

Heat / Cooling meter PolluWatt Duo

Installation and operation instructions



The integrator PolluWatt Duo is used for energy consumption measurement in heating or cooling systems filled with the energy carrier liquid water.

These installation and operation instructions specify how to install and operate the integrator PolluWatt Duo. They are an essential part of the delivered items and have to be handed over to the final user.

Delivered items

- Integrator PolluWatt Duo (incl. temperature sensors and thermowells, where appropriate)
- Sealing material (self-lock seals, sealing wire), cable binders for strain relief
- Fastening material (2 screws, 2 dowels, C-rail)
- these installation and operating instructions

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1. Technical Data

Temperature measuring range	0 ... 200 °C
Temperature difference	3 ... 150 K
Environmental temperature	0 ... 50 °C
Measuring and integration cycles resp.	Display: 2 sec
Storing temperature	- 20 °C ... + 60 °C
Dimensions (wall mounting)	ca. 160 x 200 x 80 mm (W x H x D)
Suitable temperature sensor types	Pt 500 or Pt 100 see casing lid
Protection class	IP 65 acc. to DIN 40050
Pollution degree acc.to EN 61010	None or only dry nonconductive pollution

2. Important directions

- This instrument has been delivered from our factory in a state consistent with sound safety engineering. In order to ensure safe installation and operation please read this manual thoroughly.
- Where covers are opened or parts are removed, except where this can be done by hand, live parts might be exposed. Moreover connection points can also live. **Any repair and maintenance work has to be carried out by authorized experts only, who have been adequately trained.**
- If casing and/or connection cables show any damages, the instrument is to be put out of operation and it is to be secured against accidental restart.
- Heat and chill meters are measuring instruments and have to be handled with care. For protection against damage and dirt they should be unwrapped immediately before installation only.
- Do not clean them with anything else but a cloth moistened with water. If more than one heat or chill meters are to be used in one billing unit, similar meter types and fitting positions should be selected in order to keep the consumption billing as fair as possible.
- Particular care is to be taken during the installation of the flow sensor, the thermowells or ball valves, because otherwise there might be a **danger of scalding** by leaking hot liquid. Stop cocks are to be closed before removal of components.
- For manufacturing reasons the connection threads of the flow sensors might be sharp-edged. Therefore we recommend wearing protective gloves.

2.2 Connection to main voltage 230V

- The arithmetic heat meter unit PolluWatt duo operates on mains voltage. **Only specially trained and authorized personnel are permitted to carry out the connection.** Moreover attention is to be paid to the national technical rules, e.g. VDE 0100 in particular.
- The equipment corresponds to safety class system 1 in accordance with. EN 60335-1. The mains supply to the unit must be earthed.
- When the housing is opened live connections are exposed, which pose an electric shock hazard. Before connecting the temperature sensor the volume measurement sensor and measured value transmitting cables disconnect the mains voltage supply. If the housing and/or the mains cable show any

signs of damage, for safety reasons the equipment must not be used.

- The supply to mains-operated instruments must be fused at 6 A.
Voltage: 220 ... 240 V AC
Frequency: 50/60 Hz
Max. power consumption: 0.5 VA

3. Required tools

- Fork wrench SW 24 (thermowells)
- Screw driver slot 0,8x5 (thermowells)
- Screw driver slot 0,5x3 (terminal block)
- Diagonal cutting pliers (sealing wire, cable binders)
- Screw driver Torx 6 (integrator module)

4. Combination of the sub-units

Each measuring point is composed of:

- flow sensor
- integrator PolluTherm
- one pair of temperature sensors, optionally with thermowells

For assistance to find the correct standard combination, the sub-units are marked with graphical symbols according to the table below:

Flow sensor with reed pulser

Size	Output pulse value flow sensor	Pulse value PolluWattDuo
QN 1,5 bis 10	10 Liter/pulse	0,1 pulse/L
QN 15 bis 100	100 Liter/pulse	0,01 pulse/L
QN 150 bis 400	1.000 Liter/pulse	0,001pulse/L

It is recommended to use the Opto encoder OD 02 (order nr. 117807) with Woltmann volume sensors to obtain a high resolution volume pulse and therefore an up-to-date flow- and thermal output value.

Flow sensor with OD 02

Size	Output pulse value flow sensor	Pulse value PolluWattDuo
QN 15 to 100	1 Liter/pulse	1 Imp./L
QN 150 to 400	10 Liter/pulse	0,1 Imp./L

The output pulse value is adjusted in the calculator before calibration. A change of the setting on a later date is only possible by breaking the seal.

4.2 Temperature sensor

Size	QN
100 mm	<= QN 10
150 mm	>= QN 15

5. Installation of the sub-units

PolluTherm can be used not only as a heat meter, but also as a chill meter or a combined heat / chill meter. Therefore the text hereinafter includes following terms:

return pipe of heating plants: **colder line**
supply pipe of heating plants: **warmer line**

return pipe of chilling plants: **warmer line**
supply pipe of chilling plants: **colder line**

5.1 Flow sensor

Applicable standards: EN 1434-6

Standard installation of the flow sensor is in the heating return pipe i.e. the colder line. If the flow sensor is to be installed in the heating supply pipe i.e. the warmer line, the integrator PolluTherm X is to be used (X means that the integrator has been adjusted for flow sensors in the warmer line).

Installation in chillers:

If the flow sensor is installed in the warmer line of a chill system (the warmer line is here the return pipe) it is also permitted to use PolluTherm instead of PolluTherm X, because of the small temperature difference.

An arrow on the body shows the flow direction. The maximum operating pressure and the maximum operating temperature must not be exceeded. For flow sensors with nominal size \geq DN 50 (Woltman meters) a straight inlet pipe (area of steady flow) is to be provided:

Type	Area of steady flow (e.g. acc. PTB-A 6.1)
WP and WS	standard: 3 x DN
WP and WS	after manifolds, rotary pumps, throttling equipment: flow straightener and 3 x DN
WS	after manifold: 5 x DN or straightening blade

After the flow sensor abrupt reductions of the pipe cross section are not allowed.

It is absolutely advisable to install a dirt trap before the flow sensor or at another suitable point of the heating or chilling circuit as well as shut-off valves before and after the flow sensor (in order to avoid having to empty the pipeline if the meter is to be exchanged). During initial installation a spool piece is installed instead of the flow sensor and the pipe system is thoroughly flushed. Then close the shut-off valves, remove the spool piece, clean the sealing surfaces and install the flow sensor using new gaskets. Take care not to reduce the pipe diameter by bad positioning of the gaskets, particularly if flanged versions are installed.

Examples of installation in heating systems:

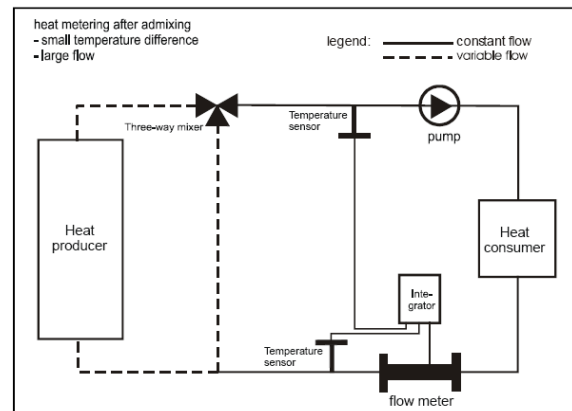


Fig. 1: Measurement after admixing

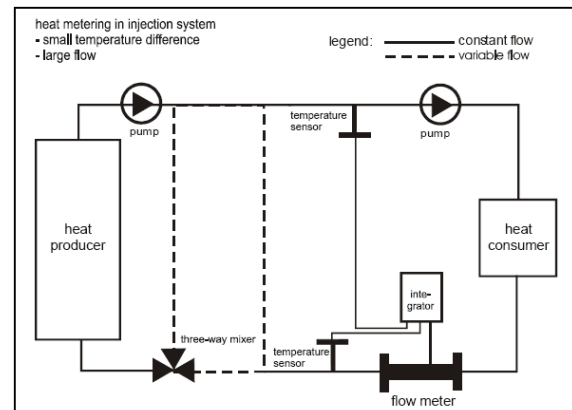


Fig. 2: Measurement in injection system

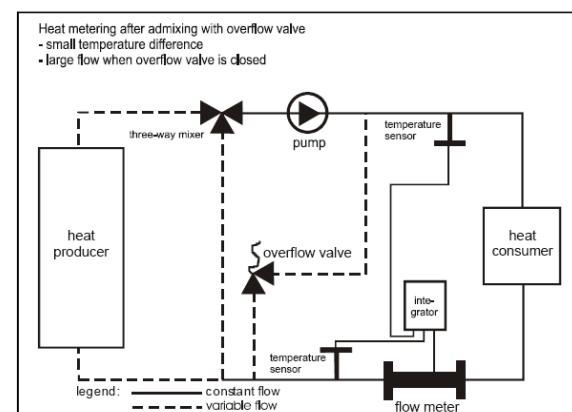


Fig. 3: Measurement with overflow valve

5.2 Installation of the temperature sensors

PolluTherm is operated with separately approved and paired temperature sensors type Pt 100 or Pt 500. The applicable type is specified on the integrator frontside. The two temperature sensors can optionally be mounted in thermowells or directly into the heating or cooling liquid. We recommend using pairs of thermowells or ball valves in order to facilitate future exchange.

For a general installation standard please refer to EN 1434-2.

For Sensus temperature sensors of the overall lengths 100 mm and 150 mm, the sensitive zone is ca. 10 to 15 mm measured from the temperature sensor's tip and has to be positioned as near as possible to the **middle of the pipe diameter**. Refer to the following guide for installing such temperature sensors:

Nominal sizes \leq DN 80:

Mount the temperature sensors in an angle of 45° **towards** the flow direction (see fig. 4).

Nominal sizes \geq DN 100:

Mount the temperature sensors at right angle to the flow direction (see fig. 5).

For larger nominal sizes (as from ca. DN 150) the thermowell has to be immersed at least as deep as 50 mm into the pipe.

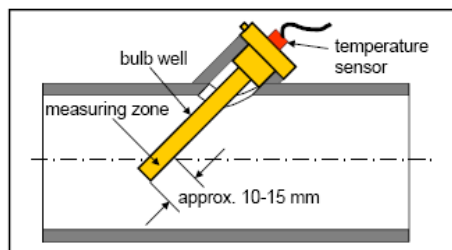


Fig. 4: Exemplary diagram for nominal sizes \leq DN 80

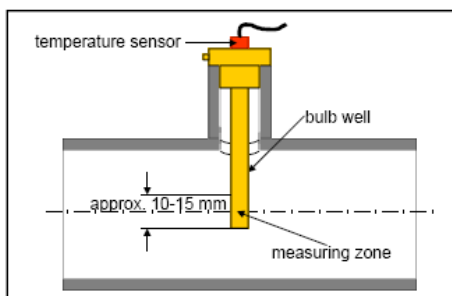


Fig. 5: Exemplary diagram for nominal sizes \geq DN 100

For the nominal sizes DN 15, 20 and 25, short temperature sensors (e.g. overall length 45 mm or type DS 27.5) can optionally be used.

6. Connection of the sub-units

Zum Öffnen des Gehäuses die beiden Schrauben lösen und den Deckel aufklappen.

6.1 Connection flow sensor

Volume measurement sensors with a two-core cable are connected to terminals 10 (+) and 11 (-). For sensors with a three-core cable the third core is connected to terminal 9. Suitable sensors can be reed switches, sensors with an open collector output or Optopulsers according to DIN 19234 are used. The maximum input pulse frequency is 400Hz.

6.2 Connection of the temperature sensors

PolluWatt Duo can be operated with temperature sensors type Pt 100 or Pt 500. The applicable type is specified on the frontside of the integrator casing. The required minimum distance from sources of electromagnetic interference (generators, frequency converters, ...), as well as from cables carrying \geq 230 V, is 0.3 m. Two-wire or four-wire connection is possible (to extend the length of the temperature sensor cables by max. 15 m, cable type I-Y(St)Y 2x2x0.8, minimum core size 0.5 mm², see also chapter 12). Allocation as follows:

Supply pipe temperature sensor (warmer line):

Connection type	Terminals
Two-wire connection	5, 6
Four-wire connection	5, 6 and 1, 2
Screening, if any	⊥

Return pipe temperature sensor (colder line)

Connection type	Terminals
Two-wire connection	7, 8
Four-wire connection	7, 8 and 3, 4
Screening, if any	⊥

After connecting all sensors the heat meter terminal housing is sealed through the hole at its upper edge with the enclosed lead seal (see also page 23: Dimensional drawings).

7. Interface

7.4 RS 232-Interface

terminals 52 (Ground), 53 (RXD) and 54 (TXD)

7.1 Pulse outputs

quantity of heat: terminals 16 (+) and 17 (-)

volume: terminals 18 (+) and 19 (-)

7.5 M-Bus-Interface

terminals 24 and 25 (Polarity is not important)

7.2 Analog outputs

analog output 1: terminals 55 (+) and 56 (-)

analog output 2: terminals 57 (+) and 58 (-)

analog output 3: terminals 59 (+) and 60 (-)

Variable data protocol acc. EN 13757-3

Allows a readout of the meter via its primary or secondary address with an M-Bus level converter (300 to 9600 Baud, normally 2400 Baud should be used, the number of readouts is unlimited).

7.3 Alarm relays

terminals 50 and 51 (max. 60 V, max. 1 A)

8. User Manual for the Integrator

8.1 General proceeding for the selection of options and attitude of parameters

„Arrow down“-button	„Arrow right“-button
Key selection of menus and options	
Selection of a menu in the basic announcement	
	Bypass into the selected menu
Selection of an assigned submenu and/or an option	
	Execution of an action (e.g. resetting limits) or activation of the programming mode (recognizable from a star symbol from the left edge of display) for the option selected before
To change numeric values first step the cursor along so that it is under the digit that is to be changed	
To change digit select a number between 0 and 9	
	Step to the next digit which can be changed or optionally exited

8.2 Menu Selection

You can select the displays and settings of the heat meter on the various menus by means of the two buttons. Functions of the buttons:



The current display will switch to the next value.



The display currently shown will be confirmed or executed.

If you press both buttons or if there is no input for approx. 2 minutes, the first display on the basic menu will be shown again and a device which may have been "opened" by entering of a password will be locked again.

Various settings of the heat meter may be protected by a PASSWORD. This means that they cannot be changed without entering the password first. There are 2 security levels:

Security level 1: hardware jumper on the mother board

Security level 2: service password

Security level 3: User password (identical to service password)

Security level 2 remains active until both buttons are pressed simultaneously or if there is no input for approx. 2 minutes.

If no password protection has been enabled (= service password cancelled), the password option will not be displayed on the "Settings Menu". If the user password protection is not intended, then the safeguard level 3 is always activated. The standard attitude of the service and user password reads:

1 0 1 0 0 1 0 1

Input in the menu „Settings“ on page 12



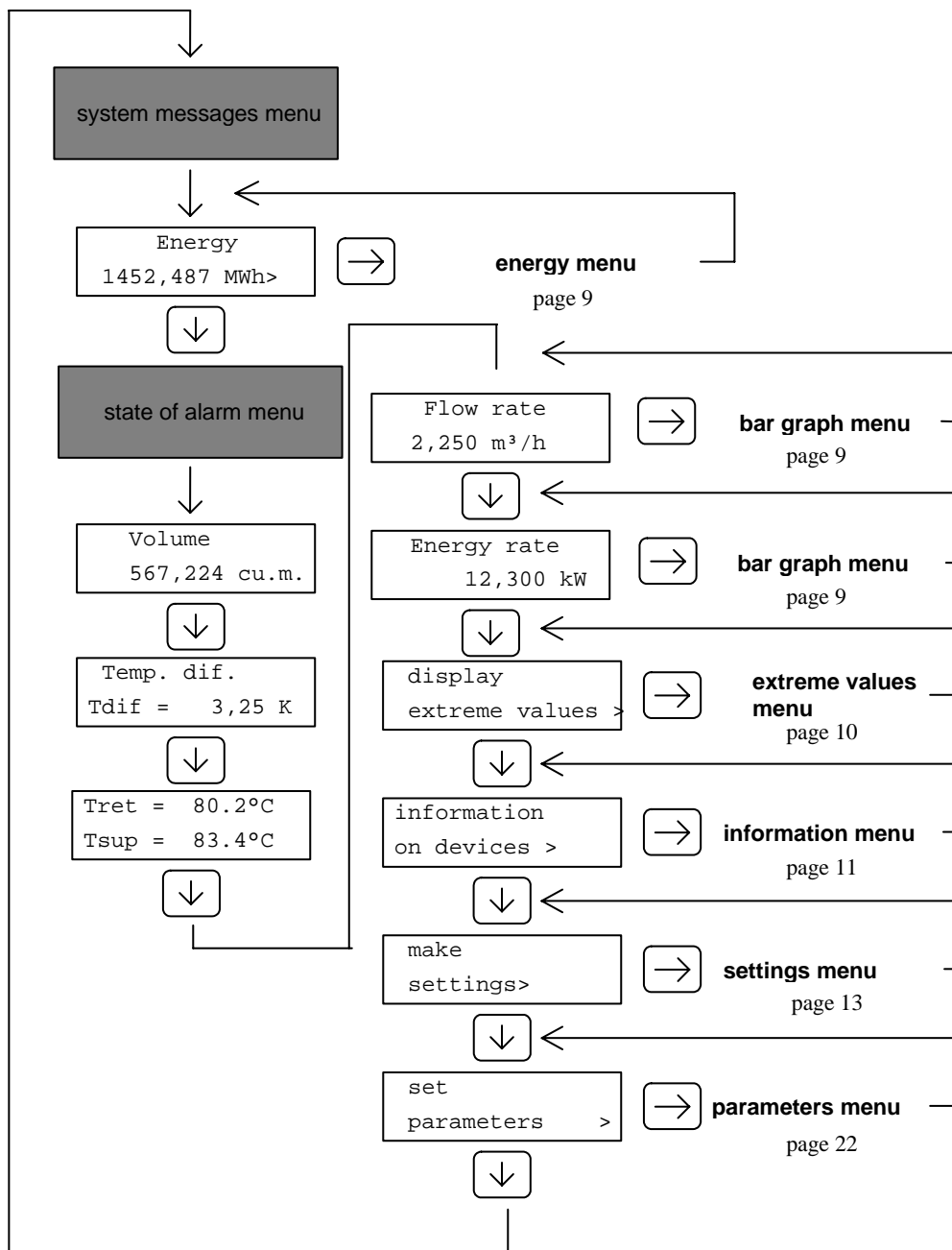
Input of the number 1



Input of the number 0

Please note that password entry is locked out after five wrong password attempts within 24 hours.

8.3 Basic Menu



The two menu sequences shown in dark-grey (system messages and state of alarm) will only be shown if required. The "energy" display has additional display functions:

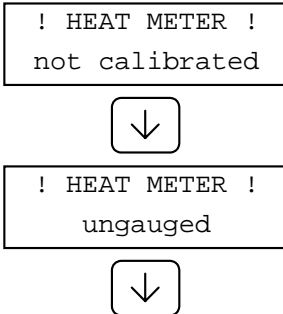
alarm indication: a flashing A on the upper right of the display indicates a state of alarm.
 temperature errors: a flashing F plus a number on the upper left of the display indicates:

- F6: flow temp. sensor open-circuit
- F7: flow temp. sensor short-circuit
- F8: return temp. sensor open-circuit
- F9: return temp. sensor short-circuit

A flashing number and energy unit indicate a situation in which no energy can be accumulated (e.g. negative temp.dif., temp. sensor error, etc.)

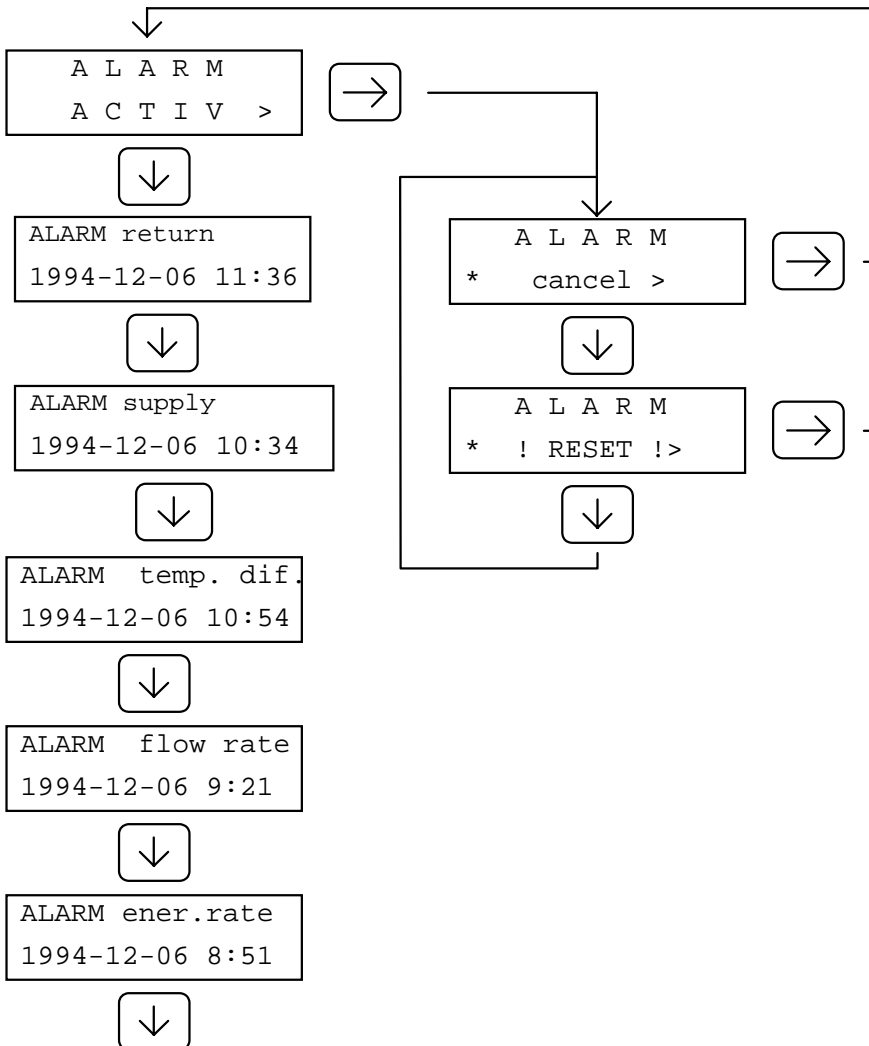
8.4 System Messages Menu

According to the state of the system the options of this menu will be displayed in the following order:



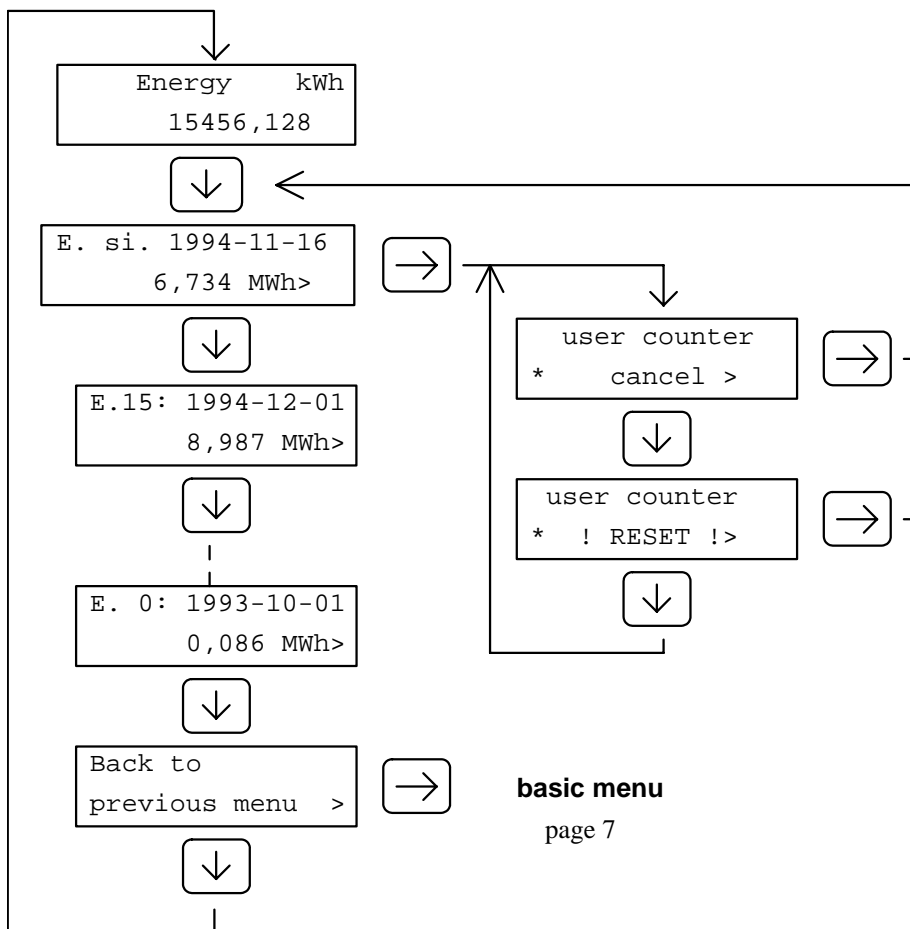
8.5 State of Alarm Menu

Depending on necessity the options of this menu will be displayed in the following order:



By selecting the first option you can deactivate the alarm relay and that option will be deleted from the menu. The cause of relay activation will still be visible in the basic menu.

8.6 Energy Menu

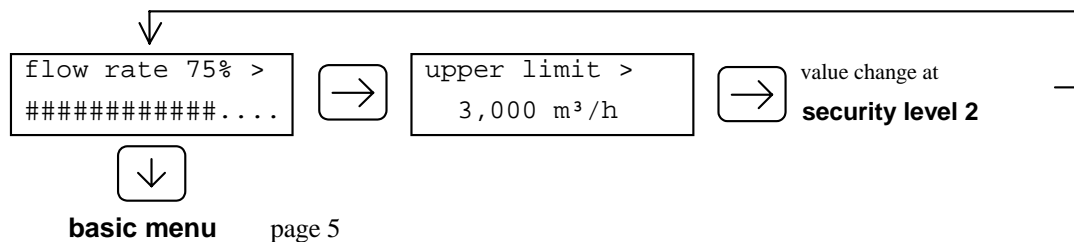


The heat meter can store the current energy state on a maximum of 12 fixed dates during one year, hereinafter referred to as fixed date.

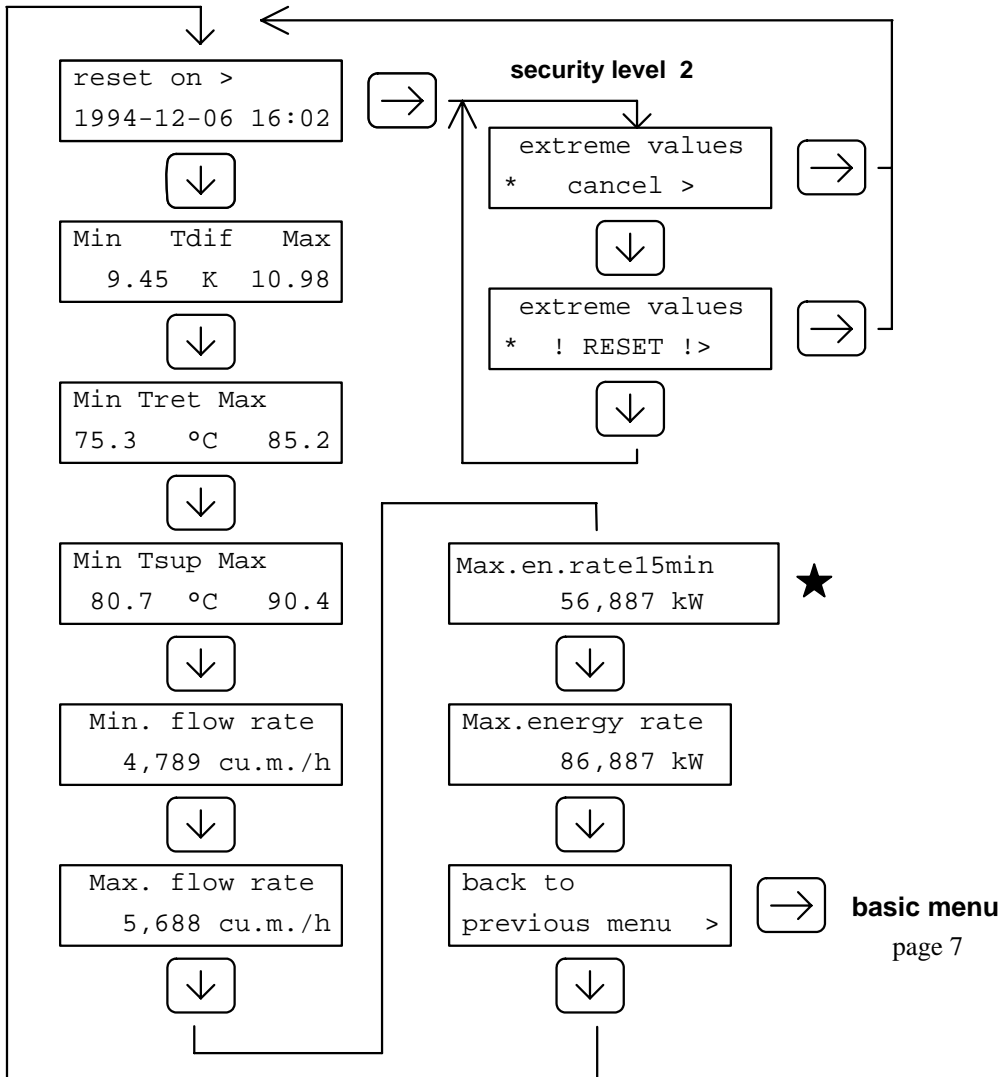
It is possible to display the energy of the 16 most recent fixed dates. The dates can be set in the settings menu.

Bar Graph Menu

(same procedure for display of flow and wattage)



8.7 Extreme Values Menu



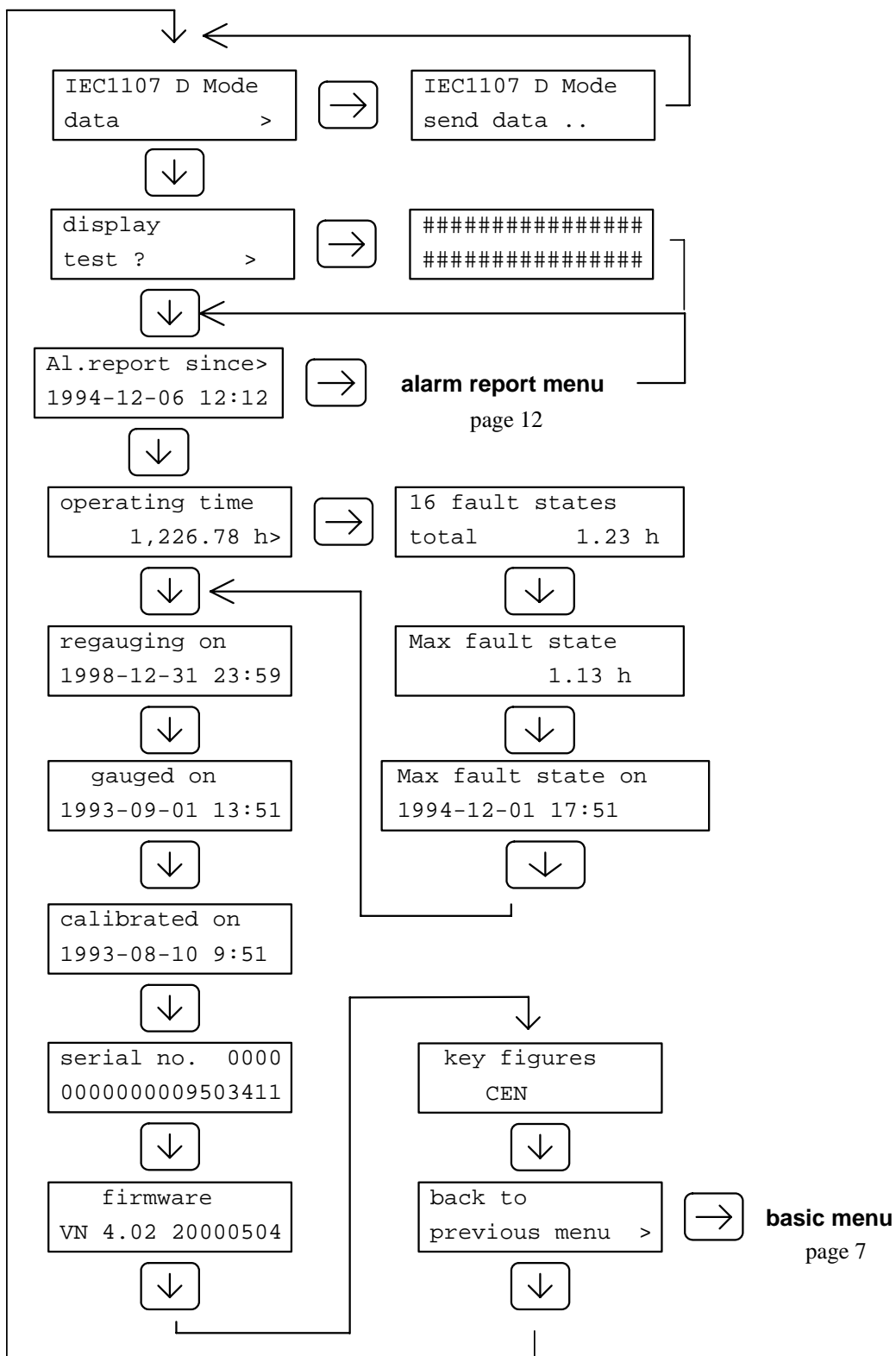
The limits can be re-programmed only after input of the service and user password.

* This display indicates over ## the minutes to integrated maximum power rating. The attitude corresponds by Damping (s. menu settings page 12) adjusted value plus one.

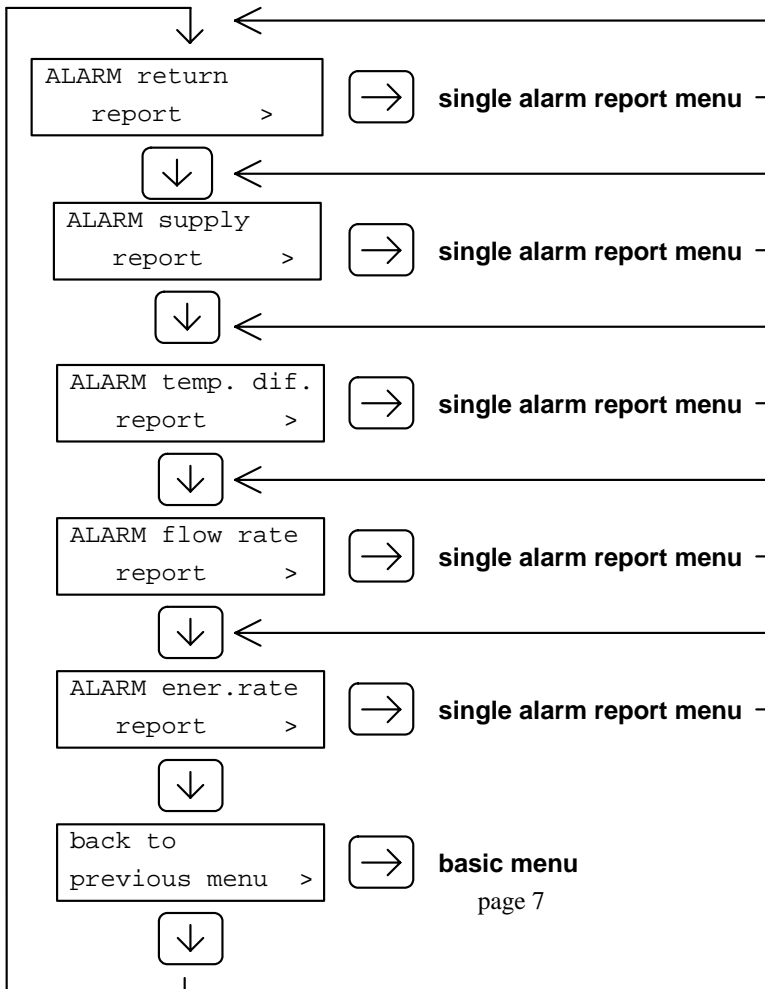
Example: Damping: 14

averaging period: 15 minutes

8.8 Information Menu



8.9 Alarm Report Menu



8.9.1 Menu Single Alarm Report

```

8 alarm states
total      4.81
  
```



```

ALARM max.
      2.78 h
  
```



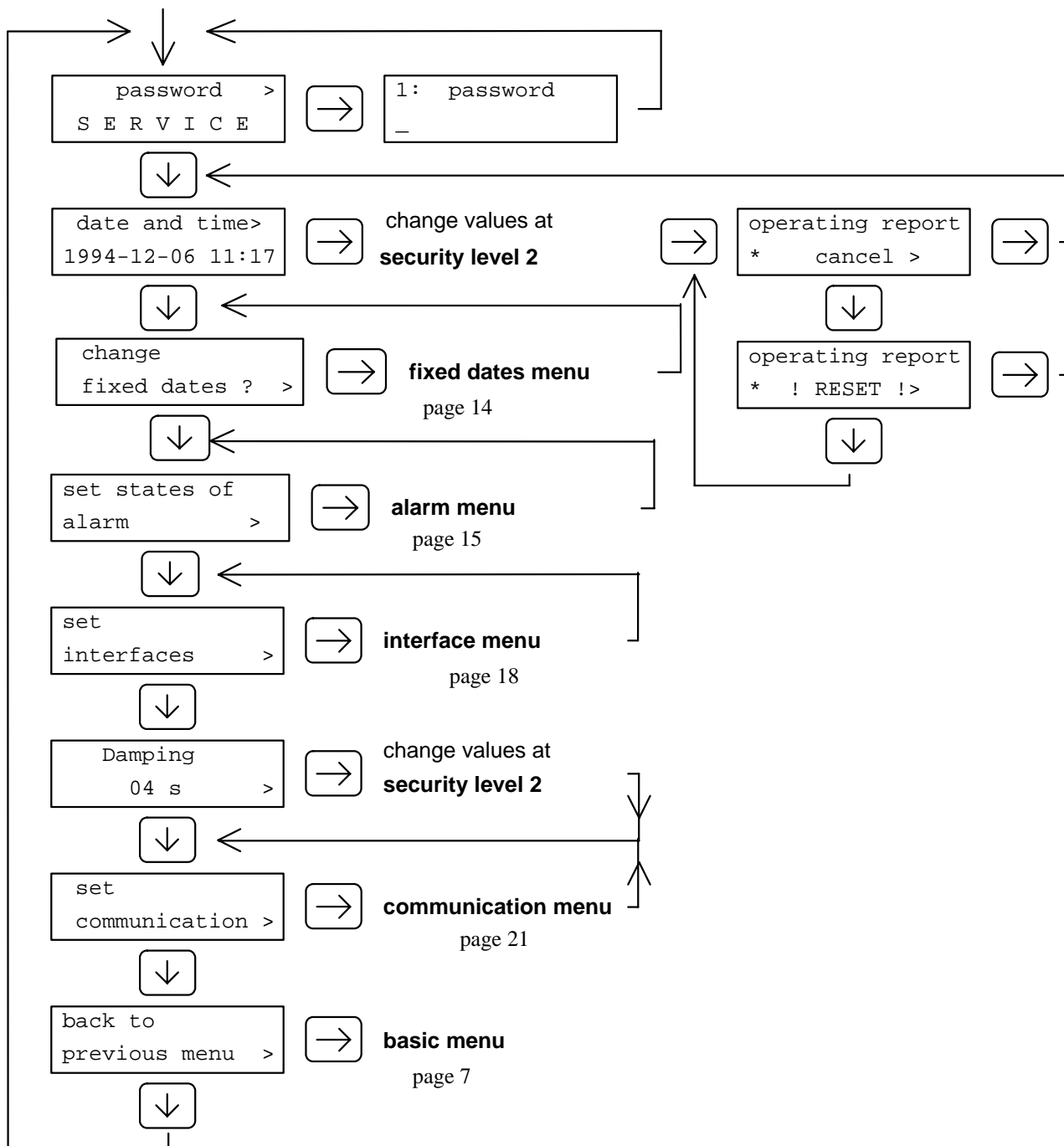
```

ALARM max. from
1994-12-06 14:20
  
```



alarm report menu

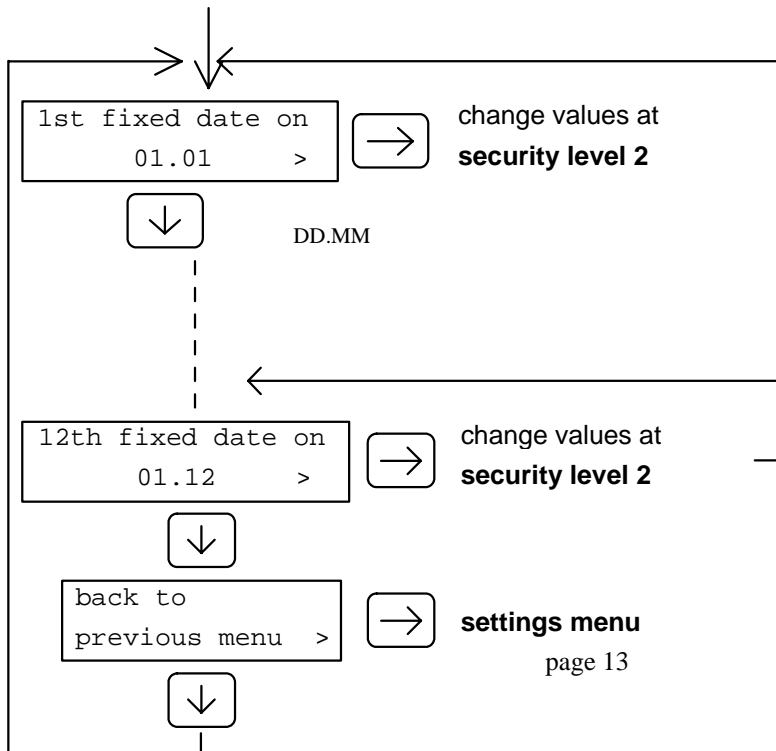
8.10 Settings Menu



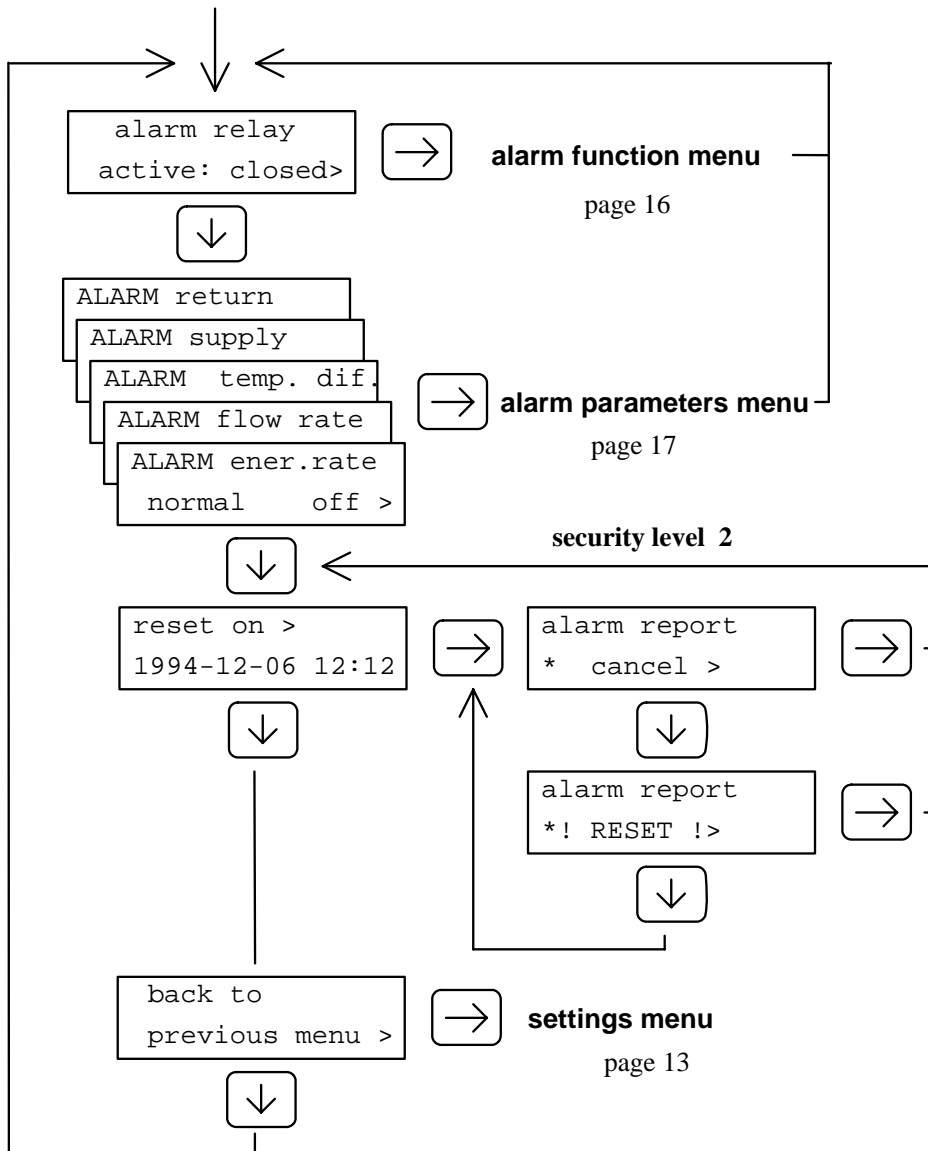
By means of the damping option the average values of flow rate and energy rate are set in seconds (1-16s).

Programmed analog outputs, if any, will also be damped in this way.

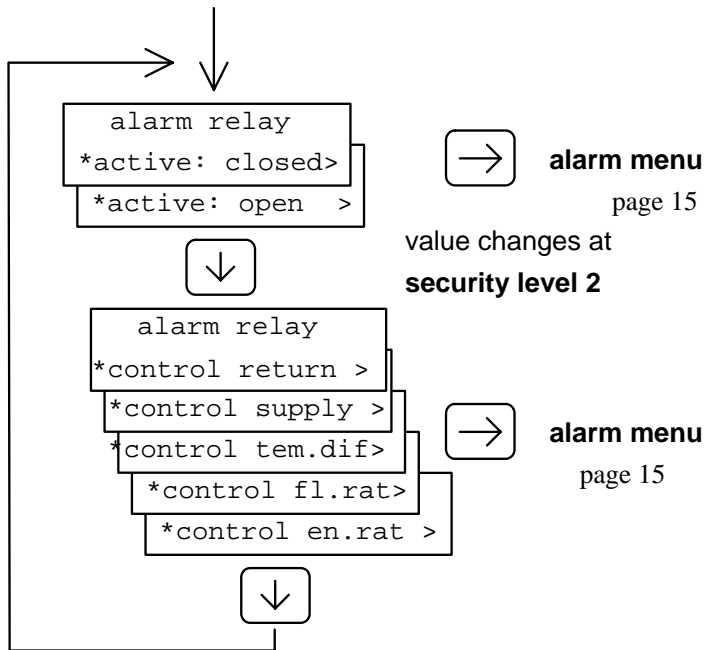
8.10.1 Fixed Dates Settings Menu



8.11 Alarm Menu



8.11.1 Alarm Function Menu



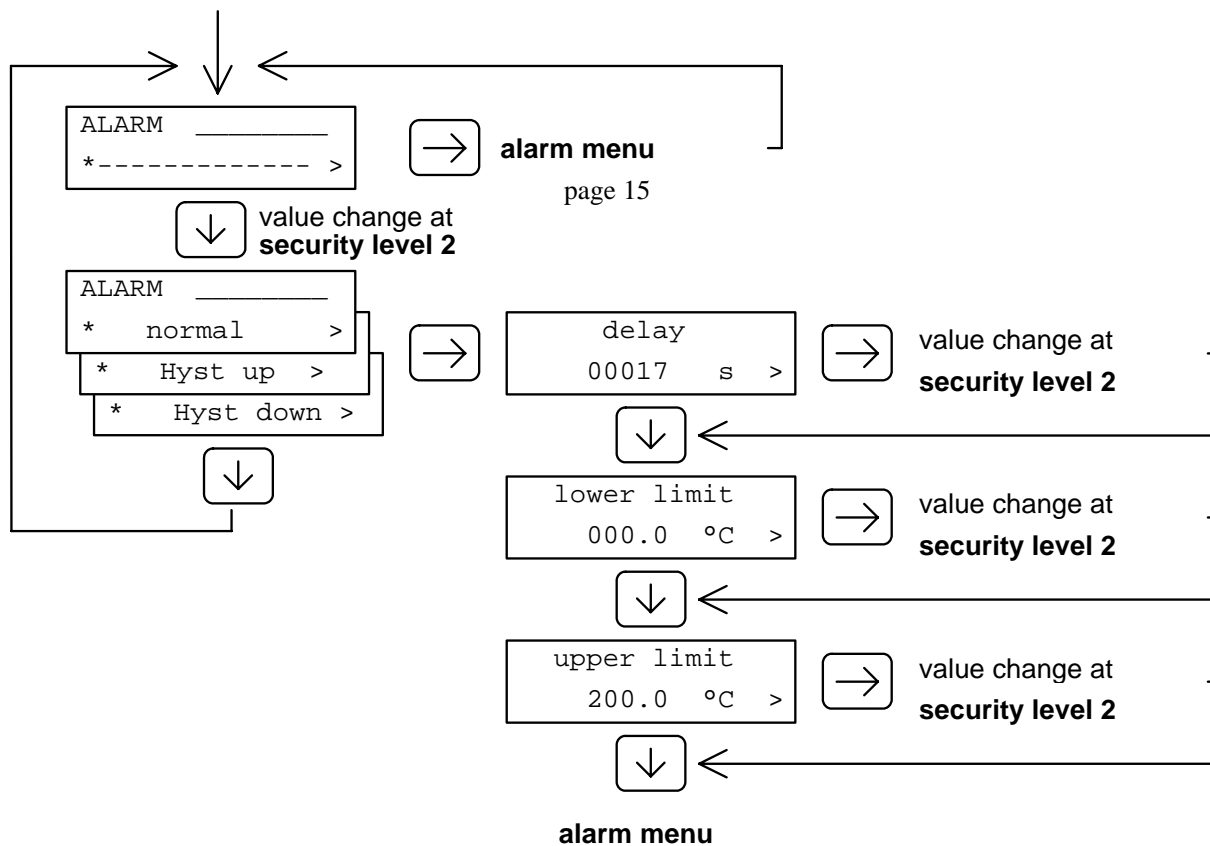
The alarm relay can be set for two different main modes of operation:

1. normal alarm function with set-off by up to 5 different sources
2. control function for one source

If the operation mode is set on "active: closed" or "active: open" it is possible to activate all 5 alarm sources and to set the respective parameters. In this operation mode the alarm reporting is also activated and can be reset at the end of the settings. In addition, in these operation modes a flashing "A" on the energy display indicates the response of the alarm relay.

If one of the 5 control modes is selected in the Operation Mode Menu, it is only possible to set the parameters for that source. All other sources will be automatically switched off.

8.11.2 Alarm Parameters Menu



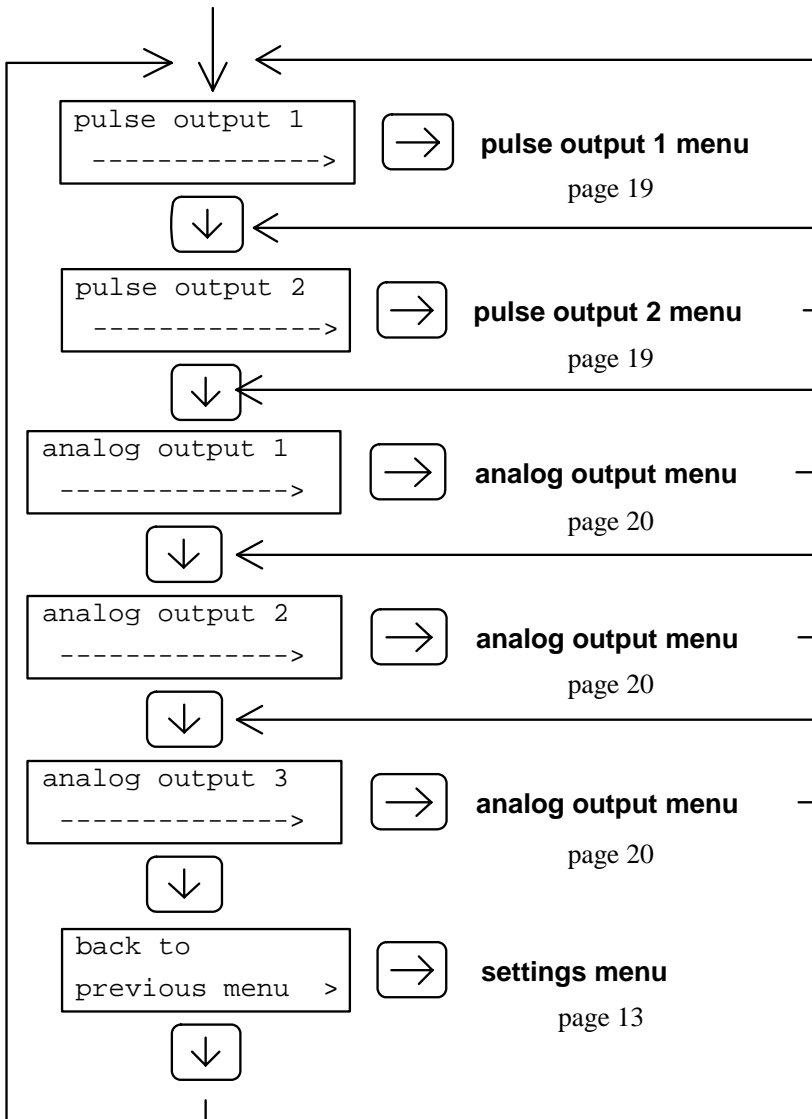
The parameter limits are shown with respect to the return source.

The alarm can be set-off in three different ways:

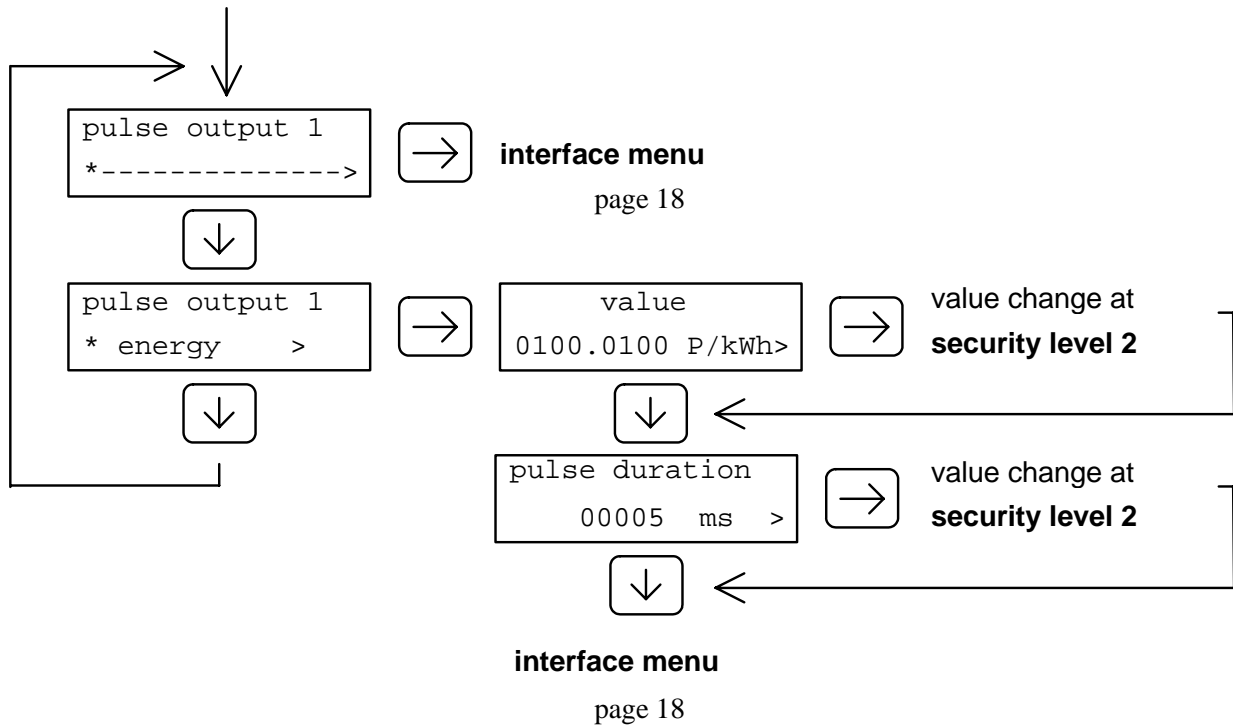
1. Normal: The source exceeds the upper limit or falls below the lower limit. If the value returns to the admissible range the alarm is switched off.
2. Hyst up: The source exceeds the upper limit. The alarm is only switched off if the source falls below the lower limit (e.g. cooling machines, solar collector control depending on temperature difference, etc.).
3. Hyst down: The source falls below the lower limit. The alarm is only switched off if the source exceeds the upper limit (e.g. for heating installations, thermostat applications, etc.).

In addition the programmed delay is relevant to the setting-off of the alarm. This means that the alarm must occur without interruption during the delay in order to be activated.

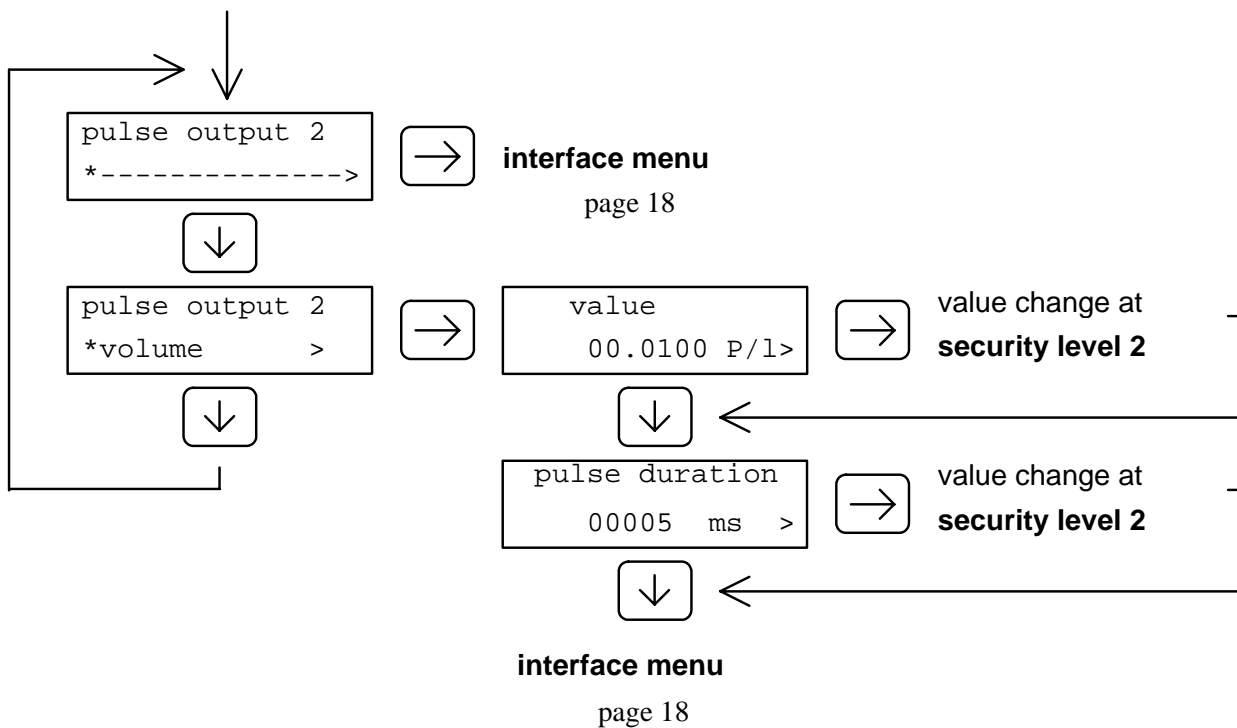
8.12 Interface Menu



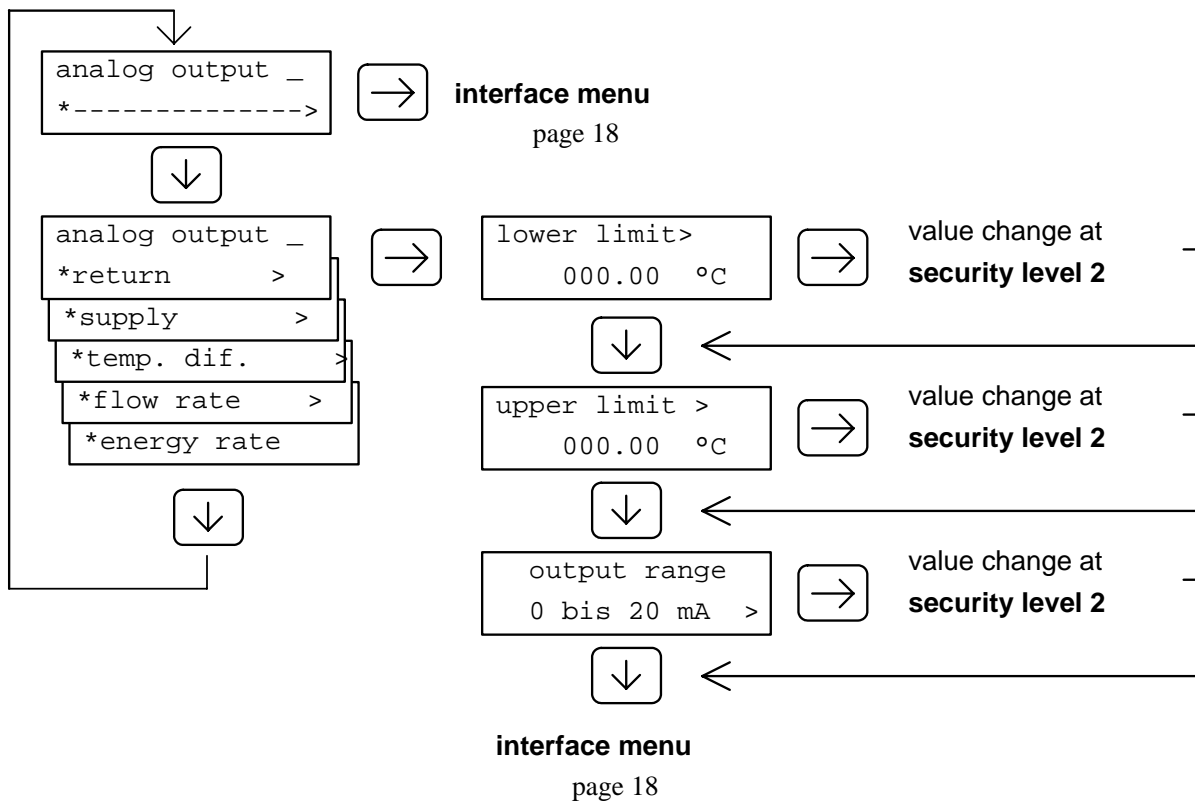
8.12.1 Pulse Output 1 Menu



8.12.2 Pulse Output 2 Menu



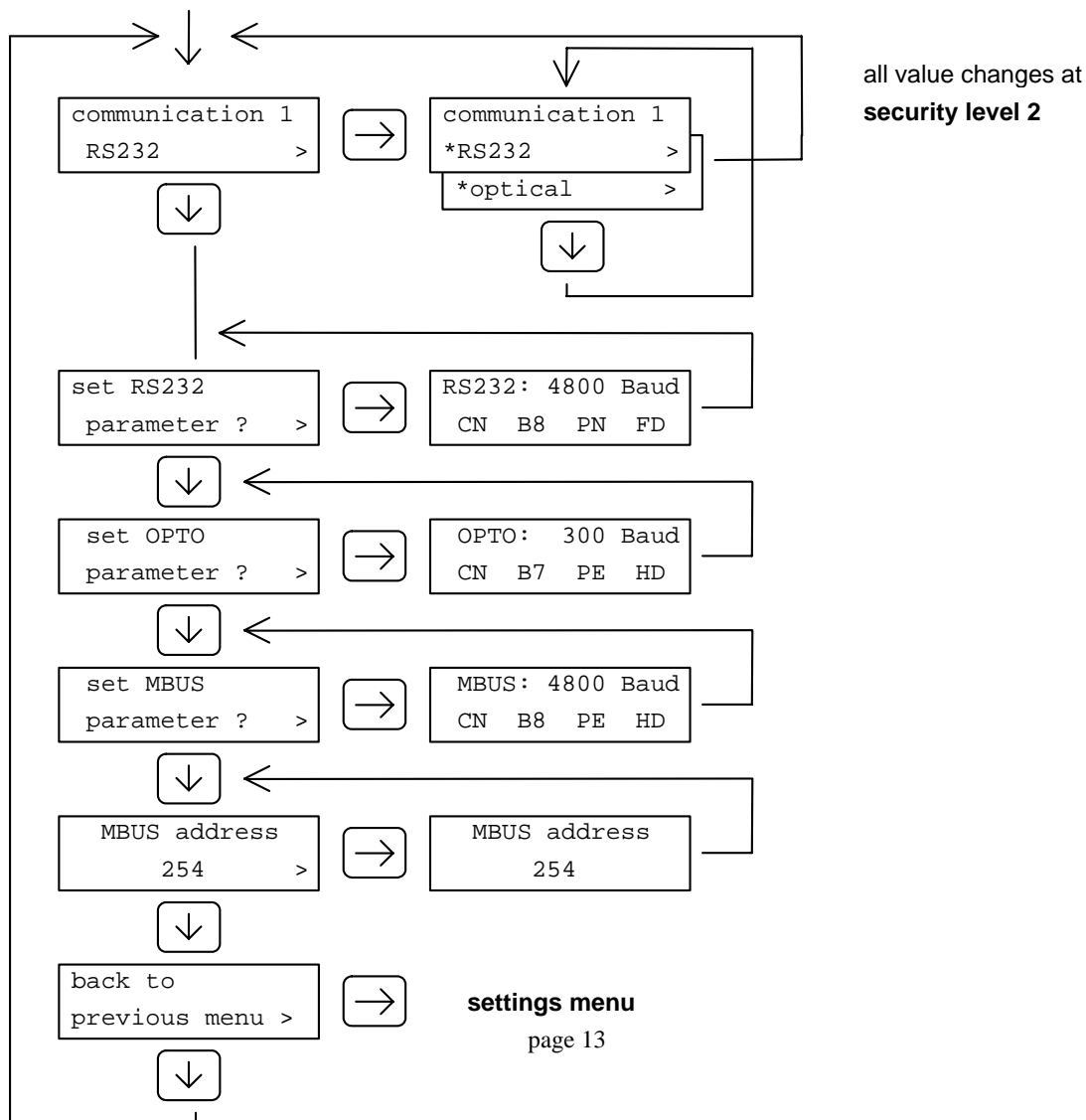
8.12.3 Analog Output Menu



Upon selection of the source for the analog outputs the respective limits for the lowest and highest value to be displayed must be determined. In addition, it must be selected whether the output is to be operated within the range "0 to 20 mA" or "4 to 20 mA". The chart shows the menu sequence for the "return" source. The other sources have a corresponding menu sequence.

Note: The programming possibilities? * ##### min and * ##### max are so-called drag indicator functions. the similar indicator connected with the heat counter indicates in this case the minimum and/or maximum value to the source (e.g. return temperature), to which during the past period of operation arose.

8.13 Communication Menu



At the communication interfaces the following values can be selected:

baud rate:

300, 600, 1200, 2400, 4800, 9600

Confirm entry waiting or not for the <CR> sign:

CY or CN

Transmission length 7 or 8 bits per character:

B7 or B8

parity check switched off or even:

PN or PE

duplex operation full or half:

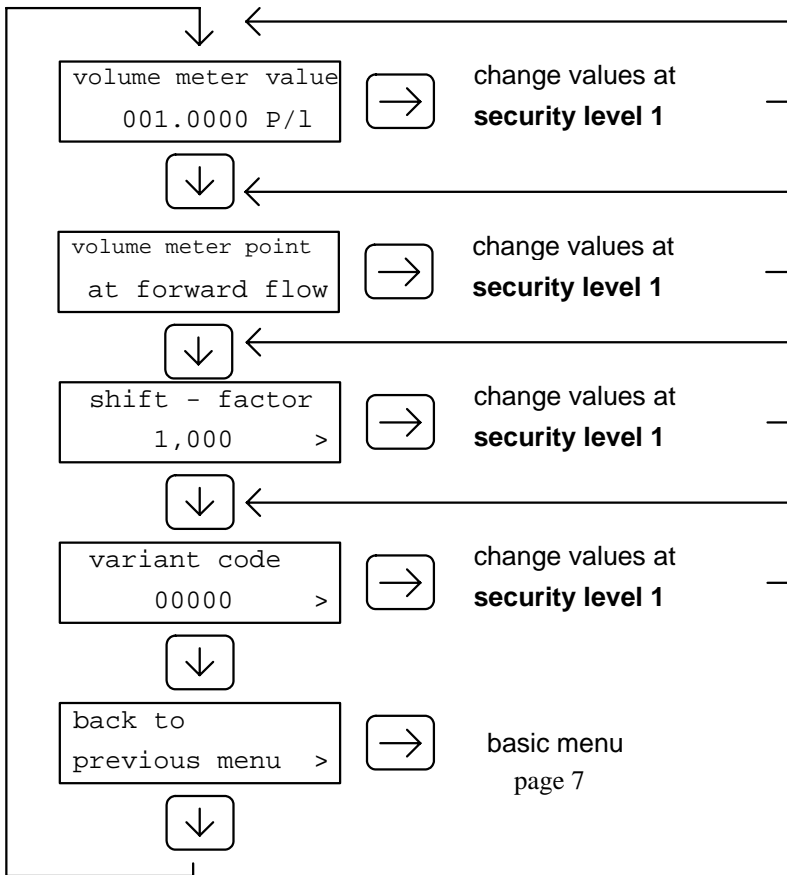
FD or HD

In case of RS232 any option may be selected.

At OPTO you cannot switch to full duplex (max. 2400 Bd)

At MBUS only the baud rate and confirmation of entry can be selected. In addition, the address can be set between the values 0 and 255.

8.14 Parameters Menu



The shift factor is a number to be multiplied with the energy. This factor is required to adjust the energy calculation of the heat transfer media to that of water.

The variant code is a figure determining the various operating modes of the heat meter.

8.15 Possible error messages

Error message	Meaning	Measure
F 6	Inlet temperature > 200 °C or break of the advance flow temperature sensor cable	Control of the flow temperature sensor cable and if necessary exchange, if temperature of the heating medium < 200 °C
F 7	Inlet temperature < 0 °C or short-circuit of the flow temperature sensor	Circuit and if necessary exchange, if temperature of the heating medium > 0 °C
F 8	Return temperature > 200 °C or break of the return temperature sensor	Circuit and if necessary exchange, if temperature of the heating medium < 200 °C
F 9	Return temperature < 0 °C or short-circuit of the return temperature sensor	Circuit and if necessary exchange, if temperature of the heating medium > 0 is °C
Flashing amount of heat announcement	Inlet temperature in the heating system lower than return temperature or feelers did not become with the installation exchange	Control of the feeler installation
Heat meter not calibrated	Authentication time ran off, the function is however not does not impair	New certified arithmetic unit installs
RTC memory	RAM or baking up battery defectively	To the repair sends in

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Appendix Dimensional Drawings

