ENERGY CALCULATOR
SCYLAR INT M (Type: mwz04)

DIEHL
Metering

Installation and User Guide

This guide must be given to the end consumer.

smart in solutions

Directory

Installation Guide

Energy calculator

This calculator is a two-channel calculator for measuring thermal energy in heating and cooling circuits.

It includes the functions of two calculators.
2 independent energy measurements can be made in one housing at the same time.

It is highly suitable in an industrial surrounding.

Billing-relevant data can be calculated in the range of local heating and district heating with very high precision.

Due to its variety of additional functions it is also very well prepared for future requirements.
It is one of the most advanced, fully electronic calculators on the market.

In the full version, there are two energy channels (A and B) with one energy-counter each for heating (+) and cooling (-) available.

However, there are also versions with a reduced number of functions available, as e.g.:
two energy channels (A and B) without cooling or only channel A with or without cooling.

Display-Type	**Channel +A heating**	**Channel -A cooling**	**Channel +B heating**	**Channel -B cooling**
AB +/-	Yes	Yes	Yes	Yes
AB +	Yes		Yes	
A +/-	Yes	Yes		
A +	Yes			

The method of calculating energy:

A flow sensor measures the circulating water in the heat- or cooling system.

A pair of temperature sensors measures the forward and return temperature.

Based on the water quantity and the temperature difference the calculator calculates the used energy.

Approval

Heating meter
According to the MID- Directive (2004/22/EC)
EC-type examination certificate number: A 0445/3504/2011

Cooling meter
National cooling approval:
BEV-Approval Nr.: GZ 5326/2012 / 1. Revision GZ 409/2014

PTB equality of BEV cooling approval

Safety requirement

This installation guide is intended for trained personnel and therefore does not include basic working steps.

Important!

The label seal on the calculator must not be damaged! A damaged seal will result in immediate invalidation of the factory warranty as well as of the verification or declaration of Conformity calibration.

- The regulations on the use of calculator must be observed!
- The regulations on electrical installations must be observed!
- The meter installation is only to be performed by an installation and/or electrical contractor using personnel trained in the use and installation of low-voltage electrical equipment (up to 1000 V)
- All instructions listed in the data sheet of the calculator must be observed.
- Medium: water without additives, with special programming also glycol-water mixes
- Calibration marks on the calculator must not be damaged or removed! Their removal invalidates the warranty and calibration of the meter. Label seals may only be removed by authorized persons for servicing purposes and must then be renewed.
- The producer does not accept liability for damages resulting from unsuitable or improper use or non-compliance with the rules.

Environmental conditions

Manufacturer information regarding measuring accuracy only applies if the requested environmental conditions are fully respected.

In case of deviating environmental conditions the calculator has to be dismounted immediately and regular services according to the requested metrological tests must be made.

Environmental temperature:	5 °C to 55 °C
Storage temperature:	-25°C to 70 °C Cutback of the backup battery life time: 3 years -10°C storage temperature and 1 year at -25°C respectively.
Environmental class:	C according EN1434;
Mechanical:	M1
Electromagnetic:	E2
Protection class:	IP65

Supply voltage

230VAC/50Hz
110VAC/60Hz upon demand
24VAC/50Hz upon demand

Technical features of power supply

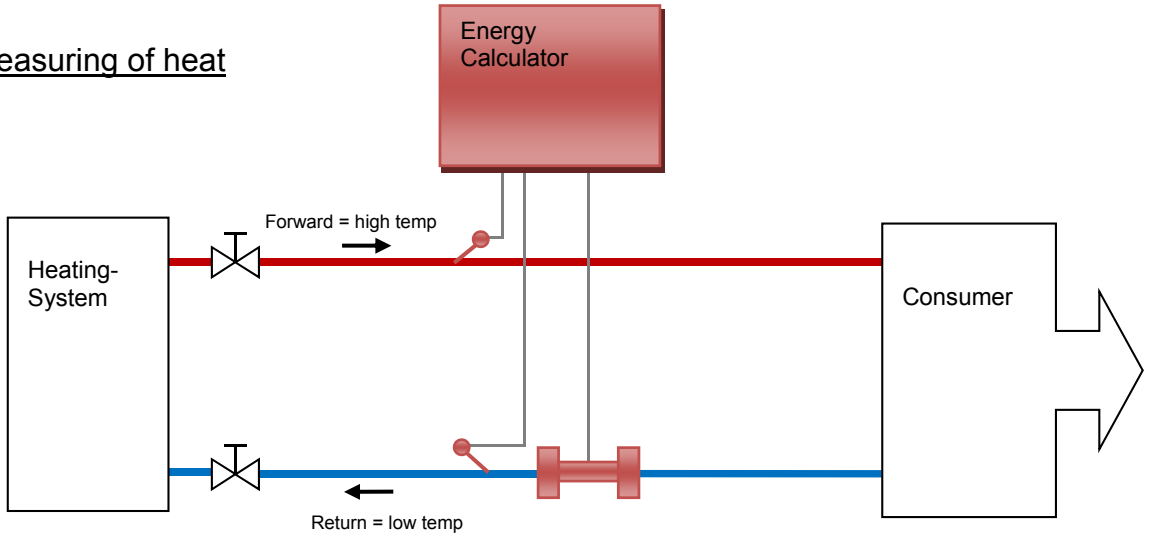
- Terminal suitable for wires up to 2.5 mm^2
- Galvanic separation
- Power consumption max. 17,5VA
- Changeable fuse 1A slow-blow fuse
- Back-up battery

If no mains supply is connected, the back-up battery keeps counting the date and time.

Attention: Never connect between two phases, as this will destroy the calculator.

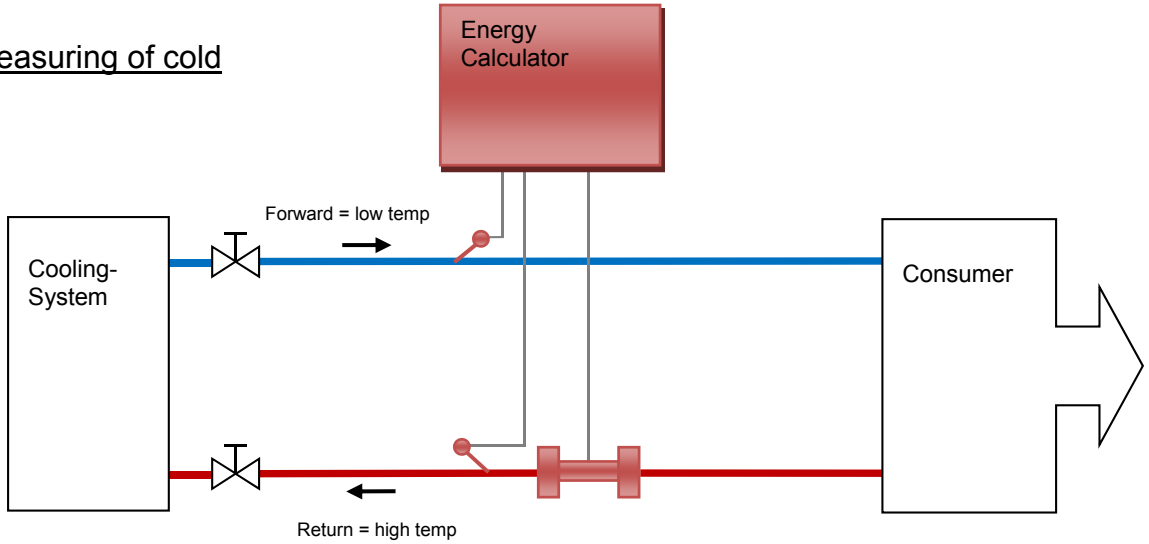
Examples for applications

Measuring of heat



(+)Δ**t x** (+)**q** x k **=** (+) **Power**

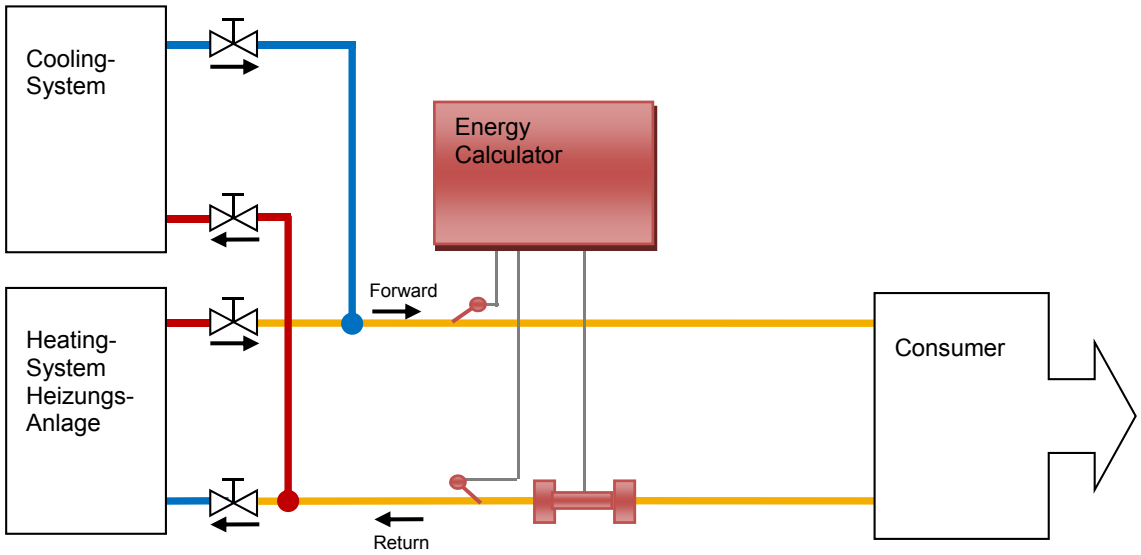
Measuring of cold



(-)Δ**t x** (+)**q**x k **=** (-)**(Power)**

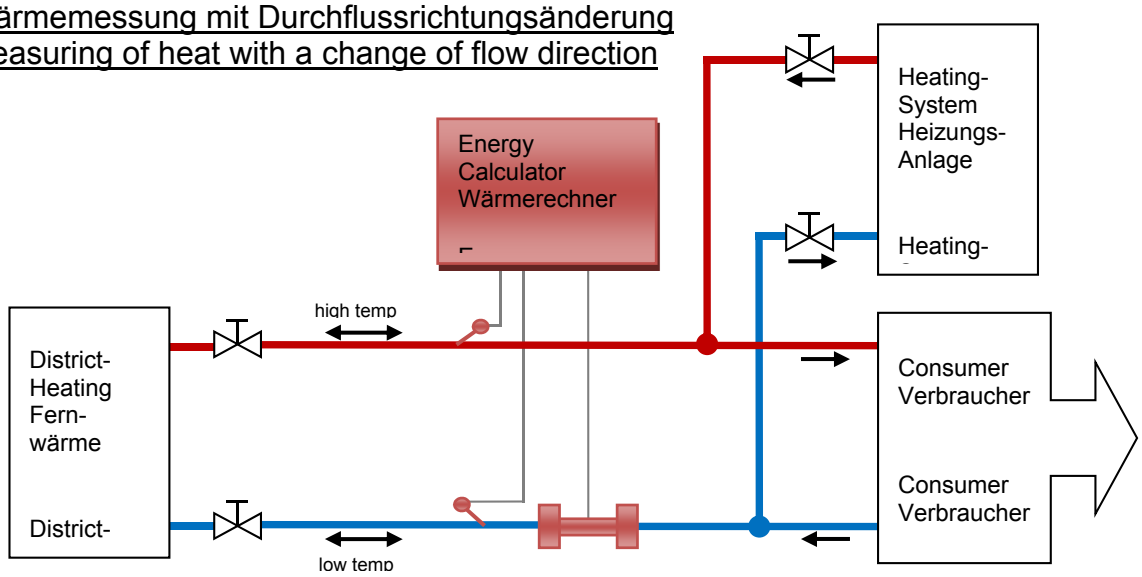
Examples for applications

Combined measuring of heat and cold



(+)Δ**t x** (+)**q** x k **=** (+)**Leistung (Power)**
or
(-)Δ**t x** (+)**q** x k **=** (-)**Leistung (Power)**

Wärmemessung mit Durchflussrichtungsänderung
Measuring of heat with a change of flow direction



(+)Δ**t x** (+)**q** x k **=** (+) **Leistung (Power)**
or
(+)Δ**t x** (-)**q x k =** (-) **Leistung (Power)**

Installation steps

1) Check the place of installation:
   The environmental condition has to be protected from direct sun rays, heat, humidity, impurity and vibration as well as sufficient distance to sources of electromagnetic interference.

   Due to its construction the calculator is well protected against electromagnetic interferences. Nevertheless it has to be made sure that the distance between the meter (calculator, flow-sensor, temperature-sensors and their cables) and possible sources of electromagnetic interference (frequency-controlled devices: converters and pumps or switches, electric motors, fluorescent lamps, etc.) is sufficient.
   The calculator must be installed on the wall at a sufficient distance from heat sources. The meter should be installed in a convenient position for service and operating personnel.

2) Check of the components:
   Before starting up the measurement the compatibility of the calculator with the flow sensors in use (pulse-value and location of flow sensor) and their respective temperature sensors (PT100 or PT500) have to be ensured.

   - Compare the calculator settings with the flow sensors pulse-value and the location of the flow sensors in use.
     Depending on the programming of the calculator the flow sensor is either mounted in the hot line or in the cold line. You will find which place of installation the calculator is programmed for in the menu ***"Unit Info"*** under ***"Pulse Input A"*** or ***"Pulse Input B".***
     The adjusted pulse values can be compared with the relevant flow sensors in the same menu.
   - Compare the calculator settings with the temperature sensors in use (PT100 or PT500).
     It is possible to connect PT100 or PT500 temperature sensors at the energy-calculator.
     You will find which type of temperature sensor (PT100 or PT500) the calculator is programmed for in the menu ***"Unit Info"*** under ***"PT 100/500".***

   This information might also be read out on an additional sticker on the front side of the calculator.
   Due to its construction the calculator is especially well protected against electromagnetic interference.

3) Install the calculator on a solid wall by using the mounting panel or on the enclosed DIN-rail (top-hat rail). For this purpose two connecting clips are fixed on the back of the calculator. These clips first must be attached to the upper side of the rail and then the calculator is pressed completely into the rail.

4) Open the calculator and remove the transport lock (if any). It must not be re-inserted during the operation.

5) Insert the connection cables via the cable glands.The cable entry is done via cable gland. Depending on the type there are up to 6pcs. PG11 and 6 pcs. PG7 available.

   The cable lengths inside the device are to be chosen in a way that the calculator can easily be opened and closed. The cable glands have to be sufficiently fixed so that tensile strain on the clamps is avoided.

6) Clamp the in- and output cables to the connectors.

7) Clamp the power supply cables to the connectors.

8) Close the calculator and check the meter for correct operation by pressing the buttons and controlling the momentary values. If necessary seal the calculator.

9) In case outputs or AUX inputs are used, they can now be adjusted.

Installation of the temperature sensors

The forward and return temperature of heating- or cooling systems is measured by the temperature sensors.

The temperature sensors are delivered in fixed pairs. The respective sensor pairs must not be mounted separately.

Every pair of temperature sensors always has to be built in symmetrically. Accordingly, both temperature sensors always have to be installed under the same conditions.

The temperature sensors must either be installed in pockets corresponding with the sensors (picture 1-4) or directly in the medium (picture 5).

If using sensor pockets the temperature sensors must reach the base ground of the sensor pockets. The diameter of the sensor must perfectly fit to the inner diameter of the sensor pocket.

It is best to mount the sensor pockets in a 45° or 90° angle in a welding sleeve. Thereby the tip of the sensor pocket shall be located in the middle of the pipe.

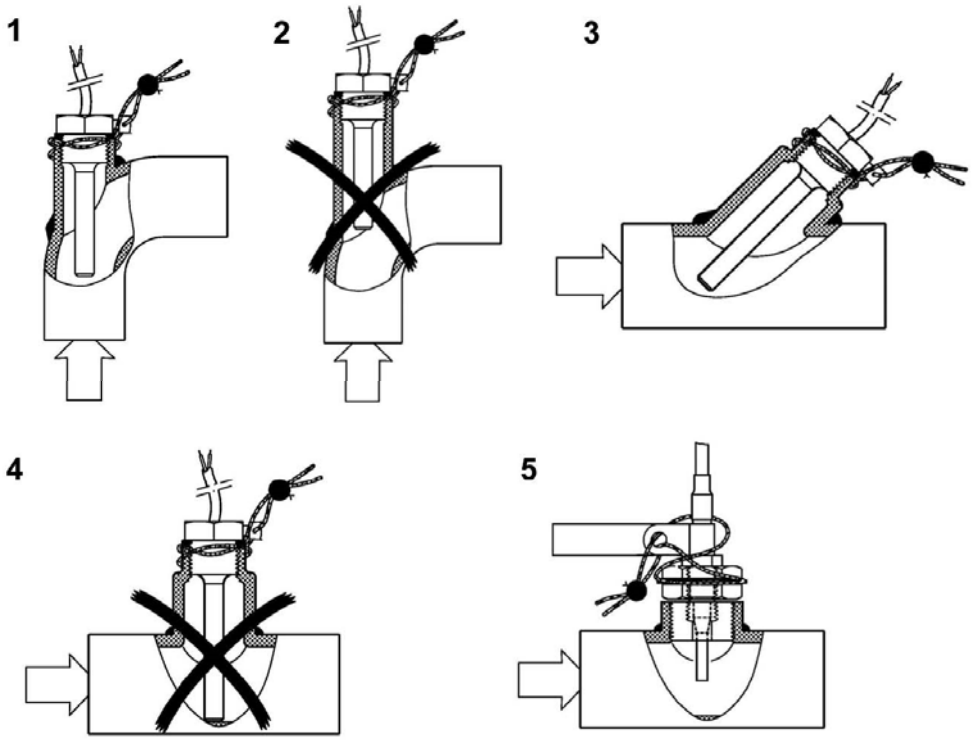
When mounting the sensor pocked in a 45° angle, its tip shall be pointed against the flow direction.

In case sensor pockets are installed only such sensor pockets that have been conformity-approved for the temperature sensors can be used in compliance with possible existing national regulations.

In case sensors are installed directly in the medium, the tip of the sensors shall be pointed in the flow located in the middle of the pipe.

With respect to EN1434 thediametersaswellasthelengthofthetemperaturesensorcablehavetobethe same. If you use 4-wire measuring the length of the temperature sensor cables can differ.

It is forbidden to wind the cable around pipes and to locate the equipment within a circle of an 0.5m distance to the sources of interference (high frequency or clocked electromagnetic radiation, etc.).



Connection of temperature sensors

Handle the temperature sensors with care!

When connecting the temperature sensors the sensor-cables preferably have to be inserted via the left bigger cable glands (PG11) and be linked at the connectors 1-5-6-2/ 3-7-8-4 of the 10-pole plug.
See the chart underneath.

The recommended sensor cables can be delivered upon request.

The use of shielded cables for sensors is strongly recommended and the shield is only connected to the respective clamp 26 on the calculator plug. Sensor cables must not be prolonged.

To facilitate the connecting process, the plug has to be removed prior to being clamped to the cables.

The temperature sensors for channel A are to be attached to the black plug and those for channel B are to be attached to the white plug. (Channel B in case of a 2 channel version)

Temperature sensors have to be paired.

4-terminal sensing (4T sensing)
Due to metrological reasons 4T sensing is always to be preferred.

In case of bigger or different sensor cable lengths or a small ΔT, 4T sensing is used.

One cable with 4 wires and shield is needed per sensor. The temperature sensors cables have to be attached to clamps 1-5-6-2 and 3-7-8-4 respectively. The short-circuit bridges have to be removed in case they are mounted on the 10-pole plug.

The two **red wires** are to be connected to clamps U+ and I+ (1-5 and 3-7 respectively)
The two **white wires** are to be connected to clamps U- and I- (6-2 and 8-4 respectively)
The relevant marking is to be found on the wires.

The clamps for the red wires are marked in red on the connectors of the temperature sensors.
The white wires are connected to the two remaining clamps.

Application	**Flow sensor installing**	**Clamp**			**Temp. Sensor installing**
		U+ **I+**	**I-** U-		
heating	T-low = return	1-**5**	**6**-2	High Temp.	forward
		3-**7**	**8**-4	Low Temp.	return
	T-high = forward	1-**5**	**6**-2	High Temp.	forward
		3-**7**	**8**-4	Low Temp.	return
cooling	T-high = return	1-**5**	**6**-2	High Temp.	return
		3-**7**	**8**-4	Low Temp.	forward
	T-low = forward	1-**5**	**6**-2	High Temp	return
		3-**7**	**8**-4	Low Temp	forward
heating/cooling variant with +/- scale	T-low = return	1-**5**	**6**-2	High Temp.	forward
		3-**7**	**8**-4	Low Temp.	return
	T-high = forward	1-**5**	**6**-2	High Temp	forward
		3-**7**	**8**-4	Low Temp	return

2-terminal sensing (2T sensing)
When using a 2T sensing (2 wires + shield per sensor) the temperature sensors have to be attached to clamp 5-6 and 7-8 respectively.

It is necessary to use the 4 short-circuit bridges between the clamps 1-5, 6-2, 3-7, and 8-4.They must not be removed. The sensor cables have to be of the same type and the same length.

Connections

A plug-system facilitates the connecting of the cables.

Depending on their functions a different number of clamps is attached to the plugs and they are therefore of different lengths. In order to differentiate them more easily the plugs are in different colours,

e.g. the temperature- and flow inputs of channel A have black plugs and socket whereas the plugs and sockets of channel B are white.

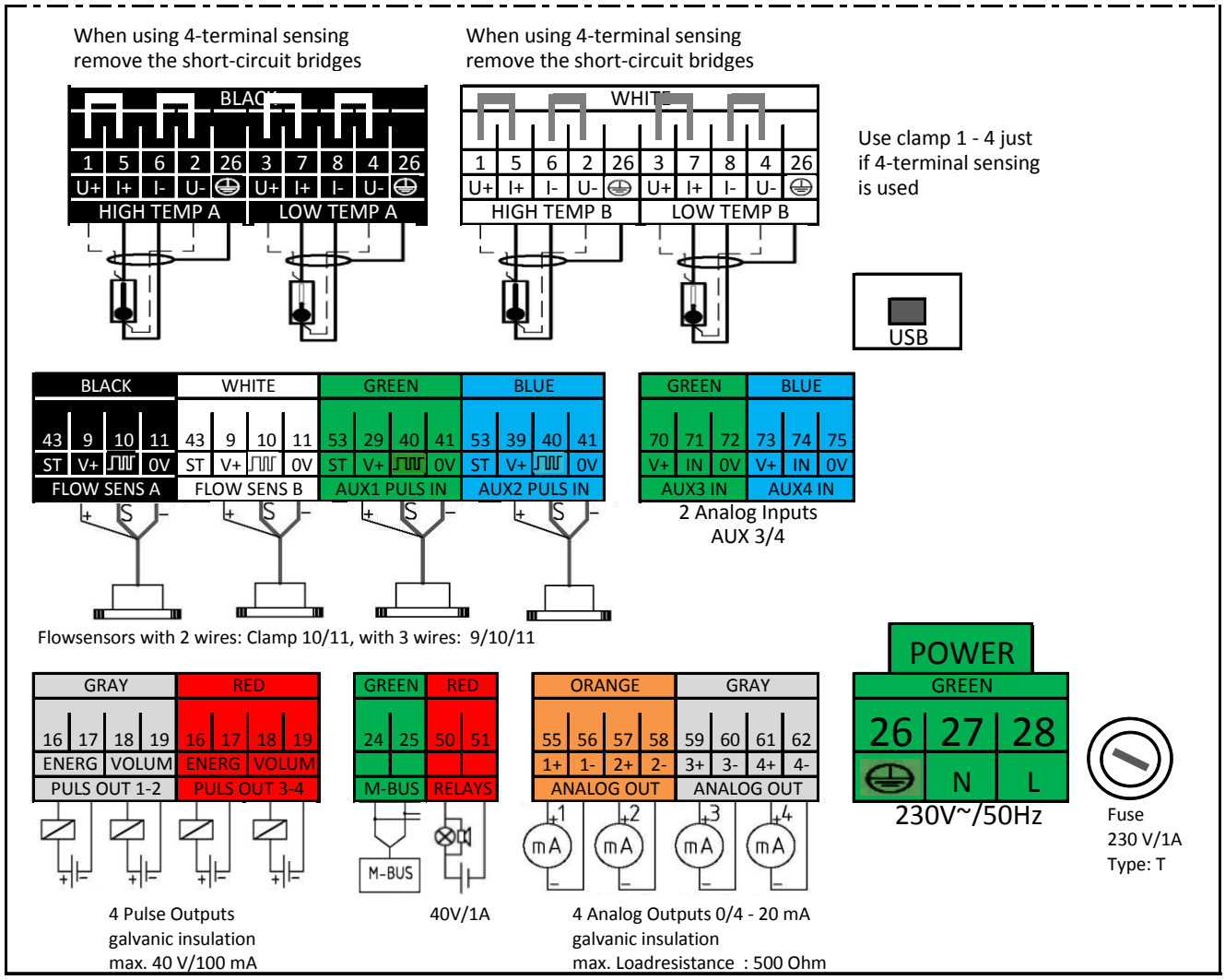
The cable lengths inside the device are to be chosen in a way that the plugs can easily be connected and disconnected.

Finally the cable glands have to be sufficiently fixed so that tensile strain on the clamps is avoided.

Funktion		Plug			Clamps	
		Identification	Array	Colour	No.	Passel
Energy Channel A	Temperature Sens. Cha. A	HIGH TEMP A / LOW TEMP A	top	black	1-8 u. 26	10
	Flow Sensor Channel A	FLOW SENS A	middle	black	9-11 u. 43	4
Energy Channel B	Temperature Sens. Cha. B	HIGH TEMP B / LOW TEMP B	top	white	1-8 u. 26	10
	Flow Sensor Channel B	FLOW SENS B	middle	white	9-11 u. 43	4
Additional Inputs	Pulse Input AUX 1	AUX 1 PULS IN	middle	green	39-41 u. 53	4
	Pulse Input AUX 2	AUX 2 PULS IN	middle	blue	39-41 u. 53	4
	Analog Input AUX 3	AUX 3 IN	middle	green	70-72	3
	Analog Input AUX 4	AUX 4 IN	middle	blue	73-75	3
Pulse Outputs	Pulse Output 1 and 2	PULS OUT 1-2	down	grey	16-19	4
	Pulse Output 3 and 4	PULS OUT 3-4	down	red	16-19	4
M-Bus Output	M-Bus	M-BUS	down	green	24 u. 25	2
Relay Output	Relay	RELAYS	down	red	50 u. 51	2
Analog Output	Analog Output 1-2	ANALOG OUT	down	orange	55-58	4
	Analog Output 3-4	ANALOG OUT	down	grey	59-62	4
Power Supply	Input supply	POWER ⏚ N L	down	green big	26-28	3

Connection of temperature sensors

Connections



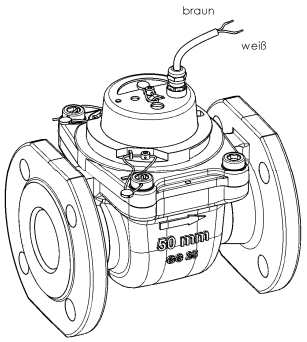
Flowsensor Connectors			
Puls Input Channels A / B	**9 (V+)**	**10 ⎍⎍**	**11 (0V)**
Reed Pulse output	not to be connected	user-defined	user-defined
Opto Pulse output or NAMUR	not to be connected	brown (S)	white (-)
Open Collector	not to be connected	+	-
Sharky FS 473 (do **not** connect the yellow wire!)	brown (Vcc)	white (Puls)	blue (GND)
Sharky FS 475 / FUE380	not to be connected	56	57
MAG 3100 / 5100W	not to be connected	56	57
Optiflux 4300 / Waterflux 3300	not to be connected	D	D-
AUX 1 / 2 Pulse Inputs	39 (V+)	40 ⎍⎍	41 (0V)
Status signals for flow direction detection: "+" at clamp 43 or 53 and "-" at clamp 11.			
If there are shielded cables they are to be connected to clam 11.			
The pulse inputs AUX 1 / 2 have the same tech. Specifications as those of channel A / B.			

Attention: The equipotential bonding has to be designed in a way that all parts of the heating/cooling system are also sufficiently electro-conductively connected with the main grounding terminal

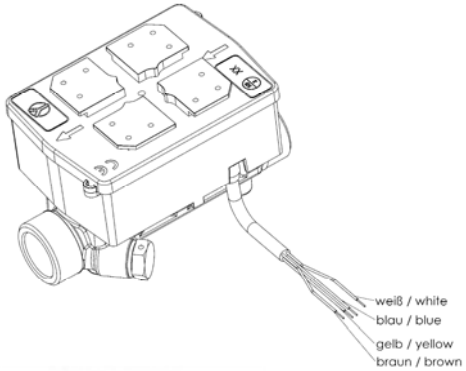
If separate grounding wires are used the electro-conductive connection remains In case the heating pipes are cut off (e.g. because of reparation work).An insufficient equipotential bonding might result in misoperation or the **destruction of the components**

Flow sensors

Reed pulse-output: e.g. of mechanical flow sensors
Use clamps 10 and 11

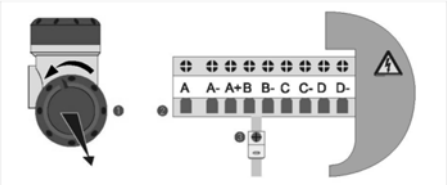


SHARKY FS 473
Pulse-output and power supply of the
SHARKY FS model 473 by calculator
Use clamps 9, 10 and 11
Brown = 9
White = 10
Blue = 11



SHARKY FS 475 / FUE 380
MAG 3100 / 5100W
Pulse-output clamps 56/57
Use clamps 10 and 11
56 = 10
57 = 11

Optiflux 4300 / Waterflux 3300
Pulse-output clamps D/-D
Use clamps 10 and 11
D = 10
-D = 11



Installation Control Checklist

The following points need to be checked:

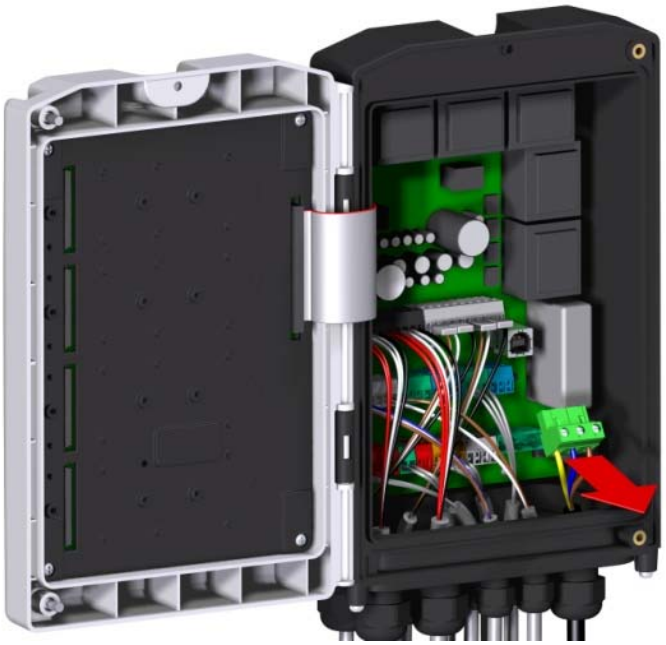
- Are the flow sensors mounted in the correct installation position and flow direction?
- Are the flow sensors mounted in the pipe the calculator is programmed for(the warm=T-high or cold=T-low pipe of the system?
- Are the pulse values of the flow sensors the same as those programmed in the calculator?
- Are the flow sensors connected to the right clamps?
- Is the pulse generator type of the flow sensors the same as programmed in the calculator?

  (Reed, Namur, Open-Collector...)
- Is the temperature sensor type the same as programmed in the calculator?
  PT100 or PT500
- Are the temperature sensor cables correctly connected in the sensors?
  e.g. 2-terminal or 4-terminal sensing?
- Are the temperature sensor cables correctly connected in the calculator?
- Is the shield of the temperature sensor cables correctly clamped in the calculator?
- Are the temperature sensors T-high and T-low mounted correctly and not mixed up?
- Is the pairing of the sensors correct?
- Do the temperature sensors fit correctly into the sensor pockets?
- Are the temperature sensors and sensor pockets mounted according to the mounting instructions?
- Are the permitted environmental conditions respected?
- Is the calculator accordingly grounded?
- Are all electrical connections correctly made and are the plugs correctly connected?
- Are the cable-glands tightly fixed?
- Are the components of the energy meter correctly installed mounted according to the mounting instructions of the producer?
- Is the meter working correctly during the operating process correctly?

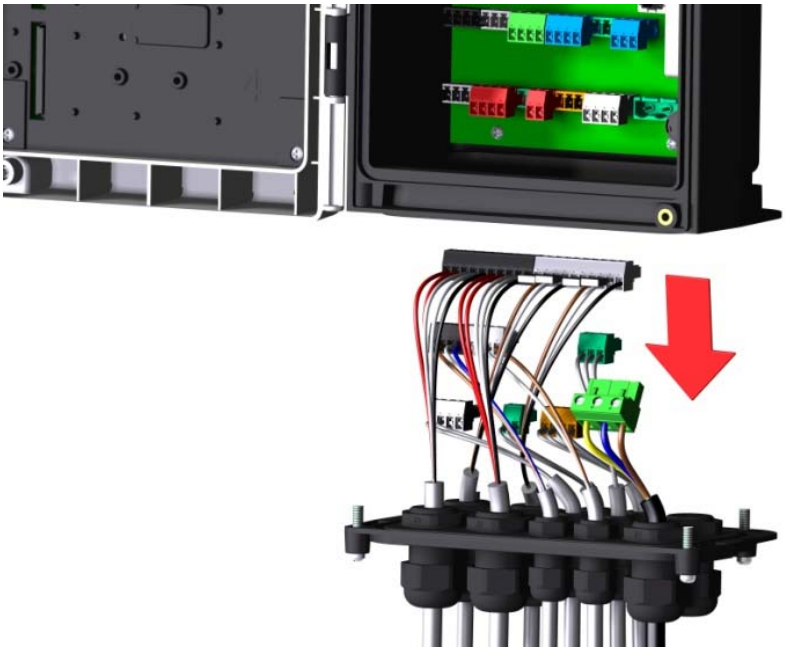
Exchange of the device

In case the calculator needs to be exchanged (e.g. after the end of the verification period) this can easily be done with just a few simple steps.

1) Open the calculator and disconnect the plug of the power supply. Then disconnect the other plugs. However, the screw terminals need not be unscrewed.



2) Unscrew the 4 screws on the bottom of the calculator. Gently pull the connecting plate with the cables and their plugs downwards out of the calculator.



Exchange of the device

3) Thereafter the calculator can be removed from the wall. Hold the calculator close to the bottom with both hands and lift it off the wall. The connecting clips first come off on the lower part of the DIN rail (top-hat rail)

4) Remove the connecting plate of the new calculator and screw it onto the old calculator.

5) The new calculator can now be mounted. Clip the connecting clips into the upper part of the rail and then press the calculator entirely into the rail.

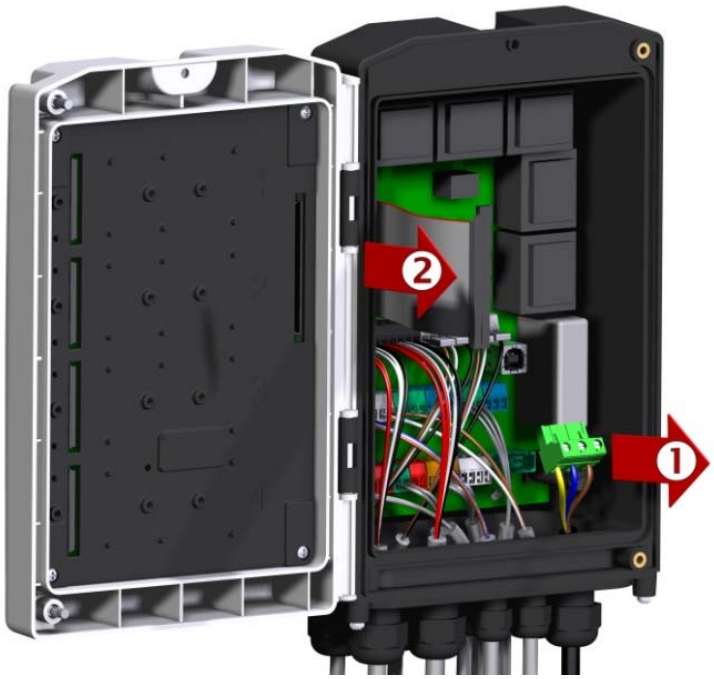
6) Insert the connecting plate with its cables and their plugs into the calculator and re-fix it with the 4 screws.

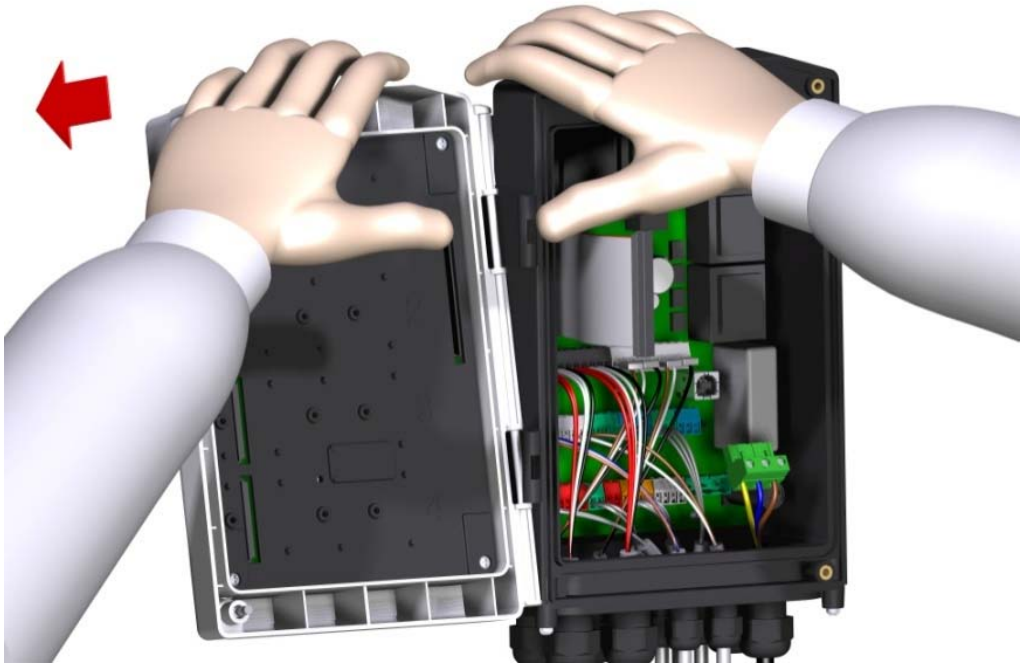
7) Thereafter the connecting plugs can be reconnected. The power supply is plugged in at last.

Exchange of the upper part

It is possible to exchange the upper part only:

1) Open the calculator and disconnect the plug of the power supply. However, the screw terminals need not be unscrewed.
2) Carefully disconnect the plug of the ribbon cable from the upper part.
3) Now the upper part is separated from the lower part. The hinge can be clipped off if the upper part is widely open >180°. Best hold both parts at their tops and press the upper part backwards.
4) The assembling is done the other way round.
   Attention: only connect or disconnect the ribbon cable if there is zero voltage in the calculator.





Optional interfaces

The heat calculator has four slots for extension modules, e.g. for a 2nd M-Bus.

Attention: The modules may only be plugged or unplugged if the power is switched off.

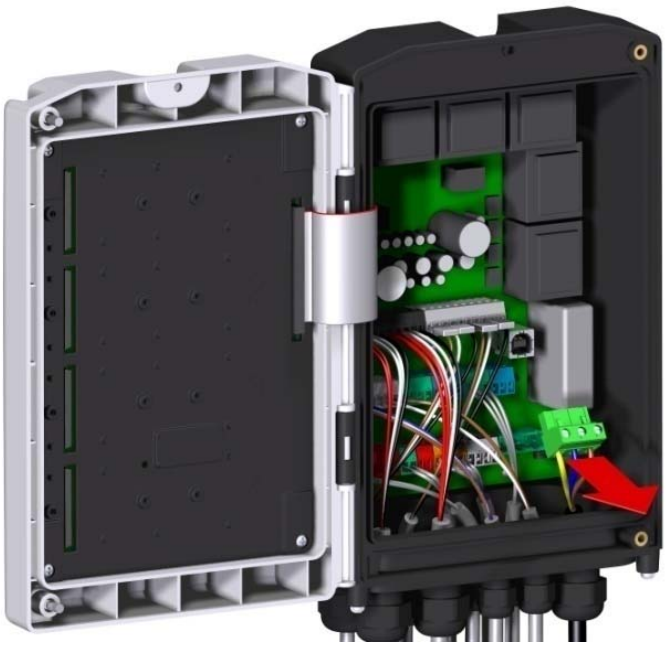
These modules have no effect on consumption recording and can be retrospectively fitted without damaging the calibration mark.

Installation of extension modules

1.) Open the calculator. In case there is a seal, remove the seal from the calculator housing and open the lid.

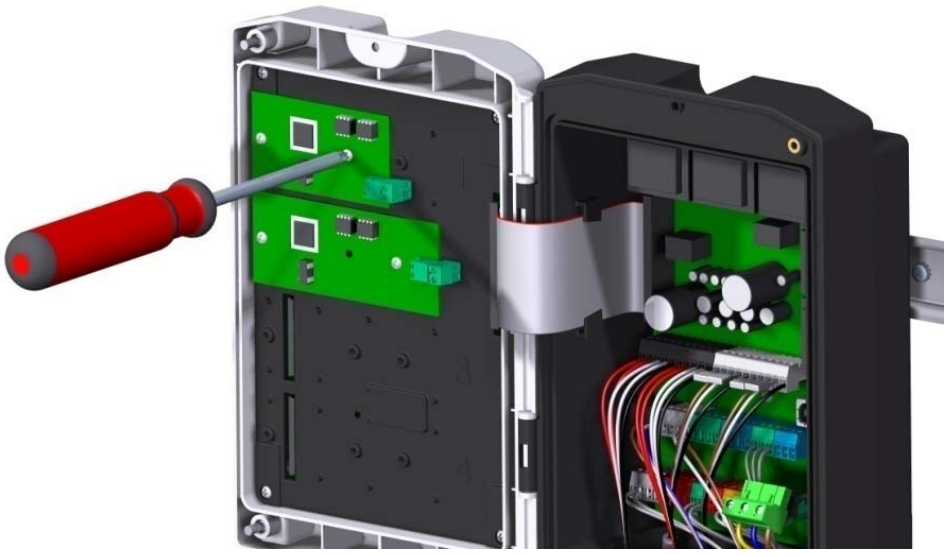
2.) The calculator is to be made **free of power.**

3.) The heat calculator has four slots for extension modules. They are placed inside the upper part (on the left side if the calculator is open).



4.) The module is to be carefully plugged in an unused plug and screwed to the predefined mountings.

5.) The calculator is to be powered.



6.) The communication cable can only be inserted via a free cable gland and be connected to the extension module The cable lengths inside the device are to be chosen in a way that the calculator can easily be opened and closed. Finally the cable glands have to be sufficiently fixed so that tensile strain on the clamps is avoided

7.) Close the lid and check the meter for correct operation by pressing the buttons and controlling the momentary values. If necessary seal the calculator again.

Access Mode

The access modes protect the adjustments from erroneous and unauthorized changes.

Apart from the normal operation mode, the calculator has 2 access modes for the user to work with: the User mode the and Service mode. A password is required for both the User- and Service mode.

In case the calculator is delivered in an officially verified form none of the verification-relevant settings can be changed. After 60 minutes without a button-strike the calculator automatically changes from the User- or Service-mode to normal operation mode

The 3rd access mode is the Verification mode for the verification body. This ode can only be accessed and left by pressing the verification button.

In officially verified devices or devices according to the Declaration of Conformity corresponding to MID this button is protected by a seal. In case the seal is damaged the verification and Declaration of Conformity respectively loses its validity.

User password: 100 000 000
Service password: 200 000 000

Both passwords can be changed as of Service mode.

Two-channel calculator

The calculator MWZ04 is a two-channel calculator for measuring thermal energy in heating and cooling circuits.

It includes the functions of two calculators. Two independent energy measurements can be made in one housing at the same time.

High resolution displays

Energy, volume and instantaneous values of channel A and B can be displayed in high resolution.

Language Selection

The menu language can be selected in the menu Adjustment.

Extremal values

The min/max values are saved with date and time in the following measurements:

- Temperature
- Temperature difference
- Flow +/-
- Power +/-

Reports

There are operating-, error- and alert reports.
The following can be found in the operating reports:

- Operating hours
- Hours without errors
- Hours without power supply
- Number of interruptions of the power supply

The following can be found in the error reports:

- Current error/s
- The total number of errors so far
- Duration of the longest error period
- Duration of the current error
- Number and duration of errors for each temperature sensor

The following can be found in the alert reports:

- Current alerts
- Number and duration of alerts

The following can be found in the tariff reports:

- Current tariffs

Memories

The calculator contains an extensive interval memory and 24 due day memories.

Due days:

There are 24 due days available. The date and time of every individual due day can be individually selected.

The time unit can be selected with the Memory Scale in which the values are saved. (minute, hour, day, month, year)

The Saving-Interval defines the intervals of the scale. Both the Saving-Interval and Memory Scale are valid for all 24 due days in the same way, e.g.: on an years base at an interval of 6 means that every single one of the 24 due day memories is filled with the momentary values every 6 years- depending on the individually adjusted point of time.

The following values are saved:
Energy counts of channel A and B
Volume counts of channel A and B
AUX1 and AUX2 counts

Interval Memory:

There are 70 memory locations available.

All areas have the same starting point.

The time units (minute, hour, day, month, year) in which the values are saved, are selected when using the Memory Scale.

The Memory-interval defines the intervals of the scale, e.g. on an hourly base at an interval of 6 means that the current values are saved 6 hours after the starting point for the first time. Thereafter the values are saved every 6 hours. In case all memory locations are full, the oldest values are overwritten (ring-memory).

The following values are saved:
Operating time in hrs *
Operating time in hrs without errors *
Hours without power supply *
Number of power supply interruptions *
Number of errors *
Total of error hours *
Tariff counts
Hours in which the tariff counter was on *
Number of times in which the tariff counter was on *
Energy counts of channel A and B
Volume counts of channel A and B
Flow max. of channel A and B *
Power max. average of channel A and B *
Temperature min/max. of channel A and B *
AUX1 and AUX2 counts
AUX1 and AUX2max.value *

*) The saved values refer to the set interval.

Alerts

Due to the adjustability of alerts a variety of alerts can be created.

In case an alert is activated an "A" comes up in the right part of the flashing status indicator.

Starting off from the main display Energy, the right button is used in order to get to the alert overview. This is where the current alerts are indicated. If there is no alert this overview cannot be seen.

The history of all alerts can be found in the menu Reports.

An alert is set by choosing a measured value (temperatures, flows, powers and AUX 1-4.

A high/low limit is then assigned to this measured value.

The operating type of the limits is chosen by using the mode (off, outside range, inside range, hysteresis high, hysteresis low).
Explanation of the modes:

- "Inside Range" in order to activate the alert, the measurement value must be between the upper limit and the lower limit of the adjusted value.
- "Outside Range" in order to activate the alert, the measurement value must be outside the upper limit and the lower limit of the adjusted value.
- "Hysteresis high" in order to activate the alert, the measurement value needs to exceed the upper limit. The alert stays active until the value falls under the lower limit.
- "Hysteresis low" in order to activate the alert, the measurement value needs to fall under the lower limit. The alert stays active until the value exceeds the upper limit.

A delay time can be additionally adjusted.

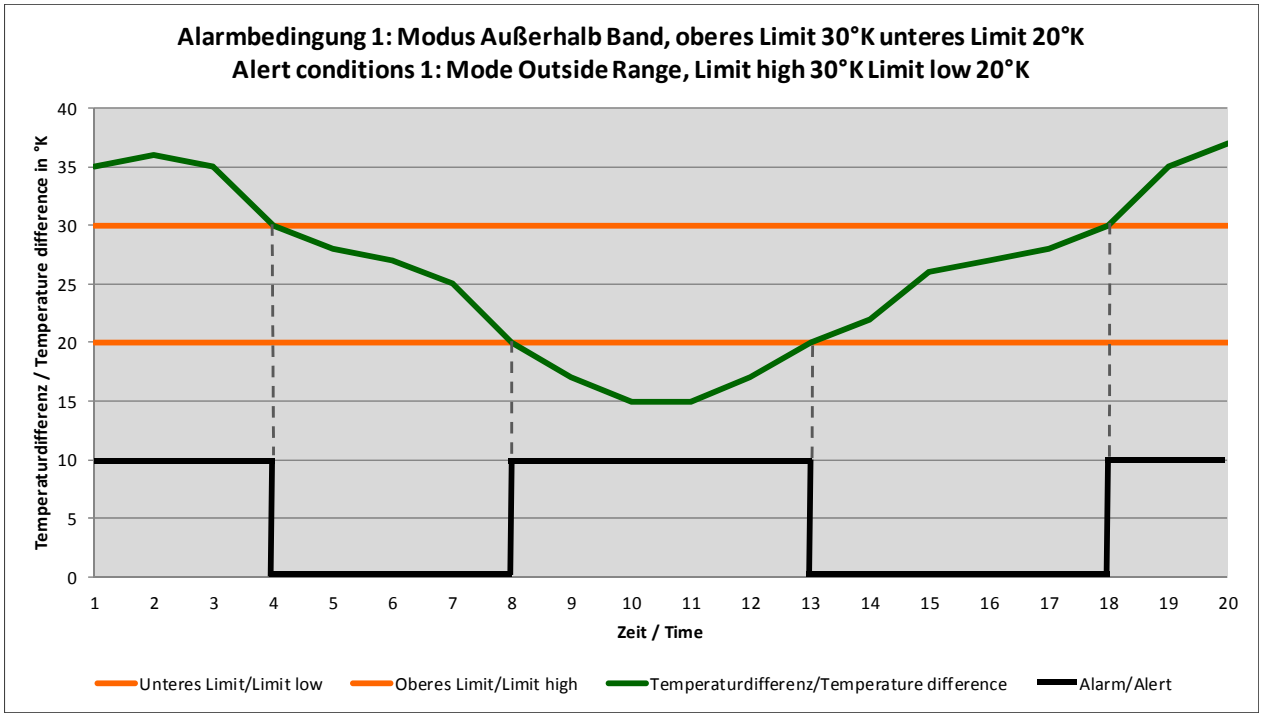
The delay is only relevant for the activating of the alert. As soon as the condition is no longer given, the alert stops without a delay.

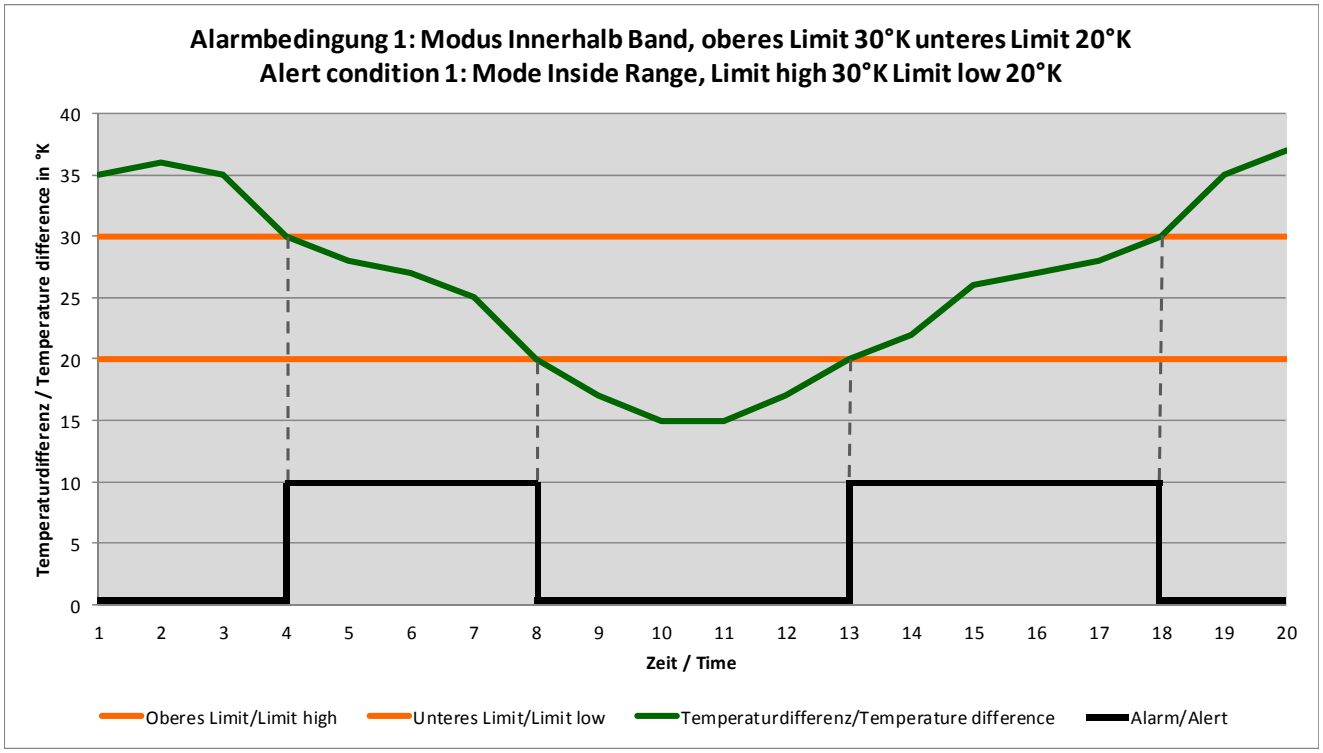
The alert is active if the adjusted condition is fulfilled. A number of alerts can be used simultaneously.

In the menu Adjustment/Pulse Outputs, alerts can also be linked to the pulse outputs or the relay output. In this case the selected output sends a state signal if an alert is activated.
See Pulse Outputs.

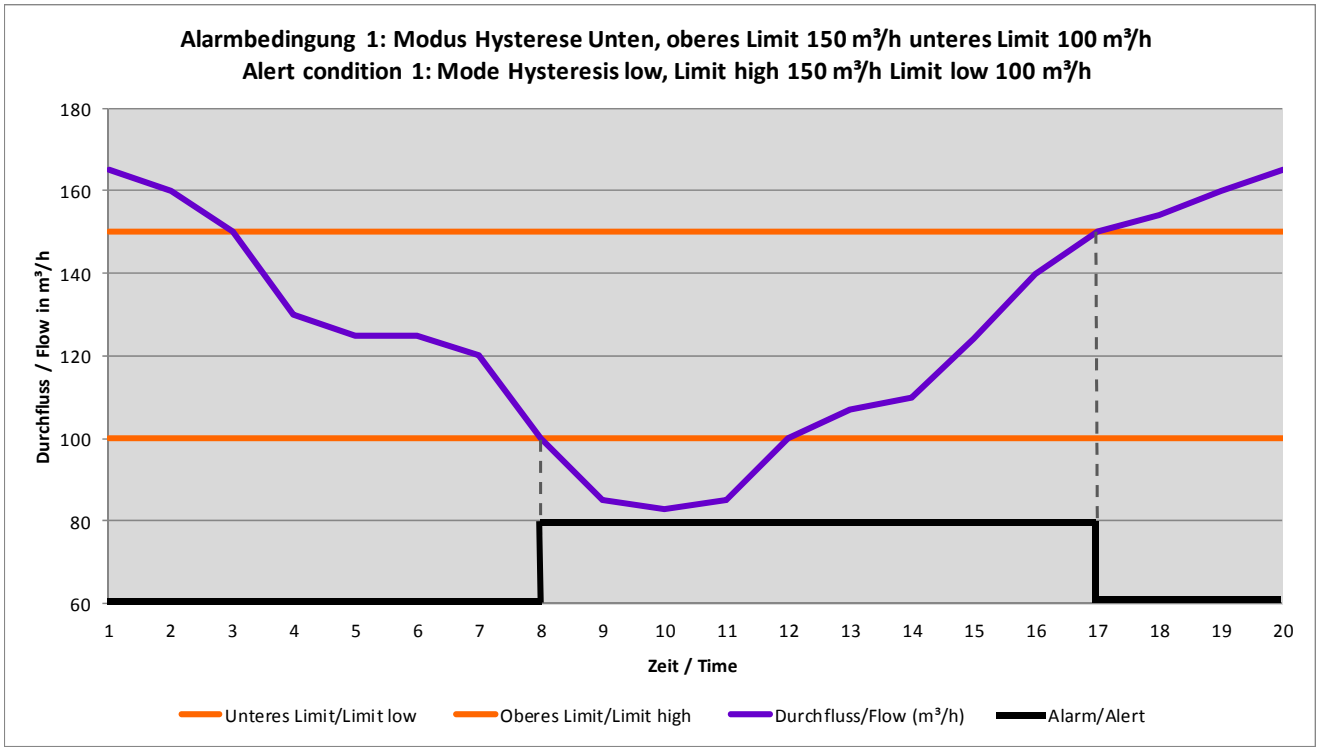
In the menu adjustment/tariffs the tariffs can also be allocated to an alert.

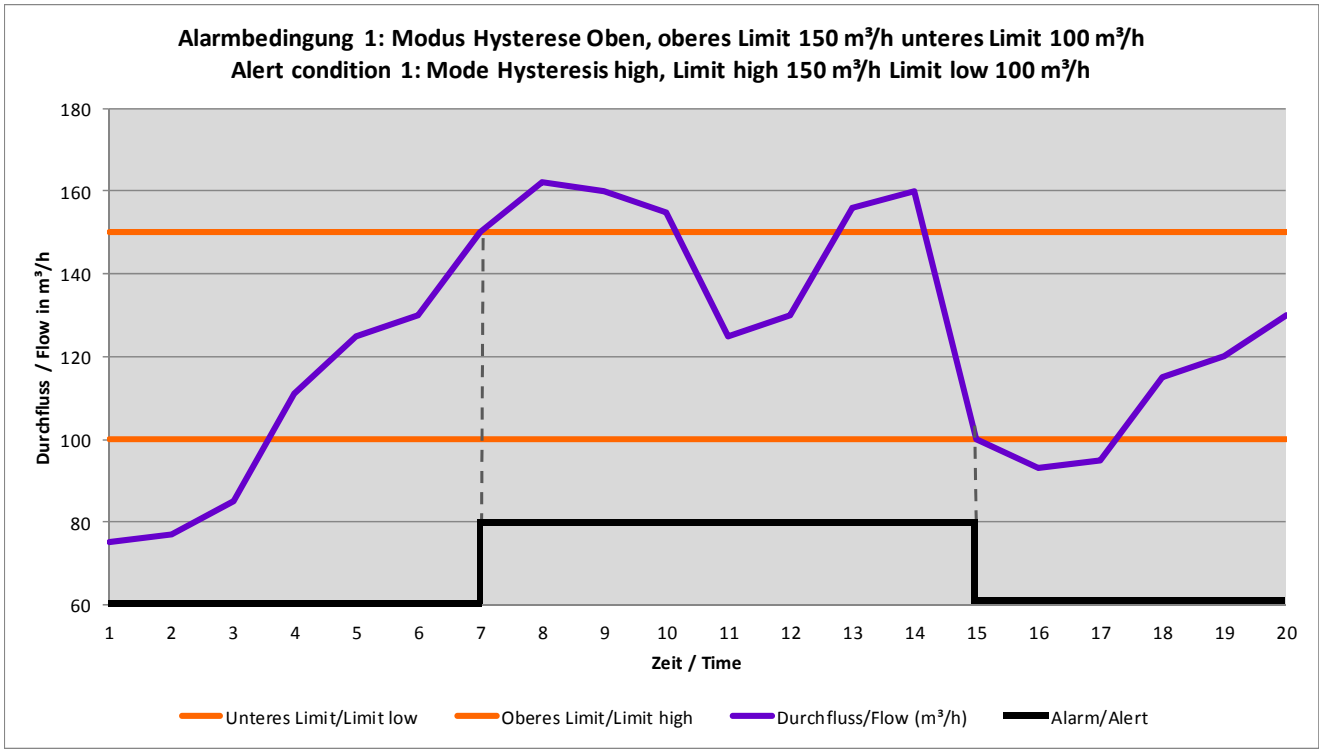
Alerts


Alarmbedingung 1: Modus Außerhalb Band, oberes Limit 30°K unteres Limit 20°K
Alert conditions 1: Mode Outside Range, Limit high 30°K Limit low 20°K
Temperaturdifferenz / Temperature difference in °K
0
5
10
15
20
25
30
35
40
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Zeit / Time
Unteres Limit/Limit low
Oberes Limit/Limit high
Temperaturdifferenz/Temperature difference
Alarm/Alert


Alarmbedingung 1: Modus Innerhalb Band, oberes Limit 30°K unteres Limit 20°K
Alert condition 1: Mode Inside Range, Limit high 30°K Limit low 20°K
Temperaturdifferenz / Temperature difference in °K
0
5
10
15
20
25
30
35
40
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Zeit / Time
Oberes Limit/Limit high
Unteres Limit/Limit low
Temperaturdifferenz/Temperature difference
Alarm/Alert

Alerts


Alarmbedingung 1: Modus Hysterese Unten, oberes Limit 150 m³/h unteres Limit 100 m³/h
Alert condition 1: Mode Hysteresis low, Limit high 150 m³/h Limit low 100 m³/h
Durchfluss / Flow in m³/h
180
160
140
120
100
80
60
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Zeit / Time
Unteres Limit/Limit low
Oberes Limit/Limit high
Durchfluss/Flow (m³/h)
Alarm/Alert


Alarmbedingung 1: Modus Hysterese Oben, oberes Limit 150 m³/h unteres Limit 100 m³/h
Alert condition 1: Mode Hysteresis high, Limit high 150 m³/h Limit low 100 m³/h
Durchfluss / Flow in m³/h
180
160
140
120
100
80
60
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Zeit / Time
Unteres Limit/Limit low
Oberes Limit/Limit high
Durchfluss/Flow (m³/h)
Alarm/Alert

Tariff

There are 8 tariffs available (=additional counters that work according to configurable conditions).

The value to be counted is to be chosen from the "Counter Type" list (Energy A/B, Volume A/B, AUX 1/2).

Two conditions can be set up per tariff. A condition is set by assigning a measured value (temperatures, flows, powers and AUX 1-4).

A high/low limit is then assigned to this measured value.

The operating type of the limits is chosen by using the mode (off, outside range, inside range, hysteresis high, hysteresis low).
Explanations of the modes see Alerts.

A delay time can be additionally adjusted.

The tariff counter is active if both conditions are fulfilled. If the second condition is switched off, only the first condition needs to be fulfilled to start off the tariff counter.

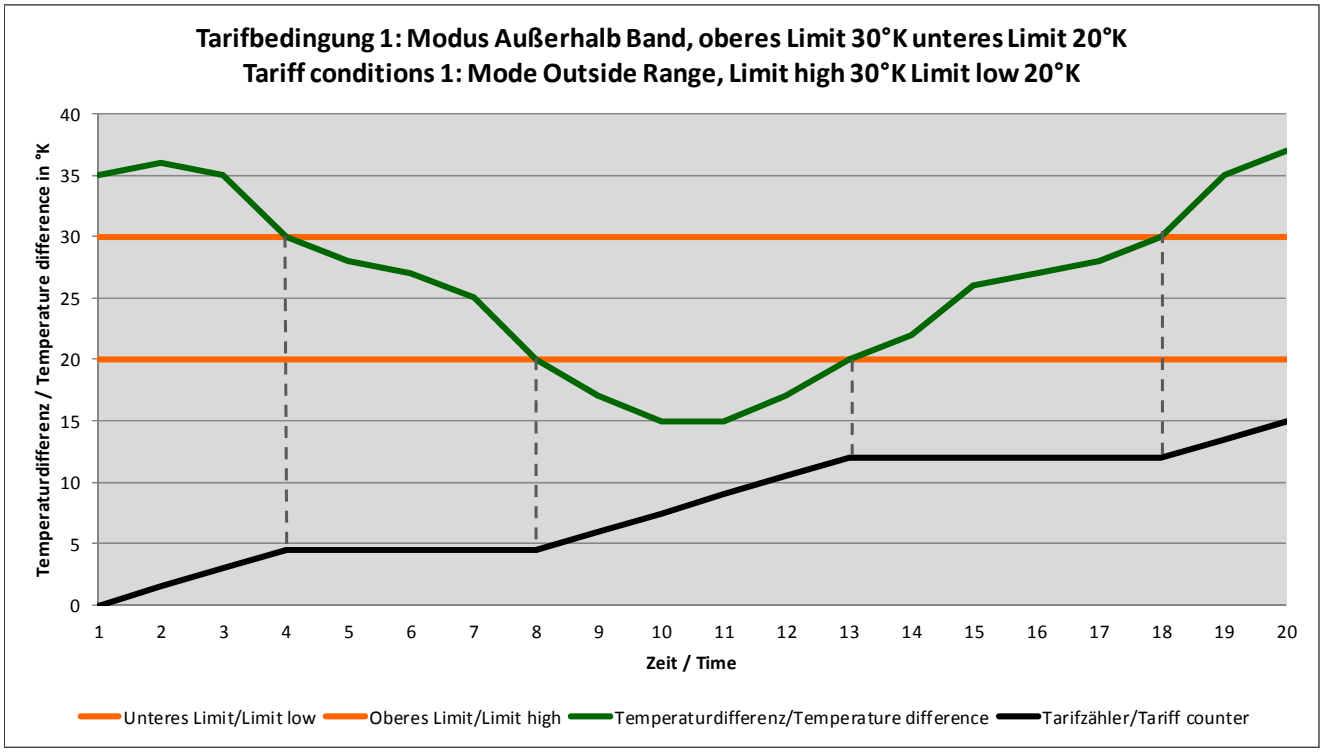
The hours in which and how often the tariff was active is counted additionally to the count value.

In case a condition is changed, the counters are automatically reset.

An active tariff counter can also be linked to an alert.

In the menu Adjustment/Pulse Outputs, tariffs can also be linked to the pulse outputs or the relay output.
See Pulse Outputs.

Examples for the functioning of limits and modes:



Communication

Both channels can be read out via communication interface. Channel A and B are separately addressed and read out. There is one primary and one secondary address each available for channel A and B. For each interface, addresses, Baud rates, telegrams, and protocols can be separately adjusted via the buttons.

- Baud rate options: 300 to 9,600 bauds.
- Primary or secondary addressing
- Protocol selectable: M-Bus, EN61107
- Answer telegram selectable

M-Bus

A remote reading of the meter data can be conducted with the M-Bus interface.

The transmission is serially made via reverse polarity proof two-wire line between the external devices (slaves) and the M-BUS level-converter (master) e.g. IZAR CENTER
Several meters can be connected to a control center.

M-Bus: clamps 24/25 green

- M-Bus module refers to EN13757 standard
- Connections for up to: 2 x 1.5 mm² wires
- galvanic insulation: YES
- Maximum voltage: 50 V DC
- Current drawn: one M-Bus- load

Optical Infrared Interface

A infrared interface is available for optical communication.

- Infrared interface according to ZVEI

USB Interface

A USB interface is available for communication.

Optional interfaces

The calculator has four slots for extension modules,
e.g. for a 2nd M-Bus.

Pulse outputs and Relay output

The calculator has 4 pulse outputs and one relay output.
These outputs can be used for counting pulses or as state signal output.
Counting pulses for: energy, volume, AUX1, AUX2 or tariff counters
State signal for: alerts, errors and tariffs.
The value assigned, pulse value and pulse duration or state signal
can be chosen in the menu 'adjustments/pulse outputs'.
If used as state signal output, the value assigned also has to be set also as state signal.

Pulse outputs

Pulse output 1 clamps 16/17 grey
Pulse output 2 clamps 18/19 grey
Pulse output 3 clamps 16/17 red
Pulse output 4 clamps 18/19 red

- Input voltage max. 40V DC
- Output current max.: 100 mA
- Switching frequency max.: 500 Hz
- Galvanic separation: YES
- Opto-Mosfet Relay bipolar
- Pulse length selectable in ms steps
- Pulse value selectable

Relay output

Relay output: clamps 50/51 red

- Input voltage max.: 40V DC
- Output current max.: 1A
- Galvanic separation: YES
- Switching frequency max.: 1 Hz
- Switching cycle max.: 100 000

ATT: the relay output is designed for state signals and not for counting pulses.

Active analog outputs

The calculator has 4 active analog outputs.
In the menu adjustments can be chosen:
The value assigned: Temperatures, Powers, Flows and the inputs AUX1-4.
The output range: 0-20mA or 4-20mA, and limit low and limit high.

Analog output 1 clamps 55/56 orange
Analog output 2 clamps 57/58 orange
Analog output 3 clamps 59/60 gray
Analog output 4 clamps 61/62 gray

- Output current: 0/4-20mA
- Overload up to: 22mA
- Galvanic separation: YES
- Load resistance max.: ≤ 500Ω

Analog Inputs

The calculator has two analog inputs AUX3 and AUX4
for additional sensors like pressure sensor.
In the menu "adjustments" the following can be chosen:

- The value assigned (= unit of the measured dimension).
- The input range: 0-20mA, 4-20mA or 0-10V, 2-10V
- The limit low and limit high

Analog input1 AUX3 clamps 70/71/72 green
Analog input 2 AUX4 clamps 73/73/75 blue

- Input signal current measurement: 0(4)-20mA
- Overload as current input: 20,5mA
- Input signal voltage measurement: 0(2)-10V
- Sensor supply voltage: 11-27V
- Sensor supply current : 25mA (*)
- Input resistance at current input: 100 Ω
- Input resistance at voltage input: >1MΩ
- Measuring accuracy: <1%

Pulse inputs

The calculator has four pulse inputs.
Two inputs are for the flow sensors of channel A and B to calculate the energy
and AUX1 and AUX2 are for additional meters.
These counters are also saved in the due days memory and the interval memory.

Flow Sensor A clamps 43/9/10/11 black
Flow Sensor B clamps 43/9/10/11 white

The necessary options for AUX 1 and AUX2 can be selected in the menu adjustments.

Pulse input 1 AUX1 clamps 53/29/40/41 green
Pulse input 2 AUX2 clamps 53/39/40/41 blue

- Type of pulse generator
- Flow direction via status signal input
- Unit m³, l, Gal, Ft³.
- Display digits pre/post-point; 6.3; 7.2; 8.1; 10.0
- Debounce time
- Measurement interval
- Pulse length measurement
- Pulse value adjustable: 0.0001 Pulse/Liter to 99999.9999 pulse/liter
- Sensor supply voltage: 5V/3.6V/8.2V
- Sensor supply current: 25mA (*)
- Input frequency depending on the type of pulse generator
  - Reed: debounced: ≤ 30 Hz
  - Open Collector: ≤ 10 kHz
  - Open Emitter: ≤ 10 kHz
  - CMOS/TTL: ≤ 10 kHz
  - Namur with detection of flow direction: ≤ 200 Hz
  - Namur without detection of flow direction: ≤ 100 Hz

(*) The individual inputs can supply sensors with up to 25mA. However, during a simultaneous load of all 6 inputs (4 pulse- and 2 analogue inputs) there are only 100mA available.

Simple operation

There are **four buttons** on the front side of the calculator. All essential data and settings are visible and adjustable respectively. The four buttons facilitate navigation between the respective displays.

The **full text display** simplifies the navigation in the menu. Thus all relevant information is simply and clearly displayed.

Due to the bright **backlight** the display can also be easily read in sunlight and darkness.

The first window in the main display shows the measured energy. In case no button is pressed for 5 minutes, the display automatically changes over to energy display and the backlight is reduced.

The content of the menu depends on the version in use.

The data measured by the calculator (e.g. energy, volume, temperatures, momentary values, extremal values, operating hours...) as well as saved previous values can be shown in the display.

The main displays show the measured energy, the volume and the momentary values. Thereafter follows the main selection.

Some of the displays are only shown on the relevant access level (entitlement). All essential settings are adjustable with the four buttons.

The **Pre-Start-Mode** is a special start configuration that enables a more flexible use of the calculator.

If the calculator is delivered in a Pre-Start-Mode the most important verification-relevant parameters can only once be selected with the 4 buttons despite valid verification.

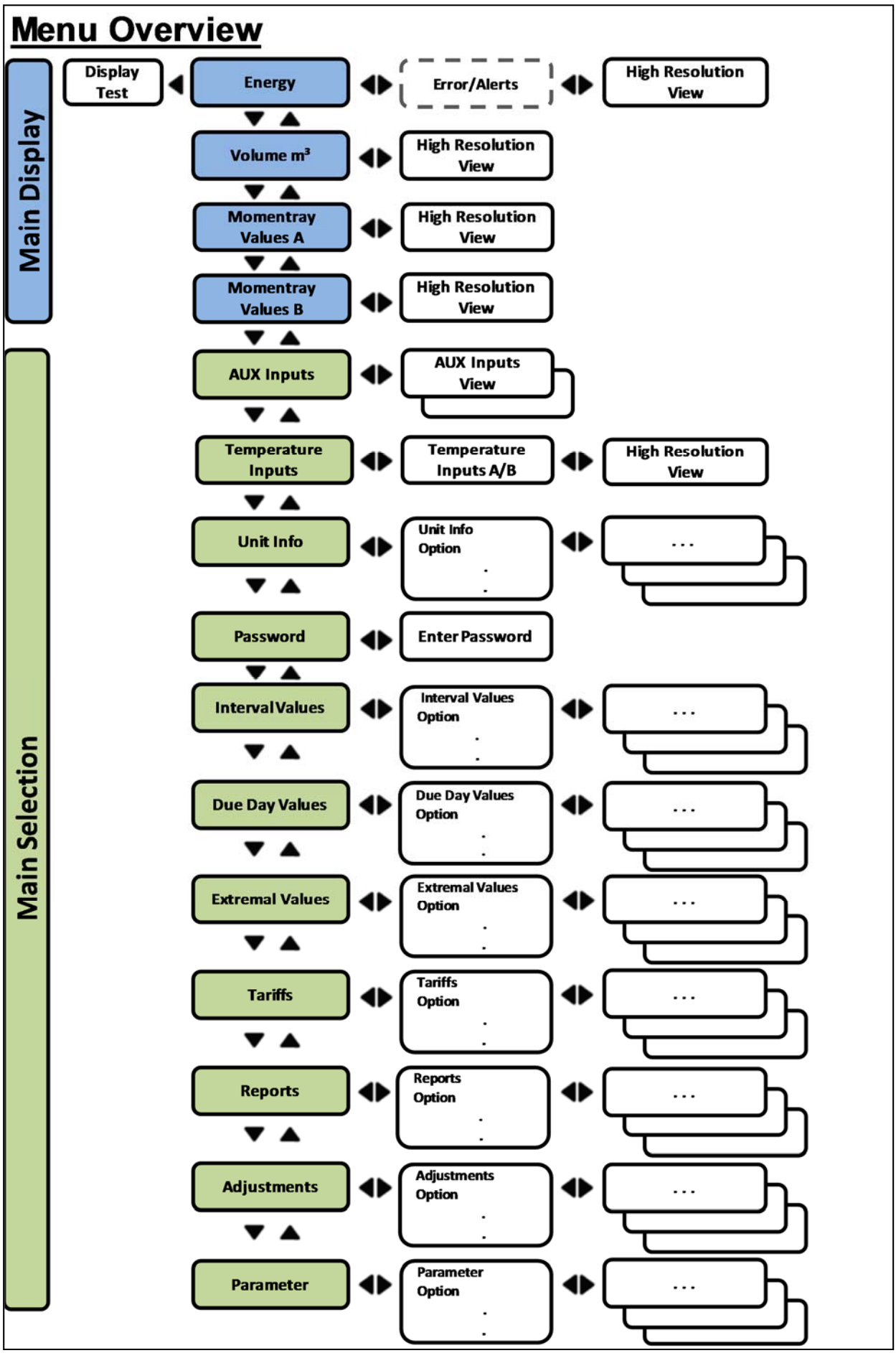
The device is not ready for operation before these parameters have been chosen.

The device does not work in this state and there is a special menu where the parameters have to be inserted. The calculator only switches to normal operation after all parameters have been accessed.

Thus the warehouse storage can be significantly simplified.

The selectable parameters are:

- Display mode (AB+/-)
- Pt 100/500
- Temperature Unit
- Energy unit
- Energy format
- Volume/Flow Unit
- Volume Format
- Location of flow sensor A
- Pulse-value of flow sensor A
- Type of pulse generator of flow sensor A
- Location of flow sensor B
- Pulse-value of flow sensor B
- Type of pulse generator of flow sensor B



If one of the display modes AB+ or A+/- or A+ is selected, the menu selection of channel B and the A-displays is limited.

Maintenance

The maintenance interval for devices with MID-conformity depends on the national re-verification period. The calculator is to be re-verified after the end of the verification period, e.g. after 5 years in Austria and Germany.

The backup-battery provides the internal clock in case the device is without electricity supply. This battery is to be exchanged after 10* years. It is a button battery that is mounted with a battery holder on the upper PCB. It can be simply exchanges by an expert (it need not be soldered)
Attention: The verification seal needs to be destroyed when the battery is exchanged. This results in the loss of the validity of the verification.
The battery must not be charged and must be disposed according to the prevailing guidelines.
(*) after 6 years without power supply
after 3 years -10°C storage temperature and after 1 year at -25°C respectively.

Disposal

The calculator must be disposed according to the prevailing guidelines for electrical devices.

Default settings of calculator

The inputs and outputs of the calculator are configured with the default settings.
See chart:

Pulse/Sate output	Value Assigned	Pulse Value	Pulse Duration
Pulse Output 1	Energy +A	1000 Wh	50ms
Pulse Output 2	Volume +A	10 L	50ms
Pulse Output 3	Energy -A	1000 Wh	50ms
Pulse Output 4	Volume -A	10 L	50ms
50ms = max 10Hz	10Hz at 1000 W/pul.	corresponds with 36MW	
	10Hz at 10 L/pul.	corresponds with 360m³/h	
The pulse value and pulse duration can be adjusted for differents measurement values.			
Relay	Status Signals	0	60000ms

Analog Outputs	Value Assigned	Output Range	Limit Low	Limit High
Analog Outputs 1-4	Off	4-20mA	0	0

Analog Inputs	Value Assigned	Input Range	Limit Low	Limit High
AUX3-4	Off	4-20mA	0	0

Pulse Inputs	Pulse Generator Type	Pulse Value	Detection of Flow Direction
AUX1-2	Reed	1 p/l	Off

Communications M-Bus internal, Module 1-4, USB, Infrared	Primary address	Secondary address	Baudrate
Channel A	1	Serial Number	2400
Channel B	2	Serial Number +1	

Interval Memory	monthly

Due Days	1.1. and 1.6

Alerts	Off

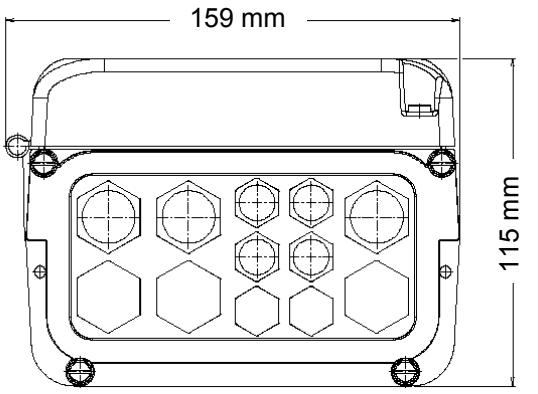
Tariffs 1-8	Off

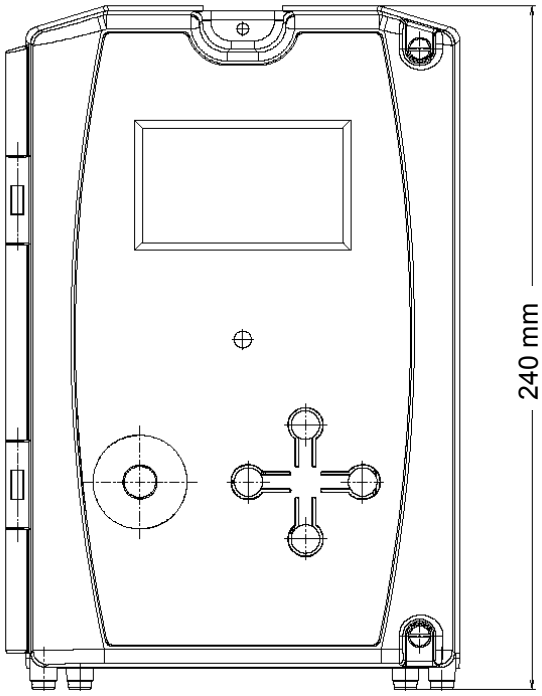
Error codes

In case an error is activated an "E" comes up in the right part of the flashing status indicator.
Starting off from the main display Energy, the right button is used in order to get to the error overview. This is where the current errors are indicated. If there is no error this overview cannot be seen. The history of all errors can be found in the menu Reports. Errors can also be linked to the pulse outputs or the relay output.

Error	**Error description**	**causes**
T-high A	Faulty temperature measuring at the sensor attached to the clamps HIGH TEMP A (channel A)	Temperature range beyond [-50°C . . 300°C] sensor shorted sensor break wrongly connected sensors
T-low A	Faulty temperature measuring at the sensor attached to the clamps LOW TEMP A (channel A)	Temperature range beyond [-50°C . . 300°C] sensor shorted sensor break wrongly connected sensors
T-high B	Faulty temperature measuring at the sensor attached to the clamps HIGH TEMP B (channel B)	Temperature range beyond [-50°C . . 300°C] sensor shorted sensor break wrongly connected sensors
T-low B	Faulty temperature measuring at the sensor attached to the clamps LOW TEMP B (channel B)	Temperature range beyond [-50°C . . 300°C] sensor shorted sensor break wrongly connected sensors
Check-sum	One or more check-sums have changed since the previous verification and calibration respectively.	The check-sum serves for internal checks and recognition of memory errors or manipulation. No more energy is calculated. The calculator must be sent to the producer to be examined.

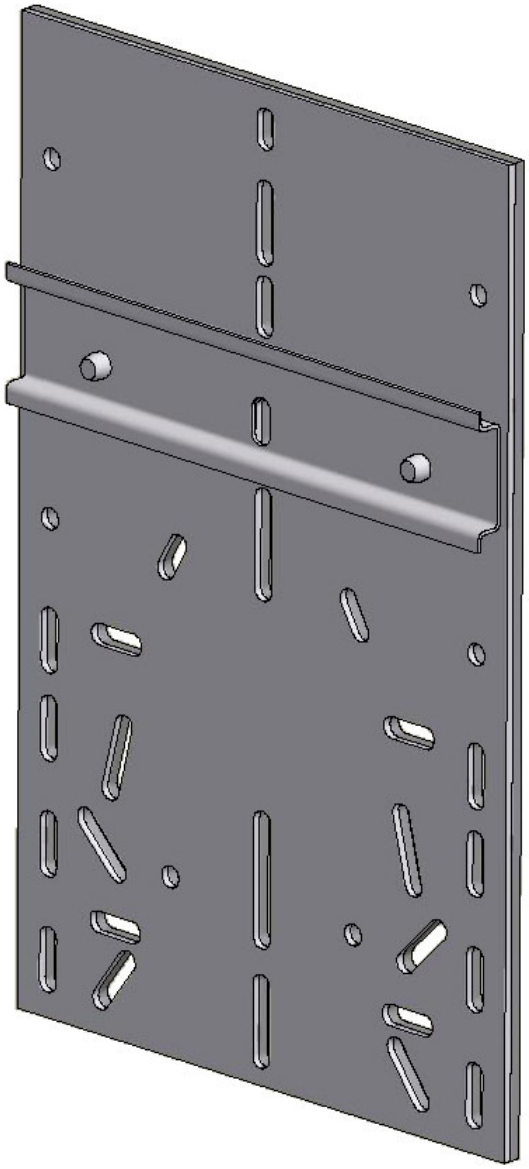
Dimensions





Optional accessories

Mounting plate (250mm x 160mm) incl. screws and dowels.
To simplify the mounting or to use existing boreholes of old calculators.



EU KONFORMITÄTSERKLÄRUNG
Déclaration UE de conformité EU / Declaration of Conformity

DIEHL Metering

DIEHL Metering GesmbH
Hainburger Straße 33
1030 Wien
AUSTRIA

Wir erklären hiermit in alleiniger Verantwortung, dass das Rechenwerk Type mwz04 zur Messung thermischer Energie in Wärme- und Kältekreisläufen konform ist mit den angeführten Richtlinien des Europäischen Parlaments und des Rates, soweit diese auf das Produkt Anwendung finden.
Das Produkt entspricht ferner den genannten harmonisierten Normen bzw. normativen Dokumenten, Regeln und technischen Richtlinien (Stand wie angegeben):

Nous soussignés, déclarons que le calculateur de type mwz04 pour la mesure d'énergie thermique sur les circuits de chauffage et de frigorie est conforme aux directives du Parlement Européen et du Conseil, si elles sont applicables au produit.
De plus, le produit respecte les normes harmonisées et les documents normatifs, les règles et les directives techniques suivants:

We hereby declare it our sole responsibility that the calculator type mwz04 for measuring thermal energy in heating and cooling circuits conforms with the guidelines of the European Parliament and the Council if they apply to the product.
Furthermore, the product complies with the following applied harmonised standards and normative documents, rules and technical guidelines respectively (norm and date as indicated):

mwz04	Rechenwerk Type / Type du calculateur / calculator Type:
SCYLAR INT M	Handelsname / Dénomination commercial / trade name:
EMC 2014/30/EU	EMV-Richtlinie / Directive CEM / EMC Directive
LVD 2014/35/EU	Niederspannung- Richtlinie / Directive basse tension / Low Voltage Directive
MID 2014/32/EU	Messgeräte-Richtlinie / Directive sur les instruments de métrologie / Measuring Instruments Directive

EN 61000-4-2 : 2009	EN 55022 Class B : 2010 / AC: 2011
EN 61000-4-3 : 2006 + A1: 2008 + A2: 2010	EN 1434: 2007
EN 61000-4-4 : 2012	EN 61000-6-2: 2005
EN 61000-4-5 : 2014	EN 61000-6-3: 2007 / A1: 2011 / AC: 2012
EN 61000-4-6 : 2014	EN 61010-1 2010
EN 61000-4-8 : 2010	EN 60529 :1991 + A1: 2000
EN 61000-4-11: 2004	OIML R 75 2002 / 2006

Die Herstellung der Produkte erfolgt gemäß den folgenden Systemen:

Les produits sont fabriqués conformément aux systèmes suivants:

The products are manufactured in accordance with the following systems:

System Système	Auditor Auditeur		Nr. des Zertifikats N° de certificat Nr. of certificate	Gültigkeit Validité Validity
ISO 9001:2009	Quality Austria		00653/0	14 Sep 2018
ISO 14001:2005			00581/0	
MID Modul Module MID	benannte Stelle Organisme notifié notified body		Nr. des Zertifikats N° de certificat Nr. of certificate	Gültigkeit Validité Validity
Modul B Modul F	BEV	0445	A 0445/3504/2011	2 Nov 2024

.....
Michael Hradecky
Geschäftsführer
Directeur général
Managing Director

Wien, 10 Mai 2017
DIEHL Metering GesmbH

.....
ppa. Peter Schneiberg
Leitung Wärme- und Kältemessung
Directeur des Ventes Energie Thermique
Sales Director for Thermal Energy

Notes:

Notes:

Notes:

Technical changes reserved

V2.07

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