

**Operating Manual**  
**for**  
**Flow-Totalizer**  
**Model: ZOE**



2" pipe mounting kit



Wall mounting kit

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### Manufactured and sold by:

Kobold Messring GmbH  
Nordring 22-24  
D-65719 Hofheim  
Tel.: +49(0)6192-2990  
Fax: +49(0)6192-23398  
E-Mail: [info.de@kobold.com](mailto:info.de@kobold.com)  
Internet: [www.kobold.com](http://www.kobold.com)

## 2. Note

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Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

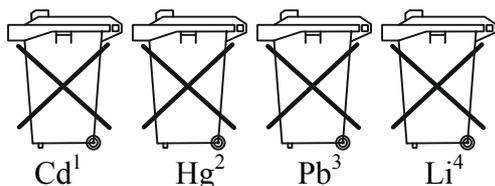
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

### 2.1 Notice according to the Battery Law

Old batteries do not belong in household waste. You can send the batteries back to us or an authorized address, free of charge. As consumer, you are legally obliged to return the used batteries.

Contaminated batteries are provided with a mark consisting of a crossed-out trash and the chemical symbol (Cd, Hg, Li or Pb) of heavy metal for classification as respective contaminant:



1. "Cd" stands for cadmium.
2. "Hg" stands for mercury.
3. "Pb" stands for lead.
4. "Li" stands for lithium.

## 3. Instrument Inspection

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Instruments are inspected before shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / delivery agent immediately, since they are responsible for damages during transit.

### **Scope of delivery:**

The standard delivery includes:

- Flow counter/- unit/-- in plastic- universal housing with wall or pipe mounting set  
Model: ZOE-ZX with universal housing 'K'  
OR  
Oval gear flow meter DON- with electronics option –ZE/ZB in compact version  
Model: ZOE-ZX with universal housing 'M'
- Operating Manual
- Battery 3.6 V Lithium size AA for battery mode

## 4. Regulation Use

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The electronic units ZOE-ZX are specifically designed for the calculation, display and transfer of calculations and flow rates of flow meters with pulse or frequency outputs. The instruments display flow rate, day counter (resettable) and total counter in the operator-selected units. A menu guides you through the programming of the device that largely eliminates the requirement of constant usage of operating manual. All user-specific program settings are retained even when changing the battery.

A trouble-free operation of the device is only guaranteed if all instructions in this manual are complied. We do not accept any liability for damage caused by failure to follow these instructions.

## 5. Environment

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The electronic options ZOE-ZX are weather resistant and adequately reflect IP66/67 (NEMA 4X). The electronics are housed in a UV-resistant, glass-filled nylon housing with stainless steel screws and FPM seals.

The instruments are suitable for harsh indoor or outdoor environments and comply with EU Directive 2014/30/EU (Electromagnetic Compatibility).

## 6. Instrument / Functions overview

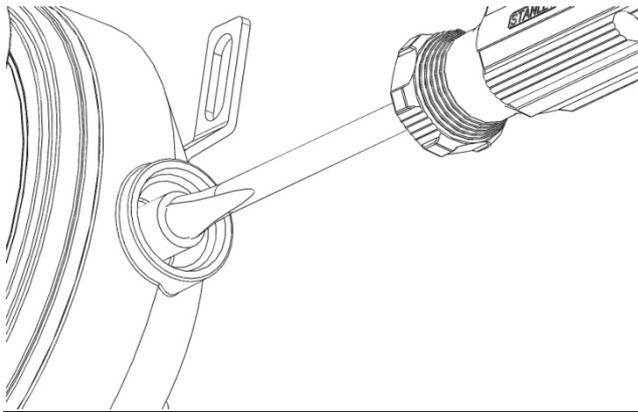
| Function                                       | ZOE-ZExxF3 | ZOE-ZBxxFB |
|------------------------------------------------|------------|------------|
| Dual counting function                         | x          | x          |
| Supply voltage                                 |            |            |
| DC-supply                                      | x          | -          |
| Battery operation                              | x          | x          |
| Sensor supply (only with external supply)      | 8 V        | -          |
| Electrical outputs (only with external supply) |            |            |
| Pulse output                                   | x          | -          |
| LCD Display                                    |            |            |
| Selectable units                               | x          | x          |
| Decimal point                                  | x          | x          |
| Accumulated totalizer                          | x          | x          |
| Resettable totalizer                           | x          | x          |
| Linearization                                  | x          | x          |
| Rate display                                   | x          | x          |
| Backlight                                      | x          | -          |

## 7. Electrical connections

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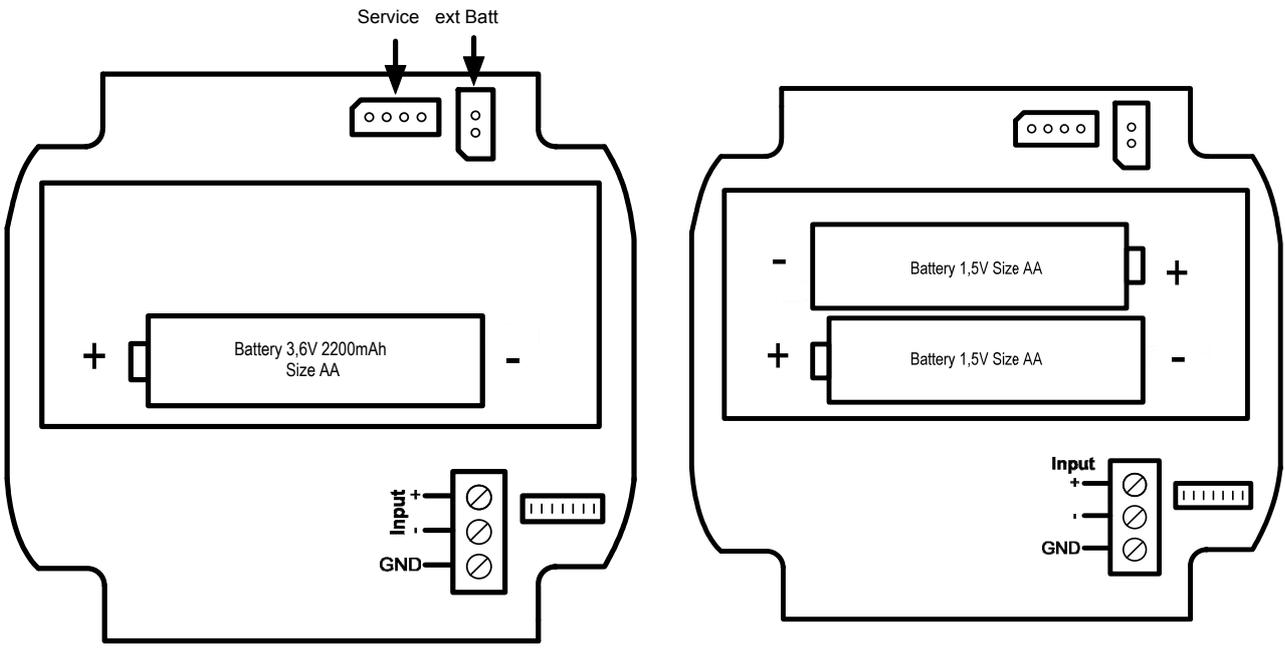
### 7.1 Cable entry for housing option -K

Up to 3 cable entries (M20x1.5 or ½ "NPT) are available for electric connection in case of electronics with plastic housing. To use these cable inlets, the existing factory protection caps must be broken with a tool (e.g. screwdriver) and a suitable cable gland should be screwed in. The cable glands are not included in the delivery.

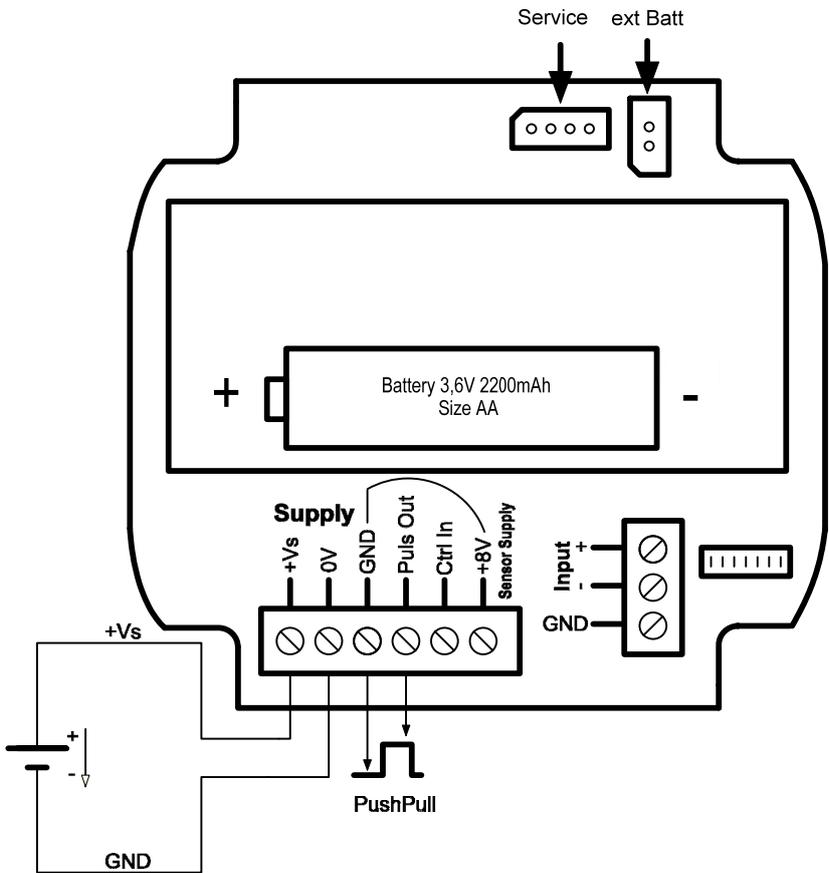


Eruption of cable inlets

7.2 Overview of Terminals ZOE-ZX with Supply option B and 3



Supply option B (only battery- either 1 x 3,6V or 2 x 1,5V)



Supply option 3 (with battery- either 1 x 3,6V or 2 x 1,5V and external supply)

## 7.3 Power Supply

Depending on functionality and features, the electronics offer different possibilities for power supply:

- Options ZOE-ZExxx3xx: Battery and ext. DC-Supply
- Options ZOE-ZBxxxBxx: Battery operation

### 7.3.1 Storing the counter readings

The storage of meter readings is carried out after each measurement cycle in the internal FRAM. If the power is interrupted and re-applied, then the meter reading revert to the last saved values.

### 7.3.2 External DC-Supply

When electronic units are supplied with external DC voltage, all functions are available i.e. Pulse output, display backlight and sensor supply can be used as needed.



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**If the device is taken out of operation and not used for longer periods, the battery must be removed. Otherwise, the device is always supplied by the battery and remains active. As a result, the battery can get discharged.**

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### 7.3.3 Battery operation (ZOE-ZB with supply option B)

The option ZOE-ZX can also be powered by a battery. In battery mode, the device function scope is relatively limited:

- Pulse output is not available.
- The backlight of the display is switched off and cannot be turned on.
- Only passive sensors may be used like reed switches, as they require no additional power supply. Usage of induction coils reduces the battery life. Other sensors, which require a sensor power for operation, are also not suitable for battery operation.

The supplied battery type 3.6 V AA Lithium (2200 mAh) should be inserted in the battery holder on the back side of the electronic (correct polarity is important!).

The following type of battery is required as a replacement for the supplied battery: 3.6 V lithium, size AA, capacity at least 2200 mAh, IEC type CR14505 For example: EVE type ER14505M, SAFT LS14500, Emmerich ER 14505, VARTA CR 14505

Battery life duration: The achievable battery life is dependent on various factors:

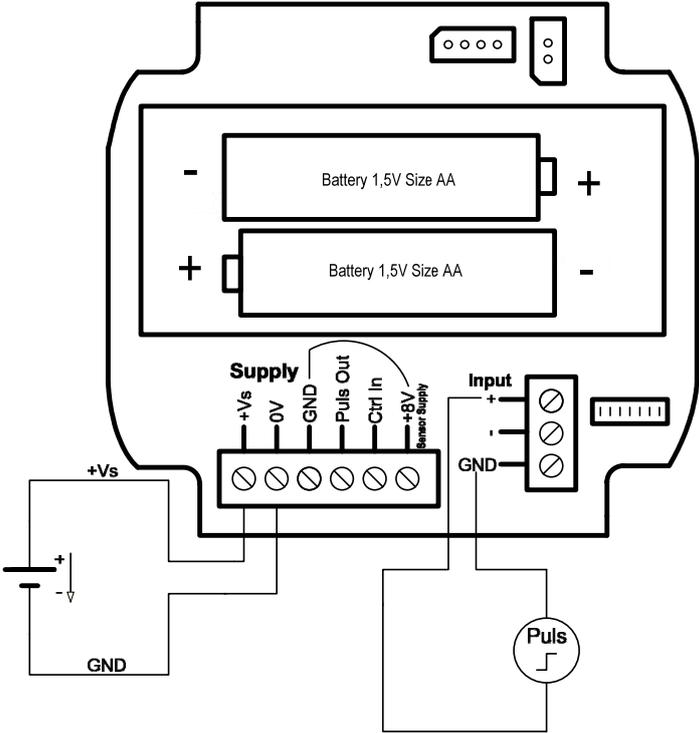
- On the total number of detected input pulses and the input frequency (higher frequencies reduce the battery life)
- On the environmental conditions - low temperatures reduce the usable battery capacity.

### 7.4 Sensor Inputs

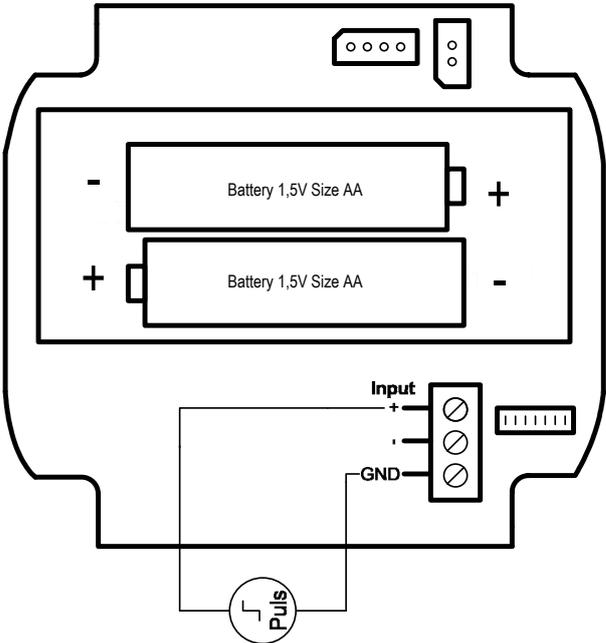
#### 7.4.1 Active pulse signal

Power Supply: External DC-Supply  
Signal input setting: „ACTIVE SIGNAL“

Wiring for ZOE-ZE with Supply option 3:



Wiring for ZOE-Z with Supply option B:



## 7.4.2 Hall Sensor, NPN- and PNP-Sensors

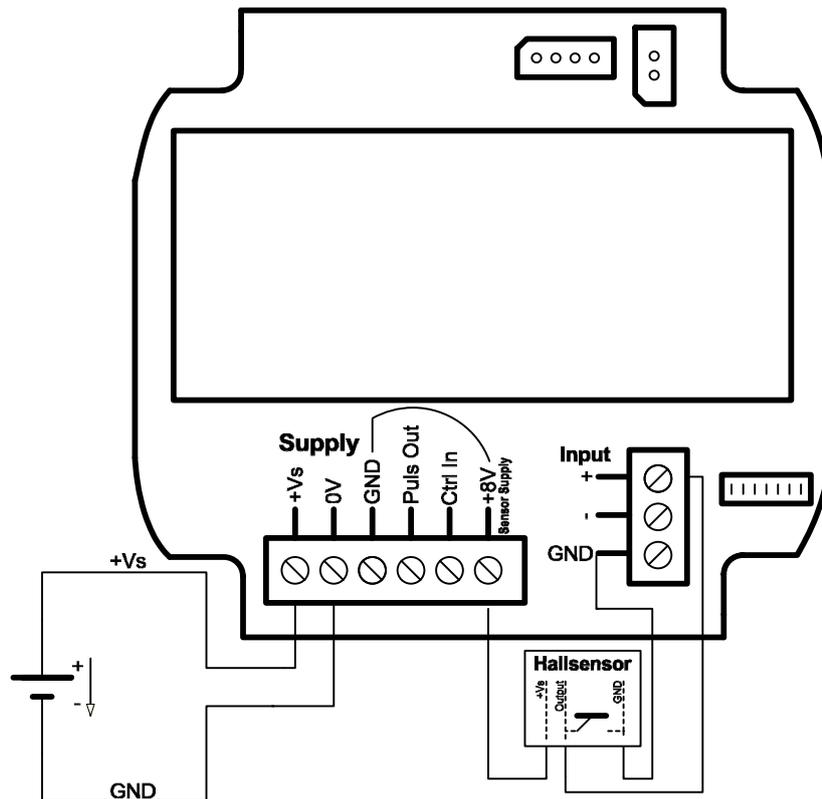
Power supply: only external DC-supply

Signal input setting: „HALL“

Signal input setting: „NPN“

Signal input setting: „PNP“

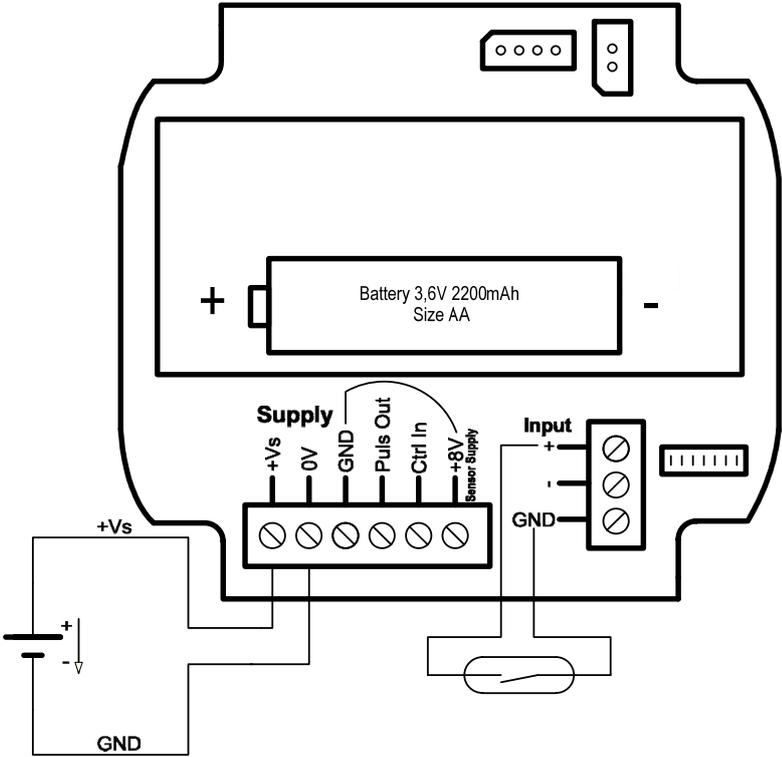
Wiring for ZOE-ZE:



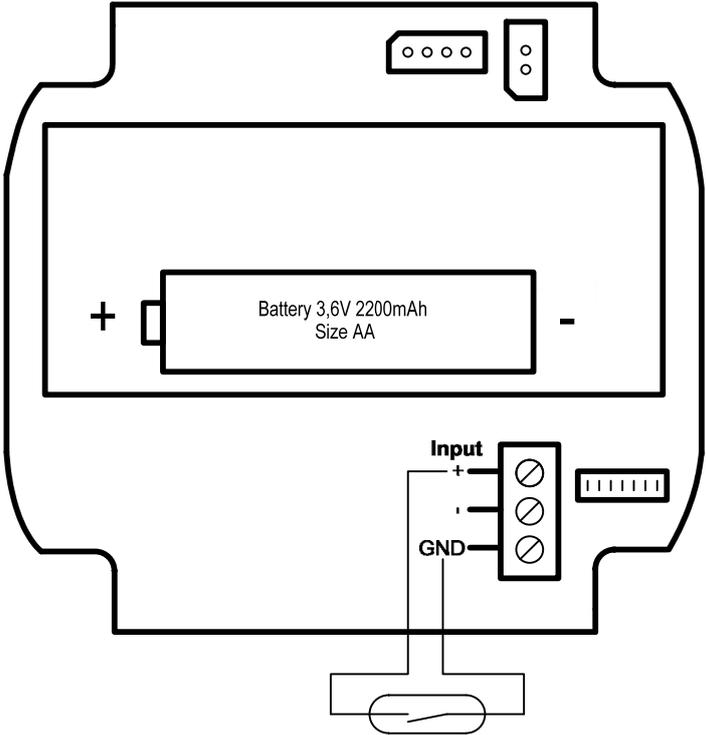
7.4.3 Reed switch

Signal input setting: „REED “

Wiring for ZOE-ZE with Supply option 3:



Wiring for ZOE-Z with Supply option B:

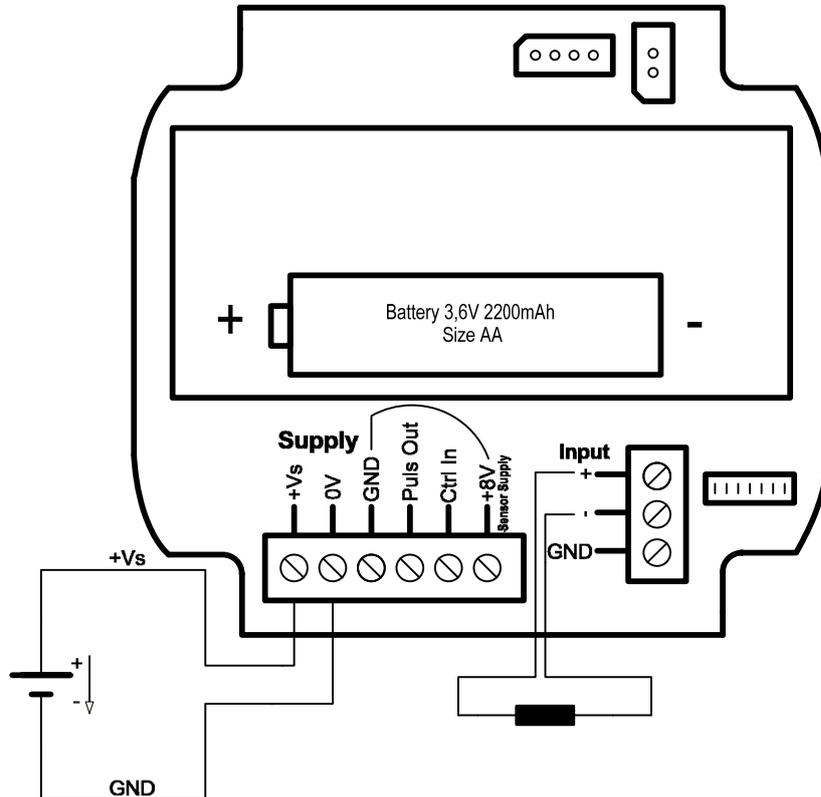


## 7.4.4 Self exciting Coil

Power supply: External DC-supply and battery operation  
(Battery operation reduces battery life)

Signal input setting: „COIL“

Wiring for ZOE-ZE with Supply option 3:

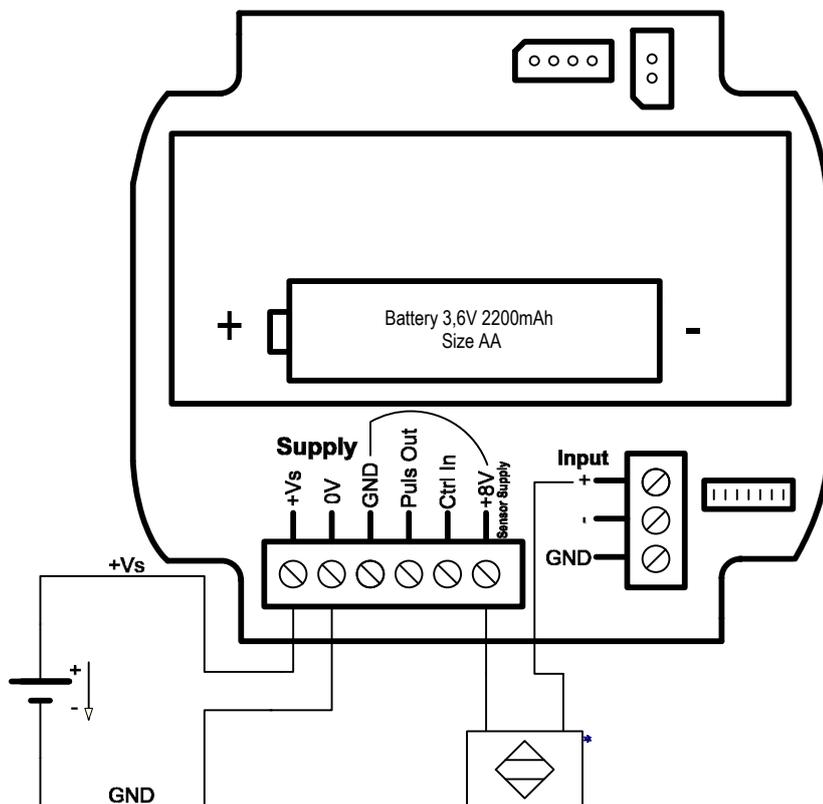


The connection of the DOT (turbine wheel flowmeter) is identical to the connection of the induction coil.

## 7.4.5 Namur-Sensor

Power supply: only external DC-supply  
 Signal input setting: „NAMUR“

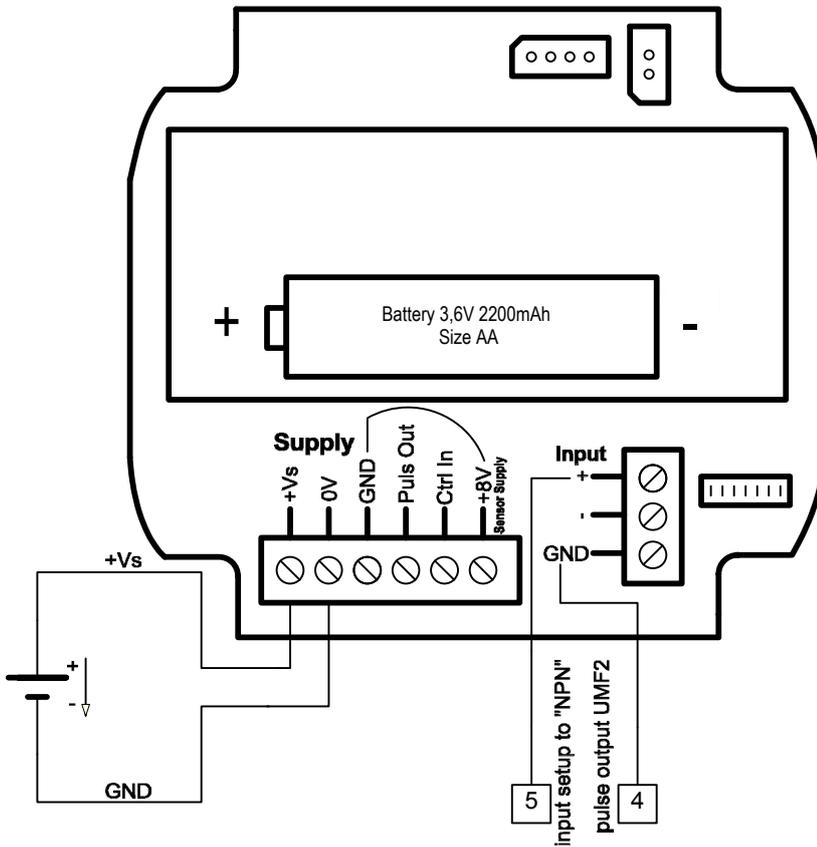
Wiring for ZOE-ZE with Supply option 3:



## 7.4.6 Transducer model UMF2

Power supply: only external DC-supply  
Signal input setting: „NPN“

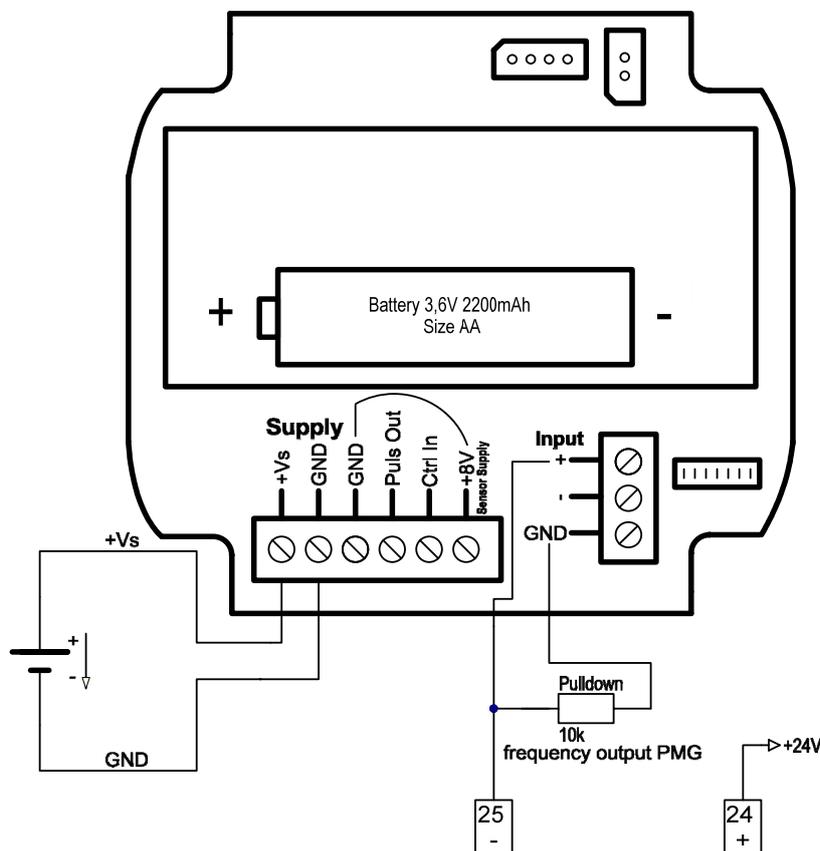
Wiring for ZOE-ZE with Supply option 3:



**7.4.7 PMG (magnetic inductive with frequency output)**

Supply Voltage: only external DC power supply  
 Signal input setting: PNP

Wiring for ZOE-ZE with Supply option 3:



**7.5 Control Input**

There is one control input available for external controlling of instrument functions. The activation of its function can be done through:

- a.) an active control input or
- b.) Carried out by a passive N/O contact.

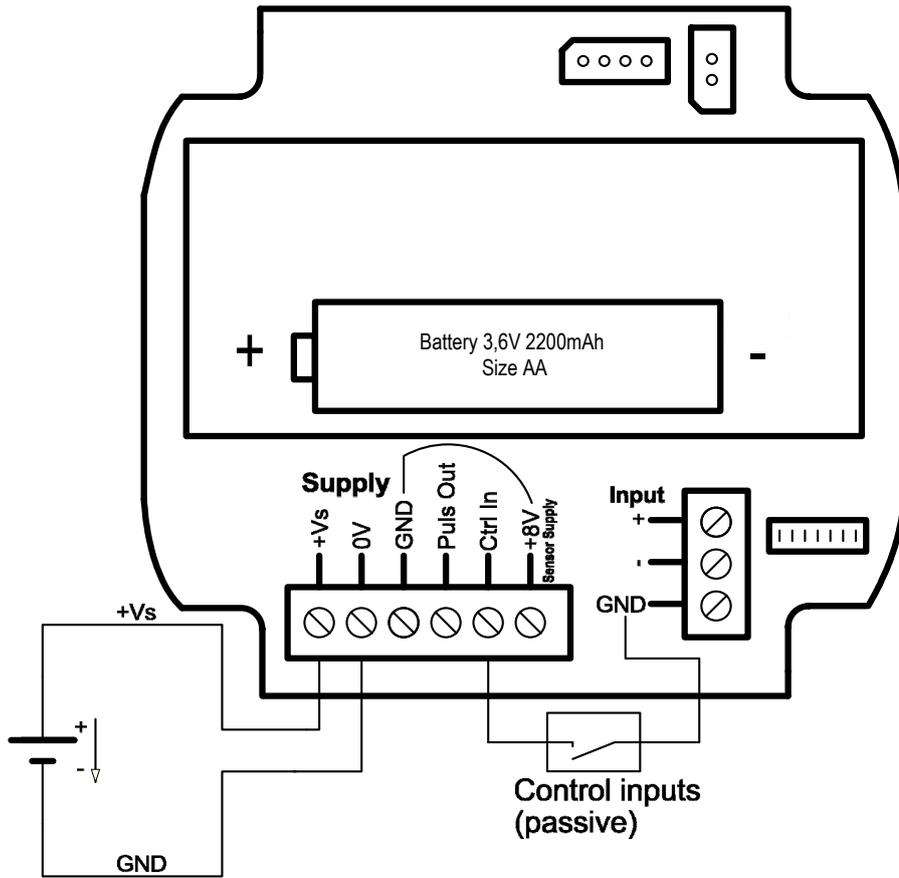
In both cases, the function will be activated on switching from HIGH to LOW level (falling edge).

When using an active control signal, the signal amplitude of the HIGH level must be from 5 to 30Vdc. When using simple normally open contact, the input potential is internally pulled of HIGH, if the contact is open. If the contact is closed, the input potential is pulled to GND and the control function is activated.

Function of control input:

| Control input | ZOE-ZX |
|---------------|--------|
| CTRL1         |        |

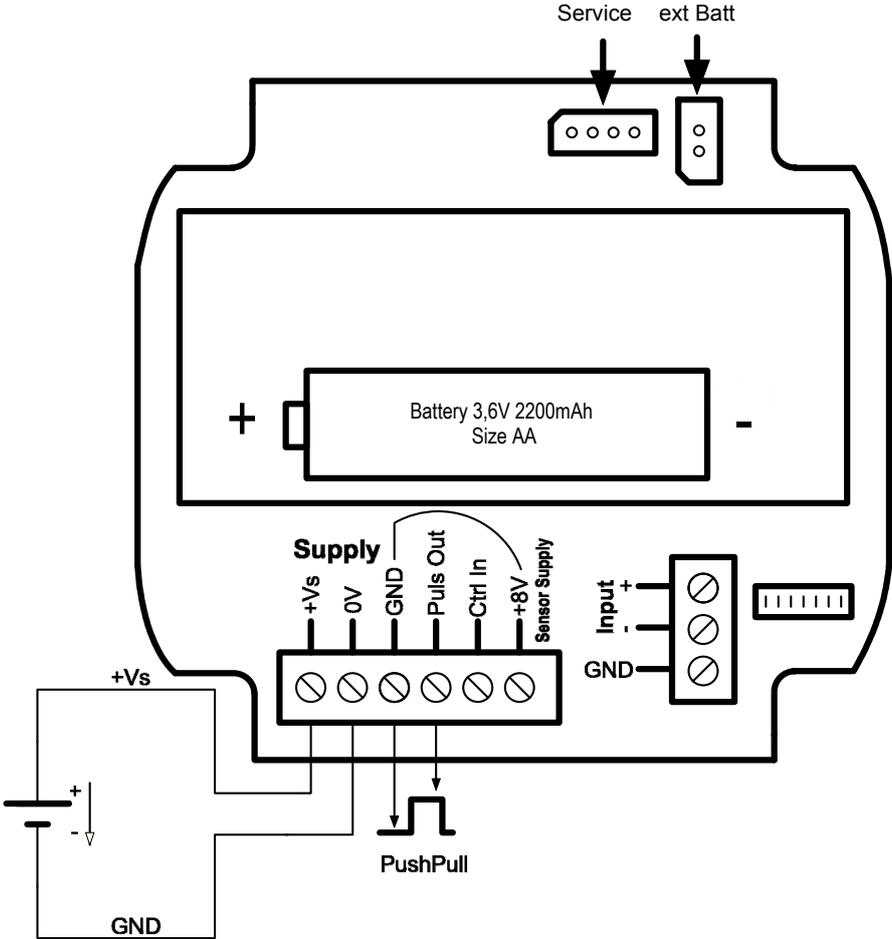
## Wiring for ZOE-ZE with Supply option 3:



### 7.6 Pulse Output

Pulse output is set to push-pull output type and provides an active digital signal with HIGH amplitude of about + Vs.

Wiring for ZOE-ZE with Supply option 3:



## 8. Operating and Menu Structure

### 8.1 Overall

#### Functions of operating buttons

| Button                                                                              | Symbol        | Function                                                                                                                       |                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     |               | Measuring mode                                                                                                                 | Menu mode                                                                                                                                             |
|    | Menu / Return | Enter Menu mode<br> To be pressed for 3-5 sec | During the parameter setting, back to main menu / return to the measurement mode/jump to the previous decimal position while setting numerical values |
|    | Down          | n.A.                                                                                                                           | Menu item selection / incrementing and decrementing digits while setting numerical values on the display                                              |
|    | Top           | n.A.                                                                                                                           |                                                                                                                                                       |
|  | Enter         | n.A.                                                                                                                           | Numerical input: Jump to the next decimal position<br>General: Saves the parameter value and returns to the parent menu                               |

### 8.2 Measuring Mode

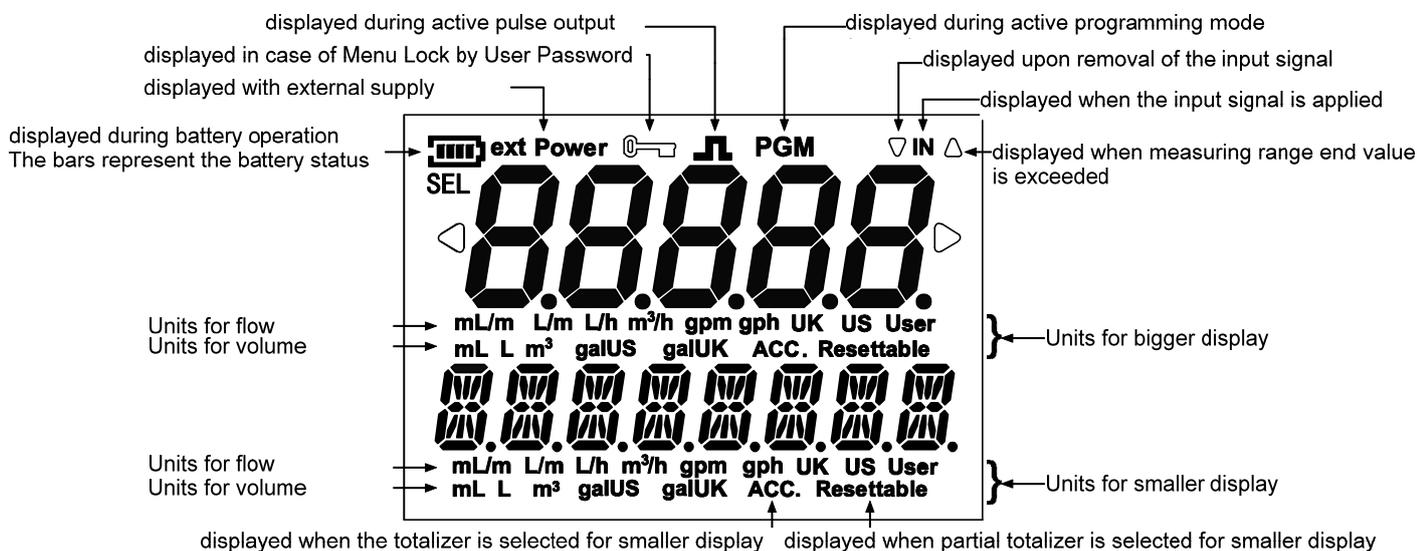
After applying the supply voltage, the electronics starts in measurement mode. In this mode, the input signals are recorded continuously; current instantaneous flow and volume counter readings are periodically calculated and displayed.

On LCD, in addition to main display, the status and configuration of the pulse output and supply voltage are also displayed.

#### 8.2.1 Display range of the Volume Counter

The number of digits that appear on the display for volume counter (partial and total volume counter) is limited to maximum 8 digits. If 8-digit display range is exceeded, the display will signal/represent it by displaying 8 hyphen signs (-----). In this case, the counter cannot be read. The user has then the possibility of changing the Unit of the volume counter in the Volume Menu so that the counter values can be brought back again within the display range.

## 8.2.2 Display layout in measuring mode (ZOE-ZX)



## 8.3 Menu Mode

### 8.3.1 General

In the menu, all device parameters can be set. The individual parameters are organized into groups according to their function. While the menu mode is turned on, the input signal detection and pulse output are still active in the background. After leaving the menu mode, all display parameters are then updated again in measurement mode.

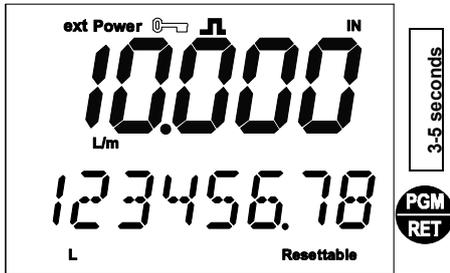
**Note:** The menu mode is not exited automatically even after a certain time without key operation. The menu mode remains active (in battery mode) until the user has once

pressed the  button.

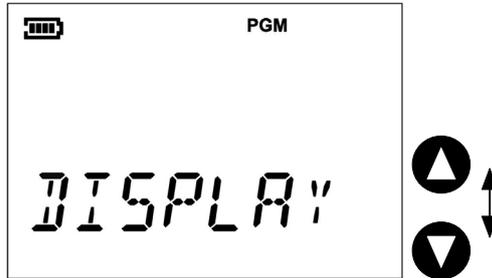
In battery mode, a long stay in menu mode shortens battery life.

## 8.3.2 Parameter setting

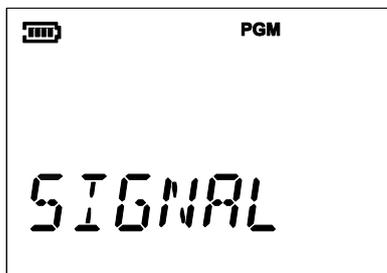
### Measuring mode



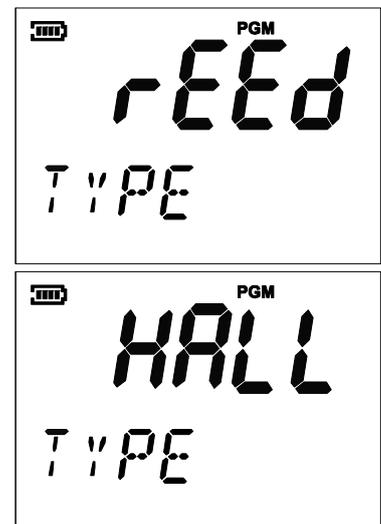
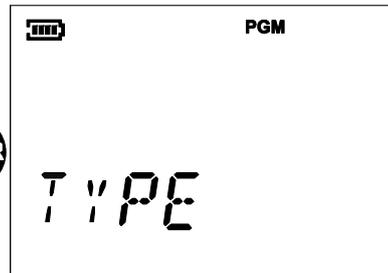
### Menu mode-Main group



### Menu mode



### Parameter selection mode-Sub group



To activate the Menu mode, the  button must be pressed for 3-5 sec. The parameters are divided into main groups and subgroups. For selection of main groups,



and  buttons are used. In the main menu, all menu groups can not be displayed simultaneously on the screen so the list of menu items can then be scrolled

up or down. To choose the selected item,  button should be pressed and the device goes into relevant sub-menu i.e. into the parameter setting level. For selection

of predefined parameter values,   and  buttons are used. After changing

the value of the parameter,  button should be pressed to save it and to return to the previous menu level. The return to the main menu or exit to the menu mode takes

place by repeatedly pressing .

## 8.3.3 Numerical value input

While setting parameters with numerical value, the value to be set is always displayed above the parameter. The maximum size and the number of decimal places are fixed and cannot be changed. While setting the numerical value of a parameter, the left outer position starts blinking first indicating the position of the cursor. These positions

can be assigned with numbers from 0 to 9 with the help of   buttons. By

pressing  button, the input cursor moves to right and the next digit can be changed. In case of a false entry at the previous position, the cursor can be moved

again to left by pressing  key and the correction can be made. If the cursor is on

the far right, the set value is saved by pressing the  button and the display changes to the parent menu.



## 9. Instrument Parameters

### 9.1 End of instrument parameterization

All ZOE-ZX electronics options are preconfigured at the factory when ordered with Oval Gear meter. A change in the parameters of the menu groups "Signal Input" and "Rate measurement" should not be made.

With subsequent changes of volume or flow rate units, dependent parameters will be converted and adapted accordingly.

In a basic scaling, all parameters of the menu groups "Scaling" and "Rate" must be edited successively.

An accidental change of configuration can be restored through "Factory defaults" function in User Service → Reset.

9.2 Overview of menu functions/ instrument parameters

| Menu level | Sublevel | Parameter level               | Description                               | Value range                | Default value     | available with voltage type |                   |
|------------|----------|-------------------------------|-------------------------------------------|----------------------------|-------------------|-----------------------------|-------------------|
| DISPLAY    | LIGHT    | [Digits]                      | Display brightness                        | 0 - 100<br>(Step size 10)  | 100               | external                    |                   |
|            | LIGHTOUT | [Digits]                      | Time out of backlight                     | 0-30 s<br>(Step size 1s)   | 0 (No timeout)    | external                    |                   |
|            | LAYOUT   | PA - tO                       |                                           | Part - Total               | List selection    | [default]                   | Battery, external |
|            |          | tO - PA                       |                                           | Total - Part               |                   |                             |                   |
|            |          | rA - PA                       |                                           | Rate - Part                |                   |                             |                   |
|            |          | PA - rA                       |                                           | Part - Rate                |                   |                             |                   |
|            |          | rA - tO                       |                                           | Rate - Total               |                   |                             |                   |
|            |          | tO - rA                       |                                           | Total - Rate               |                   |                             |                   |
|            |          | rA - AL                       |                                           | Rate - Alternating         |                   |                             |                   |
|            |          | AL - rA                       |                                           | Alternating - Rate         |                   |                             |                   |
| AL - tO    |          | Alternating - Total           |                                           |                            |                   |                             |                   |
| PA - AL    |          | Part - Alternating            |                                           |                            |                   |                             |                   |
| SIGNAL     | TYPE     | nPn                           | For NPN sensors                           | List selection             | [default]         | Battery, external           |                   |
|            |          | COIL                          | For induction coils                       |                            |                   | Battery, external           |                   |
|            |          | PnP                           | For PNP sensors                           |                            |                   | Battery, external           |                   |
|            |          | ACt                           | For active pulse signals                  |                            |                   | Battery, external           |                   |
|            |          | nAm                           | NAMUR Sensor                              |                            |                   | Battery, external           |                   |
|            |          | rEEd                          | For Reed sensors                          |                            |                   | Battery, external           |                   |
|            |          | HALL                          | For Hall sensors                          |                            |                   | Battery, external           |                   |
|            | TIMEOUT  | [Digits]                      | Input signal timeout                      | 2 – 20 s<br>(Step size 1s) | [2 s]             | Battery, external           |                   |
|            | FIL. FTR | [Digits]                      | Filter Size                               | 1-50<br>(Step size 1)      | 1                 | Battery, external           |                   |
|            | JMP. TH  | [Digits]                      | Jump threshold for jump-detector function | 0,05 – 1,00                | 0,1 [xFS]         | Battery, external           |                   |
|            | JMP. FTR | [Digits]                      | Factor for jump detector confirmation     | 1-25                       | 1                 | Battery, external           |                   |
| HWFILTER   |          | Hardware filter               | ON / OFF                                  | OFF                        | Battery, external |                             |                   |
| SCALING    | UNIT     | ml, L, m3, galUS, galUK, User | Volume unit for scaling factor            | List selection             | L                 | Battery, external           |                   |

|           |                                                    |                                                                |                                                      |                                       |           |                  |
|-----------|----------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------|---------------------------------------|-----------|------------------|
|           | LIN. PTS                                           | [Digits]                                                       | Number of linearization points                       | 0 - 9                                 | 0         | Battery,external |
|           | Q0                                                 | [Digits]                                                       | Flow rate for K0 when LIN. PTS set to 0              |                                       |           | Battery,external |
|           | K0                                                 | [Digits]                                                       | Scaling factor when LIN. PTS set to 0 [Imp/USERUNIT] |                                       | 60        | Battery,external |
| RATE      | M RATE                                             | [Digits]                                                       | Measurement repetition rate                          | 1 - 10 [s]                            | 1         | Battery,external |
|           | UNIT                                               | ml/m, L/m, L/h, m3/h, galUS/m, galUS/h, galUK/m, galUK/h, User | Unit for flow rate measreument                       | List selection                        | L/m       | Battery,external |
|           | START                                              | [Digits]                                                       | MA-value                                             | [User]                                | 00000.000 | Battery,external |
|           | END                                                | [Digits]                                                       | ME-value                                             | [User]                                | 00100.000 | Battery,external |
|           | OVERFLOW                                           | [Digits]                                                       | Allowable range can exceed to overflow value         | 0 -100 [%FS]                          | 10        | Battery,external |
| COUNTER   | UNIT                                               | mL, L, m3, galUS, galUK, User                                  | Volume units for counter                             | List selection                        | L         | Battery,external |
|           | RST PART                                           | -                                                              | Reset subset counter A                               | Button selection Yes / No             | No        | Battery,external |
| PULSE     | ACT                                                | -                                                              | Enables/disables pulse output                        | Button selection Yes / No             | No        | external         |
|           | VOLUME                                             | [Digits]                                                       | Input volume per output pulse in [L]                 | [Volume unit]                         | 1.000     | external         |
|           | UNIT                                               | mL, L, m3, galUS, galUK, User                                  | sets volume unit for pulse output                    | List selection                        | L         | external         |
|           | WIDTH                                              | [Digits]                                                       | Sets the pulse width of pulses                       | 1ms-20s                               | 2ms       | external         |
| USR SERV  | PASSWORD                                           |                                                                | Changes user password                                | 5-digit number (00000 => open access) | 0         | Battery,external |
|           | RESET                                              |                                                                | Reset the device to factory settings                 |                                       |           | Battery,external |
| FAC. SERV | Password protected - reserved for factory settings |                                                                |                                                      |                                       |           |                  |
| INFO      | STAT                                               |                                                                | Displays counter reading                             |                                       |           | Battery,external |
|           | VERSION                                            |                                                                | Displays Firmwareversion                             |                                       |           | Battery,external |

## 9.3 Signal

### 9.3.1 Signal / Sensor type

The pulse input can be optimally customized to different sensor types in Menu, so that at the time of connection no further additional wiring is required for correct function.

| Menu Parameter | Sensor type                                                         | Internal wiring          |
|----------------|---------------------------------------------------------------------|--------------------------|
| NPN            | Hall sensor, Reed switch and all NPN sensors                        | Pull-Up resistor         |
| Coil           | For induction coil (Amplitude > 20 mVpp)                            | High impedance input     |
| PNP            | For all PNP-Sensors                                                 | Pull-Down resistor       |
| Active signal  | For all sensors with active output signal, e.g. (push-pull outputs) |                          |
| NAMUR          | For sensors with 2-wire interface according to EN 60947-5-6 (NAMUR) | Pull-Down resistor 1kOhm |
| Reed           | Reed switch                                                         | Pull-Up resistor         |
| Hall           | For Hall sensors                                                    | Pull-Up resistor         |

### 9.3.2 Signal / Timeout

For the detection of input signals, the period duration of signal is determined within a measuring cycle i.e. Refresh time. However, if within the "refresh time" the input period is not complete i.e. if the input signal has a frequency lower than the frequency determined from the "Refresh time", then the flow indicator is set to "0". In the shortest "refresh time" of 1 seconds, only a minimum input frequency of 1 Hz is recorded. In order to detect even lower frequencies, "Input Timeout" parameter can be configured up to 20 s. After the completion of „Refresh time“, the signal processing waits for the full input period until the additional waiting period is expired. It should be noted that by increasing the waiting time, the reaction time for the detection, for example, a flow failure is greatly increased. The "Input Timeout" should only be large enough so that the smallest frequency signal from the connected sensors can be detected.

### 9.3.3 Signal / Filter

In case of discontinuous input signals, the integrated filter function can filter the display of flow rates, the analogue output and the switching outputs (only options E3/). Despite filtering effect, the reaction time to rapid changes in the flow rate can be kept low by appropriate choice of filter parameters.

The time base for the filtering function is the "Refresh time". The filter function operates on the principle of "moving average", where the parameter "filter factor" specifies the number of measuring values which are used to calculate the current flow value.

If "filter factor" is set to "1", the filter function is virtually eliminated.

For example : „Filterfactor“ = 3, „Refresh time“ = 1,0s

$$\text{Filtered measured value} = \frac{\text{Current measured value} + \text{Previous measured value} + \text{Last to the previous measured value}}{3}$$

The correct flow value is displayed after  $3 \times 1 = 3$  s.

In addition, a jump detector is integrated in the filter function, which monitors whether the current measured value has greatly changed compared to the last filtered measured value. With the parameter "jump threshold", the level of threshold is defined. If this „jump threshold „ is exceeded, the filter function is bypassed depending on parameter „jump factor“, thus achieving a faster response time with respect to rapid changes in flow.

The triggering of jump detector due to fluctuations in measurement value can be prevented by setting the "jump factor" > 1.

In addition to the software filter, an analogue low-pass filter with menu 'Hardware filter' can be simultaneously connected at two output signals if required.

The connection is useful when the input signal is affected by higher frequency noise and this can lead to an unstable flow indication.

In case if 'Reed' is chosen as sensor under 'Sensor type' Menu, then the hardware filter will be automatically activated. In case of other sensors, it is by default inactive and can be activated by the user anytime using Menu.

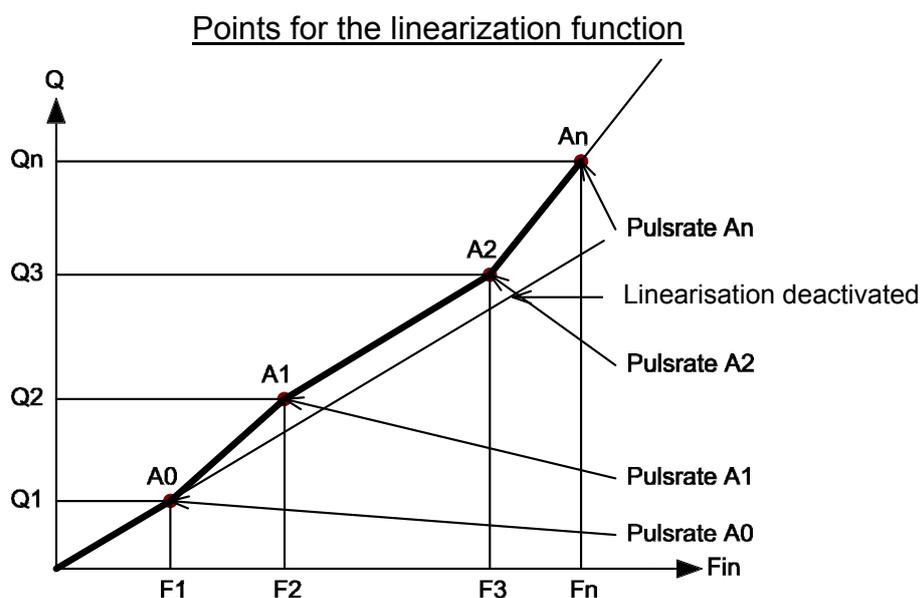
### 9.4 Scaling

The correct scaling of the signal inputs is necessary for exact indication on the display. For this purpose, entering the pulse rate of the connected sensors is necessary. For ZOE-ZX in single-channel mode for input A linearization function with up to 10 points is available. The linearization function is not available in dual channel mode!

The linearization function linearizes the flow indicator, volume counters and thereon dependent outputs (analogue output and switching outputs).

The pulse output in principle cannot be linearized and will always be calculated with the pulse rate of scaling point K0. If the linearization function is disabled and only scaling point K0 is active, the curve is linear and goes through "0" and point K0 (see graph).

For a linear function, it is not necessary to enter input parameter "flow rate K0". The "flow rate Kx" parameter is only required for the determination of the reference points when using the linearization function.



With active linearization function, the number of linearization points for parameter „linearization points“(in addition to point A0) is set fixed. Depending on the setting of this parameter, the other input parameters are shown in the menu. Input signals above the last point linearization are processed with the pulse rate of the last point.

Conditions for the base sequence:

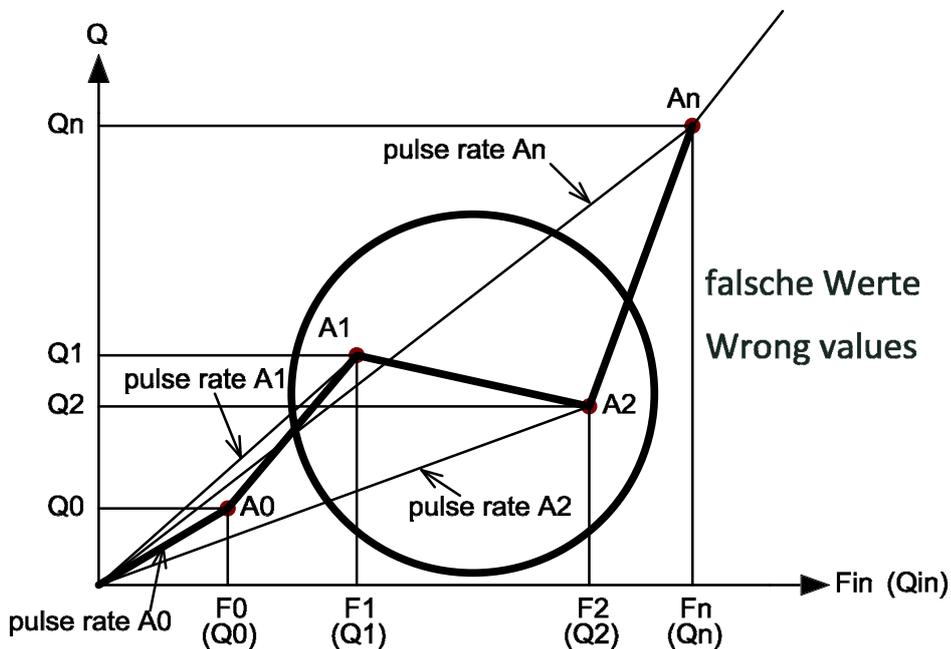
The sensor curve must be monotonically increasing, since the frequency values increase continuously with increasing flow.

Inconsistent base sequence

After entering the linearization points, a check is carried out for consistency when the user exit the menu item "Signal Input". Should one or more bases not comply with the Terms Security for the base sequence, the below message box appears:

Linearization Incorrect!  
Flowrate Ax  
negative slope!

Such a case is illustrated in the graph below, in which  $Q_2 < Q_1$ , thus having a negative slope between  $K_2$  and  $K_1$ .



To correct this error, the bases must be checked and corrected if necessary. This must always apply:

$$\frac{Q(n+1) - Q_n}{[K(n+1)*Q(n+1) - K_n*Q_n] / 60} > 0$$

## 9.5 Rate

### 9.5.1 Rate / Measuring rate

Parameter "Measuring rate" specifies the time interval within which the input signal is recorded, the flow rate is calculated and brought to display. The condition of all other outputs which depends on the flow rate (analogue output, switching outputs and status output) will be recalculated after the measurement time.

The "sampling rate" can be increased in steps of 0.5 sec. up to 10 sec. An increase in the sampling rate time on one hand causes increase in the filtering time of the input signals, but also an increased reaction time in the detection of changes in the flow values.

### 9.5.2 Rate / Unit

The unit displayed for the flow rate measurement can be selected from various predefined standard units. The definition of a user-defined unit ("User") is possible, here the „User Unit “must be programmed in Liter/min.

e.g.:

Unit: user = 100 LPM, if flow = 500 LPM then the flow rate shown on display will be 5 user.

### 9.5.3 Rate / Start

The parameter "start point" defines the lower flow rate limit for display and further evaluation. If the measured flow rate lies below the measuring range value, the flow rate is set to "0", therefore "hidden". At the same time the "underflow" icon will appear in the display.

If the value of the parameter is set to "0", this feature is effectively disabled.

### 9.5.4 Rate / End

With parameter "End point", the upper measurement limit of the connected sensors / transducers is set.

Depending on the actual flow display, the decimal point for the bigger display adjusts itself automatically.

| Flow Display   | Decimal points on the Display |
|----------------|-------------------------------|
| 0.1 to 9.9999  | 4                             |
| 10 to 99.999   | 3                             |
| 100 to 999.99  | 2                             |
| 1000 to 9999.9 | 1                             |
| 10000 to 99999 | 0                             |

If the flow rate is displayed on the smaller display, the number of decimal points is fixed to 4 and cannot be changed. However the digits before the decimal point change themselves automatically from e.g. 0-9999 [Unit] depending upon the actual flow.

### 9.5.5 Rate Measurement / Over flow value

The parameter "overflow value" is set in "% of full scale"

Example: "end point" = 100 [L / m], "overflow value" = 10 [%]

⇒ The arrow pointing upwards on the top right side of the display will be shown when flow display shows 110 l/m.

## 9.6 Counter

All electronics have options of a (non-resettable) totalizer and a (resettable) partial totalizer for the connected input. The status of all active counters can be displayed in the "INFO→STAT" menu.

### 9.6.1 Counter / Volume Unit

Parameter "volume unit" defines the unit volume of all volumetric counters. There are listed volume units to choose from. When changing the unit of volume, the actual meter readings are converted into the new unit volume.

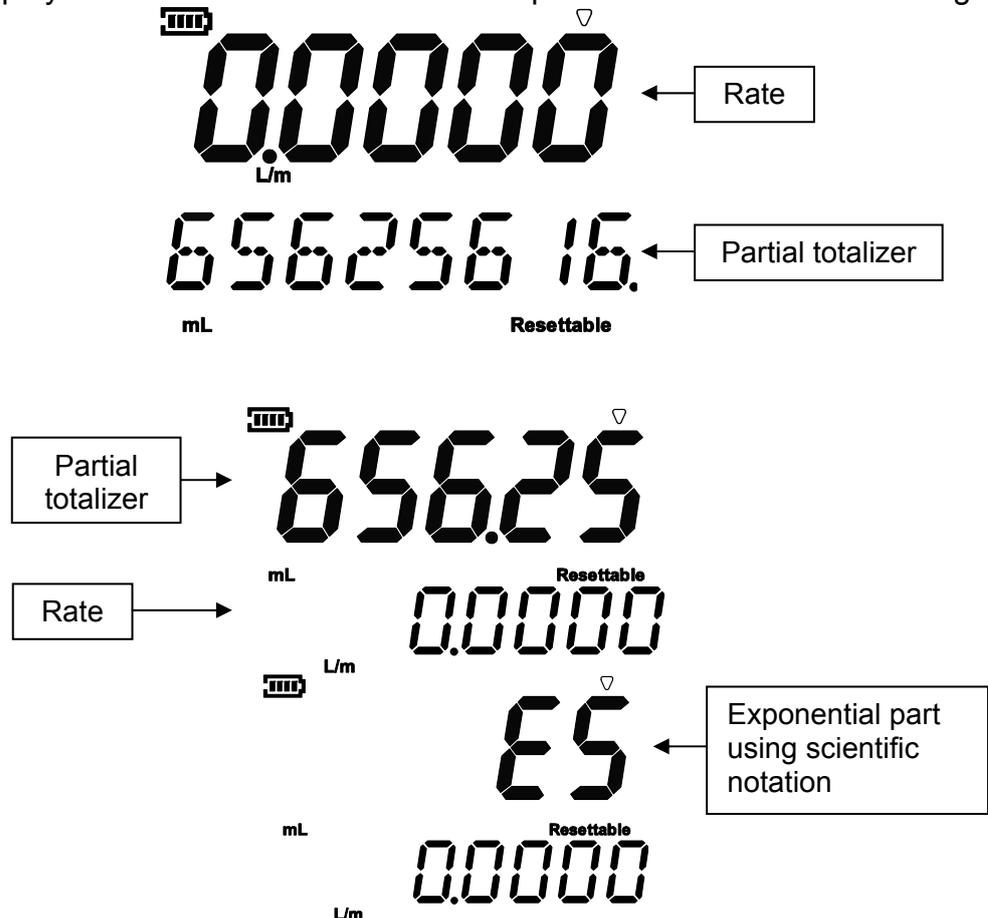
### 9.6.2 Counter / Part Volume Reset

In this menu you can reset the partial volume counter for ZOE-ZX.

#### General

The user has the option to display the totalizer/counter values on smaller as well as the bigger display with the help of different layouts available under 'DISPLAY' menu. However the bigger display is limited to display only 5 digits. If the totalizer consists of more than 5 digits e.g. 8 digits, it won't be possible to display the 3 digits.

The problem is solved with the help of scientific notation using power of 10. In this case, only 5 most significant digits will be displayed. The least significant digits will be cut off and replaced with exponent showing the total strength of the digits. However the information processed by the electronics in the background is always accurate and correct. The display switches between MSB's and exponent with a rate of 1 sec. e.g.:



Since some useful information cannot be displayed in this case, it is recommended to use a bigger unit to avoid the loss or to use the smaller display for totalizers.

## 9.7 Pulse output (only with ZOE-ZE Supply option 3)

A scalable pulse output is available for the options ZOE-ZExxxx3xx. When the pulse output is enabled, a scaled pulse output train is given at the output to the input pulses. The pulse width of the pulses is adjustable between the span of 1 ms to 20 sec.

When pulse output is activated, the symbol "⏏" for pulse output is highlighted on the display. The electrical output of the pulse output is push-pull type, so HIGH and LOW is actively switched through to the output.

To generate the output pulses, the input pulse train is directly processed in connection with the scaling factor "K0", the output pulses are therefore not derived from the calculated volume flow. The pulse output is based on a linear path of the input signal. Sensors are used with nonlinear characteristic, with the usage of linearization function only the updated volume flow can be linearized, pulse output and volume counter cannot be linearized.

### Behaviour at OVERFLOW:

If the measured volumetric flow lies in the OVERFLOW range, the pulse output is switched off and a constant HIGH level is switched at the output.

### Generation of the output pulse train:

The maximum adjustable pulse rate for the pulse output is 1000 pulses per liter. This means that the minimum pulse volume that can be represented by the pulse output is 0.001 Liter per pulse. Furthermore, the set pulse volume must meet following condition:

$$\frac{\text{Measuring range end point} * (1 + \frac{\text{Overflow value}}{100})}{60 * \text{Pulse volume}} \leq \frac{0.5}{\text{Pulse width (ms)}}$$

In case if the above mentioned condition is not complied with, it may lead to a long lagged pulse train at pulse output even when the input frequency signal has been interrupted and removed. While configuring the pulse output, if the above condition is violated, the user will be informed via notification on the display with "Lagged pulse train possible. Please check the settings." In case if the measuring range endpoint is changed during the operation of pulse output, the user needs to check the pulse output settings once again.

The pulse output works only in the measurement mode i.e. in the menu mode, no pulses will be generated at the output. The pulses acquired in the menu mode will be given out once the normal measuring mode is activated again, leading to no loss but a delayed pulse train at the output depending on how long the menu mode remains active.

## 9.7.1 Pulse output / Volume

The "pulse volume" parameter is defined as the volumetric amount for the output of a pulse at the output; the unit is in accordance with [amount of volume / pulse]. The familiar Pulse rate [pulses / unit volume] corresponds to the reciprocal of the pulse volume.

Example: Required pulse rate at output 10 Pulse/Liter => Pulse Volume = 1/Pulse rate = 1/10 L = 0.1 L

## 9.7.2 Pulse output / Unit

The volume set unit is the input unit for the parameter "Pulse volume". User can also set a user defined unit which will be given in "Liter". e.g.:

Unit: user = 10 [Liter], pulse volume = 2 [user]

In this case the pulse will be generated after  $2 \cdot 10 = 20$  Liters

## 9.7.3 Pulse output / Width

The pulse width of pulse output is flexibly adjustable from 1 to 20000 ms.

## 9.8 User service

Reset function and password activation are available for user in user service menu. Together with the activation of a user password, the access to menu for the user can be locked by a master user.

### 9.8.1 User service / Change password

The default administrator user password is set to "00000", the user functions are thus freely accessible. If the user's password has been changed from "00000", password request will be generated on next entry to User menu.

If the default password has been forgotten or misplaced, the master password can be requested from KOBOLD.

### 9.8.2 User service / Reset

By activating this function, the user can reset the device to factory settings. All user settings will be lost and the device will be reset to the factory settings.

## 9.9 Factory service

The factory service function is password protected and is not available for the user.

## 9.10 Information

### 9.10.1 Status

The partial and accumulated totalisers can be seen by the user through this menu function.

### 9.10.2 Firmware version

This menu function shows the user the installed firmware version and revision. The information about firmware version can also be seen when the electronics is first switched on.

## 10. Technical Details

|                                                          |                                                                                                                                                                                                                |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External power supply:                                   | 5...30 V <sub>DC</sub> (without sensor supply)<br>9...30 V <sub>DC</sub> (with sensor supply)<br>power consumption max. 40 mA<br>(only ZOE-ZExxx3)                                                             |
| Battery for operation:                                   | 1 x 3.6 V lithium size AA<br>or 2 x 1.5 V alkaline cell size AA                                                                                                                                                |
| Battery life:                                            | using 3.6 V lithium with 2200 mAh: up to 5 years<br>using 2 x alkaline cells with 2600 mAh each:<br>up to 2 years (at 50 µA)                                                                                   |
| Display:                                                 | LC display (for ZOE-ZExxx3 background lighting white)<br>height of digits for: 5 digits volume flow: 13 mm<br>8 digits volume counter:<br>8 mm display of battery power                                        |
| Mounting options:                                        | meter mount, wall or pipe mounting                                                                                                                                                                             |
| Measuring input:                                         | universal, configurable (NPN, PNP, NAMUR coil, reed switch or active)<br>Input frequency 0.1...1000 Hz,<br>High-low-threshold 0.6 V <sub>DC</sub><br>Minimum input voltage for coil input: 30 mV <sub>pp</sub> |
| Measuring rate:                                          | 1 s                                                                                                                                                                                                            |
| Units for volume flow:                                   | ml/h, l/m, m <sup>3</sup> /h, gpmUK, gpmUS, gphUK, gphUS, User                                                                                                                                                 |
| Units for volume counter:                                | ml, l, m <sup>3</sup> , galUS, galUK, User                                                                                                                                                                     |
| Control input<br>(only ZOE-ZExxx3):                      | for part counter resetting                                                                                                                                                                                     |
| Linearisation:                                           | 1...9 interpolation points, can be deactivated                                                                                                                                                                 |
| Accuracy of flow measurement:                            | < 0.1% of reading (depending on scaling and resolution)                                                                                                                                                        |
| Sensor supply<br>(only ZOE-ZExxx3):                      | 8 V <sub>DC</sub> , max. 25 mA (for external supply > 9 V <sub>DC</sub> )                                                                                                                                      |
| Pulse output<br>(only ZOE-ZExxx3):                       | push pull, max. 30 V <sub>DC</sub> , max. 50 mA                                                                                                                                                                |
| Operation:                                               | 4 buttons                                                                                                                                                                                                      |
| Housing:                                                 | plastic, PA6, GF-enhanced                                                                                                                                                                                      |
| Protection:                                              | IP 66/67                                                                                                                                                                                                       |
| Cable entry:                                             | 3x M20x1.5 or ½" NPT (prepared)                                                                                                                                                                                |
| Electrical connection:                                   | plug-in terminals wire size max. 0.75 mm <sup>2</sup>                                                                                                                                                          |
| Retention of meter readings<br>In case of power failure: | cyclic, non-volatile memory                                                                                                                                                                                    |
| Ambient temperature:                                     | -20 °C ≤ T <sub>ambient</sub> ≤ 80 °C                                                                                                                                                                          |
| Storage temperature:                                     | -25 °C ≤ T <sub>storage</sub> ≤ 80 °C (without battery)                                                                                                                                                        |

## 11. Order Details

Example: **ZOE-ZE K M F 3 0 0**)

| Model | Electronics                                                     | Housing Type                                                                                                                                | Electrical connection/<br>cable gland                    | Input                      | Power supply                                                                 | Options     | Special                                                   |
|-------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------|------------------------------------------------------------------------------|-------------|-----------------------------------------------------------|
| ZOE-  | ZB = rate totaliser without external power supply/ with battery | 0 = universal mount (standard, round plastic without wall mounting kit)<br>K = universal mount (standard, round plastic with holder plates) | M = 3xM20x1.5 cable entry<br>N = 3x 1/2" NPT cable entry | F = pulse/ frequency input | B <sup>1)</sup> = battery for operation                                      | 0 = without | 0 = without<br>Y = special (please specify in clear text) |
|       | ZE = rate totaliser with external power supply/ with battery    | M = universal mount (round plastic for retrofitting DON)                                                                                    |                                                          |                            | 3 <sup>2)</sup> = 9...28 V <sub>DC</sub> battery for operation, pulse output |             |                                                           |

<sup>1)</sup> Only available with ZOE-ZB

<sup>2)</sup> Pulse output, Sensor supply and LCD backlight only with external power supply. Only available with ZOE-E

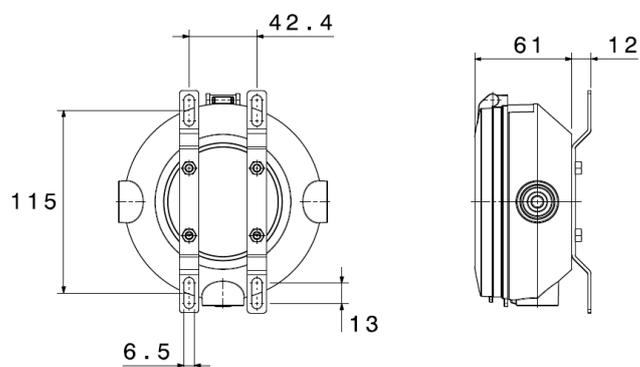
### Accessories

| Description                          | Model                 |
|--------------------------------------|-----------------------|
| Stainless steel wall mounting kit    | <b>ERS-ZOK-023618</b> |
| Stainless steel 2" pipe mounting kit | <b>ERS-ZOK-003402</b> |

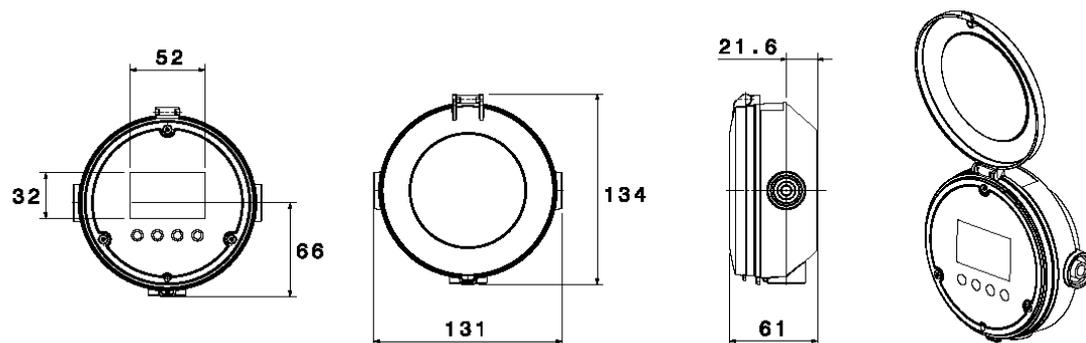
## 12. Dimensions

[mm]

### ZOE-ZXK



### ZOE-ZXM



## 13. EU Declaration of Conformance

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We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Flow-Counter/-- Unit/--                      Model: ZOE-ZX**

to which this declaration relates is in conformity with the standards noted below:

**EN 61326-1:2013**      Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Also the following EC guidelines are fulfilled:

**2014/30/EU**              EMC Directive

**2011/65/EU**              RoHS (category 9)

**EN 50581:2012**      Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

**2006/66/EC**              Directive Batteries and Accumulators



H. Peters  
General Manager



M. Wenzel  
Proxy Holder

Hofheim, 13. July 2017