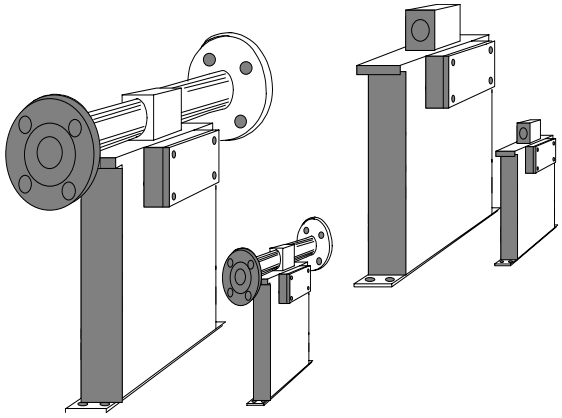

Operation Manual

RHEONIK
Mass Flowmeter

RHE 07, 08, 11
RHM .. NT, ETx, HT

www.rheonik.de - the mass flowmeter experts

REV. I, Apr. 2004

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Important safety instructions for the operation of RHE/RHM massflow-meters

The following safety guidelines must be adhered to.

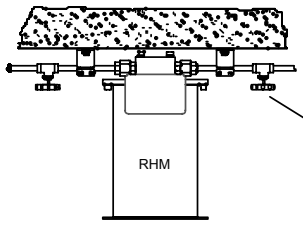
- The operation of equipment in hazardous-areas (with danger of explosion) must be carried out under adherence to the specific local guidelines.
- The flow meters are produced for different types of use according to international standards. The operation conditions of the equipment are identified on the name-plate and must be adhered to.
- The indicated limits for ambient- and medium temperature must be maintained.
- Rapid temperature changes inside the sensor due to the measuring medium must be avoided. Please note the references in the manual.
- The maximum permitted working pressure must not be exceeded.
  Especially piston pumps can produce considerable pressure peaks.
- Please note, that abrasive media can reduce the wall thickness of the measuring pipes and thus also reduce the maximum operating pressure.
- The construction material which comes in contact with the medium is identified on the name-plate.
  The manufacturer accepts no responsibility for the measuring instruments with respect to the medium to be measured.
- We recommend checking the wall thickness of the measuring tubes from time to time, should there be any doubts about the corrosion resistance of the materials in touch with the medium
- Rheonik does not assume any liability for production-stops and or consequential losses if this is not particularly agreed on.
- Furthermore, please note, that our devices shall not be used in life-preserving facilities in medical facilities, in utility vehicle, aircraft, water vehicles or in mining activities.

Rheonik Installation Quick Guide

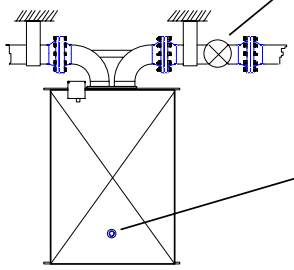
This is a short version, please read also our Field Manual

START

Installation RHM XX

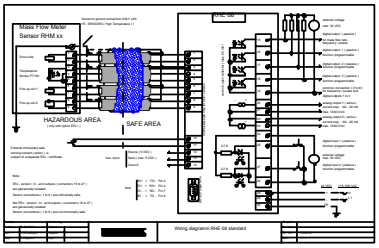


- *at least one ball valve recommended for zeroing*



- proper support at both sides of the sensor required - see manual
- avoid installation at locations with high levels of vibrations or strong electrical fields
- *remove transport fixation bold (if applicable) and re-seal the housing before operating*

Wiring RHM XX - RHE XX



- wiring of RHE XX according to our manual - attention : digital outputs optocoupler (passive) connect external power supply with pull-up resistor. Observe maximal allowed power supply

⚠ - *Check : No error message / indication for transmitter ?*

Bubble Free filling of RHM XX

- power on and allow RHE XX 30 min. warming-up.
- fill the sensor completely and bubble free with medium, flush sensor RHM through with relatively high flowrate for at least 15 minutes
- attention : avoid any temperature shock (read manual in detail)

⚠ - *Check : No error message / indication for transmitter ?*

Zeroing procedure

- shut off the flow with a ball valve properly For small meter sizes (RHM 015 - 03) two valves are recommended
- press the zero button and watch the indication (see manual)

⚠ - *Check : stable indication (zero flow) without error indication available ?*

Start with measurement

- open valves, start pump etc. - meter is ready for measurement
- if the installation conditions are changed significantly, please perform a new "zeroing"

Installation recommendations
created by : service@rheonik.de

Changes without notice
http://www.rheonik.de

1. Installation and operating instructions

1.1. General system description

The RHEONIK mass flow meter consists of one of the RHM series flow sensors and one RHE series transmitter. The remote unit RHE 07/08 is for installation in a safe non-Ex area and is connected to the sensor via a single multi-conductor cable. Please note, that the types RHE 07/08 and all sensor articles are available in non Ex-versions (without Ex-nameplate).
The RHE 11 (EEx d) may be installed and operated in hazardous Ex-areas (Zone 1 or 2).
Ex-series sensors RHM (with Ex-Label) are, when connected with a Ex- Transmitter, made for installation inside hazardous areas (Ex-zone 0, 1 or 2).

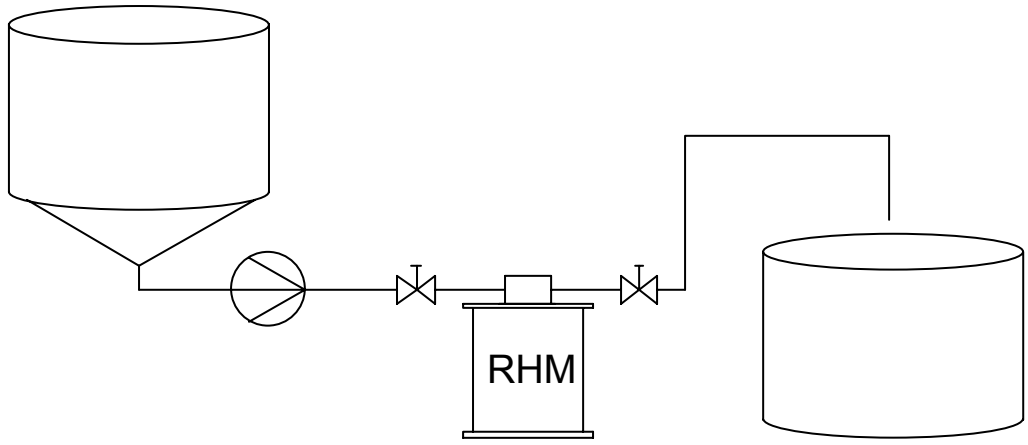
The transmitter RHE includes seven printed boards which can be replaced during servicing.

The remote electronic unit consists of two bent measuring loops in the shape of an omega.

1.2 Installation instructions for sensor RHM

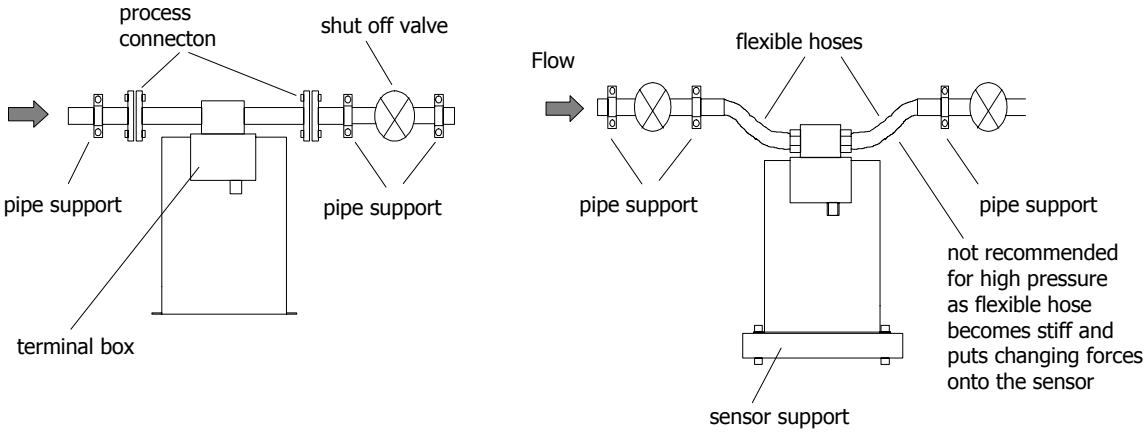
For liquids, install the sensor RHM at lowest practical level in your pipe line system. This stops gas bubbles from collecting in the sensor.

Installation example:

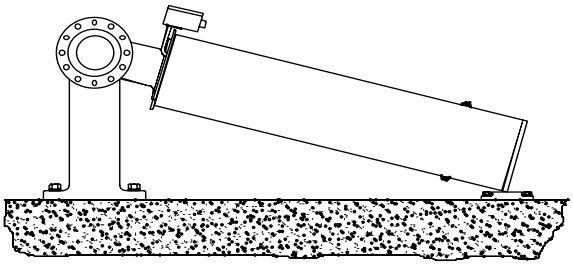


The piping system must be as free of vibration as possible. Normal building and plant vibration has no effect on meter performance. However do not mount the sensor in areas having abnormally high vibration.

see also the following informations for Sensor installation



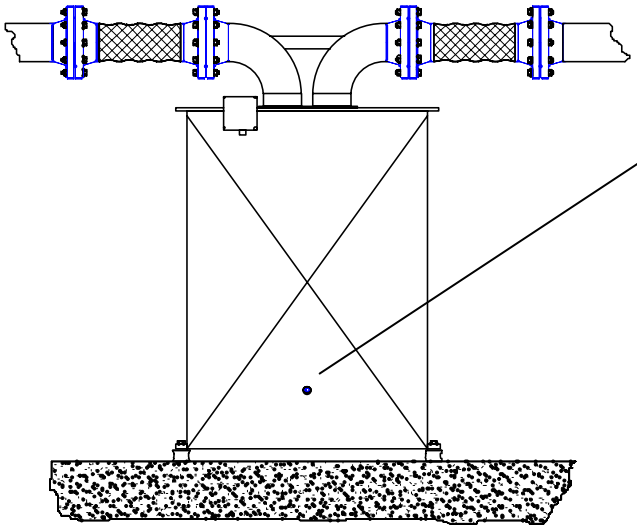
The sensor must be installed in a position with process connection on the upper side in order to measure fluids (see sketch) and correspondingly in upside down position for gases (process connection on bottom and housing on top). The sensor must be completely filled with the medium. At the same time gas bubbles must be completely removed from the device before the start of operations. This can be achieved via appropriate flushing for a few minutes with a high throughput for example. In the case of measuring minimal amounts of fluids (5 – 30 %), the sensor RHM 30, 40, 60, 80, 100, and 160 can be installed in a nearly horisontal position (parallel to the floor).



For this mounting position, the housing flanges can be used to secure it. In every instance, the sensor and the piping must be secured in front of and behind the sensor. It is preferable to use stiff piping systems. Avoid extreme reducers, because these can cause cavities within the measuring tubes. Reducers should be installed several metres from the measuring device when required.

In the case of the sensor sizes RHM 30 to 160 with parallel pipe loops, straight lengths of pipe are foreseen if the medium is fed in from a very different axis than the one allowed by the pipe curve of the sensor. We recommend a straight pipe with a length 3 – 5 times that of the pipe diameter for the outflow and 5 – 10 times that of the pipe diameter for the inflow for the above mentioned sensor designs, in order to prevent any significantly large differences in the flow speeds of the two measuring pipes.
No valves or reducers should be installed between the pipe fixings and the sensor.
In the case of these equipment sizes, be sure to remove the transport safety fixtures before putting into operation and to reseal the openings.

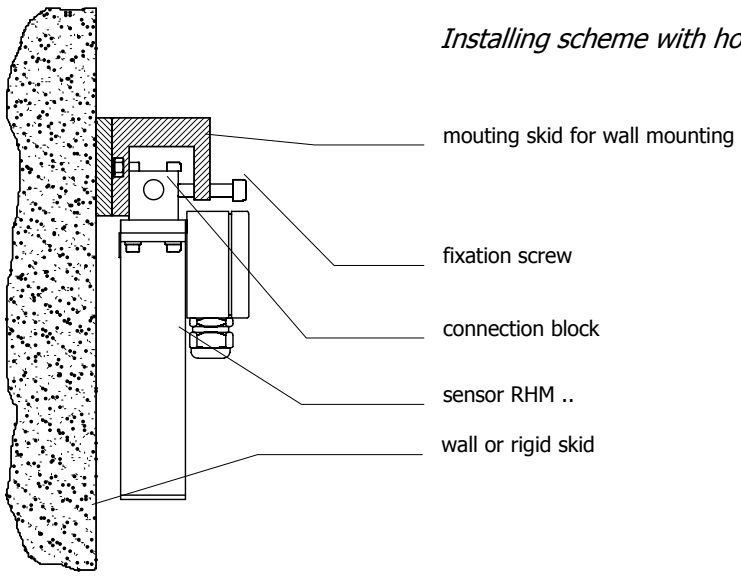
On bigger meters please <u>remove the transportation fixation screws and reseal the housing</u> before start-up.



If you are connecting flexible tubing or hose directly to the sensor please use sensor housing flanges for rigid sensor mounting. In order to insure a stable zero point, the sensor must be firmly installed.

Use a high quality valve downstream from the sensor for proper zero point calibration. For sensor sizes **RHM 015, 03 und 04** two valves, upstream and downstream, are recommended. Since the piping is not stable, we recommend installing these sensor sizes directly on the connection block.
For mechanical installation of these small meters we recommend a mounting skid made of aluminium, in order to achieve an optimum of stability with low installation time and costs.

Installing scheme with holder:



The sensor RHM, as well as the measuring cable (RHM/RHE) must be installed as far away from sources of electrical interference (transformers, high tension switching components, large electrical motors, frequency converters, etc.) as possible.

NOTES FOR HIGH TEMPERATURE USE (TYPE RHM xx ET2 und HT)

Installation:
Avoid rapid accelerations or mechanical shocks to the instrument. The instrument should be insulated in such a manner, that levels of different temperature within the instrument can be avoided.

Heat up / filling with medium:
The instrument should be heated up slowly, so that the temperature difference within the instrument does not surpass a delta of more than 50°C.
The temperature of the instrument can easily be checked at the RHE.. temperature indication.
Fast temperature changes are generally **not beneficial** for health and lifetime of mechanical devices.

Attention:
Heavy temperature shocks may damage the instrument. Please do not surpass the limit of **1°C per second** in the case of temperature change.

Example:
medium 350°C - instrument 310°C, - nearly ideal conditions for filling.

Cleaning:
For cleaning purposes temperature shocks should be avoided. Please work within the limits as above described.

1.3. Wiring sensor RHM

The sensor must be connected to the remote electronic unit RHE with a cable having four pair of shielded wires plus 1 wire (9 wires).
It is very important that the function groups, drive coils and sense coils are connected separately (Two single shielded wires for each one – see wiring plan)
In this way any interference between the drive signal and pick-up cables is prevented.
The maximum distance between the sensor and the remote electronic unit is 200 metres, and for the large sensors RHM 100 and RHM 160 a maximum of 100 metres. In the case of larger distances of up to 500 metres consult the manufacturer.

It is preferable to use the appropriate measuring cable from RHEONIK. In the case of the laying of measuring cables, we only recommend cable channels in which no high tension or high voltage cables have been laid (e.g. for motors).
Avoid connecting wiring points to external systems such as motors or other sources which are subject to electrical disturbances.
Apart from that, make sure that the main cable shielding or a single shielding can not cause a short circuit with the sensor housing or any other wiring or components. A conductor is used for the connection of the RHE terminal nr. 3 (A galvanic separated neutral point inside the appliance) with the sensor (See the wiring plan attached). All the screening and single shielded are connected to this electronic terminal.

There are three types of Rheonik Special Cables

a) Standard cable – for all devices.
temperature range -20°C .. + 70°C

b) Steel-armed high performance cable – recommend for use in outside area and for high distance over 25 m in combination with bigger sensors :
RHM 60, 80, 100 and 160.

c) High temperature cable – for all devices.
temperature range -20°C .. + 205°C

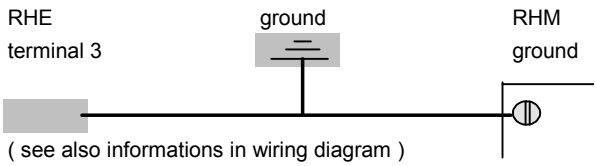
Notes for the RHM xx Typ NT and ETx

In the case of NT and ETx sensors, the main cable shield and the single shields are only connected to the electronics at terminal 3 and not connected to the sensor but rather shortened and insulated there.
These measures prevent a current flow from passing through the cable shield between different earth potentials, which could disturb measurements.

Notes for the RHM xx Typ HT

An additional potential equalising conductor must be connected between the sensor RHM xx HT and the analytical electronics RHE – terminal 3 for all high temperature sensors RHM types HT (Ceramic insulation). This is in order to compensate for the hygroscopic conducting effects of the ceramics used.
The conductor must be laid on clean ground.
The cable shield is **only** connected to the earth screw of the sensor when high temperature sensors are used.

HT- ground connection:



NOTES FOR INTRINSICALLY SAFE INSTALLATION

Only equipment with safety agency labels attached to the sensor and transmitter meet the agency approval requirements.
Intrinsically safe flow meters must be installed according to the wiring diagram, supplied with the meter.
Observe proper earth ground wiring according to this diagram.
Sensor cable must be suitable for the sensor operating temperature range.
All intrinsically safe cables must be installed separated from all other cables.
Observe temperature class and maximum allowable sensor temperature, indicated on sensor type label, for safe operation.
All electrical installations must comply with national and local codes.

1.4. Installation instructions for the RHE flow transmitter

Install the RHE unit in an area where the ambient temperature falls within the range -40°C .. +60°C. For installations outside this range please consult the manufacturer.
Locations with extreme vibrations must be avoided.
Do not locate the flow transmitter in direct sunlight.

Sensor RHM and transmitter RHE were calibrated together at the factory.
Therefore make sure that the serial numbers of connected systems comply with serial numbers indicated on instrument type labels.

1.5. Power supply wiring

The remote electronic unit RHE is delivered set up for 230 VAC, 115 VAC or 24 VDC power input.
The power supply must be turned off while wiring to the remote unit RHE ...
Power supply voltage +-10% must correspond to the voltage indicated on electronic type label or in the power supply wiring compartment.
The earth grounding of the power supply must be connected to the RHE power supply wiring section.

Failure to connect earth ground will nullify the intrinsic safety !

2. Operating and programming

This section covers the operation and parameter setup of RHEONIK RHE transmitters.

The subjects are:

- Display and keyboard handler
- Basic transmitter setup (inputs, outputs, zeroing)
- Additional setup features (sensor setup, passwords, diagnostics)

2.1. General instructions

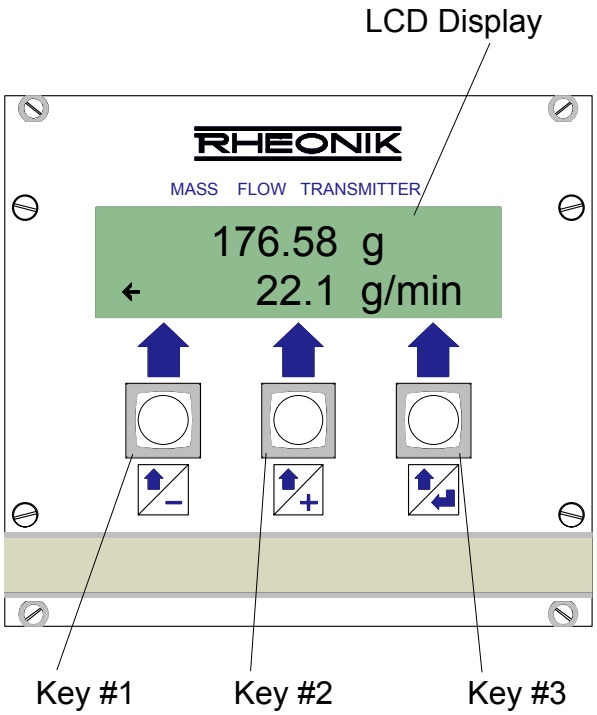
When turning on the remote unit RHE or when resetting the system, the display will show the software version number. The unit runs through an automatic diagnostic program to determine if both sensor and electronics are free of malfunctions.
After the diagnostics have been completed satisfactorily and without error, the LCD-display will show a measurement display.
If the power is cut for less than 10 seconds, the display will show ***reset error.***

2.1.1. Keyboard and display

The display is a dual line 16 character liquid crystal display (LCD). Below the display are 3 keys.
For LCD contrast adjustment a 270° angle trim potentiometer is installed on the back side of the RHE 07 , 19" housing.
Near the RHE 08 the same trim potentiometer is highly visible and located inside on the motherboard between the cards MM 03 and MIO 03.
If the display characters do not appear or there is poor readability, turn this potentiometer **slowly and carefully** from the factory set position until characters appear in the display and constrast is optimal.

Display symbols in the measuring mode with explanation:

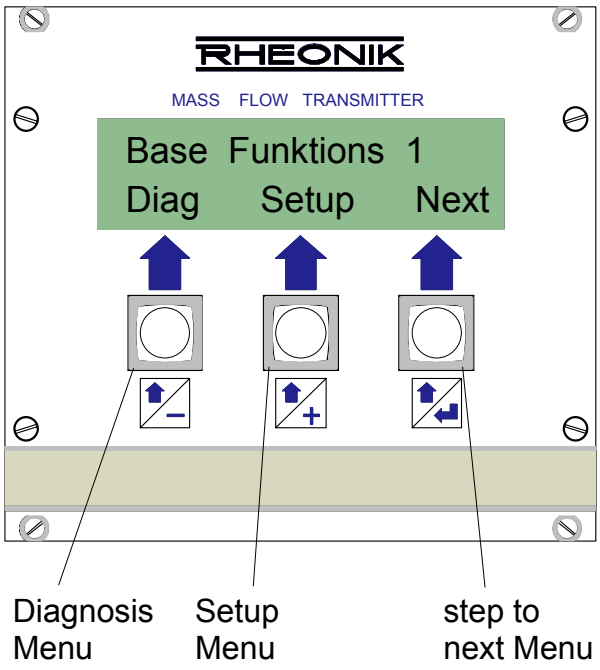
← →	:	Flow direction (direction not fixed, forward / backward)
Λ	:	Flow rate > recommended range
V	:	Flow rate < recommended range
*	:	Flow rate < low flow cut-off limit



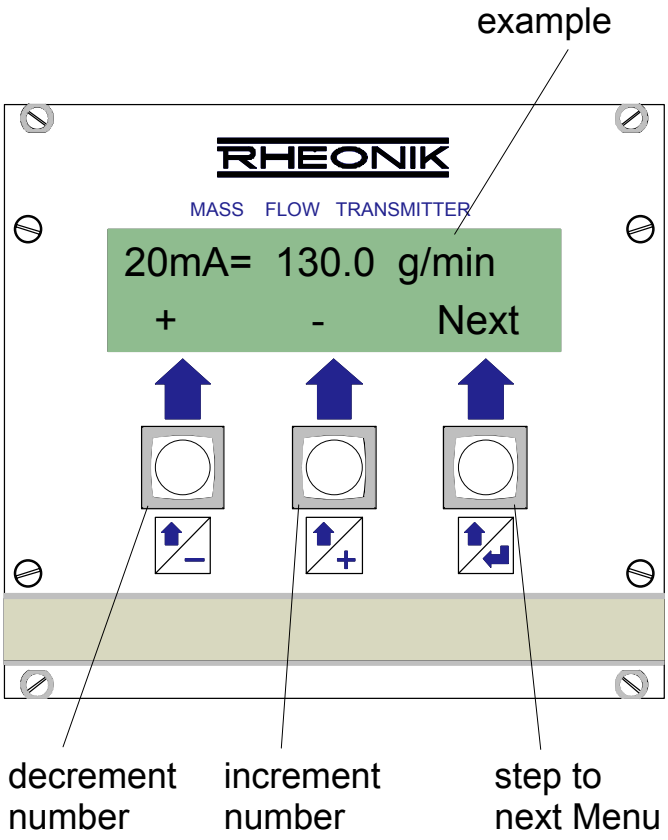
If no button is touched, the unit will automatically change to the measurement data display. The current mass totalizer and flow rate will appear.
Pressing key #3 scrolls you through the measurement data menu display.

2.1.2. Basic operating and programming principle

Operation takes place via menu control. If you want to enter any menu you have to press the button below the displayed menu point.



To modify numbers, press **+** or **-** buttons to increment or decrement the displayed numbers.
Use ***Next*** on the right to enter the next menu point. Following the ***Next*** –function, you will be guided back into the initial measurement data display.



For a complete overview of the menu,please have a look at the menu flow chart in appendix.

2.1.3. Basic functions

This section gives a short description of all functions needed to setup all inputs and outputs according to individual requirements.

2.1.3.1. Zero calibration

Zero calibration should be carried out when:

- the meter has been newly installed.
- drastic piping or fluid changes have occurred.
- meter operating temperature has changed considerably.

Before starting zero calibration, make sure that the sensor RHM is installed and wired correctly according to the wiring section of your installation manual. Observe as well the following steps to calibrate meter zero point:

- The remote unit RHE should be installed and connected to the power supply at least half an hour prior to zeroing.
- If possible run the fluid through the sensor RHM for about 15 minutes at 100% flow speed to establish normal operating conditions.
- Stop the fluid flow through the sensor with a downstream valve. Meter tubes must remain full of fluid and contain no air or entrapped gas. Even small amounts of flow will cause an inaccurate zero point calibration.
- Step through the measurement data display by pressing key #3 until you can enter the zeroing menu.
- Start the zero calibration process by pressing the zero key. While the unit is zeroing for about 20 seconds ***ZEROING active*** will be displayed. After the zeroing, ***Exit*** is displayed.

Note:

If you want to recover the prior zero point before activating the new zero calibration (for example wrong zeroing) you just have to activate the ***Undo*** key before leaving the zero calibration menu. Only then can you leave the zeroing setup menu. After this, the old zero point will be valid again.

2.1.3.2 Reset totalizer

This menu point is entered similarly to zero calibration. By pressing the ***Reset*** key the current totalizer is set to zero. Activating the ***Undo*** function before leaving the ***Reset*** menu will give back the old totalizer value before ***Reset***.

2.1.3.3. Display units

You can choose between ***SI*** -units (European standard) or ***ANSI*** units (US-standard).

Note:

With the ordered option density measurement, you can select volumetric rather than gravimetric units. Please use the + or – keys to choose the appropriate setup for each parameter.–. Standard units for each parameter are:

	SI	**ANSI**
Totalizer:	***t, kg, g,***	***tn, lb, oz***
Mass flow :	***t, kg, g / h, min, sec***	***tn, lb, oz / h, min, sec***
Density:	***kg/l (= kg/dm3)***	***lb/ga, BaumeL, BaumeH, kg/l @ *)***
Temperature:	***°C***	***°F***
Totalizer volume:	***m3, l, ml***	***ga, ba, in3***

* This density unit is referenced to a specific temperature (density at reference temperature).

The selection may be changed as often as desired and will be held in non volatile **EEProm** memory. Only certain units can be selected, depending on the type of sensor chosen.

2.1.3.4. Display sequence and Format

In order to determine the sequence of different measurement data displays you have to program first, second , .. display function (***1.Disp = XXXXX***).

In ***TOGGLE*** mode the LCD display switches every 10 seconds to one of the two possible measurement data displays (***Disp = Toggle***).

Totalizer increment resolution is selected in total format display (***TotalForm = X.XX)***.
Consider the maximum totalizer of 8 digits! Totalizer overflow will be indicated.

With ***Show Errors = off*** no error messages will be indicated on display.

After ***Lock Keys = on*** the keyboard will be blocked until next power OFF and ON.

2.1.3.5. Inputs and outputs

2.1.3.5.1. Current outputs #1 and #2 (analog)

First select the variable to be output on channel #1 or #2 from among the following (press + or **-** button):

XXmAOutX = XXXX ***i.e.*** ***20mAOut1 = Flow***

- Flow (Massflow)
- Dens (Density)
- Temp (Temperature)

Second select life zero (4 mA) for selected channel.
There are 3 modes for 4 - 20 mA output.

1. ***4 - 20 mA:*** The output signal range is in between 4 - 20 mA.
   Error status of analog output is 2 mA.

2. ***3.7 - 20 mA:*** Output signal range is in between 3.7 - 20 mA.
   Output error status is less than 3.7 mA.

3. ***4 - 22 mA:*** Output signal range is in between 4 - 22 mA.
   Output error status is above 22 mA.

After this, the first of two displays appears in order to scale the output. The first display enables you to select the high numerical value of the variable that will be represented by 20 mA of current i.e. (***20mA = XXXXX)***.
Change that value by pressing + or **-** push-buttons.

After the 20 mA value, you are shown a display to select the low value of the variable to correspond to either 0, 3.7 or 4 mA of current, depending on the option you selected previously. Scale the output similarly to the 20 mA value (***0mA = XXXX***).

After pressing the ***Next*** button, the analog output display is shown to enable you to configure the channel #2 output. All setting procedures are the same as for channel #1.

2.1.3.5.2. Analog inputs

The configuration of the analog input corresponds to the setup of the analog outputs.

Choose the desired units for the analog input (0/1-5 volt) from the following units:

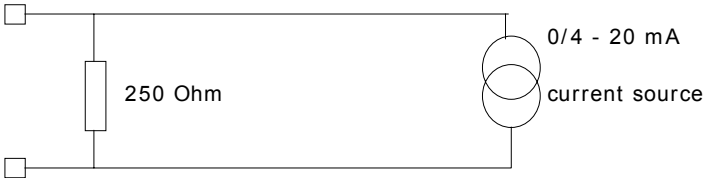
V, mA, kg/l, °C, ml/min, m3/min, bar, bara, psi, mPas.

After pressing ***Next,*** it is possible to set the input signal range to 1 - 5 Volts or to 0 - 5 Volts. Next select the lowest and highest values for this range (ie. 0/1 and 5)

Note:

For use as current loop input you have to connect a resistor of 250 Ohm.

example:



2.1.3.6. Digital inputs and outputs

2.1.3.6.1. Frequency output

Please select on of the following two modes:

Mode 1: Pulse Output

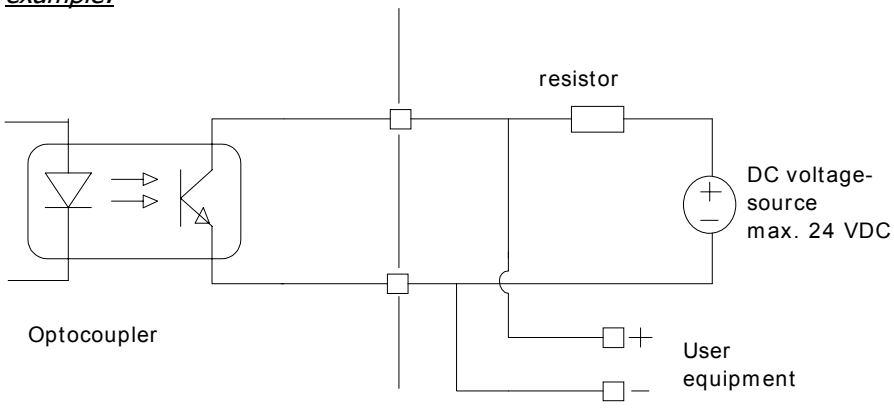
If you choose ***FreqOut = Pulse*** the next display will show the current number of pulses per volumetric or mass units. If you wish to change this output value, you can enter the number of pulses per unit by using the **+** or - push-buttons
(1, 10, 100 .. pulses/g, kg or t).

Mode2: Frequency Output

In this mode, it is possible to set the frequency with a flow rate, which corresponds to a frequency of 5 kHz. The numerical value of the flow rate with a corresponding frequency of 5kHz can be changed by using the + and - keys. The complete output frequency range is 0 to 10 kHz.

The frequency output is available from an *passive opto isolated open collector driver*. For wiring see attached RHM/RHE wiring diagram.

example:



Note:

The **open collector** output withstand up to 50 mA of current.
For a good signal shape and optimal high and low levels we recommend a current of approx. 10mA.
Typical supply voltages are 5 – 24 VDC.

2.1.3.6.2. Serial communication

The RHE remote electronic unit supports either ***RS422 / 485 full duplex*** (4 wire system) interface (RS232 only as special option).
TTL level serial can also be used. Transmission baudrate can be set in baudrate menu (300, 600, 1200, 2400, 4800, 9600, 19200 bits/second).
The serial interface can be used in a bus (4 wire). For this purpose each remote unite has to be addressed separately.

For RS422/485 connect communications wiring pairs to the TX+/TX- terminals and to the RX+ /RX- terminals (see attached wiring diagram).

Standard character format is:

7 bit ASCII, 1 start bit, 1 stop bit, parity bit EVEN.

For network communication each transmitter RHE has to have its own ***network address from A to Z*** available in menu ***Setup I/O*** / ***Dig*** in menu point ***Network Adr*** .

Basic Command Format:

Commands are sent by the computer to the transmitter. The message protocol uses only ASCII characters as follows:

- Command header: ***<7FH><7FH><#>[<address>]***

Address is any character ***´A´*** to ***´Z´***. If the transmitter has no address, no address character needs to be transmitted. If ***´$´*** is transmitted as an address, this character is valid as an address. All transmitters in a network will respond to this signal.

- Request instructions:

If any of the below listed request instructions are transmitted after the command head, the transmitter will send back the requested information.

request for	command	RHE reply	example
flow rate	***f?***	***f= ...***	***f=_1.987kg/min***
totalizer	***q?***	***q= ...***	***q=____413.4lb***
temperature ***t?***	***t= ...***	***t=-_12.4C***	
density*)	***d?***	***d= ...***	***d=16.435lb/gal***
totalizer (non resetable)	***m?***	***m= ...***	***m=___36782kg***
analog input ***a?***	***a= ...***	***a=_10.16bar***	
error message **)	***e?***	***e= ...***	***e=3FH***
warning **) ***w?***	***w= ...***	***w=5***	

*) Only with option density measurement.
**) error and warning code in HEX

- Request command termination: **<CR><LF><7FH><7FH>**

- RHE reply termination: **<7FH><7FH><CR><LF>**

CR: carriage return
LF: line feed
7FH: character for synchronizing serial DataStream (HEX)

- Commands:

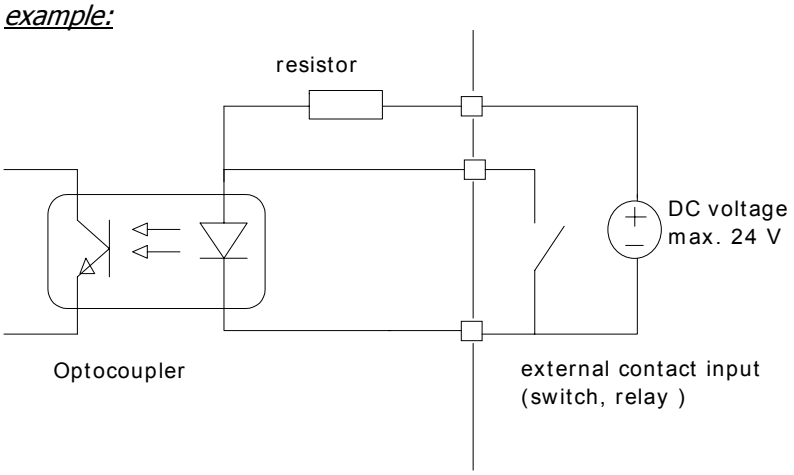
There are also some commands, that are sent to the transmitter without request for special measurement data.
These commands must also be sent like the request instructions between the command head and the command termination:

instruction	**command**	**transmitter reply**
reset totalizer	***r***	***r***
hold on totalizer	***hon***	***hon***
hold off totalizer	***hoff***	***hoff***
clear error	***c***	***c***

2.1.3.6.3. External contact inputs

The RHE electronic offers two possible inputs. Both are galvanically isolated and are passive. This means that in order to activate the inputs, the opto isolators LED's have to be switched using an external support voltage of maximum 24 VDC (R = 2700 Ohm).

example:



Both inputs can be programmed by software keys as:

- Not used	(if the input is not used)
- Reset Total	(set totalizer to zero)
- Hold Total	(block totalizer counting during flow)
- Zero Flow	(start zero calibration procedure)
- Quit Error	(acknowledge error message)
- Batch Start	(only with activated Batch Option)
- Batch Stop	(only with activated Batch Option)

Note:

Care should be taken to ensure that the flow has been completely stopped before using the input for zeroing..

- Using the ***Reset*** function, the input can be used to start a batching process in combination with totalizer limit outputs.

- Without installed I/O board inside the transmitter RHM the input function has to be programmed as ***Not used***.

2.1.3.6.4. Contact outputs

The output hardware is the same as for frequency output (see section 2.1.3.6.1.).
All outputs can be programmed as follows:

- Limit Flow, Temp, Dens:

Flow rate, temperature or density limit. The output is active below the adjusted setting.

- Limit Mass:

Mass totalizer limit. The output is active below the adjusted totalizer value.

- Error:

Output is activated when a malfunction in the flowmeter occurs or is detected.

- Flow Direc:

Flow direction output. Output is active in one flow direction and passive in the opposite.

- Empty Tube:

Empty tube signal is active, if no liquid is inside the meter tubes.

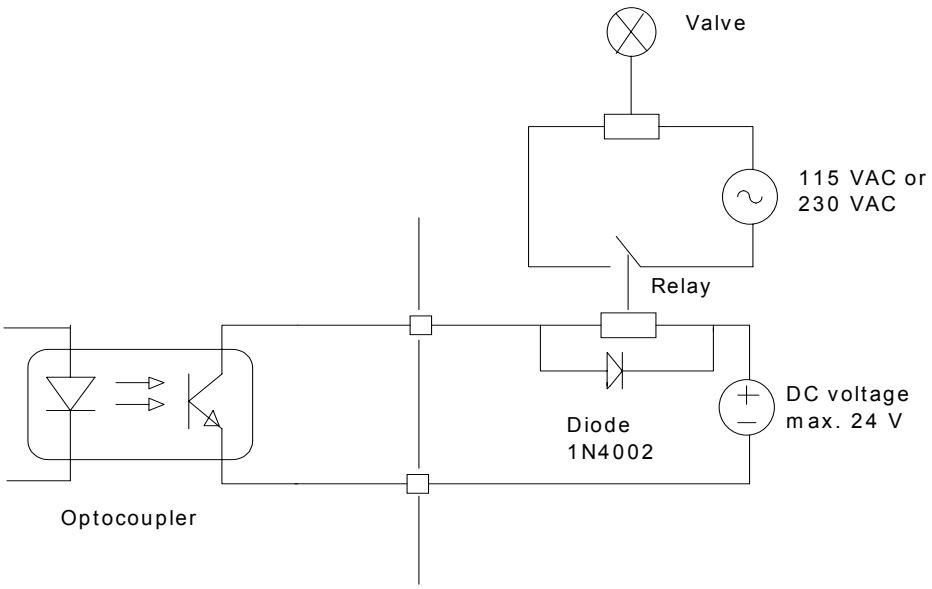
2.1.3.6.5. Configuration of the digital outputs:

Output	Status	active open	active clsd	selectable*
Limit Flow	> value	closed	open	yes
Limit Temp	> value	closed	open	yes
Limit Dens	> value	closed	open	yes
Limit Mass	> value	closed	open	yes
Error	open at error – at normal operation closed			no
Flow Direc	< > flow direction	+/-		no
Empty Tube	> 300 kg/m³ (only active with option density measurement)	closed	open	yes

* if "yes" is shown under selectable, you can choose in a separate menu point between out ***active open*** or out ***active clsd*** (closed).
All outputs can be selected in one and the same direction only !

Attention: The maximum allowed current for the output transistor is 50 mA.
Please use a protection diode for inductive loads.

example:



2.1.4. Advanced setup and diagnostics

This menu will only be displayed after key #2 and #3 have been pressed simultaneously. The menu has two options:

- Diagnostics (sensor RHM, I/O hardware)

- Basic level parameter setup (RHM sensor parameters, filtering, calibration settings, corrections). It contains items that alter calibration parameters and items that reconfigure the electronics to perform different functions.

2.1.4.1. Setup and diagnostics

This menu has two options:

1) ***Set*** (I/O to a certain status or level)

2) ***Show*** (current I/O status / level)

For example in ***Set*** mode you can set the mA output to a certain value in order to then check the output using a connected measuring device or a supervisory control and data acquisition.

In ***Show*** mode you can see the actual mA value the output should have at a certain flow rate, temperature or density indication.

2.1.4.1.1. Sensor diagnostics

This function is helpful for start-up checking or for testing sensor malfunctions.
The single diagnostic displays are:

- ***Freq:***
  Sensor oscillation frequency in ***XXX.XXX Hz***. With proper installation, constant fluid density and no electrical or mechanical interference, this value should vary only at the second decimal after the dot.

- ***Gate1:***
  Phase shift timer #1 in counts. *

- ***Gate2:***
  Phase shift timer #2 in counts. *

  * The actual phase shift corresponding to massflow rate is calculated from the difference between the ***Gate 1*** and ***Gate 2*** value.

- ***TmDiff:***
  Difference: ***Gate1*** – ***Gate2***

- ***d:***
  The d-values are given in promille (‰) of the time period of the base frequency.
  Left is shown the phase shift of the last stored zeroing and right is the actual measured phase shift.
  Press button ***Vary*** to see only the phase shift changes..
  In the case of zero flow, this value ***Vary*** should be very low.

- ***ADChannel1:***
  The Analog input value is displayed after conversion by the 10 bit analog/digital converter. Value range is 0 - 1023 steps . This channel is in use for sensor temperature measurement.

- ***ADChannel2:***
  The second analog input channel has the same technical specifications as ***ADChannel1***. It is a channel for special use (see refer. 2.1.3.5.2 analog input)

- ***RTime:***
  Electronic run time counter in days and hours.

- ***Mass:***
  Second, non resetable totalizer.

2.1.4.3. Sensor basic level programming (BASIS SETUP)

To enter this menu you have to input the password.

The password is:

- Press 3 times key #1
- Press 2 times key #2
- Press 1 time key #3

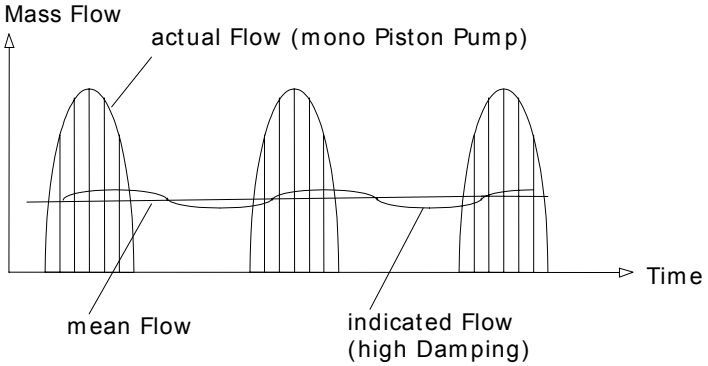
After pressing a key an asterisk * is being displayed.

Inside this menu you have to enter sensor specific data like meter size, type of connection (serial or parallel) and maximum sensor operating temperature.

There are additional settings for special operating conditions like:

- FiltArray:

A digital low pass filter for phase shift measurement can be configured. The Filt Array number is equal to number of filtered measurement cycles. Shortest measurement cycle time is two sensor oscillations. This filter is very useful for applications with pulsating flow rates (piston pumps).

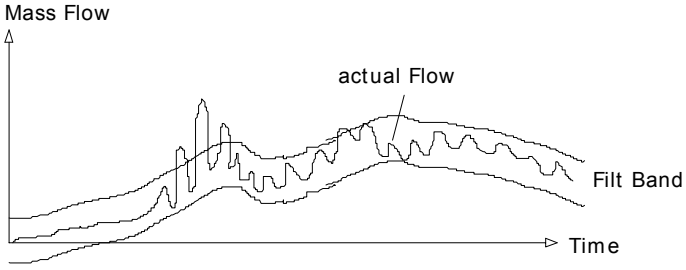


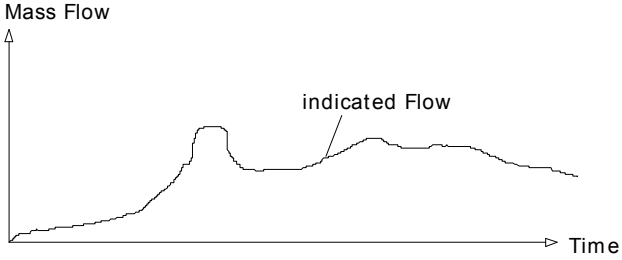
- TFlow:

Digital damping value for display and analog outputs (flow rate). ***TFlow*** is response time in X.XX seconds.

- FiltBand:

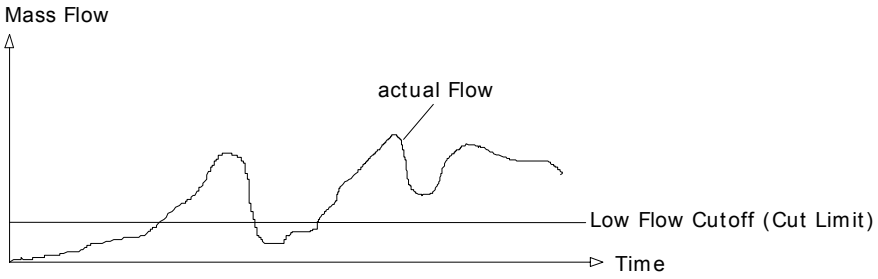
Flow rate filter band in percentage of half nominal sensor flow rate. Depending on software verion, slight and insignificant deviations of this flow rate may be given. Response time outside filter band is shortest. Inside of this, the adjusted response time TFlow is active.

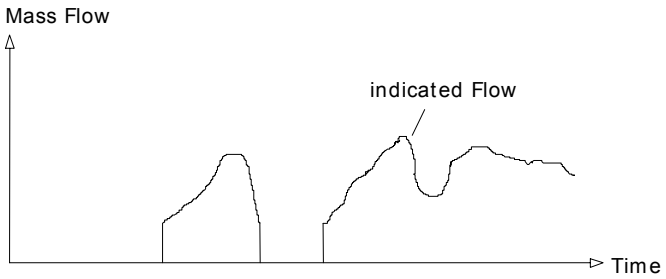




- CutLimit:

The low flow indication cut-off is indicated in percentage of the half nominal flow rate. Depending on software version, slight and insignificant deviations of this flow rate may be given. The ***CutLimit*** is valid for digital flow rate display, totalization and current outputs if preseted for ***Flow***.





- DensCutoff:

Density cut-off for flow rate indication and totalization. For applications where the liquid is removed by gas stream out of the pipeline but the meter should not count the gas stream.

3. Error codes

The internal microcontroller continually monitors several voltages and signals and checks proper operation of the sensor-transmitter measurement system.
If an error occurs, a fault code is displayed on the transmitter display. Error codes, which occur immediately after initial installation, are usually caused by incorrect electrical wiring or improper flow sensor installation (i.e. sensor tubes not totally filled with liquid).
A transmitter, which is not properly wired to the flow sensor, will indicate error code number 2 (ERR 2).

Possible error codes are:

Code	Display	Description
Err 1	**Drive**	Drive signal error. Drive amplifier gives maximum power *possible causes:* • extreme unbalanced vibrating sensor system (for instance: gas bubbles in the pipe loops or pipes are not filled completely) • drive coil (term 1 - 2) defective
Err 2	***Pick-up***	One of the two sensor signals 1 or 2 is not correct *possible causes:* • the wiring is incorrect • one or both coils defective • defective component on safety or amplifier board • Sensor is not moving *Check sensor and wiring according to trouble-shooting section.*

Err 3 ***Temperature*** The temperature detected by the PT 100 inside the sensor RHM is outside of the allowed range (-154 .. 360 °C) or temperature is outside of the allowable operating temperature, adjusted in ***MaxTemp*** menu.

Possible causes:

- PT 100 defective or circuit open or shortened
- defective component on safety or amplifier board
- defective analog to digital converter inside
- defective voltage supply (component U7 or U9)
- temperature measurement not properly adjusted

Err 4 ***Parameter*** Error on parameter check. Error occurred during parameter transfer from EEProm to RAM memory. Calculated checksum is different from backuped checksum.

Err 5 ***RAM*** Error on RAM check.

Err 6 ***ROM*** Error on ROM check. Defective EEProm storage cell detected calculated checksum is different from programmed checksum.

Err 7 ***EEProm*** No EEProm reading or writing possible.

Err 8 ***Division*** Calibration error. Internal calculation overflow.
verify calibration parameter setting.

Err 9 ***Stack*** Stack memory too small. Reduce number of measurement periods (gates) in calibration parameter setup ***(IntGates)***.

Err 10 ***A/DChan2*** Defective analog input, or input voltage outside range (0 - 5 Volt). Check input voltage
analog to digital converter defective.

4. Warnings

The microprocessor also indicates warnings. The difference to errors is that warnings are less dangerous than errors. For example there will be a warning when flow rate is above 100% sensor flow rate. But it is just a warning that tells you that meter accuracy could be reduced in this range, yet hardware and software are working properly.

Possible warning codes are:

Code	Display	Description
Warn1	***Reset***	Power failure possibly occurred, there was a processor reset.
Warn2	***FlowRange***	Flow rate is above maximum flow rate for this sensor size. Reduce flow rate to have optimum accuracy.
Warn3	***TempRange***	Sensor temperature is more than allowable sensor temperature (set in MaxTemp menu). Reduce sensor temperature. The electrical installations inside the sensor will be damaged.
Warn4	***Drive***	For a short time there was a lot of damping of the meter oscillation (for instance, due to gas bubbles in liquids).
Warn5	***OverflTot***	There was a totalizer maximum count overflow, the totalizer started again at zero.

5. Troubleshooting guide

5.1. Sensor voltages and resistances

There are four electrical circuits with which the sensor is connected to the transmitter RHE. The sensor receives drive excitation from the transmitter and returns two AC Voltage signals back to the electronics. The fourth circuit is temperature measurement with a PT100 temperature sensor.

Using a digital voltmeter the voltages can be checked:

Terminal	Circuit	Voltage
1	Drive +	0.3 - 7 V AC (terminal 1 - 2)
2	Drive -	
3	PT100	130 mV DC at 20 °C (terminal 3 - 4)
4	PT100	
5	PT100	130 mV DC at 20°C (terminal 3 - 5)
6	Coil 1 +	10 - 150 mV AC (terminal 6 - 7)
7	Coil 1 -	
8	Coil 2 -	
9	Coil 2 +	10 - 150 mV AC (terminal 8 - 9)

If the values are within the above limits, the meter will oscillate normally.
If the measured voltages are not within the ranges shown in the table, disconnect the transmitter and check the resistances at the sensor RHM terminals:

Terminal	Circuit	Resistance
1	Drive +	5 - 170 Ohm (terminal 1 - 2)
2	Drive -	
3	PT100	107 - 109 Ohm at 20 °C (terminal 3 - 4)
4	PT100	
5	PT100	0 Ohm (short circuit) (terminal 4 - 5)
6	Coil 1 +	30 - 150 Ohm (terminal 6 - 7)
7	Coil 1 -	
8	Coil 2 -	
9	Coil 2 +	30 - 150 Ohm (terminal 8 - 9)

If one of these values is infinite, the sensor RHM is defective.
Check insulation resistance to earth ground (sensor RHM housing).
If a short circuit between any sensor terminal and sensor housing is measured, the sensor RHM is defective.
If no problems are located at the sensor resistance, check Sensor-to-Transmitter wiring for correct connections and for no shorts or opens, loose conductors or poorly connected wiring.

Note for HT Sensors:

- High temperature sensors RHM HT need special grounding.
  Check ground wiring according to diagram.

- Insulation resistance to earth ground for high temperature sensors should be > 1MOhm *.

* The relatively low resistance is caused by the hygroscopic characteristics of the used ceramic construction materials and varies with the moisture inside the sensor.
A resistance of i.e. only a few hundred KOhm shows a sensor that is completely moist. That leads to failures or non-function (please contact the person responsible at your local representative, to solve this problem).

5.2. TEMPERATURE CALIBRATION

Temperature measurement is already factory calibrated. Normally a new temperature setup or new recalibration is not necessary. The PT100 is connected by 3 wires, so that the measurement is just influenced by one wire resistance.
For extreme long cable length there is a software ***Adjust*** *Funktion* for compensating the wire resistance.
This can be done in the ***Adjust Menu***. For this the actual temperature must be well known, or a resistor simulating a certain temperature has to be connected instead of the meter PT100.
Enter the correct temperature by entering a positive or negative offset value and press the adjust push-button. After this procedure the temperature reading will be ok.

6. Option batch function

(from Software version M300998 Version 1.19)

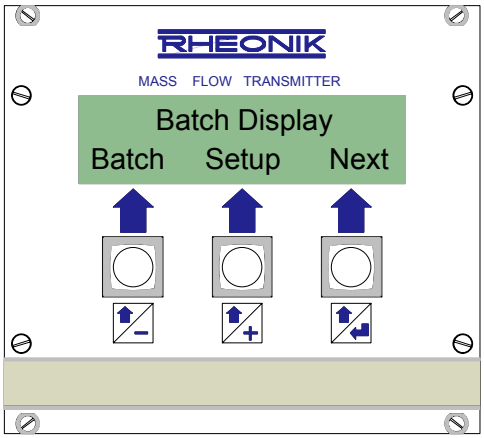
6.1. Introduction

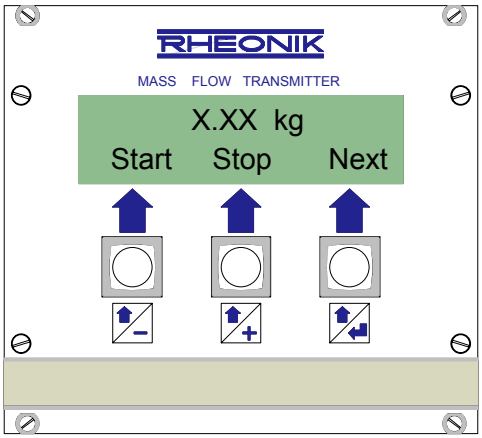
With option batch a 1 stage batch process with automatic overflow control, or a 2 stage batch process without automatic overflow control can be performed. The limit outputs of the RHE 07/08/11 unit can be used via relays to control one or two valves. The ***Preset*** value and the ***Prewarn*** value can be set either by pressing keys in the menu of the remote unit or via serial interface (option).
If automatic overflow control is activated it will automatically after a few batches set the ***Prewarn*** value to the correct value in order to have exactly the required batch value (***Pset*)**. If a batch is stopped, it is possible to decide afterwards to continue (***GoOn***) or to stop the batch and start a new one (***Clear***).
If the power supply is disconnected during a batch, this batch is stopped and cannot be continued from the last value anymore - a new batch has to be started.

6.2. Remote electronic RHE 07/08/11 batch menu

(see batch menu Schema)

To enter the batch menu the left button has to be pressed, then the following menu (picture left) appears.





If you press ***Batch*** you can use the left pushbutton as ***Start*** and middle as ***Stop.***
Press ***Setup*** to configure the ***Pset*** value in mass flow units and after pressing ***Next*** and passing the password, the ***Pwarn* setup** menu will appear.

The configuration of the digital outputs and inputs has to be done in the standard menu under ***Setup I/O =>> Dig.***

In1 (Input 1) can be configured as ***Batch Start*** or ***Batch Stop.***
In2 (Input 2) can be configured as ***Batch Start*** or ***Batch Stop.***

The function of ***Out active=clsd*** or ***open*** has no effect for the batch functions (always setup as ***active clsd***).
The valve is therefore always closed if there is a power failure on the batch system.
Preset and ***Prewarn-*** outputs have the status **off**, if the valves are open. The **Error** output has the status ***off***, if there is no error !

Out1 (output 1) can be configured ***Preset*** or ***Prewarn*** (or standard function)
Out2 (output 2) can be configured ***Preset*** or ***Prewarn*** (or standard function)
Out3 (output 3) can be configured ***Preset*** or ***Prewarn*** (or standard function)

6.3. Option code selection

Choose in the service and diagnosis menu the sub-menu-step ***Calibration Menu.***
Now press all 3 buttons in the same time.
The Display shows "***Option= 0.00000*** "
Press the + or – button to select the needed code.
If you can see the right code please press the ***Next*** button and the chosen option is active now.

- If activated - switch off the batch function with code "***Option = 0.00005*** ", go out of the menu and start the same procedure again.

- with "***Pass = 0.02808*** " you can chose TWO STAGE BATCH function with ***Preset*** and ***Prewarn*** without automatic overflow control "aoc".

- or with "***Pass = 0.02809*** " you can chose SINGLE STAGE BATCH function with just ***Preset*** and automatic overflow control "aoc" (***Prewarn*** will be set automatically).

6.4. Examples with explanation

Example 1:
We have a 1 stage batch process (1 batch valve) and want to batch a quantity of 100 kg:

Pset to be set on 100 kg
Pwarn to be set on an estimated value depending on the delay time i.e.: 2 kg

If the option aoc (automatic overflow control) is not activated the ***Pwarn*** value will always be activated at 98 kg and will close the valve. The ***Pset*** output will not be connected to any valve in this configuration.
If "**aoc**" is active, the ***Pwarn*** value will be controlled or optimized automatically in such a way that the ***Pset*** value will be reached after several batches.

Example 2:
We have a 2 stage batch process with one valve for the main flow and 1 valve for the small flow. The output for ***Pset*** will be connected to the small flow valve and the output for ***Pwarn*** to the main flow valve.

Pset to be set to 100 kg
Pwarn to be set to an estimated value depending on the delay time i.e.: 2 kg

The "**aoc**" can not be activated now !
The main flow valve will close at 98 kg and the small flow valve will close at 100 kg. This means that still a very small overflow will appear. This can be eliminated by changing the ***Pset*** value to a smaller corresponding value.

6.5. Serial interface and batch option

In addition to the standard serial interface requests and actions there are additional codes that can be used with option code "batch" active only.

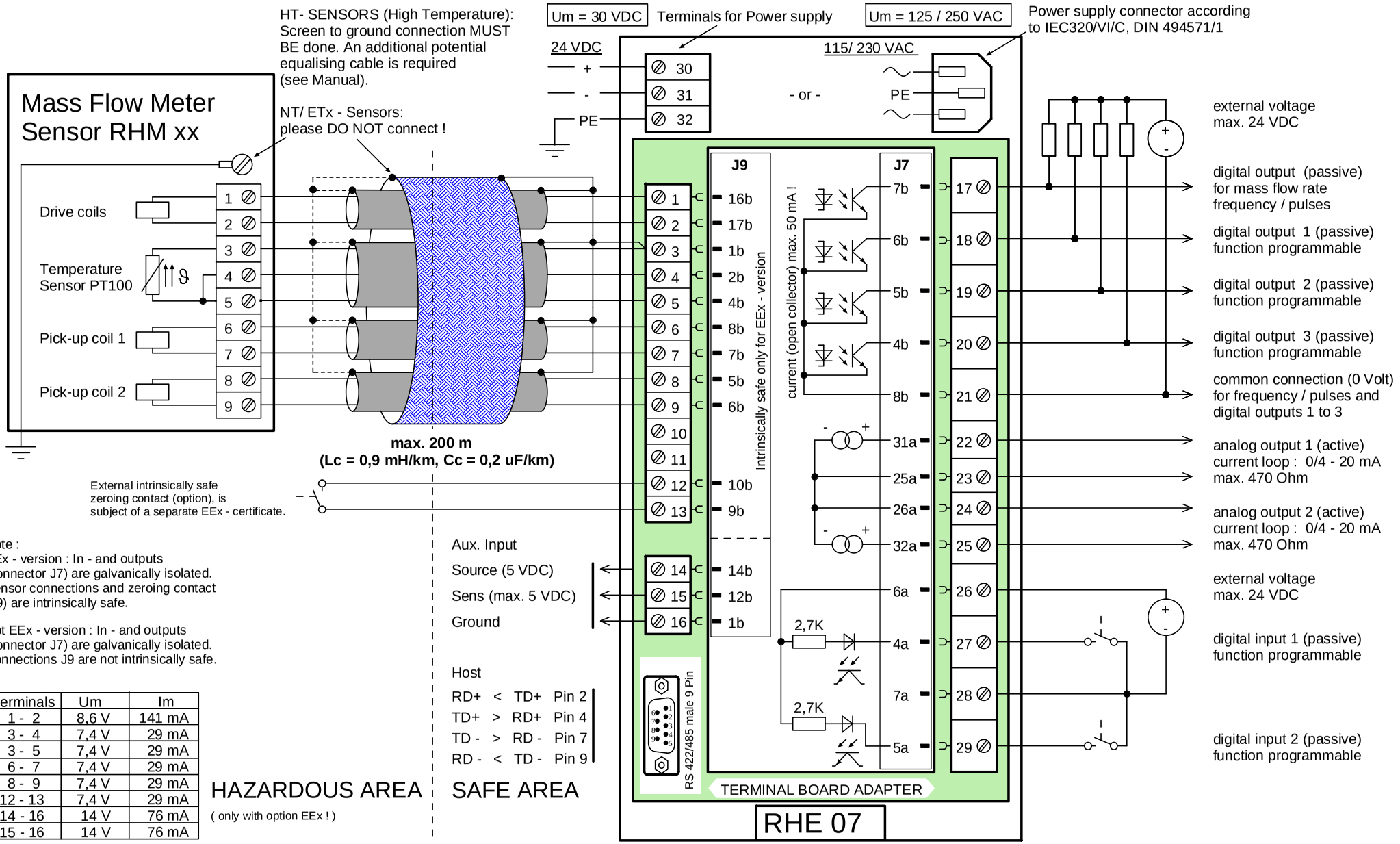
requests:	format:
print ***Preset*** value:	***7FH,7FH, '#' , <A> , 'BRs' , '?' ,0D,0A,7FH,7FH***
print ***Prewarn*** value:	***7FH,7FH, '#' , <A> , 'BRw' , '?' ,0D,0A,7FH,7FH***
write ***Preset*** value:	***7FH,7FH, '#' , <A> , 'BWsXXXXXXXEE' ,0D,0A,7FH,7FH***
write ***Prewarn*** value:	***7FH,7FH, '#' , <A> , 'BWwXXXXXXXEE' ,0D,0A,7FH,7FH***
	X: '0' , '1' , ... '9' or '.'
	EE: mass unit characters i.e. 'kg'
Actions:	
batch ***Start*** :	***7FH,7FH, '#' , <A> , 'Bst' ,0D,0A,7FH,7FH***
batch ***Stop*** :	***7FH,7FH, '#' , <A> , 'Bsp' ,0D,0A,7FH,7FH***
batch ***Clear*** : *)	***7FH,7FH, '#' , <A> , 'Bsc' ,0D,0A,7FH,7FH***

*) *not for program versions before 1.24 (M221299)*

7. Replacement parts

Part number	description
NT 06	Power Supply (115/230 VAC ; ± 10%)
NT 07	Power Supply (24 VDC ; ± 10%)
MZ 03	Safety Board - Intrinsically Safe
MV 03	Amplifier and Signal Conditioning Board
MM 03	Processor Board
MIO 03	I/O Board
Display	LCD Board
MB 07/08/11	Motherboard RHE 07/08/11
TR 50.2	Fuse 0.2 A
TR 51.0	Fuse 1 A
DINCON	Sensor/IO DIN - connector with housing for RHE07

Attention:
For sensor RHM: Due to technical reasons, only complete RHM can be offered as spare parts.
If you have a standard sensor RHM with sealing, the sensor however could be offered without connector block or flange as a spare part.

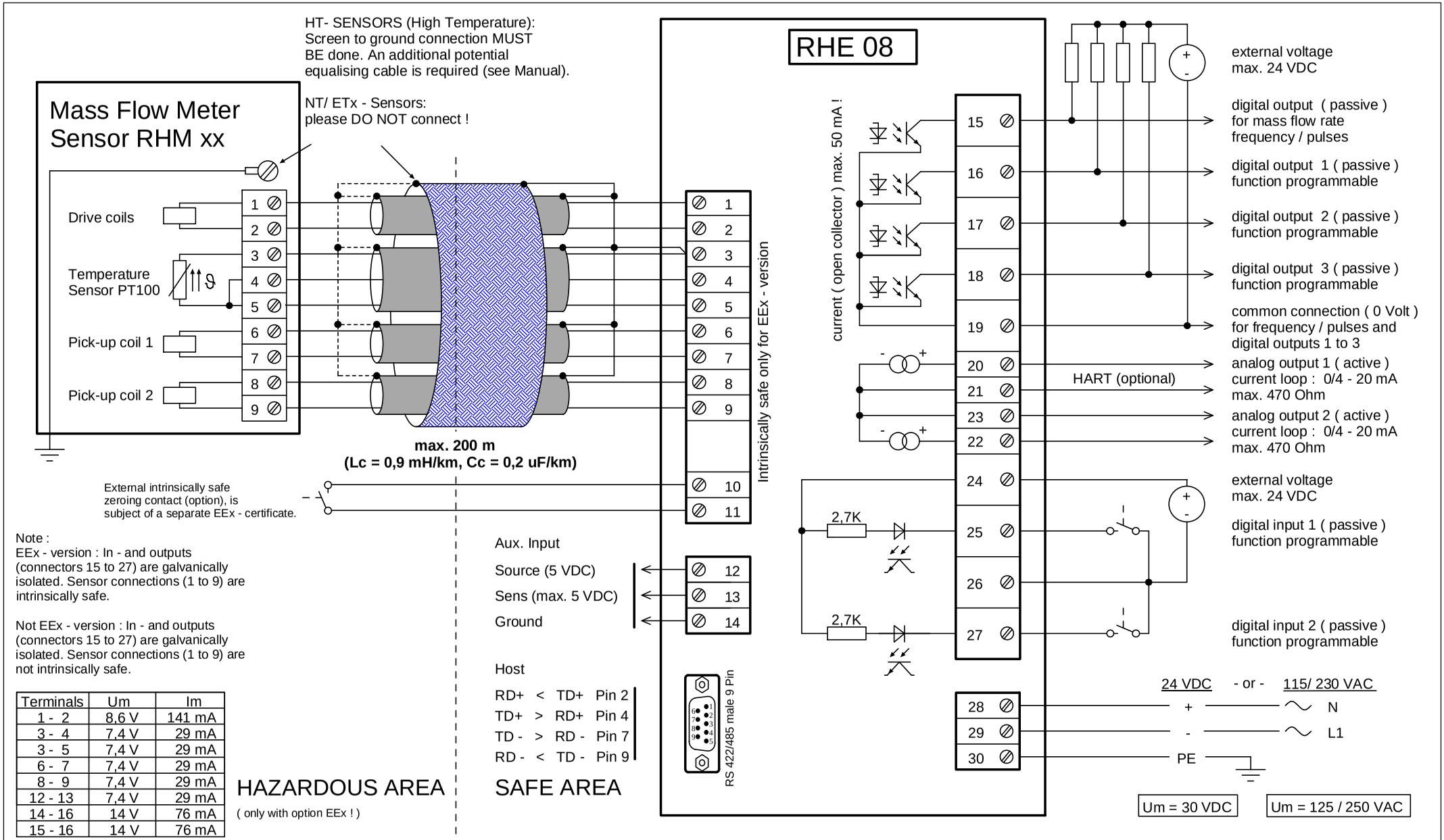


Note :
EEx - version : In - and outputs
(connector J7) are galvanically isolated.
Sensor connections and zeroing contact
(J9) are intrinsically safe.

Not EEx - version : In - and outputs
(connector J7) are galvanically isolated.
Connections J9 are not intrinsically safe.

Terminals	Um	Im
1 - 2	8,6 V	141 mA
3 - 4	7,4 V	29 mA
3 - 5	7,4 V	29 mA
6 - 7	7,4 V	29 mA
8 - 9	7,4 V	29 mA
12 - 13	7,4 V	29 mA
14 - 16	14 V	76 mA
15 - 16	14 V	76 mA

created :		RHEONIK	Wiring diagramm RHE 07 standard	Project	
Date	14.04.2004			Customer	
Drawn	H.G.Rudolph			Draw. - Rev.	E07W-E_v5
Appr.	U.Hettrich			Sheet	1 / 1

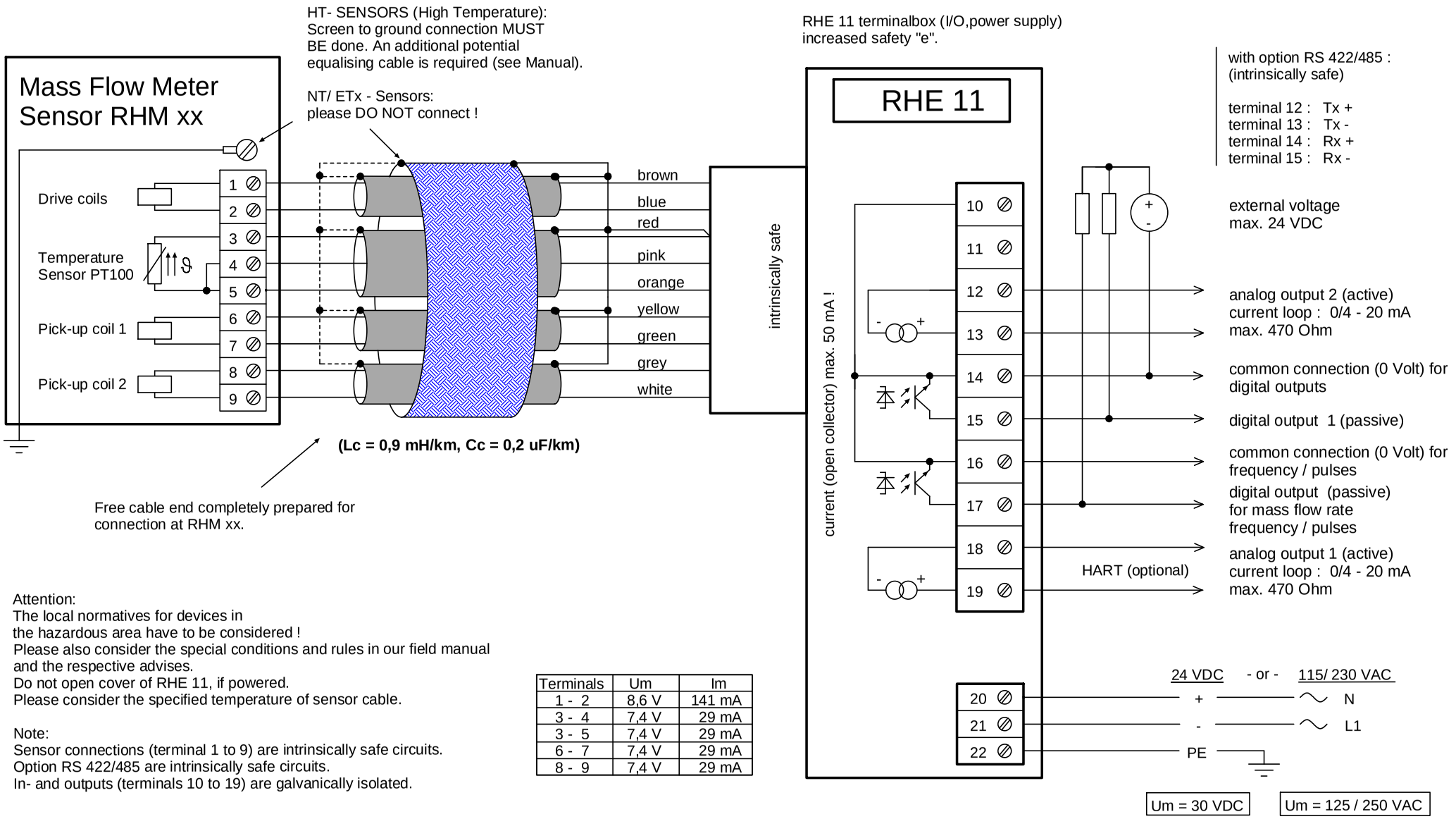


Note :
EEx - version : In - and outputs (connectors 15 to 27) are galvanically isolated. Sensor connections (1 to 9) are intrinsically safe.

Not EEx - version : In - and outputs (connectors 15 to 27) are galvanically isolated. Sensor connections (1 to 9) are not intrinsically safe.

Terminals	Um	Im
1 - 2	8,6 V	141 mA
3 - 4	7,4 V	29 mA
3 - 5	7,4 V	29 mA
6 - 7	7,4 V	29 mA
8 - 9	7,4 V	29 mA
12 - 13	7,4 V	29 mA
14 - 16	14 V	76 mA
15 - 16	14 V	76 mA

created :			
Date	15.04.2004	Wiring diagramm RHE 08 standard	Project
Drawn	H.G.Rudolph		Customer
Appr.	U.Hettrich		Draw. - Rev. E08W-E_v5
			Sheet 1 / 1

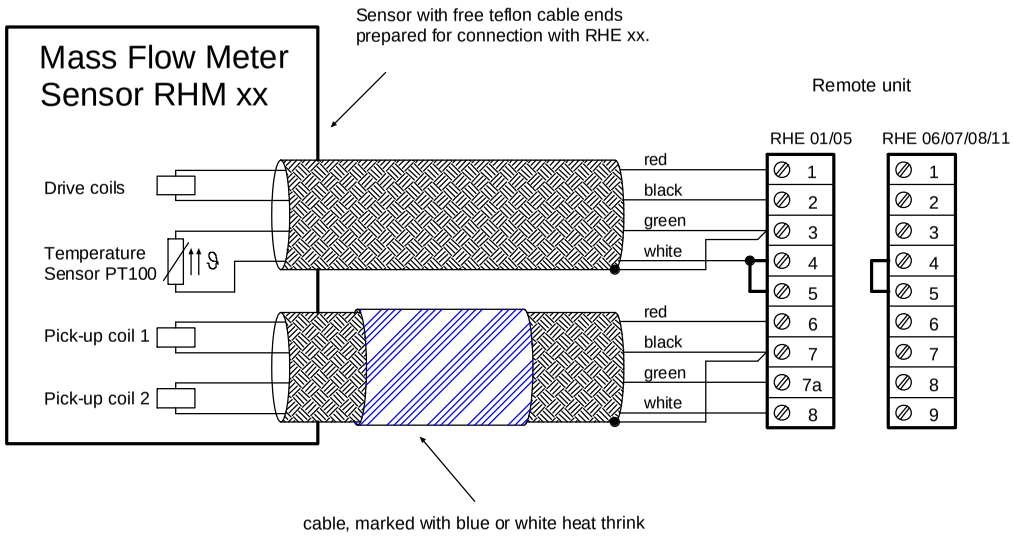


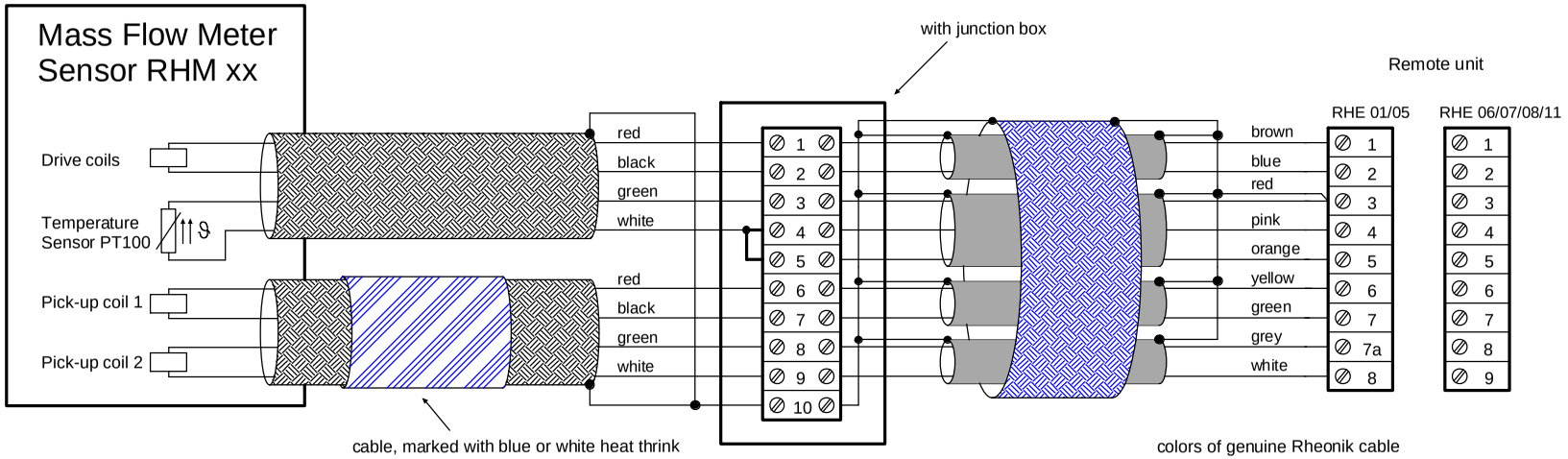
Attention:
The local normatives for devices in
the hazardous area have to be considered !
Please also consider the special conditions and rules in our field manual
and the respective advises.
Do not open cover of RHE 11, if powered.
Please consider the specified temperature of sensor cable.

Note:
Sensor connections (terminal 1 to 9) are intrinsically safe circuits.
Option RS 422/485 are intrinsically safe circuits.
In- and outputs (terminals 10 to 19) are galvanically isolated.

Terminals	Um	Im
1 - 2	8,6 V	141 mA
3 - 4	7,4 V	29 mA
3 - 5	7,4 V	29 mA
6 - 7	7,4 V	29 mA
8 - 9	7,4 V	29 mA

created :		RHEONIK	Wiring diagram RHE 11 standard (2 analog outputs)	Project	
Date	15.04.2004			Customer	
Drawn	H.G.Rudolph			Draw. - Rev.	E11W2A-E_v4
Appr.	U. Hettrich			Sheet	1 / 1

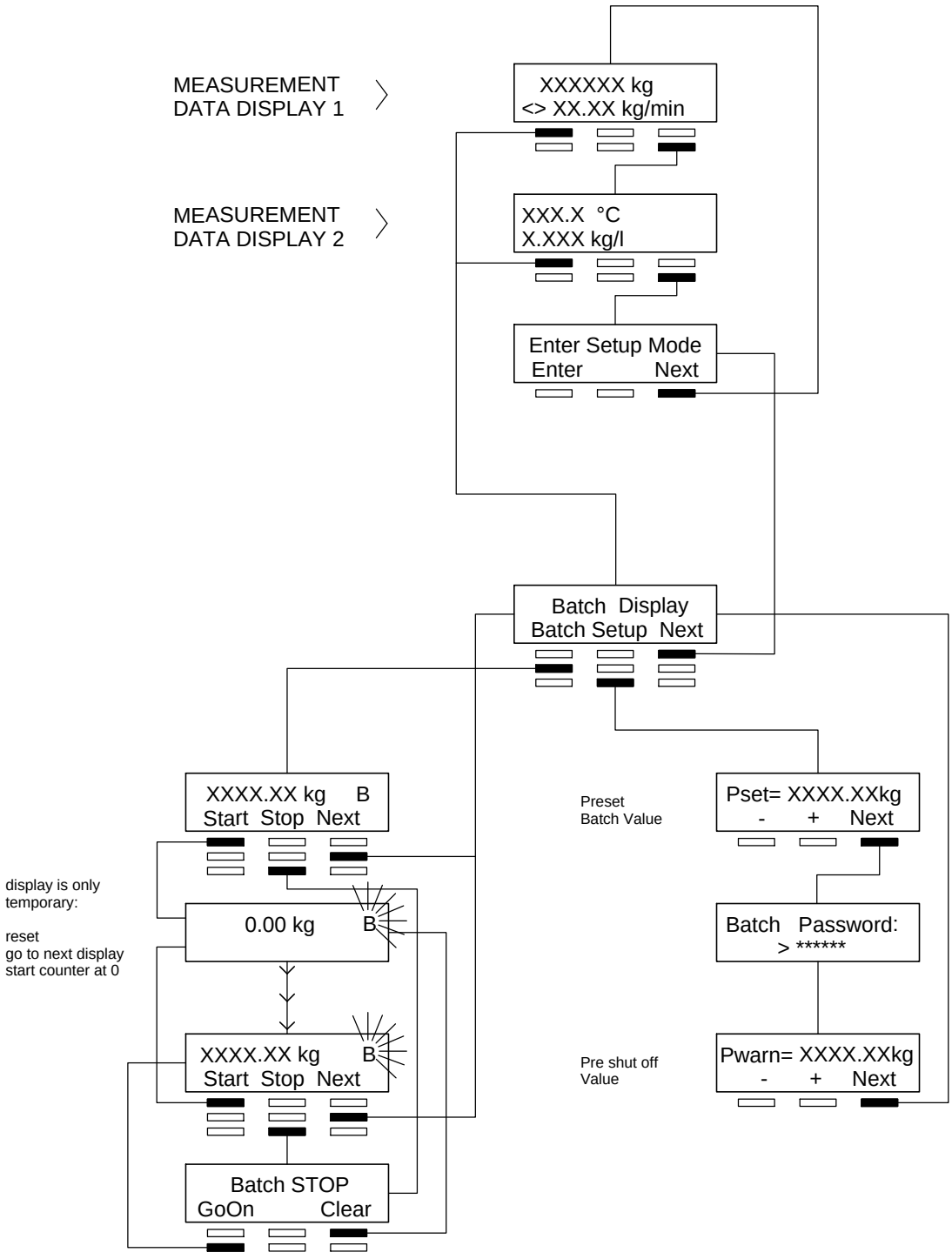




Erstellt :		Änderung :		RHEONIK	Wiring diagram RHE XX to RHM XX with free cable ends	Projekt	
Datum	16.11.2001	Datum				Kunde	
von	H.G.Rudolph	Bearb.				Z. - Nr.	EXXWFCE-E
Gepr.	M.Küppers	Gepr.				Blatt	1 / 1

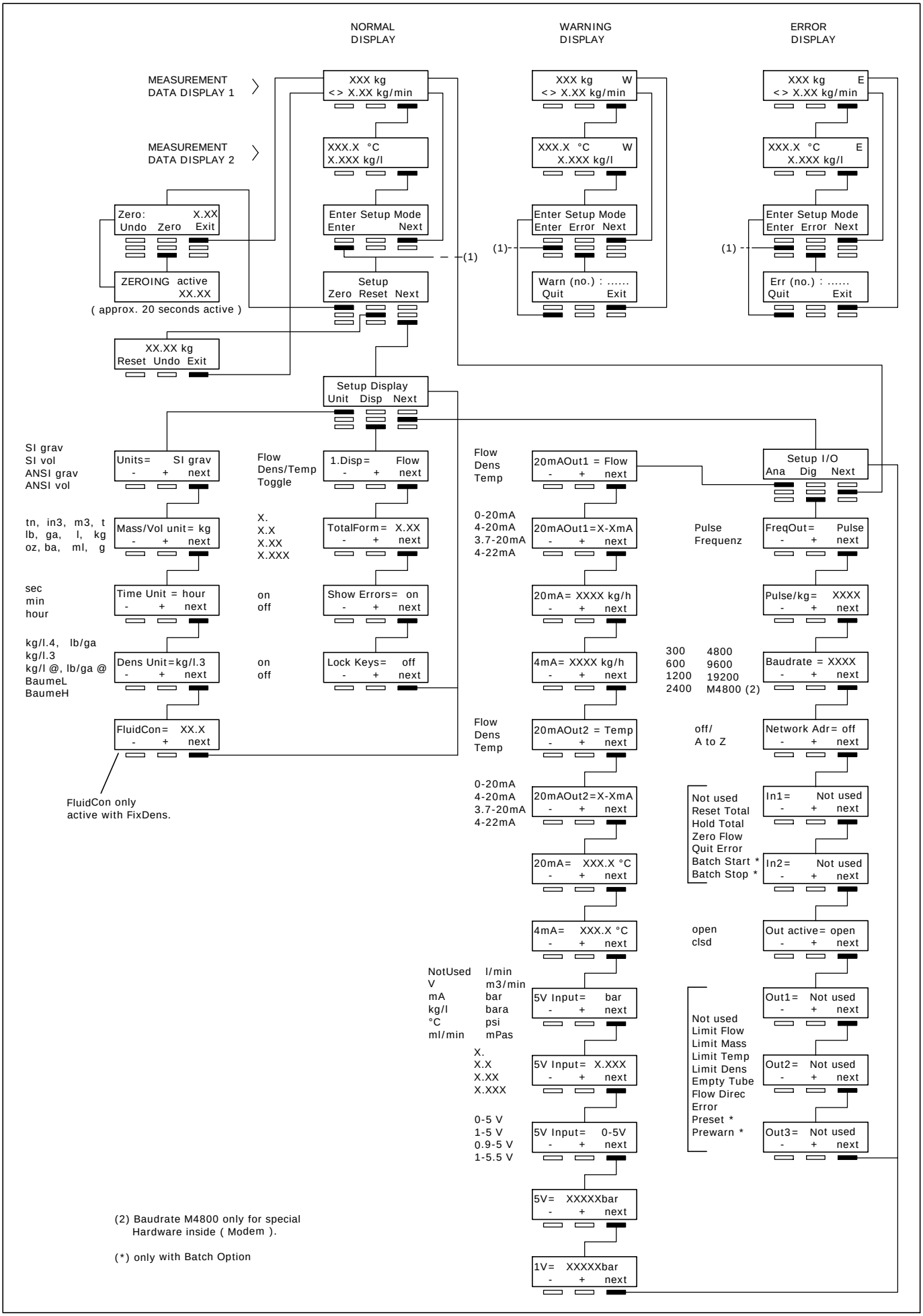
RHE 07-11 BATCH MENU

(BATCH OPTION has to be activated)



blinking B disappears after "Preset-Value" is reached.

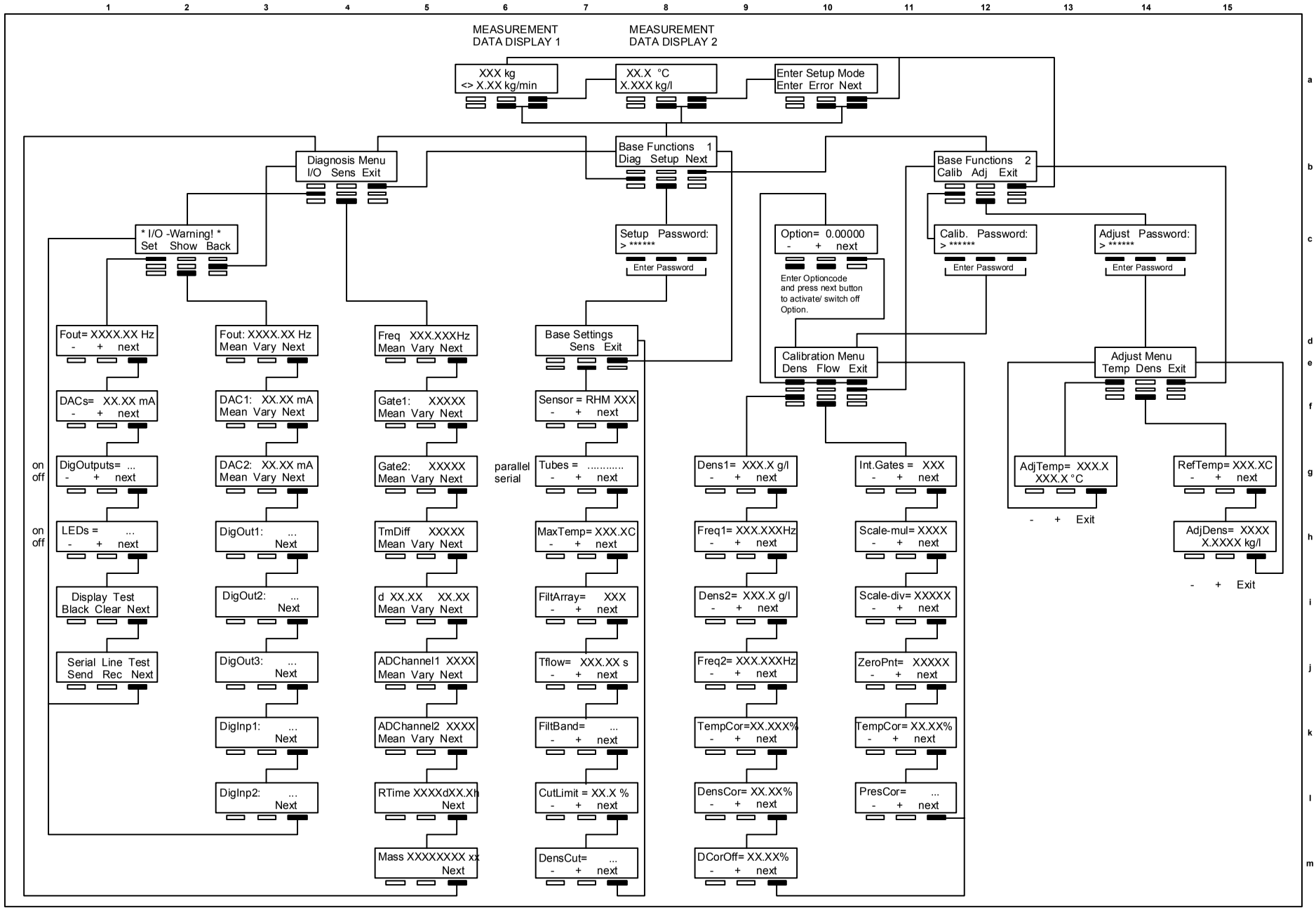
RHE 07-11 BASIC LEVEL USER MENU (ANWENDER MENÜ)



(2) Baudrate M4800 only for special Hardware inside (Modem).

(*) only with Batch Option

RHE 07-11 SERVICE AND DIAGNOSTICS MENU SERVICE UND DIAGNOSE MENÜ



V1 - 03/03 created by : service@rheonik.de

Ex-Safety Instruction for the operating manuals

Description:

The Rheonik Coriolis massflow meter system RHM/RHE has been designed and manufactured according to ATEX 94/9/CE directive with reference to EN50014, EN50018, EN50019, EN50020 standards. The measurement system is a flow-sensor RHM, connected by a multiconductor cable to the remote electronic unit RHE. Depending on the type the remote also can be mounted inside the hazardous area (see table – installation location).

Instrument type	Installation location	Group/Category	Type of protection
Sensor RHM	hazardous area, Zone 0, 1 or 2	II 1 G	EEx ia II C
Remote unit RHE06	safe area	II (1) G	[EEx ia] II C
Remote unit RHE07	safe area	II (1) G	[EEx ia] II C
Remote unit RHE08	safe area	II (1) G	[EEx ia] II C
Remote unit RHE11	hazardous area, Zone 1 or 2	II 2 (1) G	EEx d e [ia] II C

Hazardous area Group II	Zone (CENELEC) EN60079-14	Categories acc. to 94/9/CE directive
Gas, mists or vapours	Zone 0	1 G
Gas, mists or vapours	Zone 1	2 G
Gas, mists or vapours	Zone 2	3 G

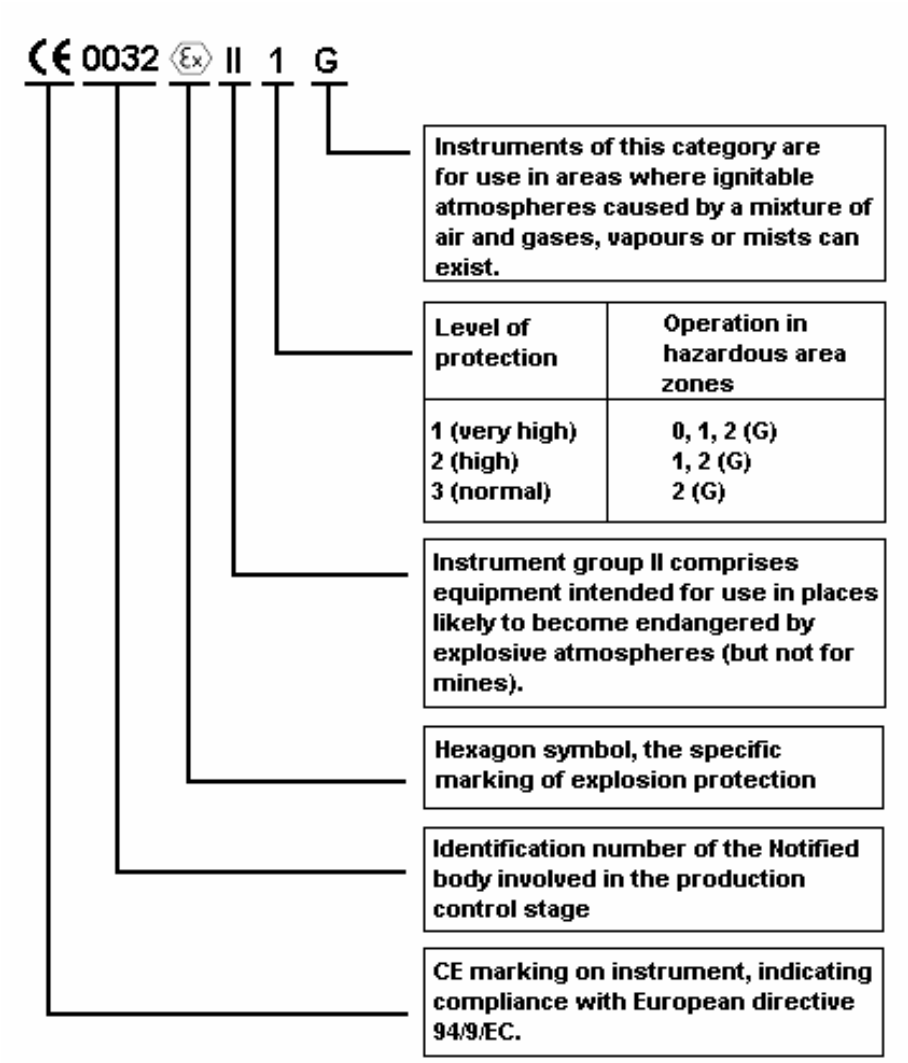
Marking:

The instrument marking comprises two parts:

1. The **specific marking**, which indicates for which ignitable atmospheres the instrument will be suitable, for which hazardous area installation locations, depending on the degree of protection, and who is the notified body, involved in the production control stage.

2. The **additional marking** gives necessary information essential for safe use. This supplementary marking is according to the European standard series EN 50014 for electrical products for potentially explosive atmospheres.

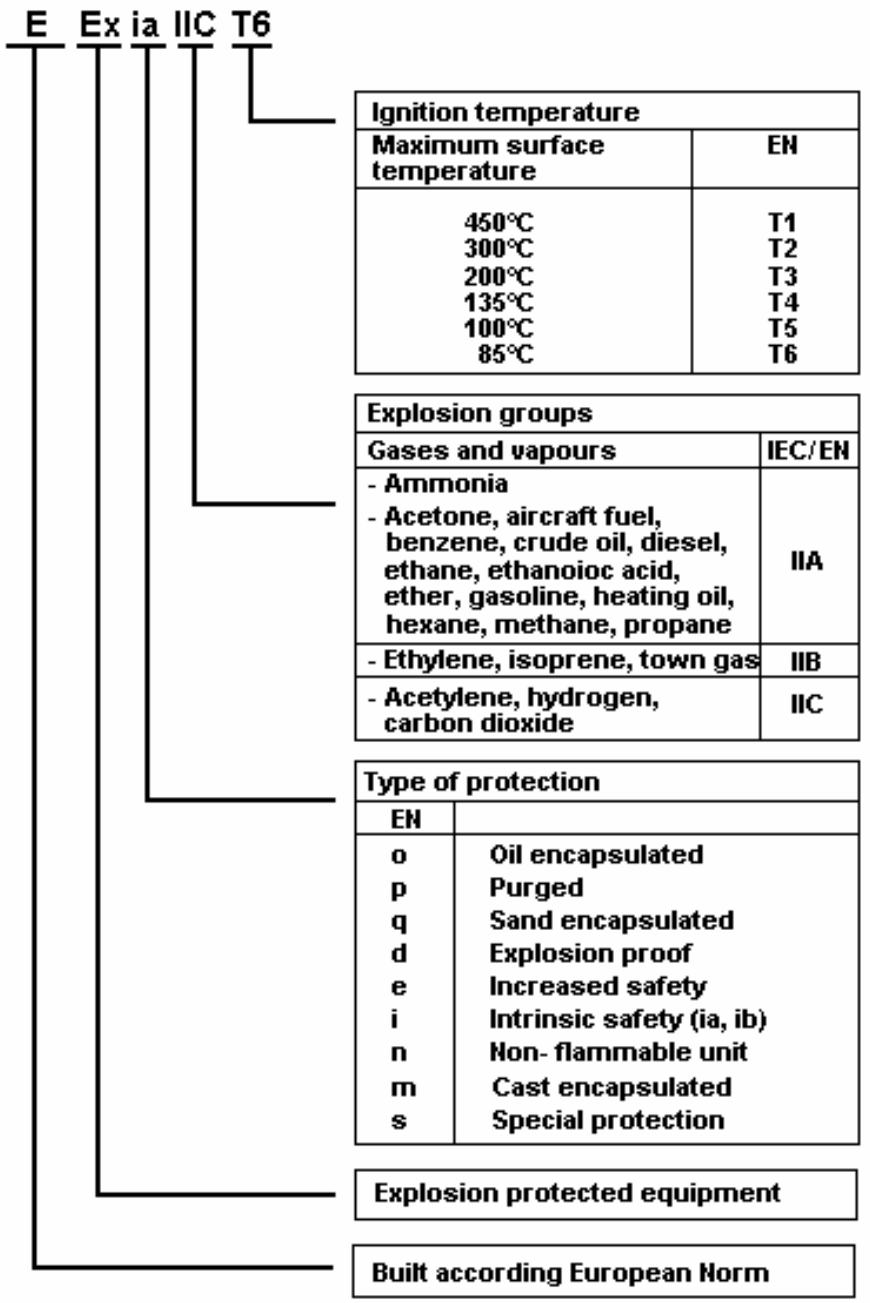
1 . Specific Marking:



Note:

If the number, indicating the level of protection is put into brackets, the instrument can be installed in a safe area only, but can be connected to the indicated category instruments in the hazardous area !

2. Additional Marking:



Electrical characteristics:

Intrinsically safe sensor RHM circuits, when connected to RHE:

Circuit name	Terminals	Uo [V]	Io [mA]	Lo [mH]	Co [uF]	Po [mW]
Drive coil	1 - 2	8, 6	141	1,6	4,8	310
PT100 sense	3 - 4	7,4	29	35	10	54
PT100 current	3 - 5	7,4	29	35	10	54
Sense coil 1	6 - 7	7,4	29	35	10	54
Sense coil 2	8 - 9	7,4	29	35	10	54

Power supply circuit, remote unit RHE (galvanically isolated):

Remote unit type	Rated voltage	Rated frequency	Maximum voltage (Um)	Rated power
RHE 06	230 VAC	50/60 Hz	250 VAC	15 VA
RHE 06	115 VAC	50/60 Hz	125 VAC	15 VA
RHE 07, 08, 11	230 VAC	50/60 Hz	250 VAC	10 VA
RHE 07, 08, 11	115 VAC	50/60 Hz	125 VAC	10 VA
RHE 07, 08, 11	24 VAC	50/60 Hz	26 VAC	10 VA
RHE 07, 08, 11	24 VDC	DC	30 VDC	10 VA

Temperature tables:

Measurement fluid temperatures (at ambient temperature 60°C):

Max. fluid temperature [°C] in temperature class

at Ta = 60°C	T6	T5	T4	T3	T2	T1
Sensor RHM NT	50	65	100	120	-	-
Sensor RHM ET	-	-	-	165	210	-
Sensor RHM HT	-	-	-	165	260	350

Min. fluid temperature [°C] in temperature class

at Ta = 60°C	T6	T5	T4	T3	T2	T1
Sensor RHM NT	-20	-20	-20	-20	-20	-20
Sensor RHM ET	-45	-45	-45	-45	-45	-45
Sensor RHM HT	-20	-20	-20	-20	-20	-20

Note: With the temperatures given, and for a certain temperature class the sensor RHM components must not be subjected to any non-permissible temperatures.

Remote unit RHE ambient temperatures Ta :

Remote unit type	Min. T_a [°C]	Max. T_a [°C]	Temperature class
RHE 06	-40	+80	-
RHE 07	-40	+60	-
RHE 08	-40	+60	-
RHE 11	-40	+60	T5

Note: Remote units RHE 06, 07 and 08 are for installation in safe area only.

Safety instructions for the installation in a hazardous area:

- The measurement system shall be installed & maintained according to the applicable standards regarding electrical installations in a hazardous area (EN60079-14, 17).
- Before installation, **read carefully the operating manual** of the RHEONIK massflow meter.
- The mounting, electrical installation, commissioning and maintenance are to be carried out by qualified personal only who are trained in explosion protection.
- All national regulations concerning the installation, maintenance and repair of instruments in explosion hazardous areas must be observed (EN 60079-17 and EN60079-19).
- The required temperature class, based on the ambient temperature and the fluid temperature must correspond to the values indicated on the meter Ex-type label or as indicated in paragraph "Temperature Tables" in this safety instruction manual.
- It is only permitted to open the Remote unit RHE11 after observing a cooling time of ten minutes after power has been disconnected. DO NOT OPEN WHILE ENERGIZED.
- Clean the RHE11 dome cover window only with wet cloths or antistatic products.
- Don't change increased safety cable glands (Ex-e) or flameproof cable glands (Ex-d) with any other type, that do not have this type of protection.
- The sensor cable connection between sensor RHM and the remote unit RHE is intrinsically safe. Only the cable delivered by RHEONIK may be used. The use of any other cable shall be clarified with RHEONIK beforehand.
- For installation below minus 30 °C the steel armored cable, blue, must be used. The use of any other cable shall be clarified with RHEONIK beforehand.
- The maximum cable length between sensor RHM and remote unit RHE is 200 meters.
- The cable installation close to the sensor RHM must be done in such a way that the cable temperature will not exceed 70 °C. Therefore care must be taken to avoid any loose cable length touching a hot sensor surface or any other hot equipment.
- Always close unused terminal box cable connections with dummy plugs
- Information about the type of protection method can be found out from the ex- plate (see also the instructions concerning labels in this instruction sheet).
- In accordance with details indicated on the ex-plate, the equipment may be used under conditions where ignitable atmospheres composed of a mixture of air and other gases, steam or dust are present. The equipment is not suitable for mines.
- The sensor RHM (type of protection intrinsic safety, ia) can be installed in hazardous areas 0, 1 or 2.
- The maximum temperature of the liquid to be measured l (ambient temperature), is dependent on the temperature class which is indicated on the sensors ex-plate.

- The electronic units RHE 06, 07 and 08 (type of protection: intrinsic safety, [ia]) may only be installed and operated in safe areas, but the intrinsically safe circuits (blue terminals) can be connected to a sensor RHM which is installed in an hazardous area.

- The remote unit RHE11 (type of protection: pressure proof capsule, enhanced safety, intrinsic safety, d e [ia]) and may be installed and operated in hazardous areas 1 or 2. The RHE11 temperature class is T5 (60°C) and has a pressure proof housing.. All connections such as inputs, outputs and power supply are connected via the terminals of a terminal box with enhanced safety.

CE

DECLARATION OF CONFORMITY

We, the offerer:

RHEONIK® Meßgeräte GmbH, Rudolf Diesel Str. 5, 85235 Odelzhausen, Germany

acknowledge our sole responsibility, that the product:

Kind of equipment: **Coriolis Mass Flow Meter**

Type designation: **RHM® massflow sensor**

RHE® remote unit/flow transmitter

in accordance with EMC Directive 89/336/EEC and it´s amendments 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC,
is in compliance with the following norm(s) or document(s):

Technical regulations: **EN 61000-6-2, EN 61000-6-3, EN 6100-6-4**

in accordance with the Low Voltage Directive 73/23/EEC and it´s amendment 93/68/EEC,
is in compliance with the following norm(s) or document(s):

Technical regulations: **EN 61010-1**

in accordance with the ATEX Directive 94/9/EEC,
is in compliance with the following norm(s) or document(s):

Technical regulations: **1) EN 50014, EN 50018, EN50019, EN50020**
2) EN 50284

in accordance with the Pressure Vessel Directive 97/23/EEC,
is in compliance with the following norm(s) or document(s):

Technical regulations: **AD2000-A4, DIN3840**

1 January 2003

RHEONIK Meßgeräte GmbH
Rudolf Diesel Str. 5
85235 Odelzhausen

Michael Küppers
Managing Director, RHEONIK GmbH,
Manufacturer