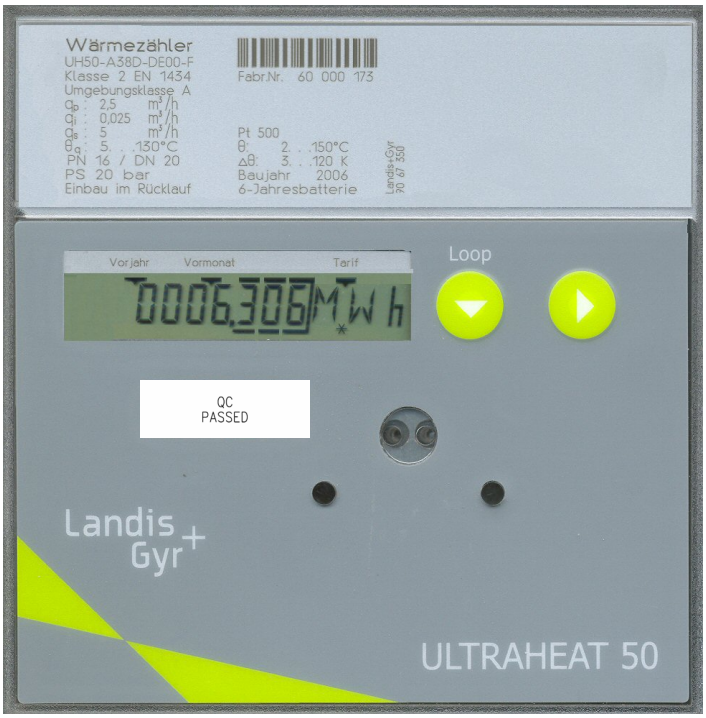
Glossary Ultrasonic ® UH50

Last update: 2007-06-29



This glossary is part of the UH50 documentation and replaces the previous basic documentation. It is intended to be used as online help and as a reference work. The content is arranged in alphabetic order of key words and is intended for simple navigation with hyperlinks. The index is at the end.

The key words are marked boldface type and surrounded by a **border**.

Note: This glossary is updated at regular intervals. Please check whether a new version is available from time to time. Changes are not marked!
Important changes are marked in red color.

If you have any corrections or additions to make, please contact Landis+Gyr IMS QM.

A

Automatic switch-on can be activated in the factory if the *UH50* is not supplied with the battery connected (e.g. if powered through a power supply unit). On subsequent start-up, the date and time are not defined. In this case, the *UH50* enters the input menu when the power supply is connected.

D 10.05.06	Entry of the date
T 10.59.59	Entry of the time
Nb-------	Return to normal mode (manual)

The LCD button 1 can be used to call the menu lines one after the other. Entry of the date and time is described under Parameter setting menu.
On (manual) return to normal mode, automatic switch-on is permanently deactivated, even if the date or time has not been entered!
If no entry is made, the *UH50* automatcical returns to normal mode after no more than 15 hours *) and automatic switch-on remains active. The next time the power supply is connected or on power recovery, the input menu will be displayed again.
Note: Automatic switch-on is **only active if the calibration seal is set**!

*) Attention: Currently there is a deviant behaviour.
“The automatical quitting of the menu after 15 hours does not work. The user must be informed that it is essential to leave the menu manually. Otherwise the meter will not count any values.”
Note: In firmware 5.06 an higher this error is removed.

B

The UH50 can output the data part of the response telegram (according to EN62056-21 Mode B) with an increased **baudrate**. The 5th character of the ID telegram (“/LUG**x**UH50”) corresponds to the code for the increased baudrate.

Code	Baudrate
C	2400 baud
D	4800 baud
E	9600 baud
F	19200 baud

After the ID telegram, the data part is transmitted with this increased baudrate.
The parameter for the high baudrate value is set by telegram in calibration mode (Eb), test mode (Pb) or or normal mode (Nb).

It is also possible to parameterize whether the increased baudrate will apply to all data traffic or just to the next telegram.

C

Calibration mode (“Eb”) can be called after opening the cover with the calibration button (= short-circuiting of two pads for 3 s; operated with a service tool).

Eb	Calibration mode

As long as the calibration seal is not set, calibration mode can also be called by telegram via the optical interface.
Calling calibration mode using the pads automatically resets a set calibration seal!
Return to normal mode is performed

- By telegram, e.g. via PappaWin
- By pressing a button (LCD button 1 or 2)
- Automatically no more than 15 hours later.

The **calibration seal** prevents subsequent changing of protected unit parameters that are relevant for measurement. For example, calling calibration mode by telegram is blocked.
Setting the calibration seal terminates any simulation that may be in progress (flowrate or temperature). Exception: “Permanent return simulation”.
After the calibration seal has been set and a volume of 10 liters has then flowed through, the accumulated missing time is set to zero.

An unset calibration seal is indicated by permanent display of three arrows. In this case, the display function is inverted, i.e. in the case of a previous year's value, previous month's value, or tariff value, the relevant symbol blinks.

Cold meter

For the **cold meter** or **combined heat/cold meter**, it is important to ensure that the black cover on the measuring tube is pointing sideways or downward (because of condensation).
The measuring tube must **always be installed in the return**. The electronic unit must be mounted separately from the flowrate measuring tube, for example, on the wall (split mounting). Please ensure that no condensed water can run along the connected pipes into the electronic unit (make a strap downwards).

Data logger ("archive")

D

The data logger contains 4 archives. Per archive, 8 channels are possible.
The number of channels is stated in the order and is parameterized in the factory.

Archive No.	Archive type	Timebase	Storage depth	Averaging time for maximum
1	Hourly archive	1 hour	45 days	1 hour *)
2	Daily archive	1 day	65 days	1 hour
3	Monthly archive	1 month	15 months	1 hour
4	Yearly archive	1 year	15 years	1 hour / 24 hours

*) For a shorter measuring period than 1 hour, the largest value from the maximum values calculated within one hour applies.
The user can select the data to be recorded from a predefined value set and assign them to any of the channels. The assignment is performed in service mode using PappaWin.
The data are recorded with their value and time stamp.

For internal information only:
When the date / time is set, maxima already calculated are reset and maximum calculation begins afresh.
Adjustment of the date / time, can result in double or missing times.
The year in the time stamp is stored in 2 digits only, allowing only the range 2000...2099 to be displayed.

Value set for data to be recorded

Meter readings at the end of the period for...	Quantity of heat Volume tariff register 1, tariff register 2, tariff register 3 Operating time *) Fault duration *) Pulse input 1, Pulse input 1 Flow rate measuring time *) as parameterized: hours or days
Instantaneous values at the end of the period for...	Power Flowrate Temperature difference Flow temperature Return temperature Error display (instantaneous error codes)
Maximum for...	Power Flowrate Temperature difference Flow temperature Return temperature

The archive data are only output via the optical interface using PappaWin. They are transmitted in a proprietary format (not AGFW format).

Details concerning calibration law

The software contains a part "*requiring official calibration*" and a part "*not requiring official calibration*".
Approval of the *UH50* under calibation law refers to the part "*requiring official calibration*". This part contains the sensing and processing of the consumption values and must not be altered without an additional endorsement in the approval. The part "*not requiring offical calibration*" contains functions that are not relevant to billing.
There are separate version numbers for the parts requiring and not requiring calibration. For the part requiring calibration, there is a CRC checksum.

FW1 5-00	Firmware version of part requiring calibration (example)
FW2 5-01	Firmware version of part not requiring calibration (example)
CRC 1234	CRC sum for part requiring calibration (example)

The values subject to calibration law ("*calibrated values*") are marked by an additional symbol (*) on the LCD.

In Germany, small heat meters (up to including DN25) may be installed according to Directive 2004/22/EC Annex MI-004 Nos. 1.1 to 1.4 on new installation only with **directy immersed sensors**.

E

Error display

The error message F8 and the accumulated missing time can be reset in parameter setting mode. This also deletes the flowrate measuring time!
The missing time is automatically reset after the calibration seal has been set (after a measured flowrate of 10 liters).

F0	Air in the volume measuring part - if measuring threshold < US signal < warning threshold, then: "contamination message" with time stamp; not treated as missing time (no F0 display on LCD) - if US signal < measuring threshold, then: "soft F0"; is evaluated as missing time; output values for flowrate and power are not defined (no LCD values, no pulses, "empty parentheses" in the telegram); no heat addition - if "soft F0" is uninterrupted for longer than 8 hours, then: "hard F0", is evaluated as missing time; the measurement timebase for the flowrate and temperature is increased to 100 s
F1 F2	Open-circuit flow sensor Open-circuit return sensor - is evaluated as missing time; output values for flow/return temperature, temperature difference and power are not defined (no LCD values, no pulses, "empty parentheses" in the telegram); no heat addition
F3	Temperature electronics defective; - Response as for F1/F2
F4	Supply voltage too low - Response as for "hard F0"
F5 F6	Short-circuit flow sensor Short-circuit return sensor - Response as for F1/F2
F7	EEPROM defective - No display while the error can be corrected via checksum - Non-recoverable error in the part **requiring calibration**: no more measuring - Recoverable error in the part **requiring calibration**: no F7 display on LCD, but error output via data telegram - Errors in the part not requiring calibration: data affected are not plausible and are therefore not output

F8	F1, F2, F3, F5 or F6 for 8 hours (unless F0, F4, F7 or F9 has been detected) - Response as for F1/F2
F9	Internal communication between ASIC and µC defective - Response as for “hard F0”

The occurrence of an error is recorded in a logbook (“occurrence” and “back to normal”). This does not apply to F4 and F7, because in these cases the EEPROM is blocked for write access.
A negative flow or negative temperature difference is displayed correctly (is not treated as missing time).
Within limits, software errors can be rectified by means of an internal bugfix mechanism.

EU directive conformity declaration

The following text has been included in the Operating Instructions (not the Configuration Instructions or the Installation and Service Instructions):

Landis+Gyr hereby declares that this product complies with the essential requirements of the following directives:

- **2004/22/EC** measuring instruments directive
- **89/336/EEC** electromagnetic compatibility of electrical and electronic devices
- **73/23/EEC** low-voltage-directive

EC type examination certificate
DE-06-MI004-PTB018

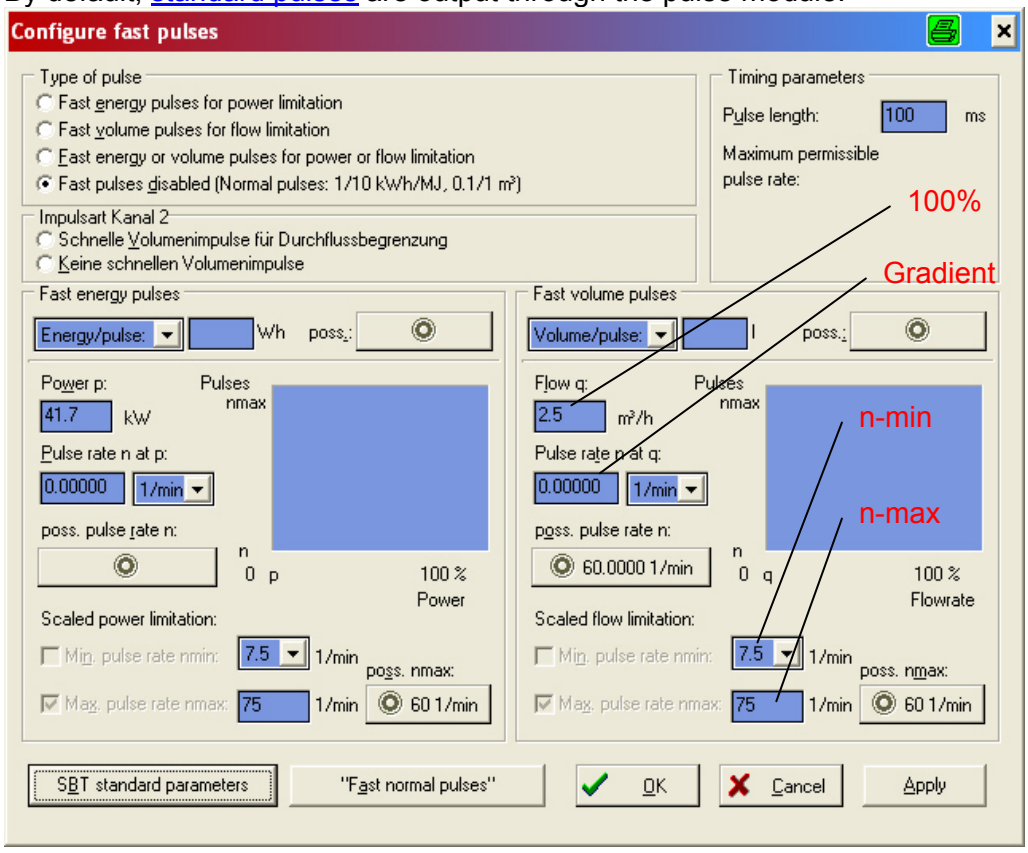
EC design-examination certificate
DE-07-MI004-PTB010

F

Factory-fitted sensors

If sensors are fitted in the factory, the cable must not be disconnected, shortened, or extended.

“**Fast pulses**” for the pulse module are parameterized using the PappaWin software.
When fitting with modules, please pay attention to the permissible combinations.
By default, standard pulses are output through the pulse module.



Parameter setting for "fast pulses"

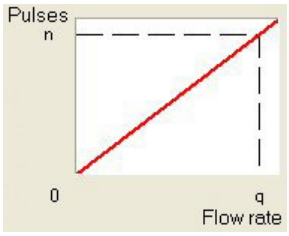
Channel 1	Channel 2
CE (count energy)	**CV** (count volume)
	- (no function)
CV (count volume)	**CV** (count volume)
	- (no function)
CE / CV *) (count energy / count volume)	**CV** (count volume)
	- (no function)

*) automatic output of the higher pulse rate
Note: For battery operation, a D cell is required!
For applications, such actuating controllers or as flowrate transmitters, higher pulse rates are required. The parameters required for this (pulse significance, pulse duration), can be configured with the *PappaWin* software.
The maximum pulse frequency is 33 Hz.
The following can be set:

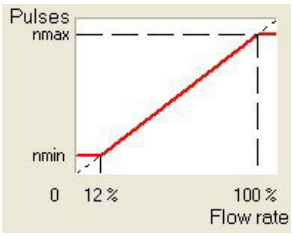
- Pulse type: "linear" or "scaled" pulses *)
- Pulse output: energy or volume
- Pulse duration, if only 1 pulse module is fitted:
  from 2 ms to 100 ms in steps of 1 ms;
  Pulse duration, if 2 pulse modules are fitted:
  von 5 ms to 100 ms in steps of 5 ms

The pulses can be received and evaluated with a suitable device. The settings must be made in accordance with the information on the data sheet of the controller.

*) Linear pulses are output proportionally to the measured value. In the case of scaled pulses, the number of pulses at the upper and lower end of the range can be defined. This enables the pulse receiving device to detect, for example, a connection error.



Linear pulses



Scaled pulses (example)

The **flowrate measuring time** (="Operating time with flowrate") (--> Timer) is acquired with a separate counter. The time acquired refers to the time over which a flowrate > response threshold was detected based on the measured values.

G

General information

The *UH50* meter senses the *flow velocity* of the heating (or cooling) water with non-wearing ultrasound technology and measures the *temperatures* in the flow and return using Pt resistors. The *k factor* of the heating water is stored in µC as an algorithm. The engineering unit "quantity of thermal energy" is calculated from the values *flow velocity*, *temperature (difference)* and *k factor*.
The *UH50* is used as a:

- Heat meter
- Cold meter
- Combined heat/cold meter
- Flow meter

I

Incorrect installation (mounting error) of the heat meter on site is indicated a relevant error display. For this purpose a flow is needed!

FL nEG	Incorrect flow direction
dIFF nEG	Incorrect sensor installation or connection

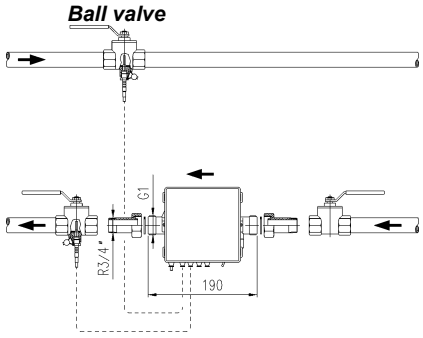
If both causes of error apply, the incorrect direction of flow has priority. Then the display for the wrong sensor installation/connection will only appear when the volume measuring unit is turned round.

Note: These messages can also occur in the event of a system stoppage without incorrect installation.

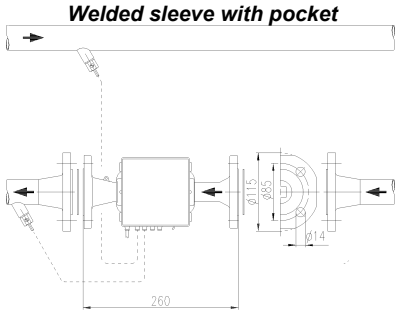
Installation

Choose a mounting location with enough clearance, based on the dimension drawings.
Mount the volume measuring unit horizontally or vertically between two shut-off valves in accordance with the arrow for the direction of flow.
No inlet or outlet sections are necessary. However, if the heat meter is installed in the shared return of two heating systems, e.g. heating and hot water, the mounting location must be a sufficient distance from the T element that forms the junction (min. 10x DN) to allow the different water temperatures to mix well.
The sensors can be mounted in ball valves or in pockets or directly. The ends of the sensors must be inserted at least up to the center of the pipe cross-section.
By overpressure, cavitation must be avoided in the entire measuring range, i.e. at least 1 bar at qp and approx. 3 bar at qs (at 80°C).

Example of mounting with a ball valve (recommended up to DN25)



Example of mounting with pockets (recommended above DN25)



Interfaces of the electronic unit

The UH50 heat meters are equipped with an optical interface per EN 61107 as standard. Moreover, up to two of the following communication modules can be used for remote reading:

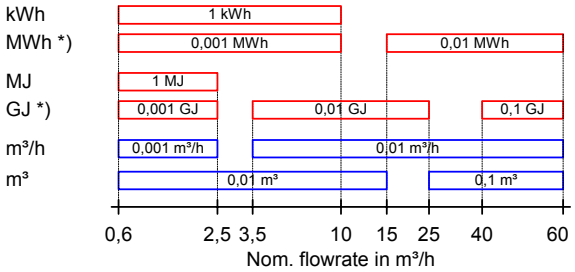
- Pulses (quantity of heat / volume / unit status / tariff register 1, tariff register 2), isolated, bounce-free
- Passive 20 mA current loop (CL) per EN 61107
- M-bus per EN 1434-3, fixed and extended, variable protocol (also for coupling with a suitable heating controller)
- Analog module
- Radio module
- Multi module (external)

These modules are have no effect on consumption metering and can therefore also be replaced at any time without violating the adhesive label.

L

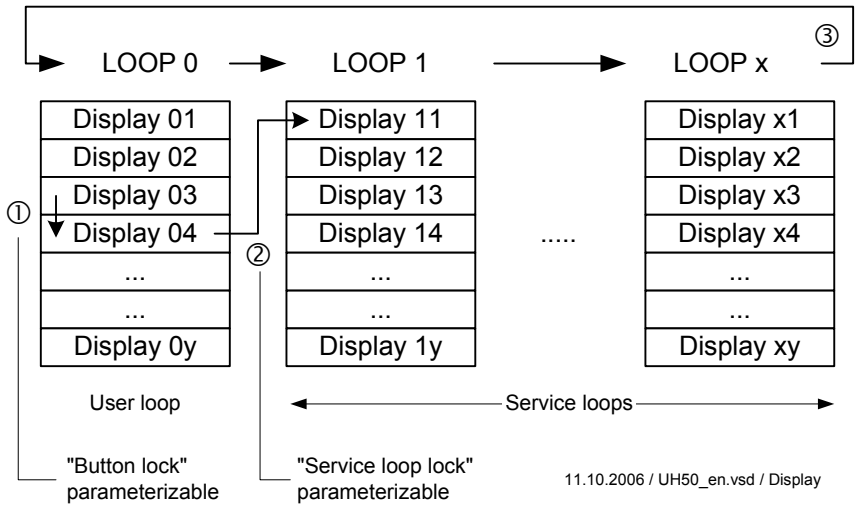
The **LC display** consists of 4 alphanumeric digits (+ various special characters), 7 numeric digits (with decimal points), 3 arrow symbols and a star.

The arrow symbols identify output of a stored previous year’s, previous month’s, or tariff value.
A *calibrated value* (quantity of heat or volume) is marked by the star symbol.
An unset *calibration seal* is indicated by permanent display of three arrows. In this case, its display function is inverted, i.e. the relevant segment blinks when a previous year’s, previous month’s, or tariff value is displayed.
The number of digits after the decimal point of a value (e.g. the quantity of heat) depends on the chosen measuring path and the chosen dimension.
The digits after the decimal point are always shown with a border.
For values requiring calibration, display of the digits after the decimal point can be parameterized (blinking, static or suppressed).



*) Places after decimal point "blinking", "static" or "suppressed"

The displays are distributed among various loops (“LOOP”). The displays are called sequentially using the operating elements (LCD buttons) on the front.
Up to 8 loops can be parameterized using PappaWin.



LCD button 2 is used to move line by line through the current loop (①). After the last line, the first line is displayed again. LCD button 1 (“Loop”) calls the first line of the next loop up (②). After the last loop, the first loop is shown again (③).
The user loop (LOOP 0) contains the consumption values. The service loops (LOOP 1...LOOP x) may contain further values.
After 30 seconds of inactivity – within the user loop - the display returns to the **default display**. The default display can be parameterized and is optionally the *error display* or any display line of the basic loop (LOOP 0) (“*Standard display”)*.
Return to the default display from the service loop occurs automatically after 30 minutes of inactivity.

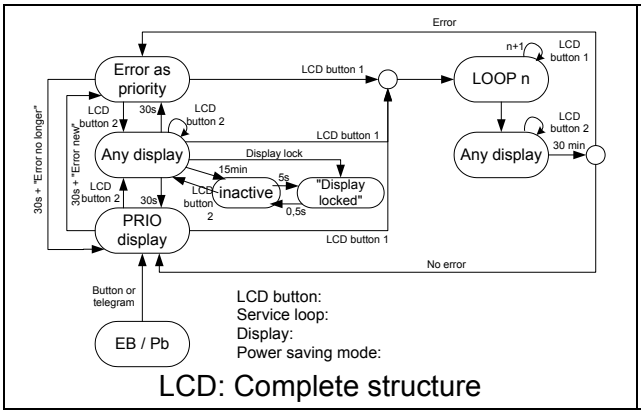
Any display line can be called directly by telegram via the assigned (internal) code number.

Further parameterization options:

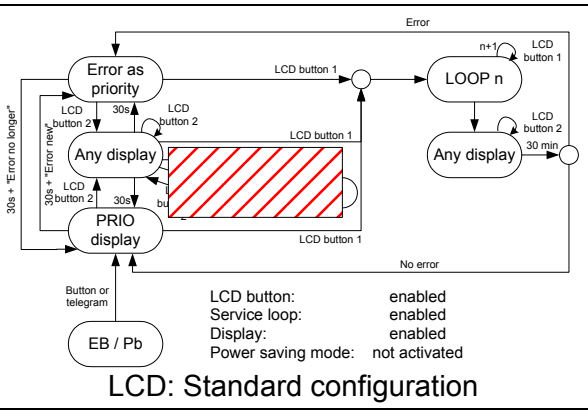
1. “Button lock”
   Advancing the display using the LCD buttons can be blocked or enabled by telegram. When locked, operating the LCD buttons has not effect.
2. “Service loop lock”
   Calling the service loops (LOOP 1...LOOP x) can be blocked or enabled by telegram. If the service loop is locked, operating LCD button 1 has no effect.
3. “Display lock” (also known as start-up lock or NEOVAC lock)
   The unit display can be locked or enabled completely by telegram. If the display is locked, the figure “8” and all decimal points blink.
   Note: In this state, it is no longer possible to see whether the calibration seal is set!
    Display locked (blinking)
4. “Power saving mode”
   Power saving mode can be locked or enabled (default) by telegram.
   If power saving mode is enabled – and the calibration seal is set – switchover to power saving mode is performed after 15 minutes if no button is pressed (and no data traffic takes place).
   If power saving mode is locked, the LCD display is permanently active.

The locking functions 1 to 4 above can be combined.

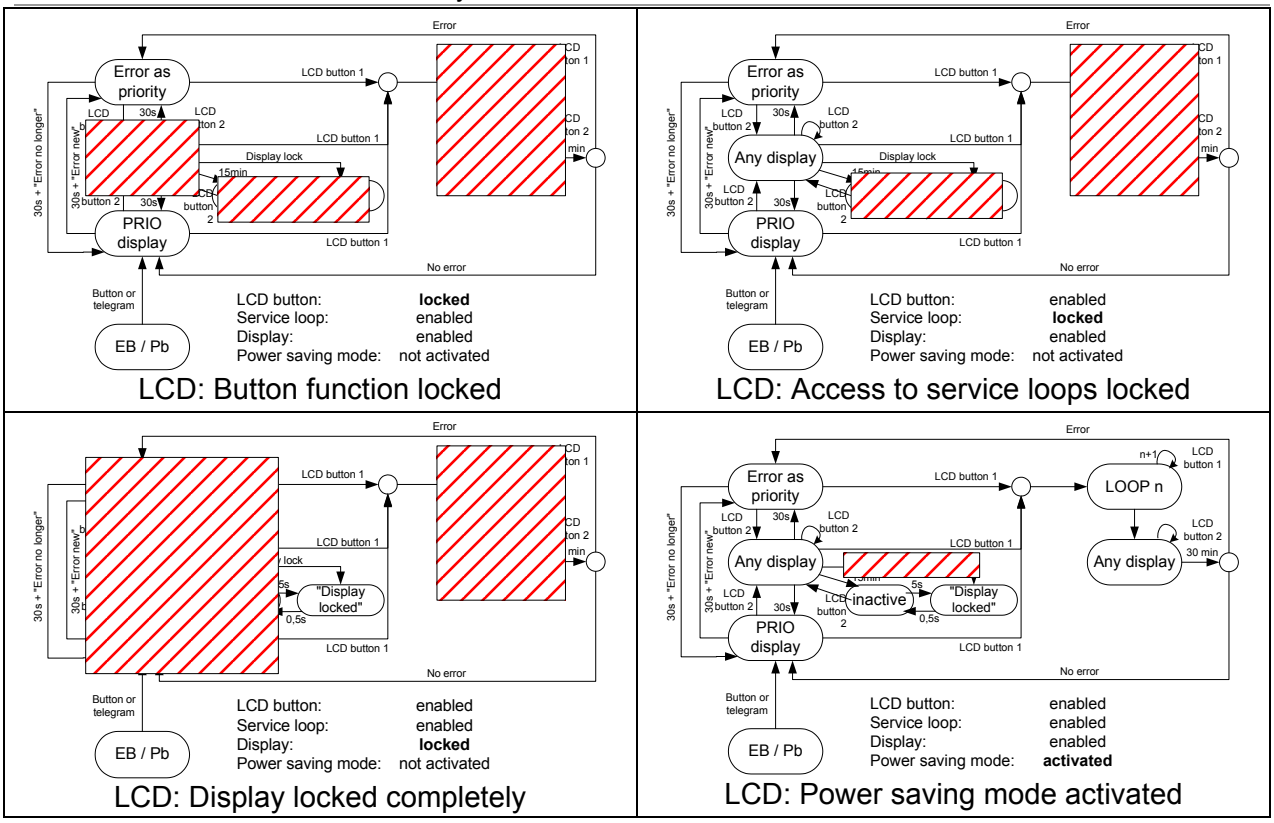
Behavior	Button lock	Service lock	Display lock	Power saving mode
Full LCD access	no	no	no	no
Full LCD access, but LCD inactive after 15 minutes	no	no	no	yes
Only “display locked”	no	no	yes	no
	no	no	yes	yes
Only user loop possible	no	yes	no	no
	no	yes	no	yes
	no	yes	yes	no
	no	yes	yes	yes
Only PRIO display	yes	no	no	no
	yes	no	no	yes
	yes	no	yes	no
	yes	no	yes	yes
	yes	yes	no	no
	yes	yes	no	yes
	yes	yes	yes	no
	yes	yes	yes	yes



LCD: Complete structure



LCD: Standard configuration



Display loops (only examples, as described in the Operating Instructions, the Configuration Instructions, and the Installation and Service Instructions)

User loop ("LOOP 0")

LOOP 0	Head of the loop
1234567 kWh	Accumulated quantity of heat with tariff status (3)
T1 1234567 kWh	Tariff register 1 (optional) (32)
12345,67 m³	Accumulated volume (4)
8.8.8.8.8.8.8 kWh	Segment test (7)
F -------	Error message with error code number (1)

Service loop 1 ("LOOP 1")

LOOP 1	Head of the loop
1,234 m³/h	Current flowrate (8)
90,4 kW	Current heat power (10)
91 56 °C	Current flow/return temperature (9)
Hrs 1234 h	Operating time (6) in hours or days
Hrs 1234 d	
Prs 1234 h	Operating time with flowrate (95) in hours or days
Prs 1234 d	
Frs 123 h	Missing time (13) in hours or days
Frs 123 d	
K 12345678	Property number, 8-digit (27)
D 10.05.06	Date (23)
SD 31.05.--	Yearly set day (TT.MM) (14)
1234567 kWh	Quantity of heat previous year on set day (15)
12345,67 m³	Volume previous year on set day (16)
FW1 5.00	Firmware version (30)

Service loop 2 ("LOOP 2")

LOOP 2	Head of the loop
Ma 3,899 m³/h St 13.12.05	Max. flowrate, at 2s intervals with date stamp (37)
Ma 288,9 kW St 1.12.05	Max. power, at 2s intervals with date stamp (38)
Ma 98 87 °C St 08.12.05 St 04.12.05	Max. temperatures, at 2s intervals with date stamp (39) for flow and return maximum
MP 60 min	Measuring period for maximum calculation (24)

Service loop 3 ("LOOP 3")

LOOP 3	Head of the loop
01.01.06 M	Set day for December 2005 (35)
01.12.05 M	Set day for November 2005 (--)
...	...
01.07.04 M	Set day for July 2004 (--) using LCD button 2:
123456,7 kWh	Quantity of heat on the set day (36)
T1 123456,7 kWh	Tariff register 1 on the set day (69)
12345,67 m³	Volume on the set day (64)
Ma 3,899 m³/h St 13.12.05	Max. flowrate on the set day, at 2s intervals with date stamp (66)
Ma 288,9 kW St 1.12.05	Max. heat power on the set day, at 2s intervals with date stamp (67)
Ma 98 87 °C St 08.12.05 St 04.12.05	Max. temperatures on the set day, at 2s intervals with date stamp (46) for flow and return maximum
Fd 123 d	Missing time count on the set day (65)

These lines repeat for all earlier months.
LCD button 1 (LOOP) can be used to jump directly to the next month back.

Service loop 4 ("LOOP 4")

LOOP 4	Head of the loop
T2 0,000 m³/h 1 0,000 m³/h	Current tariff, at 2s intervals with threshold value 1 (68)
FP 2,00 SEC	Measuring interval for flowrate (98)
TP 30 SEC	Measuring interval for temperature (33)
Modul 1 -- --	Module 1 not fitted (29)
Modul 1 AM	Module 1: Analog module
Modul 1 CL	Module 1: CL module
Modul 1 MB	Module 1: M-bus module
AP1 127	M-bus primary address 1 *) (21)
A 12345678	M-bus secondary address 8-digit *) (22)
Modul 1 MM	Modul1: Multi module
Modul 1-1 C2	Modul1: Pulse module; channel 1 = tariff register 2 **)
Modul 1-1 CE	Modul1: Pulse module; channel 1 = quantity of heat **)
Modul 1-2 C1	Module 1:Pulse module; channel 2 = tariff register 1 **)
Modul 1-2 CV	Module 1: Pulse module; channel 2 = volume **)
Modul 1-2 R1	Module 1: Pulse module; channel 2 = status display **)
Modul 2 -- --	Module 2: not fitted (92)
Modul 2 AM	Module 2: Analog module
Modul 2 CL	Module 2: CL module
Modul 2 MB	Module 2: M-bus module

AP2 128	M-bus primary address 2 *) (96)
Modul 2 MM	Module 2: Multi module
Modul 2-1 C2	Module 2: Pulse module; channel 1 = tariff register 2 **)
Modul 2-1 CE	Module 2: Pulse module; channel 1 = quantity of heat **)
Modul 2-2 CT	Module 2: Pulse module; channel 2 = tariff register 1 **)
Modul 2-2 CV	Module 2: Pulse module; channel 2 = volume **)
Modul 2-2 R1	Module 2: Pulse module; channel 2 = status display **)
P01 125,00Wh/l	Pulse significance quantity of heat(80)
P02 0,0250 L/l	Pulse significance volume (81)
P03 2ms	Pulse duration “fast pulses” (82)

*) only displayed for the M-bus module
**) only displayed for the pulse module

Logbook

The logbook is intended to record the history of the *UH50*. Its content is permanently stored on EEPROM and can only be deleted by initializing the EEPROM (only possible in the factory, not by the customers or external testing facilities)
The event memory stores the data of the last events (with time stamp) in chronological order. The monthly memory (implemented as a circulating buffer) stores the events of the last 18 months.

Only internal: Updating is performed on each full minute and transfer into the EEPROM on each detected change.
The previous month’s values are held in the RAM and are transferred into the EEPROM on the next full hour.

The events recorded are predefined and are logged with the time when they occurred.
Types of events:

- Errors
- Events (states or actions)

Types of events:

- Occurrence/back-to-normal (“KG”);
  a change of *state* is recorded (14 different events)
- Occurrence/acknowledgment (“KQ”);
  the occurrence of an *action* is recorded (10 different events)

List of predefined events

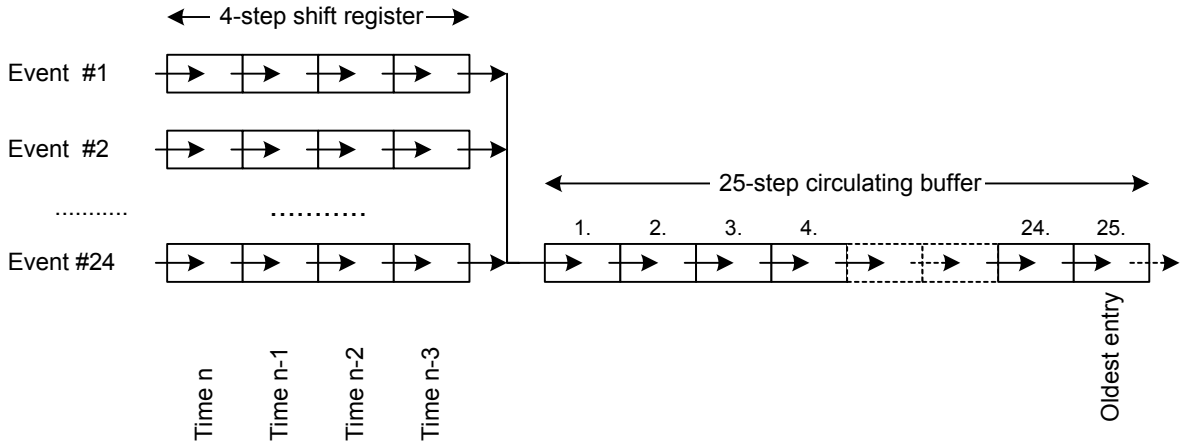
Ser. No.	Event type		Event type		Description
	Error	State or action	K-G	K-Q	
1	x		x		F0 = Air in the measuring tube
2	x		x		F1 = Open-circuit flow sensor
3	x		x		F2 = Open-circuit return sensor
4	x		x		F3 = Error in the temperature electronics
5	x		x		F5 = Short-circuit flow sensor
6	x		x		F6 = Short-circuit return sensor
7	x		x		F8 = Sensor error > 8 hours
8	x		x		F9 = ASIC errors
9		x	x		Above max. temperature in the volume measuring unit
10		x	x		Under min. temperature in the volume measuring unit
11		x	x		Max. flowrate qs exceeded
12		x	x		Contamination warning
13		x	x		Primary voltage off
14		x	x		CRC error has occurred
15		x		x	Adjustment values parameterized
16	x			x	F7 (EEPROM) pre-warning
17		x		x	Cold start / warm start (with reset) performed
18		x		x	Date and/or time parameterized
19		x		x	Yearly set day parameterized
20		x		x	Monthly set day parameterized

List of predefined events

Ser. No.	Event type Error	Event type State or action	Event type K-G	Event type K-Q	Description
21		x		x	Master reset performed
22		x		x	Operating time + missing time + unit run time reset
23		x		x	Missing time reset
24		x		x	Maxima reset

Event memory

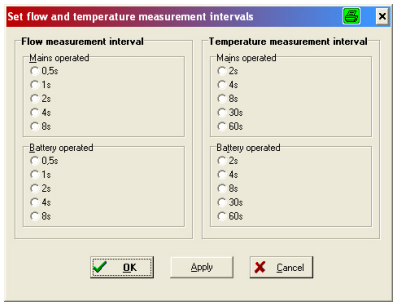
To be able to trace the history of each event, its last 4 times are stored in a separate shift register. When a further event is stored, the oldest event is moved out of the shift register and transferred into a 25-step circulating buffer.
The circulating buffer contains the “overflows” of all shift registers and provides a certain amount of information about the events. When a new value is placed in the circulating buffer, the oldest entry is lost.



M

Maxima are the stored maximum values for *heat power*, *flowrate*, *flow temperature,* and *return temperature*. The associated time stamp contains the date of occurrence. The **measuring period** for calculation of the maximum can be parameterized in the range 7.5 minutes to 24 hours in defined steps.
The **lifetime maxima** are the maximum values during the overall operating time of the *UH50* and can reset by telegram.
The **yearly maxima** are a copy of the lifetime maxima on the yearly set day.
The **monthly maxima** are the real maxima in the month in question.

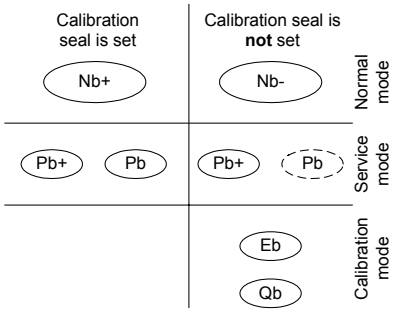
The **measuring interval** for the flowrate and temperature can be parameterized. Different values can be defined for line and battery operation.



The **measuring period** for calculation of the maxima can be parameterized in the range 7.5 min – 15 min – 30 min – 60 min – 3 h – 6 h – 12 h – 24 h.
The associated information is displayed in LOOP 1.

Modes

Nb+	Normal mode, with calibration seal
Nb-	Normal mode, without calibration seal
Pb+	Parameter setting menu (with buttons)
Pb	Test mode (by telegram or with buttons)
Eb	Calibration mode (by telegram or "pads")
Qb	Test mode (manufacturer-internal)



The *UH50* can optionally be fitted with up to two pluggable **modules**.
The module interfaces are processed – like the optical interface – in each one-second pass in a defined order. Each communication requires a certain time budget that impairs overall availability. That means that during communication with an interface, the other communication paths are temporarily not available and cannot be operated for a lengthy period.
If the sum of the communication times for the interfaces is greater than the measurement timebase, the missing measurements are corrected on the next measurement. An excessive number of missing measurements can result in the interfaces being blocked, which can have effects on the external response of the modules.
In the case of very short measurement timebases and frequent communication, the exception described can become the rule. A nominal measurement timebase of 500 ms then, for example, results in an only 2-second measurement timebase.

Permissible combinations for placement in heat meter:

Slot for module #1 can be fitted with ...		Slot for module #2 is fitted with...						
		Analog module	Pulse module: Standard pulses	Pulse module: Fast pulses *)	M-bus	Current Loop		Radio
Analog module		yes	yes	yes	yes (4)	yes		yes
Pulse module	Standard pulses	yes	yes (3)	yes (2)	yes (4)	yes		yes
	Fast pulses	no	no	no	no	no		no
M-bus		yes	yes	yes	yes (4)	yes (1)		yes
Current loop		yes	yes	yes	yes (1)	no (5)		yes
Radio module		no	no	no	no	no		no

Restrictions:

*) Only 1 module with fast pulses possible, only permissible on slot 2;
min. pulse duration = 2 ms, if no pulse module is fitted in slot 1
min. pulse duration = 5 ms, if a further pulse module is fitted in slot 1

(1) In the case of an M-bus with a controller link, the CL read-out can take up to 40 s

(2) Pulse length of the fast pulses min. 5 ms

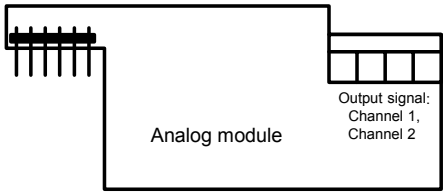
(3) The first and second channel can be parameterized individually

(4) The secondary address for both modules can only be changed via Module No. 1

(5) Because of response time 30..40s, too long for 2 modules

**) Subsequently plugging a second pulse module into slot 1, can change the set pulse duration for module 2!

The **analog module** converts a selectable measured value of the heat meter into an analog
output signal (channel 1, channel 2).



The following can be selected as measured values:

- Heat power
- Flowrate
- Flow temperature
- Return temperature
- Temperature difference

The following can be selected for the output signal:

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

A minimum value can be defined for each channel, below which the output does not fall, irrespective of the measured value. This enables detection of a wire break, for example.
Parameter setting (selection of the measured value, output measuring range, and minimum value) is performed via the heat meter using the PappaWin software.
The output signal is updated in a 4-second timebase. An LED (ERR) indicates the current mode.

Display on LCD **AM** (analog module)

Power supply

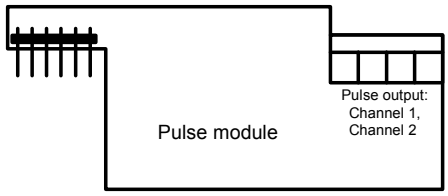
The power supply of the module is drawn from an external connector power supply unit (not included in the scope of supply). If the heat meter is operated with a battery, a 6-year battery of type D ("for all applications") is required.
Note: CE compatibility ("CE mark") is only ensured in conjunction with the intended power supply unit.

Use only the **specified power supply unit**! Use of an unsuitable power supply unit can result in malfunctions or destruction of the heat meter or module.

Analog output

For the current output, a maximum burden (load) of 100 ohm is permissible.
The voltage output is not short-circuit-proof.

The **pulse module** permits the output of pulses ("tariff pulses") that can be derived from the quantity of heat, the volume, tariff register 1, tariff register 2, or the mode. Two channels are available whose functions can be parameterized with the PappaWin software.
Output takes the form of standard pulses or "fast pulses".
The pulse duration is identical for channel 1 and channel 2.
Note: If two pulse modules are plugged, please note the restrictions!



Parameter setting for standard pulses

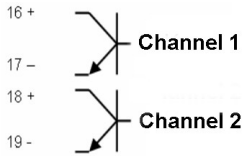
Output mode		Output value
Channel 1	**CE** (count energy)	Pulses for quantity of heat
	C2 (count tariff 2)	Pulses for tariff register 2
Channel 2	**CV** (count volume)	Pulses for Volume
	CT (count tariff 1)	Pulses for tariff register 1
	RI (ready indication)	Pulses for the modes "ready / fault"

Parameter setting for "fast pulses"

Channel 1	Channel 2
CE (count energy)	**CV** (count volume)
	- (no function)
CV (count volume)	**CV** (count volume)
	- (no function)
CE / CV *) (count energy / count volume)	**CV** (count volume)
	- (no function)

*) automatic output of the higher pulse rate

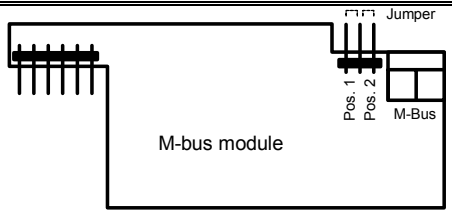
Output connection "standard":



A special version of the pulse module (“Deluxe”) is available with an Opto-MOS output.
Application example: Battery-powered pulse receiver.
Advantages: Low voltage drop and polarized (bipolar).

Labeling	pulse module
Type	open collector
Voltage	maximal 30 V =
Current	maximal 30 mA
Dielectric strength	500 V_{rms} against ground
Classification	OB (per EN 1434-2)
Voltage drop	approx. 1.3 V at 20 mA
Classification	OC (per EN 1434-2)
Voltage drop	approx. 0.3 V at 0.1 mA

With the **M-bus module**, several heat meters can be read from a central station.
The data frame can be defined with a jumper.
Jumper in pos. 1 “Fixed data frame”
Jumper in pos. 2 “Guaranteed data frame”
Jumper in “center” “Variable data frame”



Note: If two M-bus modules are plugged, please note the restrictions!

Display on LCD	**MB** (meter bus)
Standard	per EN 1434-3
Isolation	galvanic
Connection	with galvanic isolation
Voltage	50 V maximum
Current consum.	1.0 M-bus loads (1.5 mA)
Addressing	primary or secondary
Transmission rate	300/1200/**2400**/4800 baud
Literature	TKB 3417
Read-out freq.	any number of time, also with battery

Data scope with fixed data frame:
- Update after every 15 minutes
Property number; quantity of heat; volume; setting and resetting a user lock; setting the data and time, and setting the primary and secondary address.

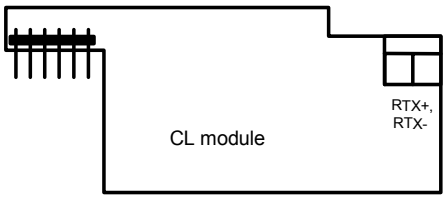
Data scope for variable/guaranteed data frame:
- Update after every 15 minutes *)
Property number; unit number; manufacturer’s identifier; medium; firmware version, fault messages; missing time; operating time; quantity of heat; volume; previous month’s values for quantity of heat, tariff register, volume, maximum for power and missing time; previous year’s values for quantity of heat, volume and maximum for power ; measuring period with maxima for power, flowrate and temperatures; actual values for power, flowrate and temperatures; F0 prewarning; setting and resetting a user lock; setting the date and time, and setting the primary and secondary address.

*) Special version with minimum update rate of 30 s can be supplied (WZU-MB-30), but it has a shorter battery life

Data scope for fast read-out:
- Update after a minimum of 4 s
Property number; quantity of heat; volume; actual values for power, flowrate and temperatures, and setting the date and time.
Fast read-out via the M-Bus is only permissible with the appropriate battery (D cell for 6 years) or a power supply module.

The **CL module** can be used to set up a point-to-point link enabling the heat meter to be read remotely, for example, at the front door.

Display on LCD	**CL** (current loop)
Standard	per EN 1434-3
Type	passive current loop



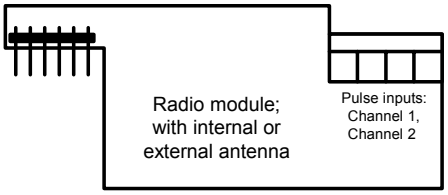
Baudrate	2400 baud, fixed
Isolation	galvanic
Polarity	yes
Voltage	30 V maximum
Current	30 mA maximum
Voltage drop	< 2 V at 20 mA
Literature	TKB 3415

Data scope

- Update on each read-out

Property number; unit number; firmware version; fault messages; missing time; operating time; quantity of heat; tariff register; volume; mounting location; adjustment values; unit configuration data; measuring range; M-bus addresses; system date and time; previous year's values with set day for quantity of heat, tariff and volume; maximum for power; fault duration and 18 monthly values for quantity of heat, tariff register, volume, missing time, maximum for power, flowrate maximum, measuring period with maxima for power, flowrate and temperatures; actual values for power, flowrate and temperatures.

With its integrated antenna, the **radio module** permits wireless read-out from a distance of up to 100 meters. For special mounting situations, the radio module can be supplied as a version with an external antenna.



The module is programmed via radio telegrams. With a button, the transmit parameters can be reset to default values.

Two LEDs indicate the current mode.

The power supply of the module is drawn from the heat meter. If the heat meter is operated with a battery, a 6-year battery of type D ("for all applications") is required.

The module contains an additional two pulse counters to acquire external counting pulses.

The following must be noted concerning the inputs for the pulse counters:

- Only connect isolated contacts (Reed contact, no open collector)
- No galvanic isolation of the electronics of the heat meter
- External power source or grounding not permissible

Display on LCD **RM** (radio module)

Technical data radio

Frequency	433 MHz	
Range	up to 100 meters (with integrated antenna)	
Read-out freq.	max. 1 read-out per day	(average)

Technical data pulse counters

Pulse counters:	2 inputs for external pulses	
Counter range:	0..99,999,999	
Pulse significance:	0.001...999.99	
Counter identifier:	8-digit	
Min. pulse length:	50 ms	
Max. pulse rate:	5 pulse/s when using both	channels
Max. pulse rate:	10 pulse/s when using only	one channel

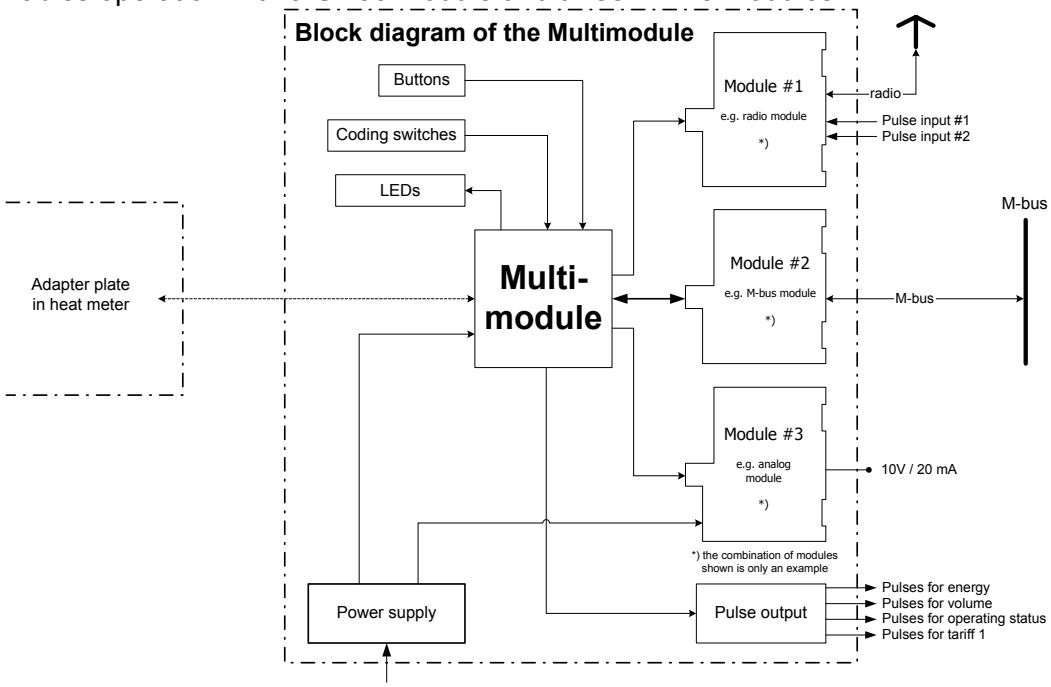
The radio module reads the data either when data is requested or only once per day.
The heat meter must be in normal mode.
The data are packed and output in various telegram types.

Data content

All telegrams are preceded by the time stamp (date and time) and the property number.

Telegram type:	Content:
“Basic”	Cumulated values and error status
“Previous year”	Cumulated previous year’s values and error status
“Previous month”	Cumulated previous month’s values and error status
“Extended”	Current instantaneous values, stored maximum values and error status
“Pulse and service”	Data of the pulse counter

The external **multi module** is delivered without adapter plate and without power adapter. The adapter plate and the power adapter must be ordered separately.
The multi module extends the heat meter by another three module slots for 2WR5 modules.
That enables operation with a UH50 module and three 2WR5 modules.



Display on LCD **MM** (multi module)
The following modules of type 2WR5 can be used without restriction:
- M-bus module
- Analog module
- Radio module

If several M-bus modules are used, one module functions as the master. The addresses of the M-bus modules can be changed independently via the M-bus system. If the master address is changed it is written back to the heat meter.
The bus address of the master can also be changed via the heat meter.
The multi module has one pulse output each as standard for energy, volume, operating status and tariff register 1.
The multi module is configured using 3 buttons and 2 coding switches.
The mode is displayed on LEDs, further LEDs indicate the status of the output pulses.
For further details and a separate description, see “WZX-MM Installation and Service Instructions”.

Monthly memory
Monthly memory contains the history of the events for the last 18 months. The monthly memory is implemented as a shift register. The current monthly data is transferred on the parameterized monthly set day. The data for the oldest previous month are then lost.

The data in the monthly memory are stored without a time stamp. The memory only indicates whether an error occurred in the month in question or a certain event occurred. No information is given, for example, about the duration of the error condition.

N

NEOVAC lock see Display lock

In **normal mode**, flowrate measurement and temperature measurement are performed in a timebase (measuring interval) of 4 seconds (parameterizable: 0.5 / 1 / 2 / 4 or 8 seconds) or 30 seconds (parameterizable: 2 / 4 / 8 / 30 / 60 seconds).
If **power saving mode** ("saving mode") has been parameterized – and the calibration seal is set – the LCD is only activated once every 5 seconds for approx. 0.5 seconds after 15 minutes of inactivity (no LCD button is pressed and no data traffic). This mode is exited when an LCD button is pressed and the LCD then permanently displays. After another 15 minutes of inactivity (no LCD button pressed and no data traffic through the optical interface), the LCD again switches to "power saving mode".
Caution: If the service button is pressed in this state, display mode remains!

The following **notes** have been included in the instructions:

Text	CI	I / SI	OI
• The electronic unit must only be cleaned on the outside. Please use a soft, damp cloth to do this, which can be dipped in a non-corrosive cleaning agent.	-	-	yes
• Regulations on the use of heat meters must be observed, see EN 1434, Part 6! In particular, cavitation in the system must be avoided.	yes	yes	-
• Heat meters up to DN25 may only be installed with directly immersed sensors according to German calibration law!	yes	yes	-
• Install the unit in such a way that no water can enter the electronic unit during operation.	yes	yes	-
• All information given on the data sheet of the heat meter must be observed.	yes	yes	-
• User seals may only be removed by authorized persons for service purposes and must be replaced afterwards.	yes	yes	yes
• The unit is supplied with Installation and Service Instructions and with Operating Instructions.	yes	-	-
• No later than 30 seconds after installation, the heat meter detects the plugged modules automatically and is ready for communication or pulse output.	yes	yes	-
• The type of modules plugged can be displayed in the service loop depending on how the display is parameterized.	yes	yes	-
• For fast pulses, the parameters must be set accordingly with the PappaWin software.	yes	yes	-
• Up-to-date versions of all instructions can be found in the Internet at **www.landisgyr.com**	yes	yes	yes

O

Operating elements:
Outside:
- LCD button 1 (“loop”);
  switches to the first line of the next loop
- LCD button 2;
  switches to the next line within a loop

Inside:
- Service button
- Calibration button“ (operated with a service tool, not supplied)

The service button and the calibration button are only accessible after the housing cover has been removed.
The calibration button is additionally protected by an adhesive label.
The optical interface permits data traffic with the associated software, e.g. PappaWin.

Operating time see Timer

Operating time with flowrate see Flowrate measuring time or Timer

An **optical interface** permits data exchange via telegrams:
- Mandatory telegram
- Optional telegram
- Eb (calibration mode) telegram
- Parameter setting telegram

The data (actual values, consumption values, stored values, and parameters) can be read out in groups as mandatory, optional, or Eb (calibration mode) telegrams. The *UH50* is configured via the parameterization telegrams.

Mandatory telegram	Optional telegram	Eb telegram
Unit number; property number; measuring range; system date/system time, current fault display; current values for W, V, TDiff, TV, TR and fault duration; previous year’s values for W, V, TDiff, TV, TR and fault duration; set day; operating time, measuring period; (lifetime) maxima for Q, TDiff, TV, TR, P; parameter setting (mounting location, TR simulation); tariff parameters; time stamp		All parameter values; Measurement results of a preceding test mode; current normal mode meter readings with all prescalers (for shortened certification/test times); tariffs
	Stored monthly values for W, V; (monthly) maxima; adjustment values; measuring path parameters; T sensor parameters; detailed fault data; actual values for Q, TDiff, TV, TR, P; prescaler for W, V and TR1/2/3; parameters for “fast pulses”	

P

Parameter setting menu

LCD button 1 is used to call the displays of the loop in the defined order. When the last line is reached, the loop is repeated.
LCD button 2 calls the relevant menu item.
Return to normal mode is performed automatically no later than 15 hours later.

F8 +	Reset the error message F8 (only if F8 is pending)
Ma +	Reset the maxima
Fd +	Reset the missing time and the flowrate measuring time
SD 31.05.--	Entry of the yearly set days (day and months) *)
SD 31.--.--	Entry of the monthly set day (day) *)
D 10.05.06	Entry of the date (day, month, year)
T 10.59.59	Entry of the time (hour, minute, second)
K 12345678	Entry of the property number, 8-digit numeric
AP1 0	Entry of the M-bus primary address for module 1 (0..255) *)
AP2 0	Entry of the M-bus primary address for module 2 (0..255) *)
Modul 1-1 CE Modul 1-1 C2	Selection of the first module function for module 1 (CE or C2)
Modul 1-2 CV Modul 1-2 CT Modul 1-2 RI	Selection of the second module function for module 2 (CV or CT or RI)
Modul 2-1 CE Modul 2-1 C2	Selection of the first module function for module 2 (CE or C2)
Modul 2-2 CV Modul 2-2 CT Modul 2-2 RI	Selection of the second module function for module 2 (CV or CT or RI)
MP 60 min	Selection of the maxima measuring period: 7.5-15-30-60 min / 3-6-12-24 h
Nb-------	Return to normal mode

*) It is up to the user to ensure that only meaningful values are entered. No plausibility check is made and "incorrect" values can be applied (month > 12 etc.)

Note: The functions for modules 1 and 2 are also offered if no or any other module is plugged.
In this way, the heat meter can be parameterized before the modules are fitted.

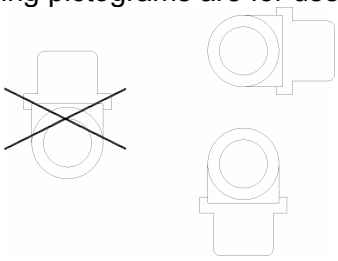
Action:	**Effect:**
„Resetting"	Pressing LCD button 2 executes the displayed function, then the next line is displayed
„Entry"	Pressing LCD button 2 causes the first digit to blink; pressing LCD button 2 again increments this value. Pressing LCD button 1 applies this value and advances to the next digit that can be changed. When the last digit has been edited, input mode is exited. Entry can be prematurely terminated by pressing the service button.
„Selection"	Pressing LCD button 2 selects a value from a defined set; pressing LCD button 1 then applies this value.

After a menu item has been edited, a star symbol (*) briefly appears as acknowledgment.

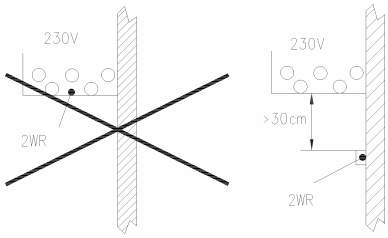
Permanent return simulation specifies a constant (simulated) return temperature. Parameter setting is performed in PappaWin.

Pictograms (“DO” – “DON’T”)

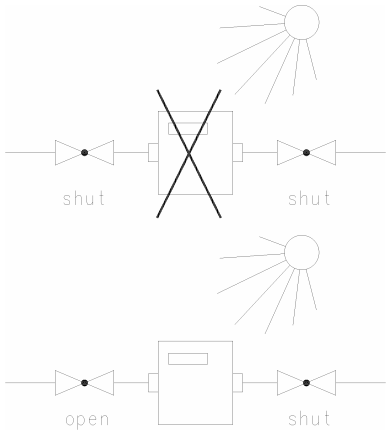
The following pictograms are for use in instructions.



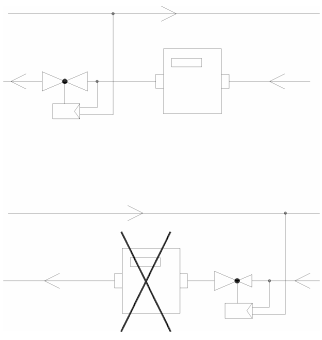
Pictogram 1: Standing on head



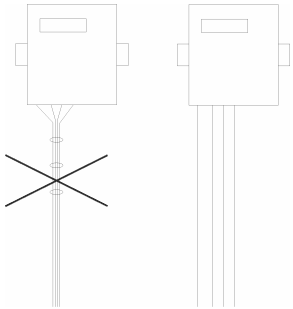
Pictogram 2: Distance 230V



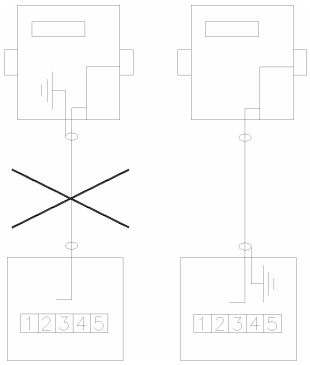
Pictogram 3: Summer operation



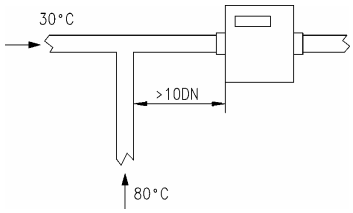
Pictogram 4: xxx



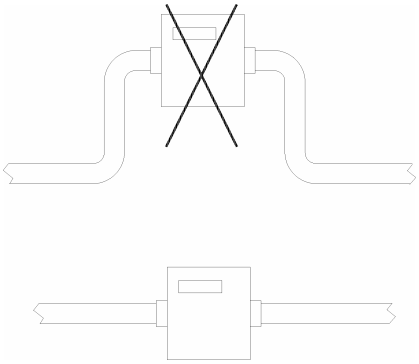
Pictogram 5: Cable routing



Pictogram 6: Shield connection



Pictogram 7: Mixing



Pictogram 8: yyy

In **power saving mode** (“power saving mode“) – with the calibration seal set – the LC display is activated at 5-second intervals for 0.5 seconds at a time. During the off time (4.5 seconds), no data traffic is possible through the optical interface. Pressing an LCD button interrupts power saving mode; after 15 minutes of inactivity (no LCD button pressed and no data traffic via the optical interface), the unit switches back to power saving mode.

Power supply

The *UH50* can be powered from a power supply unit or with a battery.
In battery operation, the type of battery used depends on the application.
In line operation, an approx. 20-minute power failure can be bridged using a super cap.

Automatic power source detection

The power supply unit detects whether a line voltage is applied. This signal is routed to the *UH50*. That enables the unit to detect automatically whether it is powered from a battery or a power supply unit.
Depending on the power supply detected, the measurement timebase for the flowrate and temperature is switched over. The measurement timebases (measuring intervals) can be set in calibration mode.
Power source detection is performed after each flowrate measurement. If a power failure is detected, the meter switches the interval to the value of battery mode. A return to the value of line mode happens at the earliest after 2 minutes. This is followed by evaluation again.
On each switchover between line and battery operation, the prescalers are taken into account.

Power supply unit variants

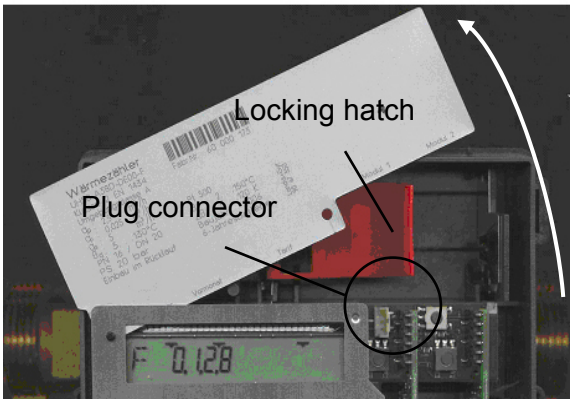
24 V ACDC
(terminals)

110 V AC, 230 V AC
(cable length 1.5 / 5 / 15m)

Battery variants

Requirements (for measurement timebase Q = 4 s and measurement timebase T = 30 s)	6 years	11 years
No M-bus fast read-out, without controller function	2x AA	D
M-bus fast read-out or fast pulses or analog module or radio module	D	--

Battery compartment



Inserting a battery

Press the four side tabs of the housing cover inward and remove the cover. Then turn the label plate counterclockwise until you feel it has gone as far as it will go.
Swing open the red locking hatch to expose the relevant battery compartment (left compartment for 2x “AA” or “C”, right compartment for “D”).
Insert the battery into the relevant compartment of the electronic unit with the correct polarity as marked.
Turn the label plate back clockwise into its original position.
Note: AA and C size batteries are snapped into a holder.

Mounting a power supply module

Instead of the battery, a power supply module (110 V / 230 V with connected cable, 24 V with terminals) can also be installed. This is done by moving the red locking hatch to the left to open the right-hand compartment for the power supply module. Remove the right-hand outside rubber sleeve upward, pull out the plugs and thread the connecting cable (line voltage) of the module through the sleeve. Insert the module in the upper right-hand corner of the electronic unit and re-insert the sleeve with the cable from above. Connect the conductors as labeled. Plug the other connecting cable (low voltage) onto the plug connector on the circuit board.

Note: For the 24 V AC/DC version, cable with a diameter greater than 5.0...6.0 mm should not be used!

The 110 V / 230 V versions must only be connected by an electrician!

When replacing a unit after the calibration period has elapsed, swing out the power supply module with the cable and sleeve, mount the new heat meter, and re-insert the module. Because it complies with safety class II, the line power supply does not have to be disconnected.

The **pressure loss** (pressure drop) is stated in the table below.

Nominal flowrate q_p	Overall length	Maximum flowrate q_s	Minimum flowrate q_i	Response threshold (variable)	Pressure lost at q_p	Kv flowrate at Δp 1 bar	Kv flowrate at Δp 100 mbar	Weight thread	Weight flange
m³/h	mm	m³/h	l/h	l/h	mbar	m³/h	m³/h	kg	kg
0.6	110	1.2	6	2.4	150	1.5	0.5	1	
0.6	190	1.2	6	2.4	150	1.5	0.5	1.5	
0.6	DN20	1.2	6	2.4	125	1.7	0.5		3
1.5	110	3	15	6	150	3.9	1.2	1	
1.5	130	3	15	6	160	3.8	1.2	1.5	
1.5	190	3	15	6	160	3.8	1.2	1.5	
1.5	DN20	3	15	6	160	3.8	1.2		3
2.5	130	5	25	10	200	5.6	1.8	1.5	
2.5	190	5	25	10	200	5.6	1.8	1.5	
2.5	DN20	5	25	10	195	5.7	1.8		3
3.5	260	7	35	14	65	13.7	4.3	3	5
6	260	12	60	24	150	15.5	4.9	3	5
10	300	20	100	40	100	31.6	10	4	
10	DN40	20	100	40	165	24.6	7.8		7
15	270	30	150	60	100	47.4	15		8
25	300	50	250	100	105	77.2	24.4		11
40	300	80	400	160	160	100	31.6		13
60	360	120	600	240	115	176.9	56		22

Prescalers

The calibrated consumption values (quantity of heat and volume) and the tariff registers (TR1, TR2, TR3) are displayed on the LCD and represented in the data telegrams with a certain resolution only. Further internal prescalers are therefore available for testing the *UH50*. These exist separately for normal mode (“Nb”) and test mode (“Pb”) and can be read out by “Eb (calibration mode) telegram”. The can be used, for example, to start normal mode measurements in calibration mode and initialize the associated prescalers.

Pulse output see tariff pulses

The pulses output can be derived from the standard registers (W, V), the tariff registers (TR1, TR2) or the mode.

A heat meter with a **removable control cable** may be separated during the installation. When installation is done be sure that only paired parts (volume part, calculator) are connected together.

R

Resolution of the display see LC display

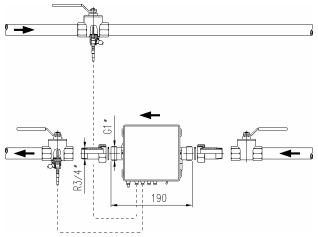
The **response threshold** for flowrate measurement is 40 % with reference to the minimum flowrate by default (see Table Pressure loss). It can be ordered depending on the MLFB or changed subsequently using the PappaWin software in the range 5..100% in steps of 5%.

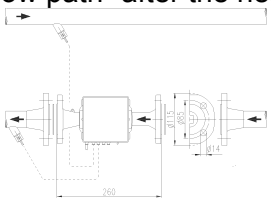
For the **returning heat meters**, the *Configuration Instructions* and the *Installation and Service Instructions* contains the note “The lithium batteries must be properly returned”.
Notes should also be included in the “Start-up guide for heat meters”! (“Practical help from sales”).

S

Sensor installation

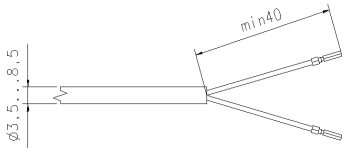
The sensor must be installed in such a way that it is in the flow path “after the heat meter”.





Sensors provided by customer

In the case of sensor provided by the customer (max. cable length 5 m – an extension is impermissible!) the 2nd and 3rd sleeves from the left must be cut to match the cross-section of the cables.
Unlatch the housing cover by pressing in the side tabs and remove it. Route the cable of the flow sensor from outside through the 2nd sleeve, the cable of the return sensor through the 3rd sleeve.



Wire-end ferrules

Connect the conductors as shown on the circuit diagram printed on the unit. The 2-wire connection is made at terminals 5/6 and 7/8. No cable shield must be connected to the heat meter. Then inset the sensors in the pockets, ball valves, or T-elements and seal against tampering.
If an error message “F8” is shown, it can be reset via the parameter setting menu (see Page 7).
Replace the housing cover and press it in gently until you hear all the tabs latch.

The **service menu** is called by opening the cover and pressing the service button for 3 s. It is possible to advance through the display loop using LCD button 1. The required function is called by pressing LCD button 2.

PRUEF----	Call the test mode menu
PArA-----	Call the parameter setting menu
Nb-------	Return to normal mode

Return to normal mode is performed automatically after no more than 15 hours.

A **set day** defines the data on which the following values are stored to be called up later:

- Current value for the missing time,
- Current value for the flowrate time,
- Current value for volume,
- Current value for quantity of heat,
- Current value for the tariff register,
- Maxima with associated time stamp.

There is a set day for the *previous year's values* and a set day for the *previous month's values*. The start of the day (00:00 Uhr) or the end of the day (24:00 Uhr) can be selected as the time of day. This time applies to both the previous month's values and previous year's values.
Note: The standard time used is Central European Time (CET). If daylight-saving is activated, storage will be performed accordingly.
The **previous year's values** are stored once a year. The previous values are overwritten.
The **previous month's values** are stored for the last 18 months. The oldest monthly value is lost each time a new value is stored. The monthly values can also be read out via the optical and the 20 mA interface.

Simulation

The following measured values can be simulated by telegram for test purposes:

- Flowrate in the range -280% ... +280% (with reference to the nom. flowrate)
- Flow in the range -10...+190°C
- Return in the range -10...+190°C

Simulation can be activated irrespective of the unit errors F0, F1, F2, F5, F6. A possible error is suppressed.
Simulation is ended with the relevant telegram "End simulation" or automatically by setting the calibration seal. Exception: "Permanent return simulation"

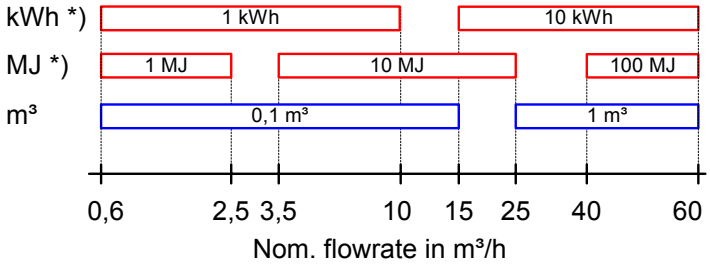
When Split mounting is made, the electronic unit is mounted separately from the flowrate measuring tube. This is necessary when the meter is used as a cold meter and in cases where the medium temperature can fall below 10°C or can exceed 90°C.

Standard pulses see also tariff pulses or "fast pulses"

Parameter setting for standard pulses

	Output mode	Output value
Chan. 1	**CE** (count energy)	Pulses for quantity of heat
	C2 (count tariff 2)	Pulses for tariff register 2
Channel 2	**CV** (count volume)	Pulses for volume
	CT (count tariff 1)	Pulses for tariff register 1
	RI (ready indication)	Pulses for the modes "ready / fault"

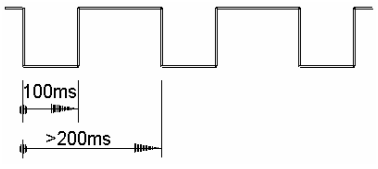
Standard pulse significance:



*) depending on the unit for heat display

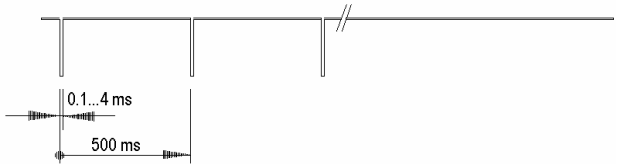
Pulses for quantity of heat, volume, tariff register 1, tariff register 2:

Pulse duration	100 ms conducting
Period duration	> 200 ms



Pulses for modes:

"Ready"	pulsed "conduct.", i.e. 0.1..4 ms pulse dur., 500 ms period
"Fault"	constantly "non-cond."



Start-up

Replace the housing cover and press it in gently until you hear all the tabs latch. Open the shut-off valves. Check the heating system for tightness and vent it carefully.
No more than 100 s later, message F0 will disappear. After that, check that the displays for flowrate and temperaures are plausible. Vent the system until the flowrate display is stable. Adjust the system with the flowrate display (updated in the flowrate timebase).
Seal the sensors. Attach user seals to the electronic unit and the sensors.
Read and note down the meter readings for quantity of heat, volume, operating time, and missing time.
We recommend resetting the maxima and the missing time (see Parameter setting).
In case of incorrect installation , the relevant error message will be displayed.
Note: During a system stoppage, such messages may appear although mounting was correct.

Start-up lock see Display lock

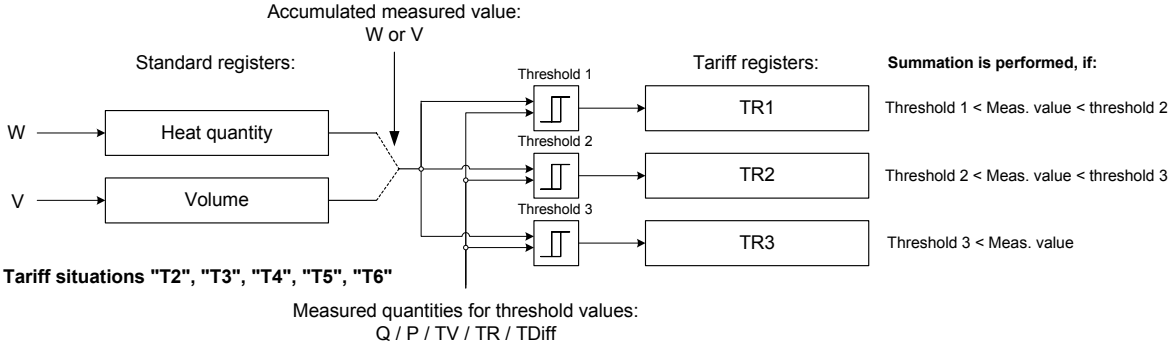
The following **safety notices** have been included in the instructions:

Text	CI	I / SI	OI
☞ Do not pick up by the electronic unit	x	x	no
☞ Be careful of sharp edges (thread, flange, measuring tube)	x	x	no
☞ Installation and removal must be performed by qualified personnel only	x	x	no
☞ Mounting and unmounting are only permitted when the system is not under pressure	x	x	no
☞ After installation, a tightness test must be conducted with cold pressure	x	x	no
☞ Only ever use under service conditions, otherwise dangers can arise and the warranty may be voided	x	x	no
☞ Breaking the calibration seal voids the warranty	x	x	no
☞ The 110 V / 230 V versions must only be connected by an electrician werden	x	x	no
☞ The lithium batteries must be properly returned	x	x	no
☞ Lightning protection cannot be ensured; this must be provided by the building wiring	x	x	no
☞ Only one compartment for the power supply must be equipped – do not remove the red locking hatch	x	x	no

Tariff control by means of threshold values (tariffs “T2”, “T3”, “T4”, “T5”, and “T6”)

T

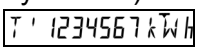
The threshold values can be derived from the *flowrate*, the *heat power*, the *return temperature*, the *flow temperature* or *temperature difference*. Up to 3 tariff thresholds are possible; the selected measured value aplies to all threshold values. Each tariff threshold is assigned its own tariff register.
In the tariff registers, it is possible to acquire either the quantity of heat or the volume.
The total quantity of heat and the total volume are summated independently of the tariff thresholds.

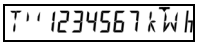


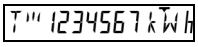
Summation in the relevant tariff register is only performed if the relevant threshold is exceeded.

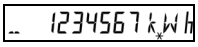
- Threshold 1 exceeded: Summation in tariff register 1
- Thresholds 1 and 2 exceeded: Summation in tariff register 2
- Thresholds 1, 2 and 3 exceeded: Summation in tariff register 3

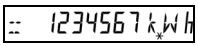
The **tariff status** is identified as follows in the display (for example, tariff register records the quantity of heat):

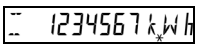

Quantity of heat in tariff register 1 *)

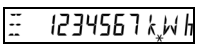

Quantity of heat in tariff register 2 *)


Quantity of heat in tariff register 3 *)


Current quantity of heat; no threshold value currently exceeded

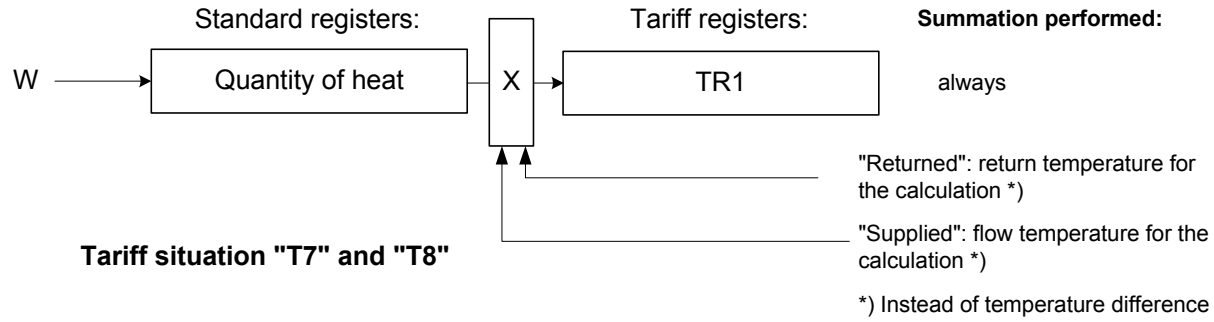

Current quantity of heat; threshold value 1 currently activated


Current quantity of heat; threshold value 2 currently activated


Current quantity of heat; threshold value 3 currently activated

*) In the tariff register, the quantity of heat or volume can be recorded

Tariff control by means of supplied/returned quantity of heat (tariffs “T7”, “T8”)

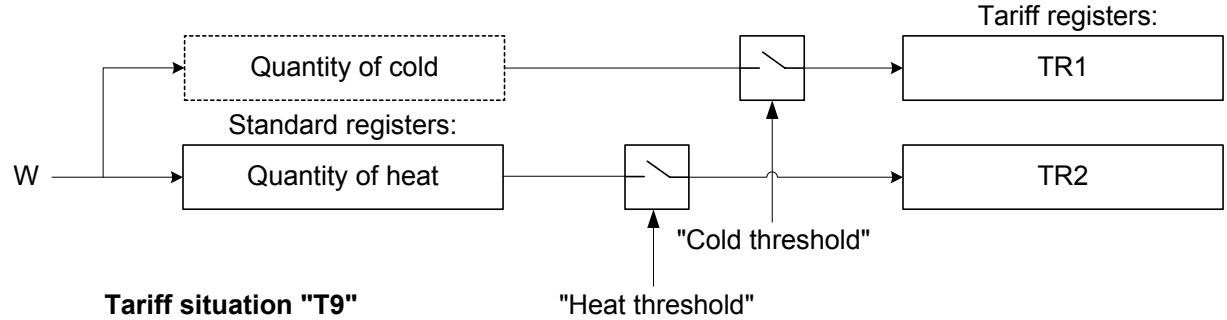


Tariff situation "T7" and "T8"

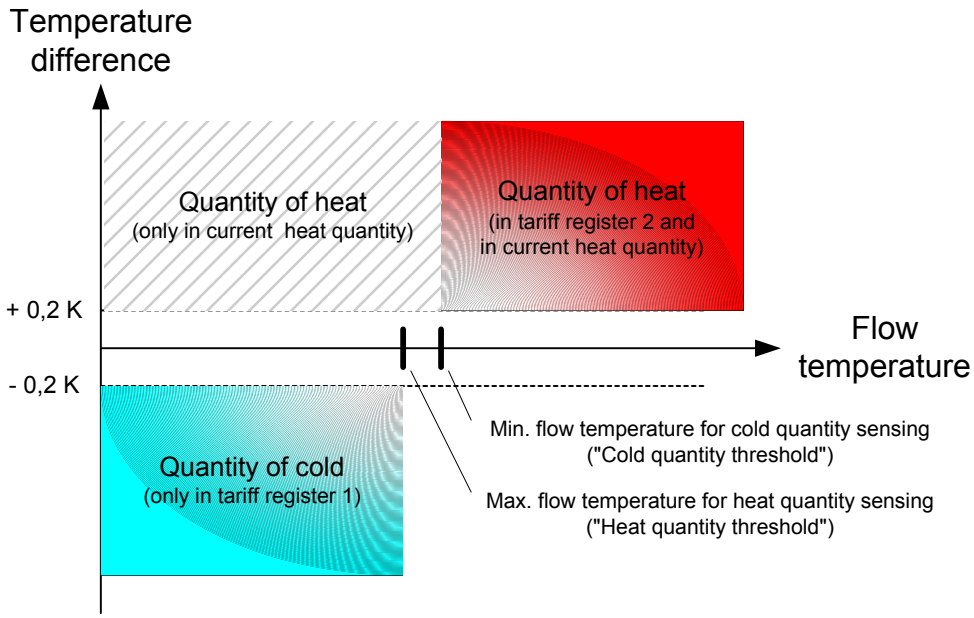
Tariff register	Contents	
	Flow temperature as reference	Return temperature as reference
TR1	Supplied quantity of heat	Returned quantity of heat

Note: With display of the current quantity of heat, the **tariff status** is not displayed (no “bar” in the display).

Combined heat/cold meter (tariff “T9”)



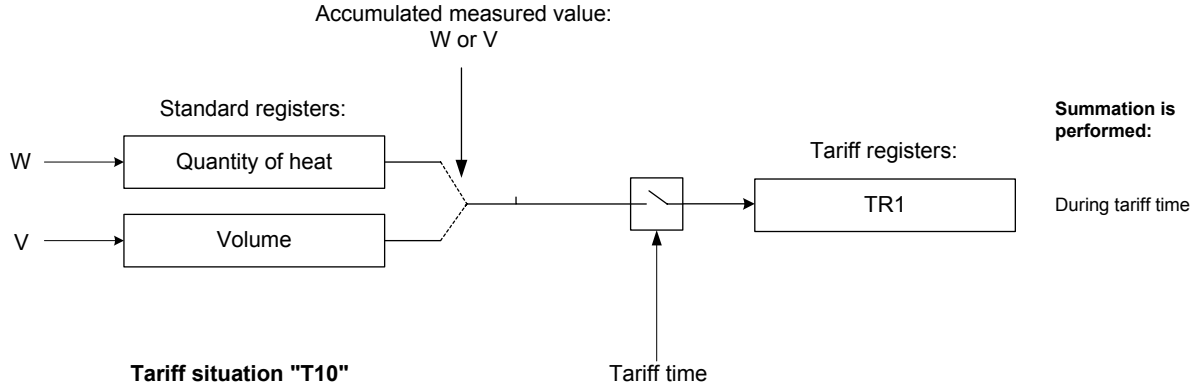
Tariff situation "T9"



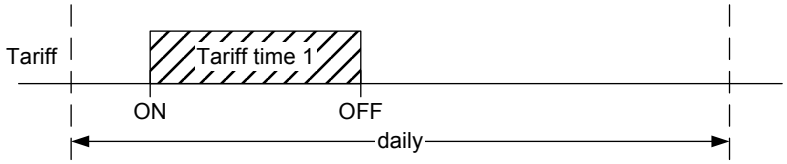
Display of the **tariff status**:

Temperature difference > 0.2 K and flow temperature > “heat threshold”	Quantity of heat is accumulated; “bar below” on LCD
Temperature difference < - 0.2 K and flow temperature < “cold threshold”	Quantity of cold is accumulated; “bar above” on LCD
All other situations	“Neither – nor”; all 3 bars

Tariff control by means of tariff timer switch (tariff “T10”)



Tariff register	Content
TR1	Quantity of heat or volume during tariff time



Two settable switching points specify at what time each day the tariff will be activated or deactivated.

Example: 12:00 to 24:00 tariff 1

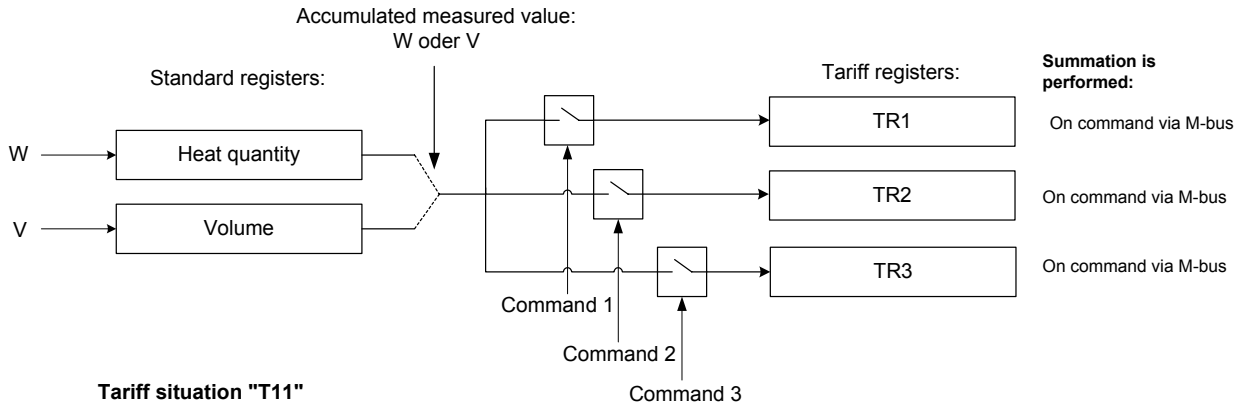
T1 00,00 0	Tariff time 1 (switch-off time)
T2 12,00 1	Tariff time 2 (switch-on time)

Example: 00:00 to 12:00 tariff 1

T1 00,00 1	Tariff time 1 (switch-on time)
T2 12,00 0	Tariff time 2 (switch-off time)

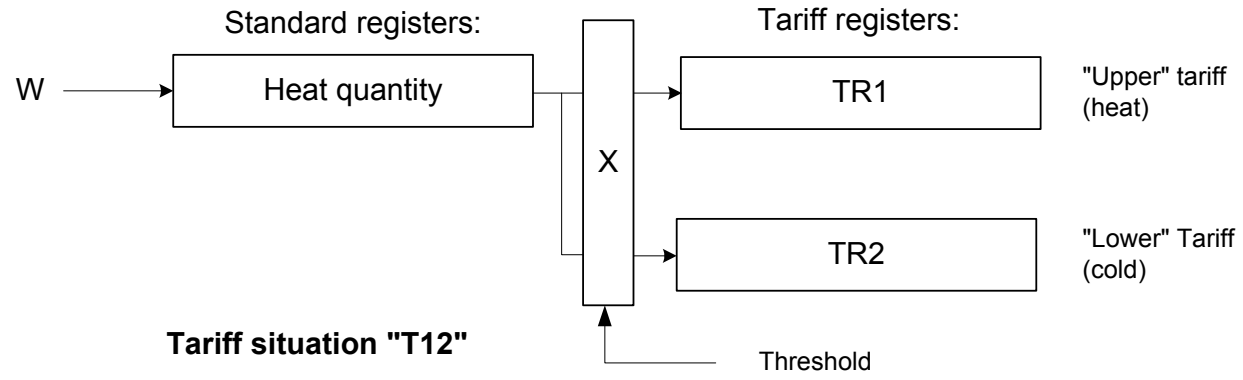
Daylight-saving/standard time switchover can be activated or deactivated. The monthly values for the switch-on and switch-off times of the daylight-saving time can be specified for 16 years.
Display of the **tariff status** is identical with the "tariff control by means of threshold values".

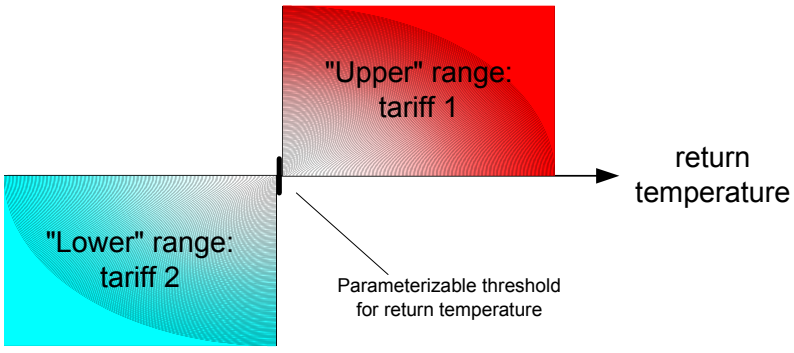
Tariff control by means of M-bus command (tariff „T11")



Either all tariffs can be switched off or one of three tariffs activated via a connected M-bus module.
Note: Only tariff selection can be performed via the M-bus module, not parameter setting for the tariffs!
Parameter setting of the tariffs and display of the **tariff status** are identical to "tariff control by means of threshold values".

Tariff control by means of return temperature (surcharge quantity tariff) (tariff "T12")





Based on a parameterized threshold for the return temperature T_R, two tariffs are formed:

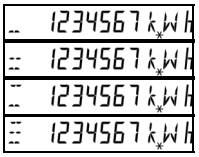
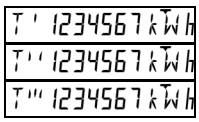
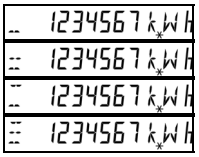
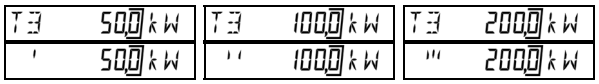
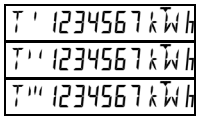
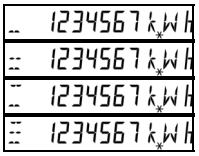
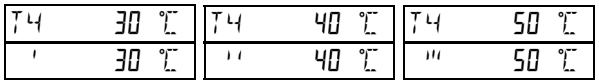
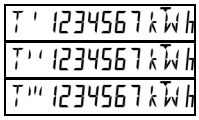
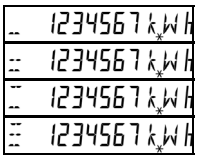
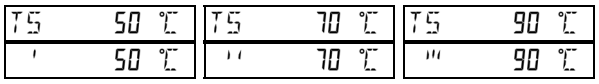
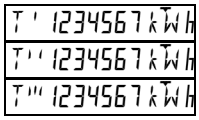
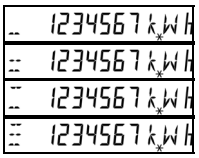
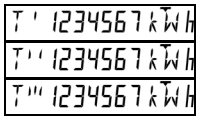
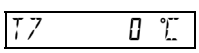
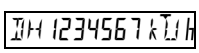
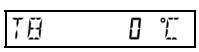
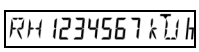
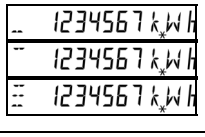
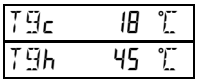
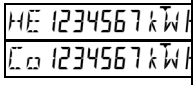
- T_R > threshold value --> tariff 1
- T_R < threshold value --> tariff 2

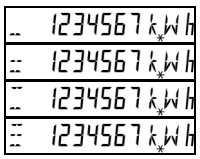
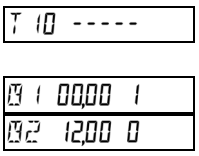
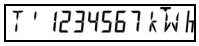
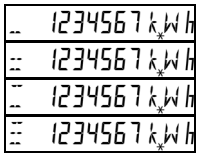
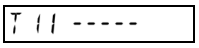
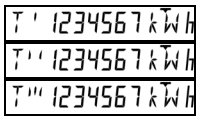
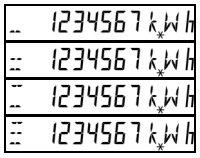
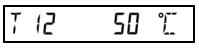
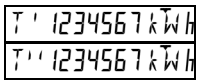
Calculation of the quantity of heat is performed based on the “return temperature difference from the threshold value” instead of the temperature difference between the flow and return.

Tariff register	Content
TR1	Quantity of heat for “upper” range
TR2	Quantity of cold for “lower” range

Display of the tariff status is identical to “tariff control by means of threshold values”.

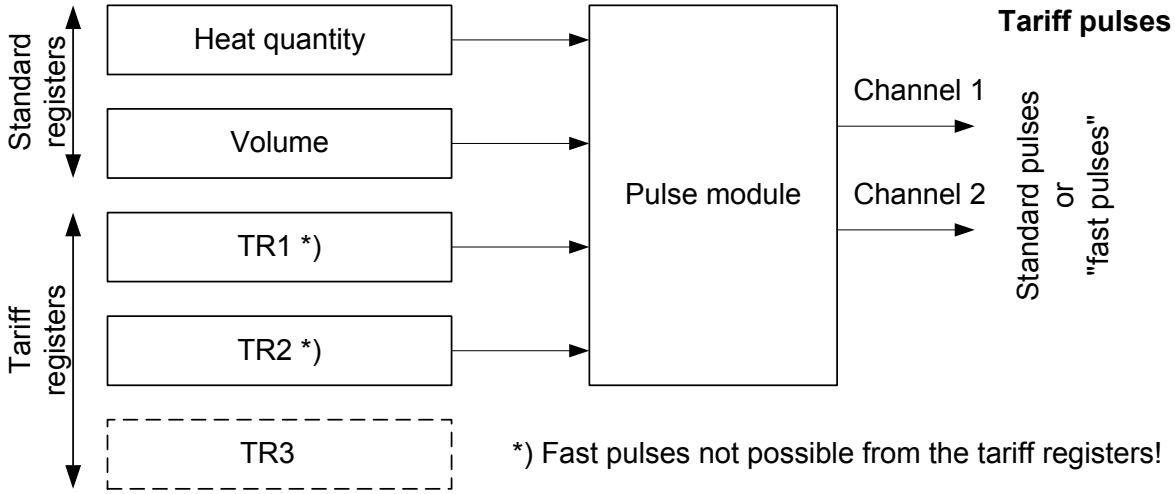
The **tariff display** shows the current tariff and its status.

Display of the tariff status	Display of the type of tariff	Display of the tariff values
T2: Threshold value tariff using flowrate threshold		
		
T3: Threshold value tariff using heat power threshold		
		
T4: Threshold value tariff using return temperature threshold		
		
T5: Threshold value tariff using flow temperature threshold		
		
T6: Threshold value tariff using temperature difference threshold		
		
T7: Tariff recording using supplied quantity of heat		
No status display		
T8: Tariff recording using returned quantity of heat		
No status display		
T9: Tariff recording using combined cold/heat meter		
		

T10: Tariff recording using timer switch switched		
		
T11: Tariff recording using M-bus switched		
		
T12: Tariff recording using return temperature (“surcharge quantity tariff”)		
		

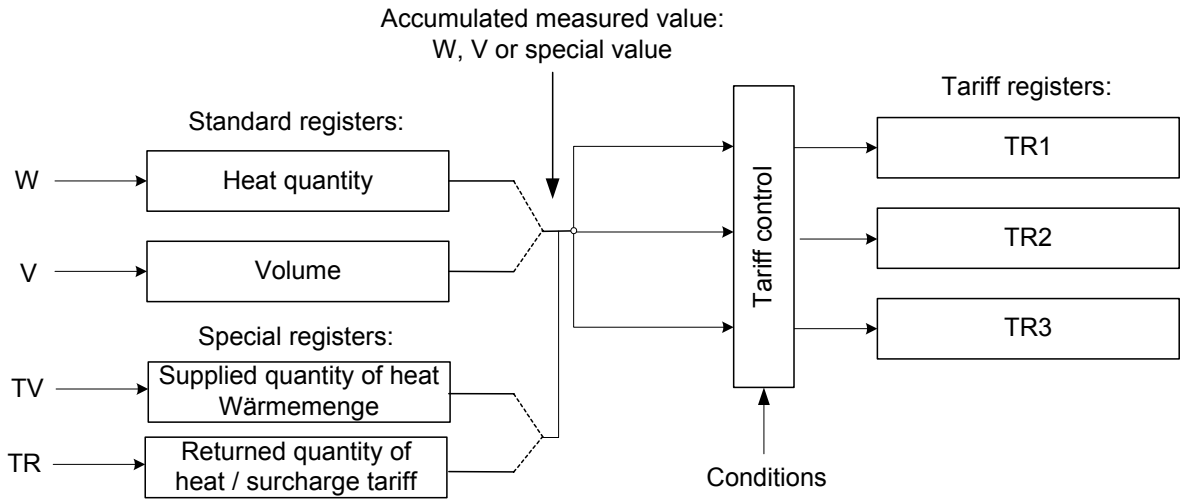
Tariff pulses

The contents of the registers quantity of heat, volume, tariff register 1 and tariff register 2 can be output via the pulse module as standard pulses. This function can be selected in the parameter setting menu or parameterized by telegram.
The fast pulses can only be generated from the standard registers (or the mode).

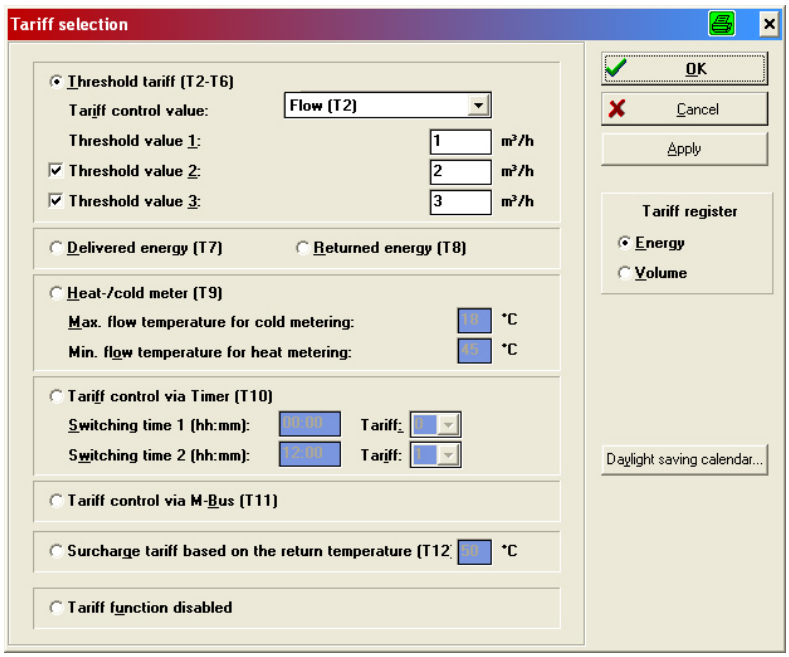


Tariff selection

Three registers are available in which – in addition to the accumulated values for quantity of heat and volume – tariff values can be acquired under specifiable conditions.
The tariff registers are assigned by parameter setting using the PappaWin software.



The following types of tariff control are available.			
Identifier	Tariff control by means of...	Thresholds	Tariffs
T2	...current flowrate	3	max. 3
T3	...current power	3	max. 3
T4	...current return temperature	3	max. 3
T5	...current flow temperature	3	max. 3
T6	...current temperature difference	3	max. 3
T7	...supplied quantity of heat	-	1
T8	...returned quantity of heat	-	1
T9	...combined heat/cold meter	2	2
T10	...tariff time-switch	-	1
T11	...M-bus command	-	max. 3
T12	...return temperature (surcharge quantity tariff)	-	max. 2



Terminals (module)

To connect the external cables to the module, 2-way or 4-way (Phoenix) screw terminals are used. Here is an extract from the data sheet:

Insulation stripping length
- 5 mm

Connection capacity
- rigid or flexible, 0.2 - 2.5 mm²
- flexible with wire-end ferrule, 0.25 - 1.5 mm²
- conductor sizes 26 - 14 AWG

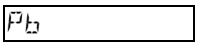
Multiple-conductor connection (2 conductors with same cross-section)
- rigid or flexible, 0.2 - 0.75 mm²
- flexible with wire-end ferrule without plastic sleeve, 0.25 - 0.34 mm²
- flexible with TWIN ferrule with plastic sleeve, 0.5 - 0.75 mm²

Recommended screwdriver
- 0.6 x 3.5 mm

Tightening torque
- 0.4 Nm

Test mode

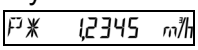
Test mode can also be called from normal mode by telegram (“heat meter to Pb”).

 Test mode

From here it is possible to call any of the test modes.
Return to normal mode is performed automatically after no more than 15 hours.

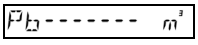
Test mode flowrate

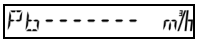
The flowrate measurements are performed in a measurement timebase of 250ms. Pulses proportional to the volume are output via the optical interface.
The flowrate is – depending on volume measuring unit - displayed with a resolution of e.g. 0.0001 m³/h (100 ml/h). Each update of the display value is indicated by brief display of an arrow symbol on the LCD.

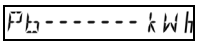
 Measured flowrate

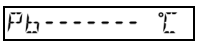
Return to normal mode is performed automatically after no more than 15 hours.

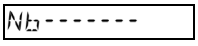
In the **test mode menu**, it is possible to call the required test mode manually. The display loop can be operated with LCD button 1. The required function is called by pressing LCD button 2.
The values for volume and quantity of heat measured in normal mode remain unchanged.
While the calibration seal is not set, the required test mode can also be called by telegram via the optical interface.

 Call test mode volume

 Call test mode flowrate

 Call test mode quantity of heat

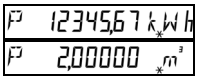
 Call test mode temperature

 Return to normal mode

Test mode is ended by pressing LCD button 1. A star symbol (*) now appears in the second digit as acknowledgment. When LCD button 1 is pressed again, the next line of the menu is shown and it is possible to advance further through the display loop.
Return to normal mode is performed automatically after no more than 15 hours.

Test mode quantity of heat

The accumulated quantity of heat is displayed with a resolution of 0.01 kWh. The average of 640 temperature measurements is evaluated.
The measurements are ended when the simulated volume of 2 m³ is reached. Then the numeric values for the measured quantity of heat and the simulated volume are displayed at appox. 2-second intervals.

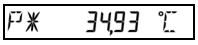


Measured quantity of heat,
alternating with the simulated volume

Return to normal mode is performed automatically after no more than 15 hours.

Test mode temperature

The temperature difference (or the return temperature) is displayed with a resolution of 0.01 °C. The average of, for example, 640 temperature measurements is evaluated (parameterizable). Each update of the display value is indicated by brief display of an arrow symbol on the LCD.

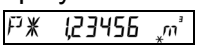


Measured temperature difference (or return temperature)

Return to normal mode is performed automatically after no more than 15 hours.

Test mode volume

The flowrate measurements are performed in a measurement timebase of 250 ms. Pulses proportional to the volume are output via the optical interface.
The accumulated volume is displayed with a resolution of 0.00001 m³ (10 ml). Each update of the display value is indicated by brief display of an arrow symbol on the LCD.

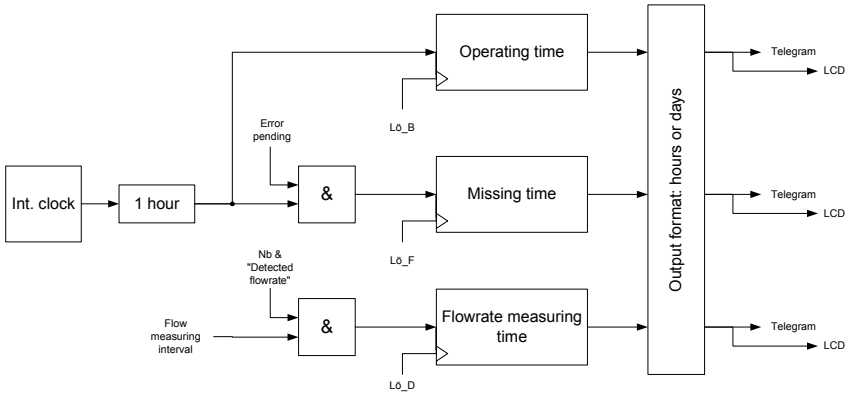


Measured volume

Return to normal mode is performed automatically after no more than 15 hours.

Timers

The timers for the operating time and the missing time are increment in the internal hourly timebase.
The flowrate measuring time is incremented with each flowrate measurement also in the internal hourly timebase.
The format for output in the telegram and on the LCD can be parameterized for all timers together (hours or days).



The meter readings can be reset via telegram or in the parameter setting menu, currently, singly or all together.

Function:	Called by...	Lö_B	Lö_F	Lö_D
“Master Reset” (all counter registers and prescalers)	Telegram	**x**	**x**	**x**
“Reset times”	Telegram	**x**	**x**	**x**
“Reset operating time”	Telegram	**x**	**x**	**x**
“Reset missing time”	Telegram		**x**	
“Reset missing time”	Parameter setting menu		**x**	**x**

The **operating time** is

- always summated
- reset – together with the missing time and der flowrate measuring time – with the telegrams “master reset”, “reset times” and “reset operating time”

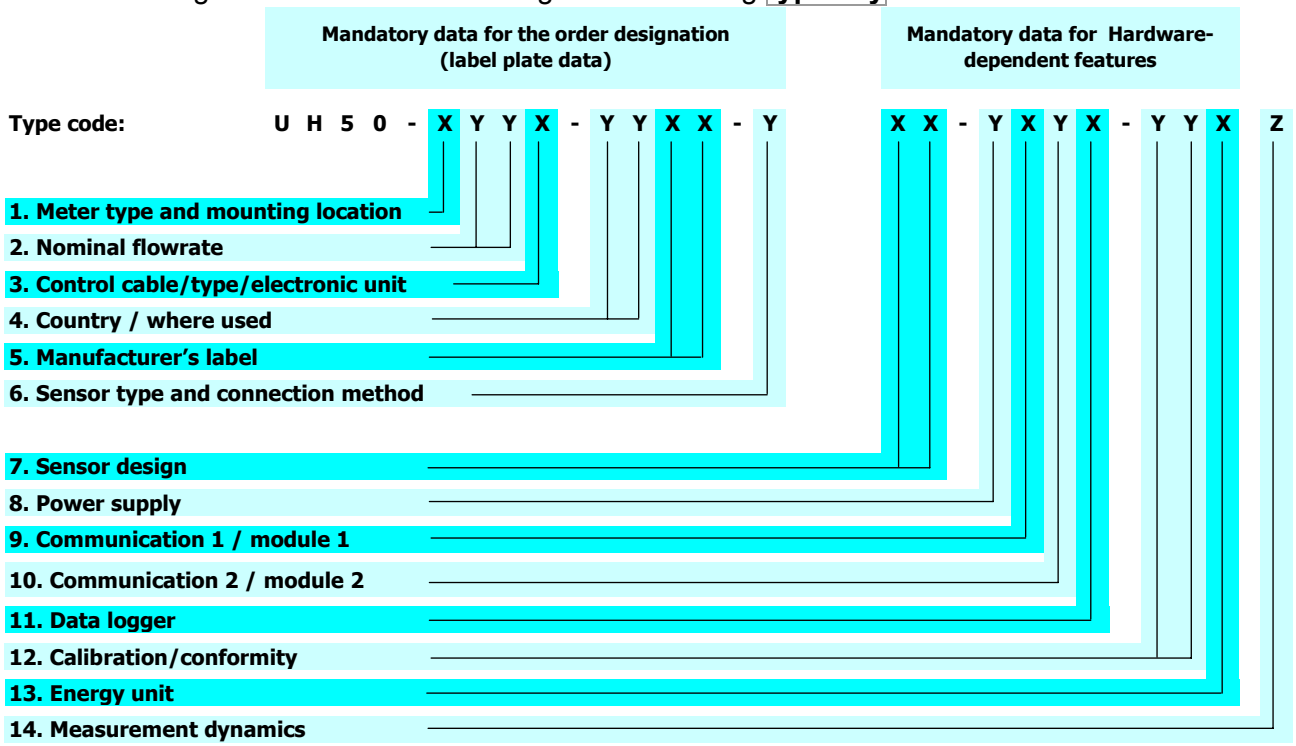
The **missing time** is

- summated, if an error is pending that prevents recording the quantity of heat.
- reset – together with the operating time and der flowrate measuring time – with the telegrams “master reset”, “reset times“ and “reset operating time”
- reset – singly – with the telegram “Reset missing time”
- reset – together with the flowrate measuring time – im parameter setting menu

The **flowrate measuring time** is

- summated, while a flowrate is detected that can be included in the calculation.
- reset – together with the operating time and der missing time – with den telegrams “Master reset”, “Reset times” and “Reset operating time”
- reset – together with the missing time – in the parameter setting menu

The order designation is formed according to the following **type key**.



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