

MXL-INST_ERAC
REV 1
03/20



## ***FLOWRATE INDICATOR / TOTALIZER*** ***Electronic Register (ERAC)***

### ***REMOTE MOUNT***



**ERAC-RMA**  
**(F110-P-AP-CH-HA-IX-OT-PD-XX-ZB)**

***Signal input flowmeter: NPN and Reed***

***Signal outputs: 4-20 mA, flowrate, scalable pulse, Modbus Communication and backlight***

#### **To the Owner**

Please read and retain this instruction manual to assist you in the operation of this product. This Instruction Manual provides instruction guide on the operation and programming of the Type ERAC, 17mm LCD Digital Register. Should you require further assistance please contact your local Macnaught representative. Macnaught offer a comprehensive set of web-based support materials to complement our product range. Access the website by scanning the QR code. [WWW.MACNAUGHT.COM.AU](http://WWW.MACNAUGHT.COM.AU)



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## SAFETY INSTRUCTIONS

- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- LIFE SUPPORT APPLICATIONS: The ERAC is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

## DISPOSAL - WEEE DIRECTIVE



- The WEEE Directive requires the recycling of waste electrical and electronic equipment in the European Union.
- Whilst the WEEE Directive does not apply to some of Macnaught's products, we support its policy and ask you to be aware of how to dispose of this product.
- The crossed-out wheeled bin symbol illustrated and found on our products signifies that this product should not be disposed of in general waste or landfill.
- Please contact your local dealer national distributor or Macnaught Technical Services for information on product disposal.

## SAFETY RULES AND PRECAUTIONARY MEASURES



- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the ERAC implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the ERAC supplied.
- Open the casing only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacturer's plate and chapter 4.2).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labour and safety laws and regulations must be adhered to.

## ABOUT THE MANUAL

This operation manual is divided into two main sections:

- The daily use of the unit is described in chapter 2 "Operation". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This operation manual describes the standard unit as well as most of the options available. For additional information, please contact your supplier.

**A hazardous situation may occur if the ERAC is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:**



A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the ERAC or connected instruments.



A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the ERAC or connected instruments.



A "**note**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

**Information in this manual is subject to change without prior notice. The manufacturer is not responsible for mistakes in this material or for incidental damage caused as a direct or indirect result of the delivery, performance or use of this material.**

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## WARRANTY

For warranty terms & conditions,  
visit <https://au.macnaught.com/warranty>

## 1 INTRODUCTION

### 1.1 SYSTEM DESCRIPTION

#### Functions and features

The flowrate / totalizer model ERAC is a microprocessor driven instrument designed to display flowrate, total and accumulated total.

This product has been designed with a focus on:

- ultra-low power consumption to allow long-life battery powered applications,
- Remote mountable with Aluminium enclosures for industrial surroundings,
- ability to process two types of flowmeter signals, NPN and Reed.
- transmitting possibilities with analogue / pulse and communication outputs.

#### Flowmeter input

This manual describes the unit with a pulse type input from the flowmeter.

One flowmeter with an NPN or Reed switch output can be connected to the ERAC. To power the sensor, several options are available.

#### Standard outputs

- Configurable pulse output: a scaled pulse mirroring a certain totalized quantity. Maximum frequency 60Hz.; the pulse length can be set from 7,8msec up to 2 seconds.
- Configurable passive linear 4-20 mA analogue output with 10-bits resolution mirroring actual flowrate. Flowrate levels as well as the minimum and maximum signal output can be tuned.

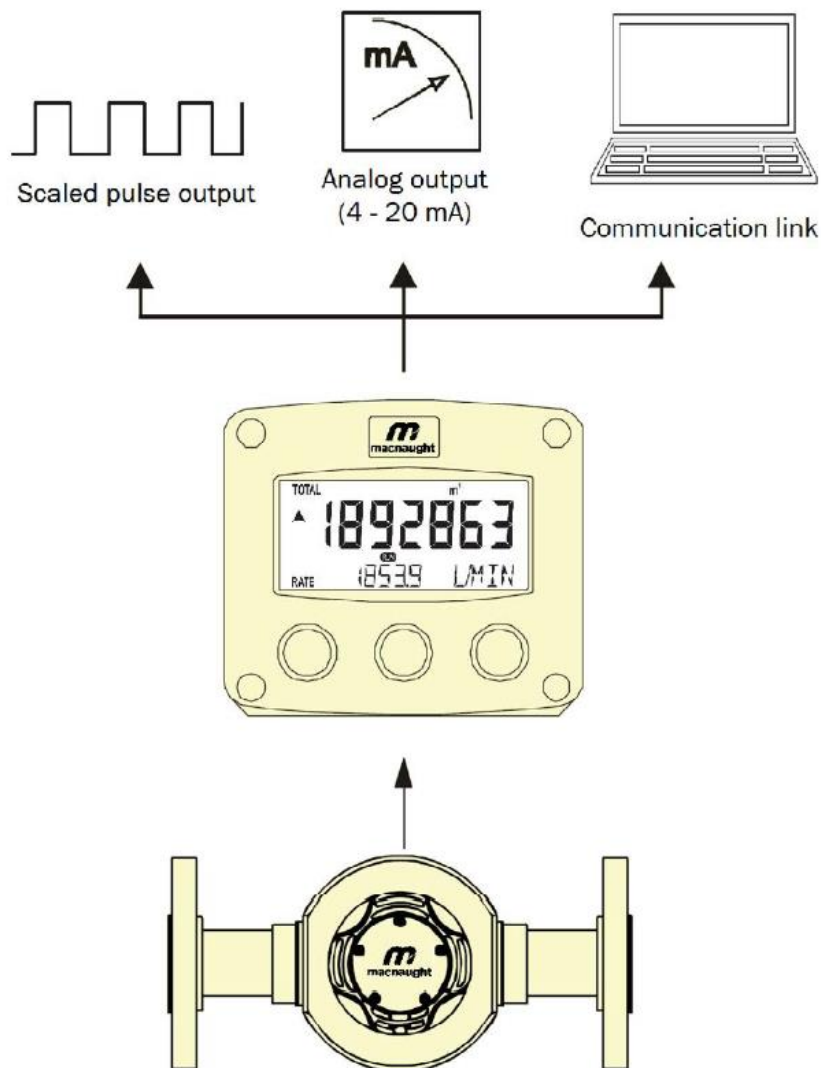


Fig. 1: Typical application for the ERAC

### Configuration of the unit

The ERAC has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your ERAC according to your specific requirements.

The setup includes several important features, such as K-Factors, engineering units, signal selection, power management (to extend battery life-time), etc. All settings are stored in a non-volatile memory and therefore kept in the event of a power failure or an exhausted battery.

### Display information

The unit has an LCD with (optional) backlight to show the process information, status and alarm messages. The display refresh rate is programmed in the setup menu. At a key press, the display refresh rate will switch to FAST for 30 seconds. When 'OFF' is selected, the display goes off after 30 seconds after the last key press. The display temporarily comes on after a key press. A backup of the total and accumulated total in EEPROM memory is made every minute.

### Options

The following options are available: passive 4-20mA analogue output, full Modbus communication R485 (also battery powered), power and sensor-supply options, wall-mount and weather-proof enclosures, and LED backlight.

## 2 OPERATIONAL



- The ERAC may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Take careful notice of the " Safety rules, instructions and precautionary measures " in the front of this manual.

This chapter describes the daily use of the ERAC. This instruction is meant for users / operators.

### 2.1 CONTROL PANEL

The following keys are available:



Fig. 2: Control Panel

### Functions of the keys



This key is used to program and save new values or settings.

The **PROG/ENTER** key is also used to gain access to the setup menu (read chapter 3).



This key is used to select the accumulated total and temperature.

The **"SELECT"** ▲ key is also used to increase a value after the PROG/ENTER key has been pressed (read chapter 3).



This key is used to reset the total.

The "CLEAR"  $\blacktriangleright$  is also used to select a digit or an option after the PROG/ENTER key has been pressed (read chapter 3).

## 2.2 OPERATOR INFORMATION AND FUNCTIONS

In general, the ERAC operates in the operator mode. The shown information depends on the settings which are made in the setup menu. The signal from the connected sensor is processed by the ERAC in the background, independent from the selected display refresh rate.



Fig. 3: Example of display information during process

For the Operator, the following functions are available:

- **Display flowrate / total or flowrate**

This is the main display information of the ERAC. After selecting any other information, it will always return to this main display automatically. Total is displayed on the upper-line of the display and flowrate on the bottom line. When selected in the setup menu, the display shows the flow rate only. When you press the select key, the total shows momentarily. When "-----" is shown, then the flow rate value is too high to be shown. The arrows  $\blacktriangle$  indicate the increase/decrease of the flow rate trend.

- **Clear total**

The value for total can be reset. To do so, press the CLEAR/ $\blacktriangleright$  key twice. When the key is pressed once, the text "PUSH CLEAR" is shown. To avoid a reset at this stage, press another key other than the CLEAR/ $\blacktriangleright$  key or wait for 20 seconds. A reset of the total does not influence the accumulated total. Re-initialization of total DOES NOT influence the accumulated total.

- **Display accumulated total**

When the SELECT/ $\blacktriangle$  key is pressed, total and accumulated total are displayed. The accumulated total cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for total.

- **Low-battery alarm**

When the battery voltage drops, it must be replaced. At first "low-battery" will flash, but as soon as it is displayed continuously, the battery MUST be replaced shortly after! Only original batteries supplied by the manufacturer may be used, else the guarantee and liability will be terminated. The remaining lifetime after the first moment of indication is generally several days up to some weeks.



Fig. 4: Example of low-battery alarm.

- **Alarm**

When "alarm" is displayed, please consult Appendix B: problem solving.

### 3. CONFIGURATION

#### 3.1 INTRODUCTION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.

#### 3.2 PROGRAMMING SETUP-LEVEL

##### 3.2.1 GENERAL

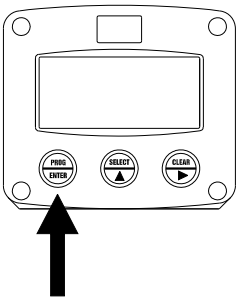
Configuration of the ERAC is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ↕ will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the ER remains fully operational.



Note !

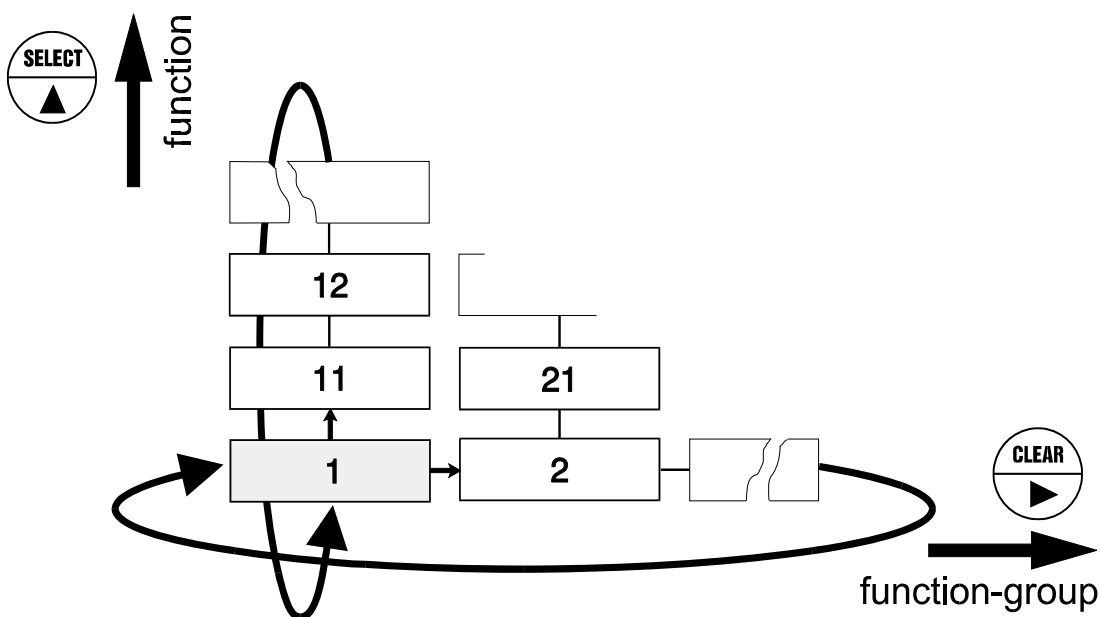
**Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

To enter SETUP-level:



Press  for 7 seconds

Matrix structure SETUP-level:

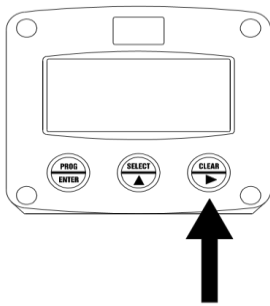


SCROLLING THROUGH SETUP-LEVEL

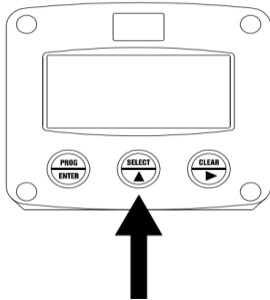


### Selection of function-group and function:

SETUP is divided into several function groups and functions.



Select function-group with



Select function with



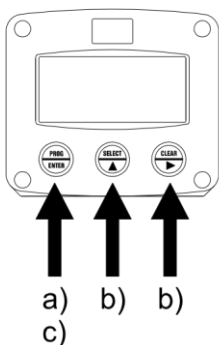
Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.





Note !

After selecting a sub-function, the next main function is selected by scrolling through all "active" sub functions (e.g., 1<sup>▲</sup>, 11<sup>▲</sup>, 12<sup>▲</sup>, 13<sup>▲</sup>, 14<sup>▲</sup>, 1<sup>▶</sup>, 2<sup>▶</sup>, 3<sup>▲</sup>, 31 etc.). The "CLEAR" button can be used to jump a step back if you missed the desired function.

### To change or select a value:



a) press  briefly; **PROGRAM** will start flash

b) select or enter value with  and / or 

c) press  to confirm the value / selection.

To change a value, use <sup>▶</sup> to select the digits and <sup>▲</sup> to increase that value.

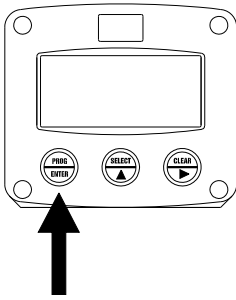
If the new value is invalid, the increase sign <sup>▲</sup> or decrease-sign <sup>▼</sup> will be displayed while you are programming.

To select a setting, <sup>▲</sup> is used to select in one direction and <sup>▶</sup> can be used to select in the other direction.

When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.

**Note:** Alterations will only be set after ENTER has been pressed!

To return to OPERATOR-level:



Press  for 3 seconds

In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.

### 3.3 OVERVIEW FUNCTIONS SETUP LEVEL


SETUP FUNCTIONS AND VARIABLES			
<b>1</b>	<b>TOTAL</b>		
	11	unit	L - m <sup>3</sup> - kg - lb - GAL - USGAL - bbl - no unit
	12	decimals	0 - 1 - 2 - 3 (Ref: displayed value)
	13	k-factor	0.000010 – 9,999,999
	14	decimals k-factor	0 – 6
<b>2</b>	<b>FLOW RATE</b>		
	21	unit	mL - L - m <sup>3</sup> - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm <sup>3</sup> - NL - P
	22	time unit	sec - min - hour - day
	23	decimals	0 - 1 - 2 - 3 (Ref: displayed value)
	24	k-factor	0.000010 - 9,999,999
	25	decimals k-factor	0 - 6
	26	calculation	per 1 - 255 pulses
	27	cut-off	0.1 - 999.9 seconds
<b>3</b>	<b>DISPLAY</b>		
	31	function	total; rate
	32	light	0% (off); 20%; 40%; 60%; 80%; 100% (full brightness)
<b>4</b>	<b>POWER MANAGEMENT</b>		
	41	LCD update	Fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	42	battery mode	Operational - Shelf
<b>5</b>	<b>FLOWMETER</b>		
	51	signal	NPN - NPN_LP - REED - REED_LP
<b>6</b>	<b>ANALOG</b>		
	61	output	disable - enable
	62	Rate-min	0000.000 - 9,999,999 unit/time unit
	63	Rate-max	0000.000 - 9,999,999 unit/time unit
	64	cut-off	0.0 - 9.9%
	65	tune min – (0)4ma	0 - 9,999
	66	tune max- 20ma	0 - 9,999
	67	filter	00 - 99
<b>7</b>	<b>IMPULSE</b>		
	71	width	0.000 - 9.999 sec (0 = Off)
	72	decimals	0000000; 111111.1; 22222.22; 3333.333





	73	amount	0.001 - 9999999
<b>8</b>	<b>COMMUNICATION</b>		
	81	speed	1200 - 2400 - 4800 - 9600
	82	address	1 - 247
	83	mode	bus-rtu; bus-asc; off
<b>9</b>	<b>OTHERS</b>		
	61	TYPE / MODEL	ERAC
	62	SOFTWARE VERSION	MCN0121
	63	SERIAL NO.	N/A
	64	PASS CODE	0000 – 9999
	65	TAG NUMBER	0000000 - 9999999

### 3.4 EXPLANATION OF SETUP-FUNCTIONS

<b>1 - TOTAL</b>	
<b>MEASUREMENT UNIT</b> <b>11</b>	<p>SETUP - 11 determines the measurement unit for total and accumulated total. The following units can be selected:</p> <p>L - m<sup>3</sup>- kg - lb. - GAL - USGAL – bbl. - (no unit)</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.</p>
<b>DECIMALS</b> <b>12</b>	<p>The decimal point determines for total and accumulated total the number of digits following the decimal point. The following can be selected:</p> <p>0000000 - 111111.1 - 2222.22 - 3333.333</p>
<b>K-FACTOR</b> <b>13</b>	<p>With the K-factor, the flowmeter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 11), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p><b>Example 1: Calculating the K-factor</b> Let us assume that the flowmeter generates 2.4813 pulses per litre and the selected unit is "m<sup>3</sup>". A cubic meter consists of 1000 parts of one litre which implies 2,481.3 pulses per m<sup>3</sup>. So, the K-factor is 2,481.3. Enter for SETUP - 13: "2481300" and for SETUP - 14: decimals K-factor "3".</p> <p><b>Example 2: Calculating the K-factor</b> Let us assume that the flowmeter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for SETUP - 13: "6523100" and for SETUP - 14: decimals K-factor "6".</p>
<b>DECIMALS K-FACTOR</b> <b>14</b>	<p>This setting determines the number of decimals for the K-factor entered. (SETUP 13). The following can be selected:</p> <p>0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this setting influences the accuracy of the K-factor indirectly. (i.e., the position of the decimal point and thus the value given). This setting has NO influence on the displayed number of digits for total (SETUP 12)!</p>
<b>2 - FLOWRATE</b>	
<p>The settings for total and flowrate are entirely separate. In this way, different units of measurement can be used for each e.g., cubic meter for total and litres for flowrate. The display update time for flowrate is one second or more. <b>NOTE:</b> These settings also influence the analogue output.</p>	
<b>MEASUREMENT UNIT</b>	<p>SETUP - 21 determines the measurement unit for flowrate. The following units can be selected:</p>

<b>21</b>	<p>mL - L - m<sup>3</sup> - mg - g - kg - ton - GAL - bbl. - lb – cf. - REV - no unit - scf. - Nm<sup>3</sup> - NL - P.</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values.</p> <p>Please note that the K-factor has to be adapted as well; the calculation is not done automatically.</p>
<b>TIME UNIT</b> <b>22</b>	The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
<b>DECIMALS</b> <b>23</b>	<p>This setting determines for flowrate the number of digits following the decimal point. The following can be selected:</p> <p style="text-align: center;">00000 - 1111.1 - 2222.22 - 3333.333</p>
<b>K-FACTOR</b> <b>24</b>	With the K-factor, the flowmeter pulse signals are converted to a flowrate. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 21), for example per litre. The more accurate the K-factor, the more accurate the functioning of the system will be. For examples read SETUP 13.
<b>DECIMALS K-FACTOR</b> <b>25</b>	<p>This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected:</p> <p style="text-align: center;">0 - 1 - 2 - 3 - 4 - 5 - 6</p> <p>Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flowrate" (SETUP 23).</p>
<b>CALCULATION</b> <b>26</b>	<p>The flowrate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flowrate will be. The maximum value is 255 pulses.</p> <p><b>Note:</b> the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).</p> <p><b>Note:</b> for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.</p> <p><b>Note:</b> for high frequency application (above 1kHz) do program a value of 100 or more pulses.</p>
<b>CUT-OFF TIME</b> <b>27</b>	With this setting, you determine a minimum flow requirement thresh-hold, if during this time less than XXX-pulses (SETUP 26) are generated, the flowrate will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).
<b>3 - DISPLAY</b>	
<b>FUNCTION</b> <b>31</b>	The large 17mm digits can be set to display total or flowrate. When "total" is selected, both total and flowrate are displayed simultaneously. When "flowrate" is selected, only flowrate will be displayed with its measuring unit while total will be displayed after pressing SELECT.
The functions below will only affect the optional LED-backlight.	
<b>LIGHT</b> <b>32</b>	<p>If a LED backlight has been supplied, the colour can be selected. Following selections are available:</p> <p style="text-align: center;">0% (off); 20%; 40%; 60%; 80%; 100% (full brightness)</p>
<b>4 - POWER MANAGEMENT</b>	
When used with the internal battery option, the user can expect reliable measurement over a long period of time. The ER has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:	
<b>LCD UPDATE</b> <b>41</b>	<p>The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is <b>strongly advised</b> to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signal will be generated in the normal way. The following can be selected:</p> <p style="text-align: center;">Fast - 1 sec - 3 sec - 15 sec - 30 sec - off.</p>

 <b>Note !</b>	<p><b>Note:</b> after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.</p> <p>Example battery life-time with a coil pick-up:</p> <ul style="list-style-type: none"> <li>• 1kHz pulse and FAST update: about 2 years;</li> <li>• 1kHz pulse and 1 sec update: about 5 years.</li> </ul>			
<b>BATTERY-MODE 42</b>	<p>The unit has two modes: <b>operational or shelf</b></p> <p>After "shelf" has been selected, the unit can be stored for several years; it will not process the sensor signal; the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low.</p> <p>To wake up the unit again, press the SELECT-key twice.</p>			
<b>5 - FLOWMETER</b>				
<b>SIGNAL 51</b>	<p>The ERAC is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with SETUP 51.</p> <p>Read also par. 4.4.2. or 4.4.3 - flowmeter input terminals.</p>			
<b>TYPE OF SIGNAL</b>	<b>EXPLANATION</b>	<b>RESISTANCE</b>	<b>FREQ. / MV</b>	<b>REMARK</b>
NPN	NPN input	100 k-Ohm pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100 k-Ohm pull-up	1.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1 m-Ohm pull-up	600 Hz.	-
REED - LP	Reed-switch input with low pass filter	1 m-Ohm pull-up	120 Hz.	Less sensitive
<b>6 - ANALOG</b>				
<p>A passive linear analogue 4-20mA signal is generated according to the flowrate with a 10 bits resolution. The settings for flowrate (SETUP - 2) influence the analogue output directly.</p> <p>The relationship between rate and analogue output is set with the following functions:</p>				
<b>DISABLE / ENABLE 61</b>	<p>If the analogue output is not used, select disable to minimize the power consumption (e.g., save battery life-time).</p> <p>3.5mA will be generated if a power supply is available but the output is disabled.</p>			
<b>MINIMUM FLOWRATE 62</b>	<p>Enter here the flowrate at which the output should generate the minimum signal (4mA) - in most applications at flowrate "zero".</p> <p>The number of decimals displayed depend upon SETUP 23.</p> <p>The time and measuring units (L/min for example) are dependent upon SETUP 21 and 22 but are not displayed.</p>			
<b>MAXIMUM FLOWRATE 63</b>	<p>Enter here the flowrate at which the output should generate the maximum signal (20mA) - in most applications at maximum flow.</p> <p>The number of decimals displayed depend upon SETUP 23.</p> <p>The time and measuring units (L/min for example) are dependent upon SETUP 21 and 22 but cannot be displayed.</p>			
<b>CUT-OFF 64</b>	<p>To ignore leakage of the flow for example, a low flow cut-off can be set as a percentage of the full range of 16mA, (20mA).</p> <p>When the flow is less than the required rate, the current will be the minimum signal (4mA).</p> <p><b>Examples:</b></p>			
<b>4mA (SETUP 62)</b>	<b>20mA (SETUP 63)</b>	<b>CUT-OFF (SETUP 64)</b>	<b>REQUIRED RATE</b>	<b>OUTPUT</b>
0 L/min	100 L/min	2%	$(100-0) \times 2\% = 2.0$ L/min	$4+(16 \times 2\%) = 4.32\text{mA}$
20 L/min	800 L/min	3.5%	$(800-20) \times 3.5\% = 27.3$ L/min	$4+(16 \times 3.5\%) = 4.56\text{mA}$
<b>TUNE MIN / 4mA 65</b>	<p>The initial minimum analogue output value is 4mA. However, this value might differ slightly due to external influences such as temperature for example. The 4mA value can be tuned precisely with this setting.</p>			

	<p><b>Before tuning the signal, be sure that the analogue signal is not being used for any application!</b></p> <p>After pressing PROG, the current will be about 4mA. The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value.  <b>Remark:</b> the analogue output value can be programmed “up-side-down” if desired, so 20mA at minimum flowrate for example!</p>			
<p><b>TUNE MAX / 20mA</b> <b>66</b></p> 	<p>The initial maximum analogue output value is 20mA. However, this value might differ slightly due to external influences such as temperature for example. The 20mA value can be tuned precisely with this setting.</p> <p><b>Before tuning the signal, be sure that the analogue signal is not being used for any application!</b></p> <p>After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value.  <b>Remark:</b> the analogue output value can be programmed “up-side-down” if desired, so 4mA at maximum flowrate for example!</p>			
<p><b>FILTER</b> <b>67</b></p>	<p>This function is used to stabilize the analogue output signal.  The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained.  The filter principal is based on three input values: the filter level (01 - 99), the last analogue output value and the last average value. The higher the filter level, the longer the response time on a value change will be.  Below, several filter levels with their response times are indicated:</p>			
<p><b>FILTER VALUE</b></p>	<p><b>RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS</b></p>			
	<p><b>50% INFLUENCE</b></p>	<p><b>75% INFLUENCE</b></p>	<p><b>90% INFLUENCE</b></p>	<p><b>99% INFLUENCE</b></p>
<p>01</p>	<p>filter disabled</p>	<p>filter disabled</p>	<p>filter disabled</p>	<p>filter disabled</p>
<p>02</p>	<p>0.1 second</p>	<p>0.2 second</p>	<p>0.4 second</p>	<p>0.7 second</p>
<p>03</p>	<p>0.2 second</p>	<p>0.4 second</p>	<p>0.6 second</p>	<p>1.2 seconds</p>
<p>05</p>	<p>0.4 second</p>	<p>0.7 second</p>	<p>1.1 seconds</p>	<p>2.1 seconds</p>
<p>10</p>	<p>0.7 second</p>	<p>1.4 seconds</p>	<p>2.2 seconds</p>	<p>4.4 seconds</p>
<p>20</p>	<p>1.4 seconds</p>	<p>2.8 seconds</p>	<p>4.5 seconds</p>	<p>9.0 seconds</p>
<p>30</p>	<p>2.1 seconds</p>	<p>4 seconds</p>	<p>7 seconds</p>	<p>14 seconds</p>
<p>50</p>	<p>3.5 seconds</p>	<p>7 seconds</p>	<p>11 seconds</p>	<p>23 seconds</p>
<p>75</p>	<p>5.2 seconds</p>	<p>10 seconds</p>	<p>17 seconds</p>	<p>34 seconds</p>
<p>99</p>	<p>6.9 seconds</p>	<p>14 seconds</p>	<p>23 seconds</p>	<p>45 seconds</p>
<p><b>7 - IMPULSE</b></p>				
<p>One transistor output is available as scaled pulse output according to the accumulated total.</p>				
<p><b>PULSE WIDTH</b> <b>PULSE OUTPUT</b> <b>71</b></p>  <p>Note !</p>	<p>The pulse width determines the time that the output will be switched on (in other words the pulse length). The time between two pulses (when the output is switched-off) is at least as long as the pulse width time (50/50 duty time).  The pulse width is set in milliseconds in the range of 0.0001 – 999.9 seconds.  Value “zero” disables the pulse output.  <b>Note:</b> If the frequency should go out of range - when the flowrate increases for example - an internal buffer will be used “to store the missed pulses”. As soon as the flowrate slows down the buffer will be “emptied”.  It might be that pulses will be missed due to the buffer over-flow, so it is advised to program, these settings within its range.</p>			
<p><b>DECIMALS</b> <b>72</b></p>  <p>Note !</p>	<p>This setting determines the decimal position for settings 73.  <b>Note:</b> The measuring unit is according to setting 11 (for total).</p>			
<p><b>AMOUNT</b> <b>73</b></p>	<p>According to the measurement unit settings for total, a pulse will be generated every X-quantity. Enter this quantity here while taking the displayed decimal position and measuring unit into account.</p>			
<p><b>8 – COMMUNICATION</b></p>				



Note !

**Note:** This product is designed for the connection to a communication network. Products with a communication option do not include cyber security functions. Macnaught cannot take any responsibility for the cyber security, omissions or errors in the communication safety. To maintain a secure operation, automation and control, it is the sole responsibility of the owner to install and manage the appropriate safety measures to protect the network, the product and the communication against any kind of security breaches.

The functions described below deal with hardware that is not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation.

<b>SPEED</b> 81	For external control, the following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 Baudrate
<b>BUS ADDRESS</b> 82	For communication purposes, a unique identity can be attributed to every ERAC. This address can vary from 1 - 247.
<b>MODE</b> 83	This setting is used to set the Modbus transmission mode. Select OFF to disable the communication.
<b>9 - OTHERS</b>	
<b>TYPE OF MODEL</b> 91	This setting shows the model's name.
<b>VERSION SOFTWARE</b> 92	This setting shows the version number of the firmware (software).
<b>SERIAL NUMBER</b> 93	This setting shows the serial number.
<b>PASS CODE</b> 94	This setting is used to set a password (pin code) to limit the access for the setup menu. Only persons who know the pin code can access the setup menu. The pin code 0000 disables the pin code to allow for access by any person.
<b>TAGNUMBER</b> 95	This setting is used to set a tag number for the ERAC.

## 4. INSTALLATION

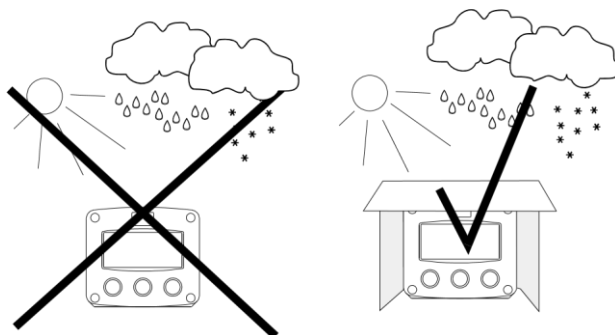
### 4.1 GENERAL DIRECTIONS

- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The ERAC may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
- Take careful notice of the " Safety rules, instructions and precautionary measures " at the front of this manual.

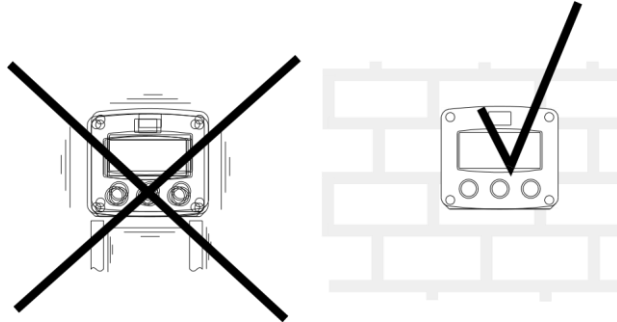


Caution !

### 4.2. INSTALLATION / SURROUNDING CONDITIONS



- Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.
- When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case.



Mount the ERAC on a solid structure to avoid vibrations.

### 4.3. DIMENSIONS- ENCLOSURE

#### Aluminium enclosures ERAC-RMA:

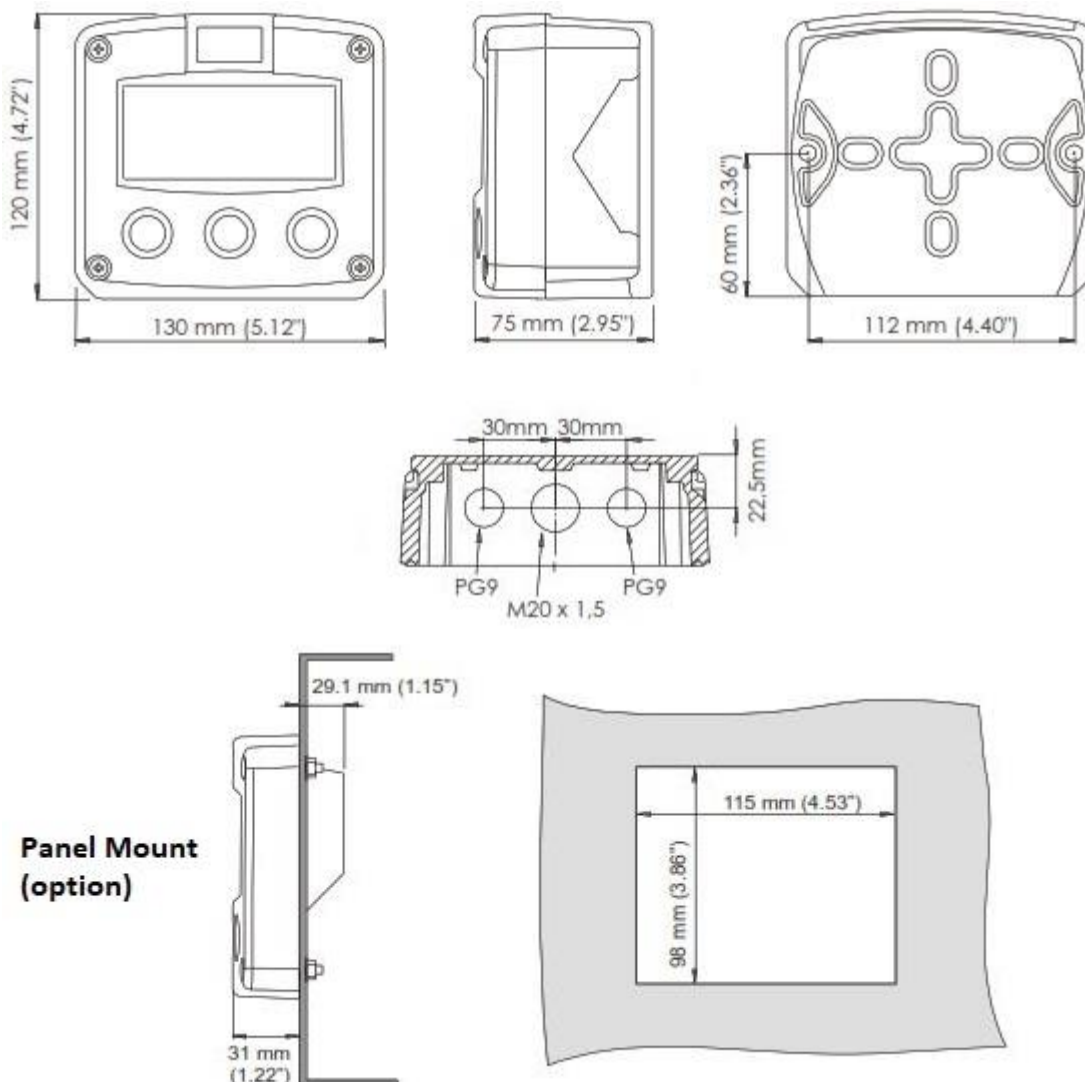


Fig. 4: Dimensions Aluminium enclosures



#### 4.4 INSTALLING THE HARDWARE



- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).

##### Aluminium enclosures

- When installed in an aluminium enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- Do ground the aluminium enclosure properly as indicated.

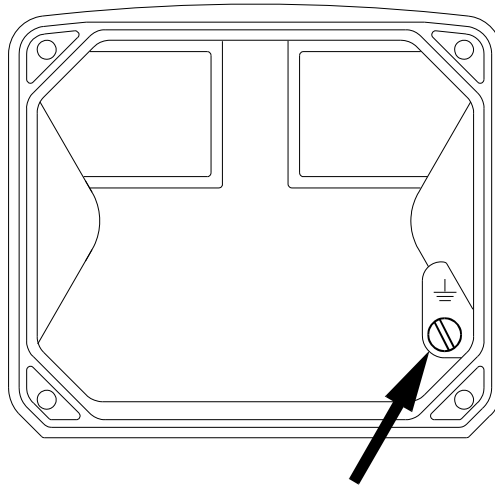


Fig. 5: Grounding Aluminium enclosure



Note !

##### FOR INSTALLATION, PAY EMPHATIC ATTENTION TO:

- Separate cable glands with effective IP67 (NEMA4X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 (NEMA4X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal casing. (above)
- An effective screened cable for the input signal, and grounding of its screen to the “⊥” terminal or at the sensor itself, whichever is appropriate to the application.

##### 4.4.1 TERMINAL CONNECTORS WITH POWER SUPPLY

###### Battery powered and output loop-powered applications:

Terminal 11 provides a limited supply voltage of 3.2 V DC for the signal output of the flowmeter when battery powered.

**Note:** This voltage MAY NOT be used to power the flowmeters electronics, converters etc, as it will not provide adequate sustained power! All energy used by the flowmeters pick-up will directly influence the battery life-time. It is strongly advised to use a "zero power" pickup such as reed-switch when operating without external power. It is possible to use some low power NPN output signals, but the battery life time will be significantly reduced (consult Macnaught).

**Sensor supply: 3.2V / 8.2V / 12V or 24 V DC: (When external power supply connected to display GND, 1)**

With this option, a real power supply for the sensor is available. The flowmeter can be powered with 8.2 / 12 or 24 V DC. Total power consumption PD: max. 50mA@24V. The voltage is selected with the three switches inside the enclosure.

**Warning:** be sure that all the leads to the terminals are disconnected from the unit when the internal plastic protection cover has been removed!

First, remove the terminal strip(s) after which the internal plastic cover can be removed. The switches are located in the top left corner as indicated:

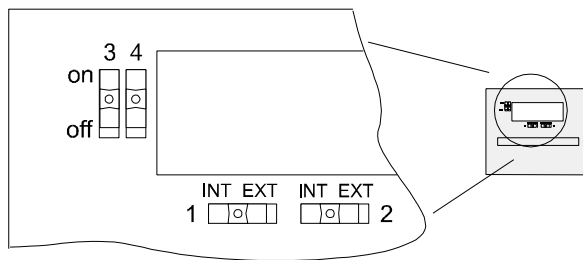


Fig. 6: Switch setting sensor supply voltage.

**Switch positions:**

Sensor A		Sensor B		Voltage Selection		
Switch 1	Voltage	Switch 2	Voltage	Switch 3	Switch 4	Voltage
Internal	3.2 V DC	-	-	On	On	8.2 V DC
External	Switch 3 + 4	-	-	On	Off	12 V DC
				Off	Off	24 V DC
Function Switch 1		Voltage selection sensor A - terminal 11				
Function Switch 1		Not available for this model				
Function Switch 1		The combination of these switches determines the voltage as indicated. Do move switch 1 and / or switch 2 to the OFF position to enable the selected voltage with switch 3 + 4				

**4.4.2 TERMINAL CONNECTORS**

The following terminal connectors are available:

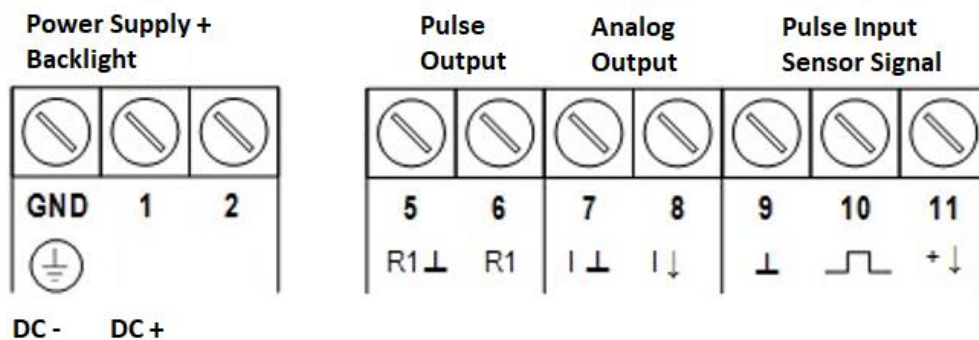


Fig. 7: Overview of terminal connectors standard configuration ERAC and options.

**REMARKS: TERMINAL CONNECTORS:**

**Terminal GND- 01- 02: Power Supply - only available with type PD:**

Type	Sensor Supply	Terminal			Backlight
		GND	01	02	
8 - 30 V DC	8.2 / 12 / 24V max. 50mA	DC -	DC +	-	◇



Note !

**Backlight**

**Note:** The backlight supply is integrated, so the text following is not applicable.

To supply the ERAC with power (>24V DC) for the backlight the terminal connectors below are used:



Fig. 8: Overview terminal connectors backlight option.

**Terminal 05-06; scaled pulse output R1:**

Setup 7 determines the pulse output function. The maximum pulse frequency of this output is 60Hz. If a relay output option has been supplied, be sure that the output frequency does not exceed 5Hz or else the life-time of the relay will be reduced significantly.

A **passive transistor output** is available with this option. Max. driving capacity 300mA@50V DC.

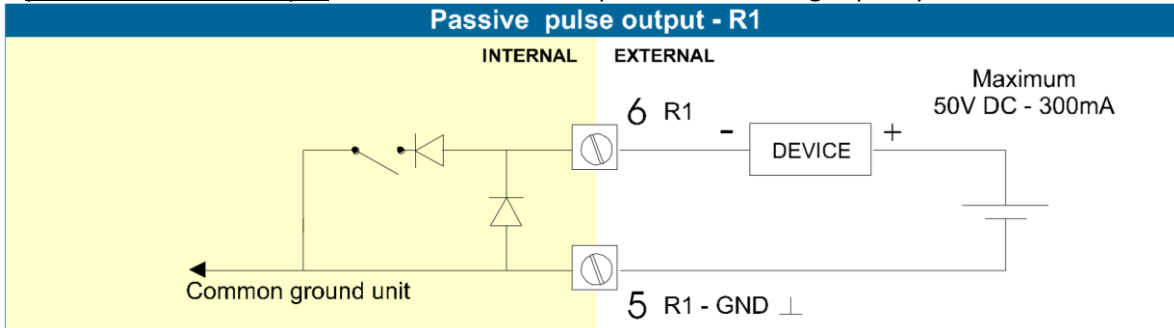


Fig. 9: Overview terminal connectors - Scalable Pulse Output

**Terminal 07-08: basic POWER SUPPLY - output loop powered:**

Connect an external power supply of 18-30 VDC to these terminals or a 4 - 20 mA loop.

Do connect the "-" to terminal 7 and the "+" to terminal 8. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time.

A passive 4-20mA signal proportional to the flowrate is available with this option. When a power supply is connected but the output is disabled, a 3.5mA signal will be generated. Max. driving capacity 1000 Ohm. This output does loop power the unit as well.

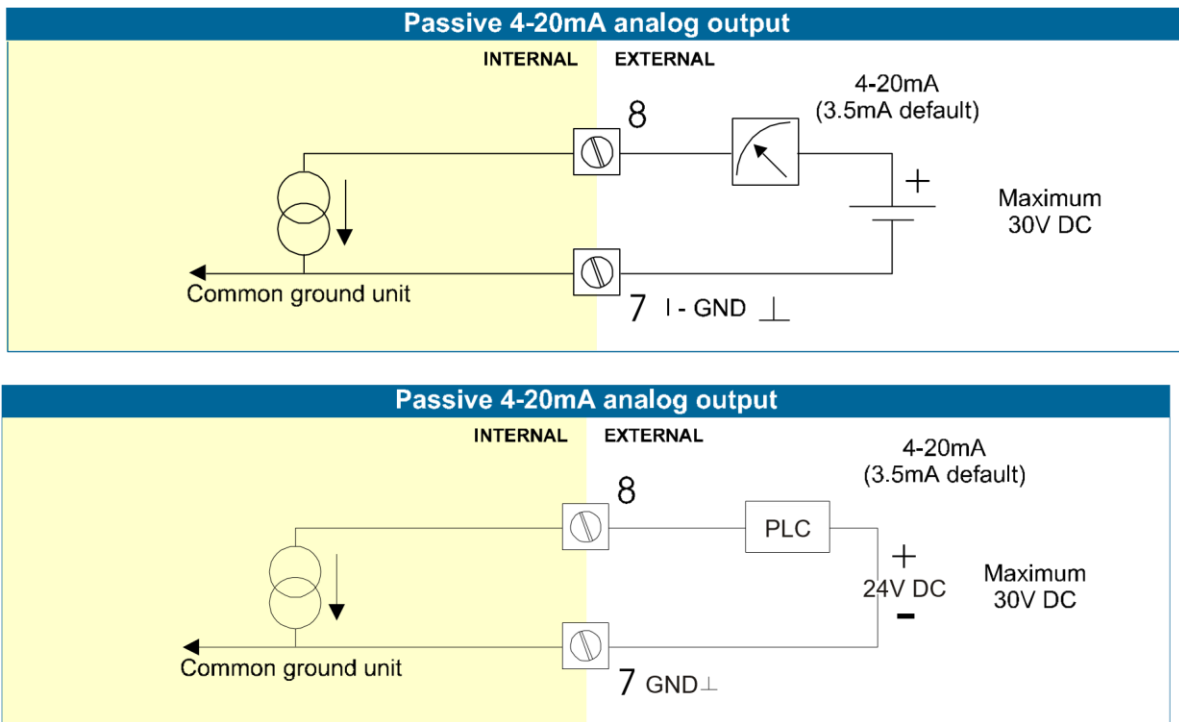


Fig. 10: Overview terminal connectors - Passive 4-20 mA

#### Terminal 09-11: Flowmeter input:

Two basic types of digital flowmeter signals can be connected to the unit: Reed or NPN. The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself). The maximum input frequency is approximately 10 kHz (depending on the type of signal).

#### Pulse-signal NPN / NPN-LP:

The ERAC is suitable for use with flowmeters which have an NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency.

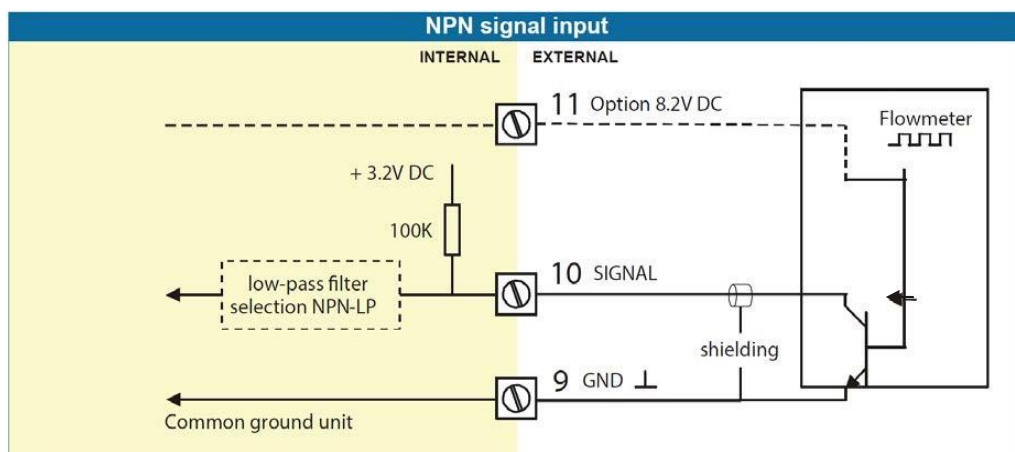


Fig. 11: Overview terminal connectors - NPN Signal input

#### Reed-switch:

The ERAC is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 3.2.3.)

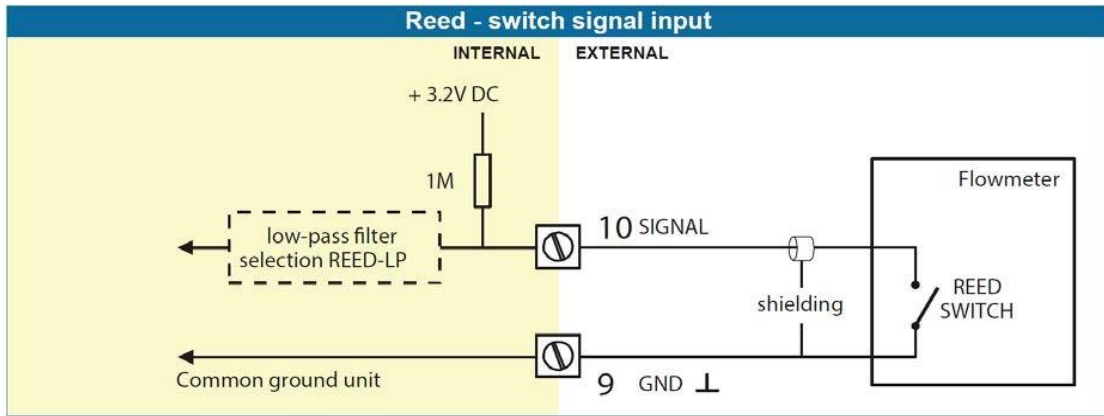


Fig. 12: Overview terminal connectors - Reed Switch input

### Terminal 26-31: Modbus Communication RS485 (2-Wire)

- Full serial communications and computer control in accordance with RS485 (length of cable max. 1200 meters) is possible.
- Read the Modbus communication protocol.

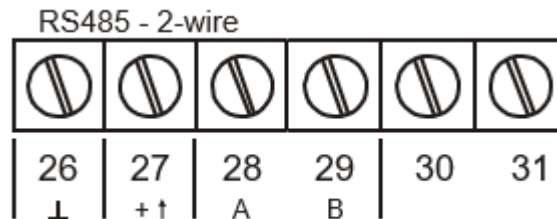


Fig. 13: Overview terminal connectors communication option

## 5. MAINTENANCE

### 5.1. GENERAL DIRECTIONS

The ERAC does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the user's responsibility to take all precautions to dehumidify the internal atmosphere of the ERAC in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

#### Battery life-time:

It is influenced by several issues:

- Type of sensor: NPN sensor consumes more energy than reed switch
- Input frequency: the higher the frequency, the shorter the battery life-time.
- Flowrate calculation: the lower number of pulses (SETUP 26) the shorter the battery life-time.
- Analog output signal; be sure that an external power supply is connected or that the function is disabled if not in use; or else it will have an influence on the battery life-time (SETUP 61).
- Display update: fast display update uses significantly more power; SETUP 41.
- Pulse output and communications.
- Low temperatures; the available power will be less due to battery chemistry.

**Note:** It is strongly advised to use only necessary functions.

#### Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.

- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

## 5.2. REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

### APPENDIX A: TECHNICAL SPECIFICATION

GENERAL	
<b>Display</b>	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17 mm (0.67") and eleven 8 mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec – 30 secs.
Backlight	LCD with green LED backlight. Good readings in full sunlight and darkness. <b>Note:</b> only available for safe area applications. Power requirements: 8 – 30V DC (1 Watt)
<b>Enclosure</b>	
Field/wall-mount enclosures Classification Aluminium enclosures Type ERAC-RMA GRP enclosures Type ERAC-RMP	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – L x H x D IP67 / NEMA4X  Drilling: 2x PG9 – 1x M20.  Drilling: 2 x 16mm (0.63") – 1 x 20mm (0.78")
Operating Temperature	- 40 °C to + 80 °C (- 40 °F to + 178 °F).
Power Requirement	Lithium battery – life-time depends upon settings – up to 5 years.  8 – 30 V DC + 10%. Power consumption max. 10 Watt.
Sensor excitation	Sensor supply voltage: 3.2V DC for pulse signals <b>Please note:</b> this is not a real sensor supply. Only suitable for sensors with a very low power. Consumption like reed-switches. With pulse input type P: sensor supply 3.2 / 8.2 / 12 and 24V DC – max. 50Ma@24V DC – external power supply to be connected to display
Terminal connections	Removable plug-in terminal strip. Wire max. 1.5mm <sup>2</sup> and 2.5 mm <sup>2</sup>
<b>Data protection</b>	
Type Pass Code	EPROM backup of all settings. Data retention at least 10 years. Configuration settings can be pass code protected.
<b>Directives and Standards</b>	
EMC	EN 61326-1; FCC 47 CFR part 15
LVD	EN/IEC 61010-1
RoHS	EN 50581
IP & NEMA	EN 60529; NEMA 250
<b>Inputs</b>	
	NPN, reed-switch
Frequency	Minimum 0 Hz – maximum 7 kHz for flowrate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-factor	0.000010 – 9,999,999 with variable decimal position
Low-pass filter	Available for all pulse signals



Note !

<b>Outputs – Analog</b>	Function Accuracy  Load Type	Transmitting flowrate. 10 bits. Error < 0.05% - update 10 times a second. Software function to calibrate the 4.00Ma and 20.00Ma levels precisely within set-up. Max. 1 kOhm Passive 4-20mA output – output loop powered.
<b>Outputs – Switch</b>	Function Pulse Output  Type	One pulse output – transmitting accumulated total. Max. frequency 60Hz. Pulse length user definable between 7,8msec up to 2 seconds. Passive transistor output – not isolated. Load max. 50V DC – 300mA.
<b>Communication</b>	Functions Protocol Speed Addressing Type	reading display information, reading / writing all settings. bus-rtu; bus-asc 1200 - 2400 - 4800 - 9600 baudrate maximum 247 addresses RS485 2-wire
<b>Operational</b>	Operator functions (Displayed)	total and/or flowrate total and accumulated total total can be reset to zero by pressing the CLEAR-key twice
<b>Total</b>	Digits Units Decimals Note	7 digits L, m <sup>3</sup> , GAL, USGAL, KG, lb, bbl., no unit 000000; 11111.1; 22222.22; 3333.333 Total can be reset to zero
<b>Accumulated Total</b>	Digits Units/Decimals	11 digits According to selection for total
<b>Flowrate</b>	Digits Units Decimals Time Units	7 Units mL, L, m <sup>3</sup> , Gallons, KG, Ton, lb, bl, cf, RND, ft <sup>3</sup> , scf, N m <sup>3</sup> , NI, igal - no units 0 - 1 - 2 or 3 /sec - /min - /hr - /day.

## APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the ERAC is going to be installed or while it is in operation.

### Flowmeter does not generate pulses:

Check:

- Signal selection
- Pulse amplitude
- Flowmeter, wiring and connection of terminal connectors
- Power supply of flowmeter

### Flowmeter generates "too many pulses":

Check:

- Settings for total and Flowrate:

- Type of signal selected with actual signal generated -
- Sensitivity of coil input
- Proper grounding of the ERAC
- Use screened wire for flowmeter signals and connect screen to the "1" terminal 9.

#### **Analog output does not function properly:**

Check:

- is the analogue output enabled?
- are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

#### **Pulse output does not function:**

Check:

- AMOUNT - pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- WIDTH - impulse width; is the external device able to recognize the selected pulse width and frequency?

#### **Flowrate displays "0 / zero" while there is flow (total is counting):**

Check:

- are the K-Factor and time unit correct?
- The unit has to count the number of pulses according to setup 26 within the time according to setup 27. Make sure, setup 27 is set to 10.0 seconds for example: the result is that the unit has at least 10 seconds time to measure the number of pulses according to setup 26.

#### **The pass code is unknown:**

If the pass code is not 1234, there is only one possibility left: call your supplier.

### **ALARM**

When the alarm flag starts to blink an internal alarm, condition has occurred. Press the "select button" several times to display the error code. When multiple errors arise at the same time, their error codes are added and their sum is shown. The digital [d] codes are:

Not recoverable by the end user:

[d] 0 = no error;

[d] 1 = display error;

[d] 2 = data-storage error;

[d] 3 = error 1 + error 2 simultaneously;

[d] 4 =: initialization error.

For a not recoverable error, keep the error code at hand and contact your supplier.

### **APPENDIX C: COMMUNICATION VARIABLES**

#### **GENERAL**

The product is fitted with the Modbus communication protocol and can be equipped with RS485 (please see device datasheet for available options). The tables below show the various variables that can be accessed through the communication.

Currently, the function codes supported are:

- function code 3 "Read Holding Registers" (4x references);
- function code 16 "Pre-set Multiple Registers" (4x references).



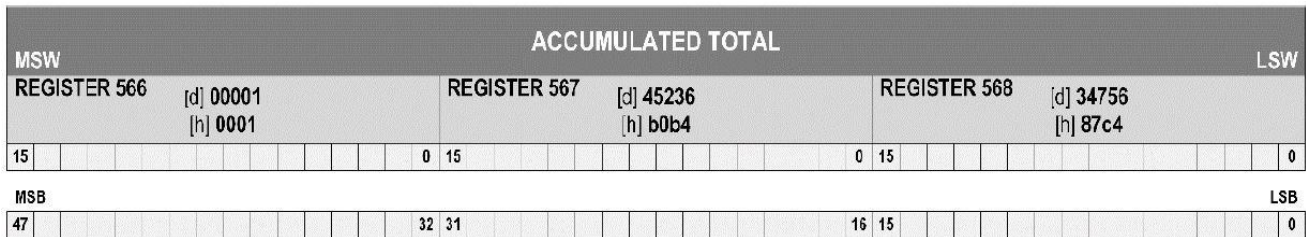
The table below shows the Modbus PDU addresses in a decimal format, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references are typically used by PLCs), please add a value of 40001 to the Modbus PDU address. E.g., reading the serial number of the product with PLC-based addressing means: 165 + 40001 = register 40166.

**The variables that consist of a multiple register must always read/write in 1 single action!**

Refer to the illustration:

For this example, it is assumed that the variable accumulated total has 3 registers (words) with address 566, 567 and 568. When a transmission is done, register 566, which acts as the MSW, arrives first with bit 15 which is the MSB of the lowest addressed word, but is also the MSB (bit 47) of the complete variable that represents the Accumulated total.

Although most Modbus Masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.



**ACCUMULATED TOTAL:** [register 566 \* 4294967296] + [register 567\* 65536] + [register 568\*1] =  
 [d] **ACCUMULATED TOTAL:** [00001 \* 4294967296] + [45236 \* 65536] + [34756\*1] = 7259588540  
 [h] **ACCUMULATED TOTAL:** 0x[0001] [b0b4] [87c4] = 1B0B487BC

For additional information regarding using your Modbus device, please read our 'General Modbus Communication Protocol' and 'Modbus troubleshooting guide' that are available through our website or your distributor.

## Runtime variables

PDU ADDRESS	REGISTER	VARIABLE RUN TIME	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 572 [h] 0x23C	40573	flow rate	2	R	uint32	0...9999999, Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 566 [h] 0x236	40567	total	3	R*	uint48	0...9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 560 [h] 0x230	40561	accumulated total	3	R	uint48	0...99999999999999, Representation: unit, decimals depending on variables 32, 33
[d] 516 [h] 0x204	40517	error status (bitfield)	1	R	uint16	[d] 0 = no error [d] 1 = display error [d] 2 = data-storage error [d] 3 = error 1 + error 2 simultaneously [d] 4 =: initialization error

**Reading flow rate, total or accumulated total:** The returned values are given including the decimals and represent the actual value. The given value may differ from the value that is shown on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate set. For example, when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a “total” of 12345678 (note that the decimals should be adapted according the setting in “total decimals” which is in this case 2).

**Clearing total:** It is possible to clear the total counter by means of writing a value of 0 to all the 3 registers of total/flow rate in a single write action. Writing any other value will result in the reply of an error message because the registers of total/flow rate are during operation read-only.

**Setup Variables**

PDU ADDRESS	REGISTER	VARIABLE TOTAL	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 32 [h] 0x020	40033	unit	1	R/W	uint16	0=none 1=L 2= m <sup>3</sup>
[d] 33 [h] 0x021	40034	decimals	1	R/W	uint16	3=kg 4= lb 5=GAL 6= USGAL 7=bb1
[d] 34 [h] 0x022	40035	K-Factor	2	R/W	uint32	1...9999999 Representation: 0.000010...9999999 depending on variable 37: K-Factor decimals.
[d] 37 [h] 0x025	40038	K-Factor decimals	1	R/W	uint16	0...6
PDU ADDRESS	REGISTER	VARIABLE FLOW RATE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 48 [h] 0x030	40049	unit	1	R/W	uint16	0=mL 1=L 2= M <sup>3</sup> 3=mg 4=g 5=kg 6=ton 7=GAL 8=bb1 9=lb 10=cf 11=rev 12=none 13=scf 14=NM <sup>3</sup> 15=NL 16=P
[d] 49 [h] 0x031	40050	time unit	1	R/W	uint16	0=/sec 1=/min 2=/hour 3=/day
[d] 50 [h] 0x032	40051	decimals	1	R/W	uint16	0...3
[d] 51 [h] 0x033	40052	K-Factor	2	R/W	uint32	1...9999999 Representation: 0.000010...9999999 depending on variable 54: decimals K-Factor.
[d] 54 [h] 0x036	40055	K-Factor decimals	1	R/W	uint16	0...6
[d] 55 [h] 0x037	40056	number of pulses	1	R/W	uint16	1...255
[d] 56 [h] 0x038	40057	cut-off time	1	R/W	uint16	1...9999 Representation: 0.1 - 999.9 sec
PDU ADDRESS	REGISTER	VARIABLE DISPLAY	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 64 [h] 0x040	40065	display function	1	R/W	uint16	0=total 1=flow rate
[d] 67 [h] 0x043	40068	backlight brightness	1	R/W	uint16	0=off 1=20% 2=40% 3=60% 4=80% 5=100%
PDU ADDRESS	REGISTER	VARIABLE POWER MANAGEMENT	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 80 [h] 0x050		LCD update time	1	R/W	uint16	0=fast 1=1sec 2=3sec 3=15sec 4=30sec 5=off
[d] 81 [h] 0x051		power mode	1	R/W	uint16	0=operational 1=shelf
PDU ADDRESS	REGISTER	VARIABLE FLOWMETER	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 96 [h] 0x060	40097	flowmeter signal	1	R/W	uint16	0=NPN 1=NPN LP 2=Reed 3=Reed LP 4=PNP 5=PNP LP 6=NAMUR 7=coil hi 8= coil lo 9=act 8.1V 10= act 12 V 11=act 24V

PDU ADDRESS	REGISTER	VARIABLE ANALOG OUTPUT	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 112 [h] 0x070	40113	analog output	1	R/W	uint16	0=disable 1=enable
[d] 113 [h] 0x071	40114	minimum rate	2	R/W	uint32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 116 [h] 0x074	40117	maximum rate	2	R/W	uint32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
[d] 119 [h] 0x077	40120	cut off percentage	1	R/W	uint16	0...99 Representation: 0.0 – 9.9%
[d] 120 [h] 0x078	40121	tune minimum rate	1	R/W	uint16	0...9999
[d] 122 [h] 0x07A	40123	tune maximum rate	1	R/W	uint16	0...9999
[d] 127 [h] 0x07F	40128	filter	1	R/W	uint16	1...99
PDU ADDRESS	REGISTER	VARIABLE PULSE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 128 [h] 0x080	40129	pulse width	1	R/W	uint16	0...9999, (0=disabled) Representation: 0.000 – 9.999 sec
[d] 133 [h] 0x085	40134	decimals	1	R/W	uint16	0...3
[d] 130 [h] 0x082	40131	amount	2	R/W	uint32	1...9999999 Representation: 0.001 – 9999999 depending on variable 133
PDU ADDRESS	REGISTER	VARIABLE COMMUNICATION	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 144 [h] 0x090	40145	speed (Baudrate)	1	R/W	uint16	0=1200 1=2400 2=4800 3=9600
[d] 145 [h] 0x091	40146	Modbus address	1	R/W	uint16	1...247
[d] 146 [h] 0x092	40147	Modbus mode	1	R/W	uint16	0: ASCII 1: RTU 2: OFF
[d] 147 [h] 0x093	40148	delay	1	R/W	uint16	delay between read and write command 0...65355
[d] 150 [h] 0x096	40151	index	1	R/W	uint16	used for indexed values
[d] 149 [h] 0x095	40150	Index use	1	R/W	uint16	0= static 1= increment 2= decrement
[d] 25 [h] 0x019	400026	reboot	1	R/W	uint16	Returns 0 on read. Write 0xA50F for unit restart Write 0xA5AF0 for factory settings
PDU ADDRESS	REGISTER	VARIABLE OTHERS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 173 [h] 0x0AD	40174	model number	1	R	uint16	0...9999
[d] 160 [h] 0x0A0	40161	model suffix	1	R	char	Representation: ASCII character
[d] 162 [h] 0x0A2	40163	firmware version	2	R	uint32	0...9999999 Representation: nn:nn:nn
[d] 165 [h] 0x0A5	40166	serial no	2	R	uint32	0...99999999 Representation: nnnnnnn
[d] 168 [h] 0x0A8	40169	password	1	R	uint16	0...9999
[d] 170 [h] 0x0AA	40171	tag-nr	2	R/W	uint32	0...99999999 Representation: nnnnnnn

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## LIST OF CONFIGURATION SETTINGS

SETTINGS	DEFAULT	DATE:	DATE:
<b>1-Total</b>		Enter your settings here	
11 unit	L		
12 decimals	0000000		
13 K-factor	0000001		
14 decimals K-factor	0		
<b>2-Flowrate</b>			
21 unit	L		
22 time unit	/min		
23 decimals	0000000		
24 K-factor	0000001		
25 decimals K-factor	0		
26 calculation / pulses	010		
27 cut-off time	30.0 sec.		
<b>3-Display</b>			
31 function	total		
32 light	100%		
<b>4-Power Management</b>			
41 LCD-new	1 sec.		
42 mode	operational		
<b>5-Flowmeter</b>			
51 Signal	NPN		
<b>6-Analog Output</b>			
61 output	disable		
62 rate-min	0000000		
63 rate-max	9999999		
64 cut off	0.0%		
65 tune min	0160		
66 tune max	6656		
67 filter	0 (off)		
<b>7-Pulse Output</b>			
71 width	000 sec		
72 decimals	0		
73 amount	0001000		
<b>8-Communication</b>			
81 speed	9600		
82 address	1		
83 mode	BUS-RTU		
<b>9-Others</b>			
91 model	ERAC		
92 software version	MCN0121		
93 serial number	-----		
94 pass code	0000		
95 tag-number	0000000		



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