/are switched off at "min.limit operation" and a fault is indicated.

231

Min. pre-pressure

Applies only to **PFU 2000**, control parameter "pressure" and "pressure with pre-pressure measuring".

Only appears when pre-pressure measuring is **[on]**.

This display is used to set the "min.prepressure" at which a fault indication is to be given. If the pressure falls below "min.prepressure", all the pumps are switched off and a fault indication is given.

The default value is 0.

232

Maximum head

Applies only to **PFU 2000**.

This display is used to set the maximum head at maximum speed and flow = 0.

233

Running hours

Applies only to **PFU 2000**.

This display is used to set the running hours of the pump.

Is only relevant in connection with service or when a pump is replaced.

When a pump is replaced the running hours for the pump can be changed in this display.

8.2 Start/Stop Menu

300

Start/stop of zones

The top line indicates the specific zone, zone name and its control parameter.

The bottom line is used to select whether the zone is to be in operation or switched off.

The zone has four different settings.

[on] The pumps in the zone are started from PMU 2000 depending on the performance required.
[off] The pumps in the zone are switched off.
[local] The pumps in the zone are not controlled from PMU 2000, but by the settings made on the individual pumps.
[max.] All pumps which are ready for operation are put into operation so they run at maximum performance.
All internal monitoring functions are active.
Any remote-controlled setpoints, clock program and external start/stop are not active.

301

Start/stop of pumps

The top line indicates the specific pump and its operating condition (see pump status).

The bottom line is used to select whether the pump is to be in operation or switched off.

[on] The pump is started from PMU 2000 depending on the performance required.

[off] The pump is switched off.

8.3 Zone Status Menu

In the Zone Status Menu many of the displays will depend on the set values/parameters in the Setting Menu.
The figures in ( ) indicate where a value/parameter was set in the Setting Menu. This also gives a clue to where you can read more about the specific function.

401

Actual setpoint

This display indicates the actual setpoint of the zone.

The reason why the actual setpoint may deviate from the set "setpoint max." is that various factors may influence the setpoint.

These factors are described under other displays.

If you want to see which factors influence the setpoint, press "**Enter**".

402

Setpoint influence

This display indicates the setpoint influences selected and the impact they will have on the setpoint.

Please note: More than one setpoint influence is possible, which again may trigger off several underlying displays.

[clock progr.]
(201)

[remote] If the setpoint is influenced from PCU 2000, the resulting value is indicated in this display.

[medium temp.infl]
Applies only to UPE.
(202)

[progressive infl]
(202)

403

Actual value

This display indicates the actual value of the zone.

404

Speed

Applies only to **PFU 2000**.

The pump performance in % for the pumps in operation is indicated in this display.

Example:
In a three-pump system where all the pumps are running at max. speed, the pump performance will be 300%.
In the same three-pump system with one pump running at max. speed and one pump frequency-controlled to 50% of pump performance and one pump not running, pump performance will be 150%.

405

Setpoint max.

This display indicates the maximum setpoint for the zone.
(200)

406

Clock program

This display gives an overview of the switching times set.
(201)

407

On/off-band

Applies only to **PFU 2000**.
This display indicates the set "on/off-band".
(207)

408

System time constant (reaction time)

Applies only to **PFU 2000**.
This display indicates the system time constant (reaction time).
(204)

409

Minimum switching time

Applies only to the **PFU 2000**.
This display indicates the minimum switching times set.
(205)

410

Pump change

This display indicates whether time-dependent change has been selected.
[on] Time-dependent pump change is carried out.
[off] Time-dependent pump change is not carried out.
After each pump stop, PMU 2000 will change the starting order of the pumps.
(208)

411

Time for pump change

This display indicates when **[00:05]** the pump change is to take place.
(209)

412

Control function

Applies only to **PFU 2000**.
This display indicates the control function selected.

[normal] If the actual value is smaller than the set-point, the pump performance will be increased.
[invers] If the actual value is smaller than the set-point, the pump performance will be reduced.
(214)

413

Pressure measuring

Applies only to **PFU 2000.**
This display indicates whether the system carries out pressure measuring.
[on] Pressure measuring is carried out.
[off] Pressure measuring is not carried out.
(215)

414

Pre-pressure measuring

Applies only to **PFU 2000.**
This display indicates whether the system carries out pre-pressure measuring.
[on] Pre-pressure measuring is carried out.
[off] Pre-pressure measuring is not carried out.
(216)

415

External set-point influence

Applies only to **PFU 2000.**

This display indicates the external influence selected for the setpoint.
(217)

416

Signal transmitter measuring range. Input 1

Measures the actual value in the system.

Applies only to **PFU 2000**.

This display indicates the measuring unit, type and measuring range of the signal-transmitter as well as input no.
(219)

417

Signal transmitter measuring range. Input 2

Pressure, pre-pressure measuring and differential temperature.

Applies only to **PFU 2000**.

This display indicates the measuring unit, type and measuring range of the signal-transmitter as well as input no.
(220)

418

Signal transmitter measuring range. Input 3

Temperature measuring and remote control.

Applies only to **PFU 2000**.

This display indicates the measuring unit, type and measuring range of the signal-transmitter as well as input no.
(221)

419

Input 4

Applies only to **PFU 2000**.

This display indicates the function of PMU 2000 digital input 4.
(222)

420

Input 4 (value)

This display indicates the values set in the following display nos:

[ramp time]
(223)

or

[reduced op]
(224)

or

[setpoint max1]
(225)

Applies only to **PFU 2000**.

421

Stand-by pumps

This display indicates the number of stand-by pumps selected for the zone.
(226)

422

Pump priority

Applies only to **PFU 2000**.

Indicates the operating priority of the pumps.
(227)

423

Max. limit

Applies only to **PFU 2000**.

Indicates the set maximum limit (e.g. pressure). If this limit is exceeded for 5 sec. the pump/pumps will stop and a fault is indicated.
(228)

424

Min. limit

Applies only to **PFU 2000**.

Indicates the set minimum limit (e.g. pressure). If the value falls below this limit, a fault is indicated.

Please note: If **[off]** is selected in display no. 230, the pump /pumps is/are also switched off.
(229) and (230)

425

Min. limit operation

Applies only to **PFU 2000**.

Indicates whether "min. limit operation" is active.

[on] No pumps are switched off if the value falls below the minimum limit, but a fault is indicated.

[off] The pump/pumps is/are switched off when the value falls below the minimum limit, and a fault is indicated.
(230)

426

Zone actual head

Applies only to **UPE**.

Indicates the actual head in the zone in metres.
[STOP] The pump/pumps in the zone has/have been switched off.

427

Zone actual flow

Applies only to **UPE**.
Indicates the actual flow of the zone.

428

Zone actual power consumption

Applies only to **UPE**.

Indicates the actual power consumption which is the sum total of the power consumed by all the pumps in the zone.

429

Zone maximum head

Applies only to **UPE**.
Indicates the maximum head in the zone.

430

Zone maximum flow

Applies only to **UPE**.
The maximum flow of the zone is the sum total of the maximum flow for all the pumps in the zone.

431

Min. curve. Night-time duty

Applies only to **UPE**.
Indicates the "min. curve" selected.
(203)

432

P-band

Applies only to **PFU 2000**.
Indicates the P-band set.
(206)

433

Temp.Tf

Applies only to **PFU 2000**.
Indicates the actual flow-pipe temperature.

434

Temp. Tr

Applies only to **PFU 2000**.
Indicates the actual return-pipe temperature.

435

Min. pre-pressure

Applies only to **PFU 2000**.
Indicates at which minimum pre-pressure a fault is indicated.
(231)

8.4 Pump Status Menu

500

Examples of pump status

Applies to systems with **UPE Series 2000** pumps connected.

The top line indicates pump number and zone.

The bottom line indicates the actual operating condition of the pump.

[I] The pump is running.

[O] The pump is not running.

[A] There is a fault indication for the pump.

[M] The pump is set to max. speed.

[is running] The pump is running in accordance with the zone setting.
[cascade cont] The pump has been switched off due to a low performance requirement or the zone has been switched off via an external start/stop switch.

[zone is off] The zone has been switched off from PMU 2000 via the start/stop menu.

[at the pump] The pump has been switched off on the pump or via R100.
[remote off] The pump has been switched off via an external start/stop switch connected to the pump, PCU 2000 or PFU 2000.
[switched off] The pump has been switched off from PMU 2000 via the start/stop menu.
[not availabl] No power supply to the pump or the pump has not been connected to PMU 2000.
[communicat] Fault in communication line between the pump and PMU 2000.
[is blocked] The pump is blocked.
[motor temp] The motor temperature is too high.
[overvolt] The supply voltage is too high.
[undervolt] The supply voltage is too low.
[fault] Other fault which has caused the pump to be switched off.

500

Examples of pump status

Applies to systems with **PFU 2000** connected.

The top line indicates pump number and zone.

The bottom line indicates the actual operating condition of the pump.

[I] The pump is running.

[O] The pump is not running.

[A] There is a fault indication for the pump.

[M] The pump is set to max. speed.

[is running] The pump is running in accordance with the zone setting.
[cascade cont] The pump has been switched off due to a low performance requirement or the zone has been switched off via an external start/stop switch.

[zone is off] The zone has been switched off from PMU 2000 via the start/stop menu.
[remote off] The pump has been switched off via an external start/stop switch connected to the pump, PCU 2000 or PFU 2000.
[switched off] The pump has been switched off from PMU 2000 via the start/stop menu.
[not availabl] No power supply to the pump or the pump has not been connected to PMU 2000.
[communicat] Fault in communication line between the pump and PMU 2000.
[fault] Other fault which has caused the pump to be switched off.

501

Actual head of pump

Applies only to **UPE**.

Indicates the actual head of the pump.
[STOP] The pump has been switched off.

502

Actual flow of pump

Applies only to **UPE**.

Indicates the actual flow of the pump.

503

Actual pump power consumption

Applies only to **UPE**.

Indicates the actual and maximum power consumption of the pump.

504

Pump maximum head

Indicates the maximum head of the pump at maximum speed and flow = 0.

505

Pump maximum flow

Applies only to **UPE**.

Indicates the maximum flow of the pump at head = 0.

506

Setpoint under "local" control

Applies only to **UPE**.

Indicates the setpoint which has been set on the pump or via R100.

507

Min. curve under "local" control

Applies only to **UPE**.

Indicates the min. curve which has been set via R100.

508

Pump running hours

Indicates the accumulated running hours of the pump. (233)

509

Power consumption

Applies only to **UPE**.

Indicates the accumulated energy consumption of the pump.

600

Examples of fault indications

Applies to systems with **UPE Series 2000** pumps connected.

The top line indicates the pump number and the fault in question.

The bottom line indicates the time at which the fault occurred, when it disappeared or whether it still exists.

Under "Alarm", the last 10 fault indications can be viewed, distributed by time of occurrence.

The latest fault indication appears first.

When the fault has been remedied, reset the indication by pressing "**Enter**".

If "alarm suppression" was set to **[on]** in the Basic Menu, the alarm output will be suppressed for 15 min. by pressing one of the buttons on PMU 2000.

Examples of pump faults:

[overvolt] Supply voltage is too high.
[undervolt] Supply voltage is too low.
[fault] Other fault which has caused the pump to be switched off.
[motor temp] The pump was switched off due to too high motor temperature.
After cooling of the motor, the pump is again switched on.
[blocked] The pump is blocked, the fault should be remedied manually.
[communicat] Communication fault in the line between the pump and PMU 2000.

The communication fault may be caused by:

- No voltage supply to the pump.
- Defective communication cable between the pump and PMU 2000.
- Fault in the pump or PMU 2000.

[11:59] Time when the fault occurred.
[13-06] Date when the fault occurred.
[actual] The fault still exists, and has not been remedied so the fault is still indicated.

Examples of fault indications

Applies to systems with **PFU 2000** connected.

The top line indicates **[PFU]** and pump numbers.

The bottom line indicates the time at which the fault occurred, when it disappeared or whether it still exists.

Under "Alarm", the last 10 fault indications can be viewed, distributed by time of occurrence.

The latest fault indication appears first.

When the fault has been remedied, reset the indication by pressing "**Enter**".

If "alarm suppression" was set to **[on]** in the Basic Menu, the alarm output will be suppressed for 15 min. by pressing one of the buttons on PMU 2000.

The cause of the fault can be:

- No voltage supply to PFU 2000.
- Defective communication cable between PFU 2000 and PCU 2000/PMU 2000.
- Fault in PFU 2000 or PMU 2000.

Examples of fault indications for PFU 2000:

[7 8] Fault in PFU 2000 connected to pumps 7 and 8.
[11:59] Time when the fault occurred.
[13-06] Date when the fault occurred.
[13:20] Time when the fault disappeared.
[14-06] Date when the fault disappeared.
[actual] The fault still exists and has not been remedied so the fault is still indicated.

Examples of fault indications

Applies to systems with **PCU 2000** connected.

The top line indicates **[PCU]** and pump numbers.

The bottom line indicates the time at which the fault occured, when it disappeared or whether it still exists.
Under "Alarm", the last 10 fault indications can be wiewed, distributed by time of occurrence.
The latest fault indication appears first.

Once the fault has been remedied, reset the indication by pressing **"Enter"**.

If "alarm suppression" was set to **[on]** in the Basic Menu, the alarm output will be suppressed for 15 min. by pressing one of the buttons on PMU 2000.

The cause of the fault can be:

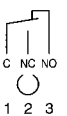
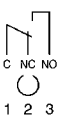
- No voltage supply to PCU 2000.
- Defective communication cable between PCU 2000 and PMU 2000.
- Fault in PCU 2000 or PMU 2000.

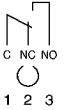
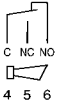
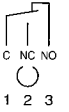
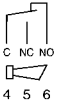
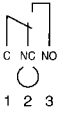
Examples of fault indications for PCU 2000:

[1 2 3 4] Fault in PCU 2000 connected to pumps 1, 2, 3 and 4.
[11:59] Time when the fault occurred.
[13-06] Date when the fault occurred.
[13:20] Time when the fault disappeared.
[14-06] Date when the fault disappeared.
[actual] The fault still exists and has not been remedied so the fault is still indicated.

9. Operating and Fault Indications

The functions of the PMU 2000 operating and fault indicator lights and operating and fault signal outputs appear from the following tables.

Indicator Lights		Description	Operating and Fault Signal Outputs	
Operation (Green)	Fault (Red)		Operation	Fault
Off	Off	The electricity supply is switched off.		
Perma-nently on	Off	At least one pump in each zone is in operation.		
Flashing	Off	In at least one zone all pumps have been stopped, either: • on the pump/pumps, or • via PMU 2000/PCU 2000		

Indicator Lights		Description	Operating and Fault Signal Outputs	
Operation (Green)	Fault (Red)		Operation	Fault
Off	Permanently on	At least one pump stopped due to fault.		
Permanently on	Permanently on	At least one pump has been out of operation due to fault. At least one pump in each zone is in operation.		
Flashing	Permanently on	In at least one zone all pumps have been stopped, either: • on the pump/pumps or • via PMU 2000/PCU 2000 At least one pump has been out of operation due to fault.		

10. Fault Finding

Fault	Cause	Remedy
PMU 2000 unintentionally out of operation.	No voltage supply. Cause: • Defective back-up fuse. • Cable breakdown.	Check the following: • Back-up fuse. • Cable. If no defects are found during this check, PMU 2000 is defective and must be replaced.
Pump unintentionally out of operation.		Check communication cables of the entire system. See also Installation and Operating Instructions for the UPE Series 2000 pumps.

11. Technical Data

Voltage Supply
1 x 230-240 V +6%/ – 10%, 50 Hz, PE.

Back-up Fuse
Max. 10 A.

Power Consumption
Max. 3 W.

Enclosure Class

IP 42: Enclosed version
IP 00: Built-in version for panel mounting
Enclosure class of front cover: IP 42.

Battery back-up
Lithium cell.
Min. lifetime: 10 years.

Ambient Temperature
IP 42: 0°C to +40°C.
IP 00: 0°C to +55°C.

Storage Temperature
– 30°C to +70°C.

Relative Air Humidity
Max. 95%.

EMC (Electromagnetic Compatibility)

- EN 50 081-1.
- EN 50 082-1.

Operating and Fault Signal Outputs
Potential-free change-over contacts.
Max. contact load: 250 V, 2 A, AC 1.
Min. contact load: 5 V/1 mA.

Communication Cable between the Units of the Pump Management System 2000 (BUS)
Screened two-core cable.
Cross-section: Min. 0.25 mm^2.
Max. 1.0 mm^2.
Total cable length for entire Pump Management System 2000: Max. 500 m.

Communication
RS-485.

Cable Entries IP 42
Entries into PMU 2000:
4 x Pg 11.
Supplied with PMU 2000:
4 x Pg 11.
2 x Pg 11 blanking plugs.

Weight
IP 42: Net: 1.0 kg.
Gross:1.4 kg.

IP 00: Net: 0.6 kg.
Gross:1.0 kg.

Dimensions

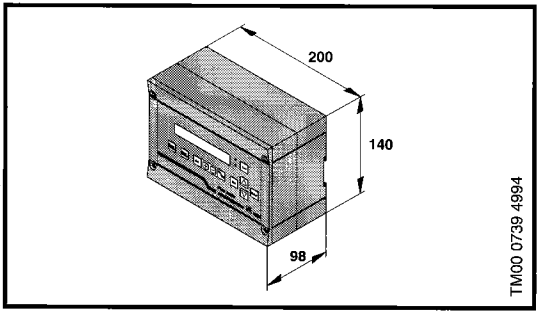


Fig. 46. IP 42

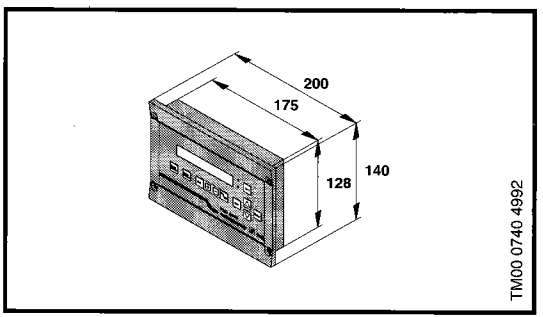


Fig. 47. IP 00

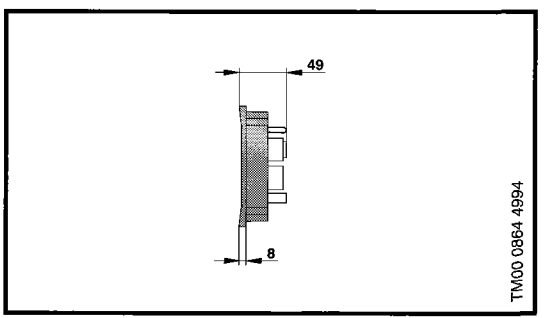


Fig. 48. IP 00

12. Glossary

Analog input
Analog signals from signal transmitters can be connected to the analog inputs of PFU 2000.

BUS
The GRUNDFOS-BUS enables communication between the units connected to Pump Management System 2000. The communication (RS-485) is performed according to the socalled GRUNDFOS-protocol.
Please be aware that some of the UPE Series 2000 pumps must be fitted with a socalled BUS module to be able to communicate via the BUS.
(See Installation and Operating Instructions for UPE Series 2000).

Constant curve operation
To enable operation on a constant curve, the pump performance can be continuously variably set (in %) between the max. and min. curves. The result is that the pump will operate along a curve corresponding to the curve for an uncontrolled pump.

Control
The word "control" as used in these Operating Instructions generally covers both the following situations:

1. PMU 2000 operates on the basis of a set control signal (without receiving a sensor signal). (See "Open Loop").
2. The controller incorporated in PMU 2000 compares a signal from an external sensor (pressure, temperature, flow, level) with a setpoint.
   The setpoint is an indication of a required state and the sensor constantly registers whether this required state is maintained. On the basis of the above-mentioned comparison the controller continuously adapts pump speed so as to automatically make system performance result in the required state.

Cursor
A cursor is the flashing spot appearing in the display and indicating position.

Default value
The default value is the factory-set value/parameter, i.e. the value/parameter which will apply if no other value is set. This is for instance the case in connection with presettings.

Differential pressure
Differential pressure is the pressure difference between two measuring points, e.g. between suction and discharge ports of the pump.

Differential temperature
The differential temperature is the temperature difference between two measuring points, e.g. flow or return pipe.

Digital input
Digital signals from signal transmitters can be connected to the digital inputs of PFU 2000.

Display overview
A display overview is a total overview of the displays which may appear in a menu with a given presetting.

Flow
Flow is the quantity of pumped liquid in m^3/h which passes through a pump/zone.

Head
Head is indicated in 'm' and designates the pressure increase imparted to the liquid by the pump.

"Local" operation
When the pump is not controlled via PMU 2000 but according to the settings made on the pump or via PFU 2000, the operating mode is referred to as "local".

Max. curve
When operating on the max. curve, the pump is running at maximum speed (independent of external signals).

Menu
Menu is the designation of one of six different groups of displays in PMU 2000 (see page 17). Settings and readings are made in the menus, which consist of a number of displays.

Min. curve
When operating on the min. curve, the pump is running at minimum speed.
Min. curve is for instance used in connection with reduced nighttime duty or during holiday periods.

Open loop
Open loop is the designation of a control system without feedback signal from a sensor. (See 'Control').

Pre-pressure
Pre-pressure is the pressure which can be measured immediately before the system/pump.

Proportional pressure
Proportional pressure means that the pressure in the system rises/falls proportionally with the flow (friction-loss compensation).

R100
The GRUNDFOS R100 remote control is designed for wireless communication with GRUNDFOS products. Communication is performed via infrared light.
The functions available in R100 depend on the individual product (See Installation and Operating Instructions for UPE Series 2000 and Operating Instructions for R100).

Temperature influence
Temperature influence means that the setpoint is influenced by the actual liquid temperature. The liquid temperature is continuously measured and the setpoint automatically adjusted according to this measurement.
In systems with flow-pipe temperature control, this function may result in a further improvement of the system performance.

Zone
A zone is a closed hydraulic system in which all pumps have common suction and discharge pipes.
A non-return valve must be fitted on the discharge side of each pump.

13. Index

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