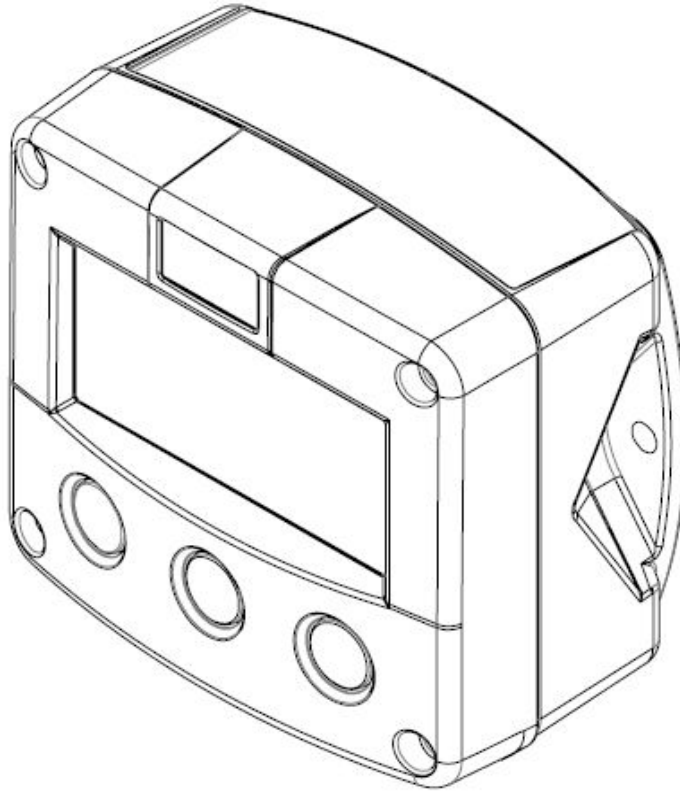


# **Wiring & Programming Instruction Manual**

*(Options: RW3-4 & DR-1)*

**FLOWRATE INDICATOR / TOTALIZER**  
**WITH SCALED PULSE OUTPUT and MODBUS RS485**



**Signal input flowmeter: 4-20mA (linear signal)**  
**Output: One scaled pulse ref. accumulated total**  
**Modbus communication protocol: RS485**  
**Backlighting**



## SAFETY INSTRUCTIONS

Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.

**LIFE SUPPORT APPLICATION:** The digital display 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 EMC guidelines (Electro Magnetic Compatibility).

Do connect a proper grounding as indicated if the digital display has been supplied with an aluminum casing. The green / yellow wire between the back-casing and removable terminal-block may never be removed.

## DISPOSAL

At the end of its life this product should be disposed of according to local regulations regarding waste electronics equipment. If a battery is present in this product it should be disposed of separately. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment.

## SAFETY RULES AND PRECAUTIONARY MEASURES

The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and procedures as described in this manual are not followed. Modifications of the digital display implemented without preceding written consent from the manufacturer, will result in immediate termination of product liability and warranty period. Installation, use, maintenance and servicing of this equipment must be carried out by authorized technician.

Check the mains voltage and information on the manufacturers' plate before installing the unit. Check all connections, settings and technical specifications of the various peripheral devices with the digital display 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.

If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.

The local labor and safety laws and regulations must be adhered to.

## ABOUT THE OPERATION MANUAL

This operations manual is divided into two main sections:  
The daily use of the unit is described in chapter 2 “Operations”. 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 any option available. For additional information, please contact your supplier.

A hazardous situation may occur if the digital display 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 digital display or connected instruments.



A “caution” indicates actions or procedures which, if not performed correctly may, lead to personal injury or incorrect functioning of the digital display 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.

Contact your supplier if you require additional information regarding the digital display installation requirements and application suitability. Carefully read this manual prior to installation.

Hardware version:	FB03.01xx
Software version:	03.01xx
Manual:	M13 Rev. A Wiring & Programming Instructions Option RW3-4 & DR-1 w/Modbus Communication Protocol RS485
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# 1. INTRODUCTION

## 1.1 SYSTEM DESCRIPTION

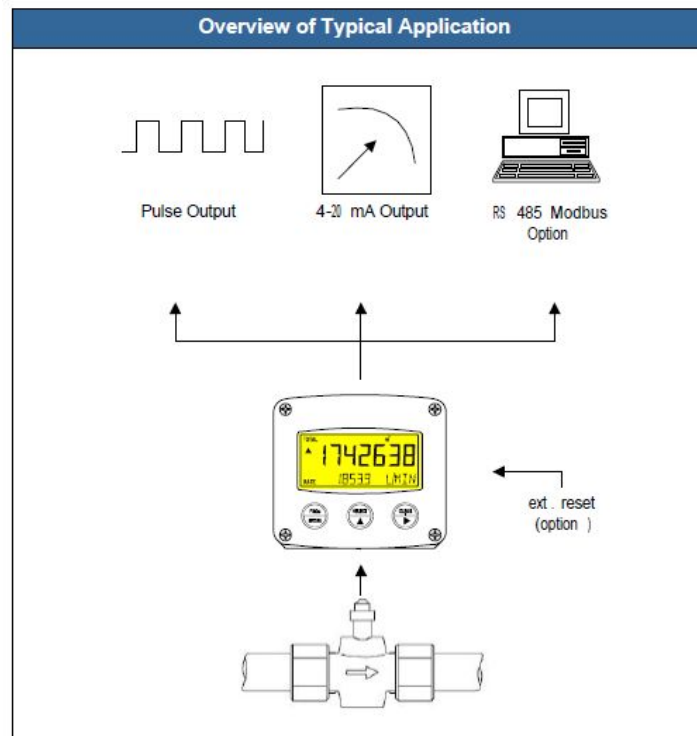
### Functions and features

The flowrate / totalizer is a microprocessor driven instrument designed to display flowrate, total and accumulated total as well as to generate a scaled pulse according the accumulated total and Modbus communication protocol.

### Flowmeter input:

This manual describes the unit with an analog 4-20mA input from flowmeter provided.

The flowmeter provides a 4-20mA signal output connected to the display. The display is powered by a 24VDC supply and 2 pairs of wire one for the transmitter (4-20mA) pin 1 & 2 and one for the display pin 7 & 8.



*Fig. 1: Typical application*

### Configuration of the unit:

The display has been designed to be implemented in many types of applications. All settings are stored in EEPROM memory and will not be lost in the event of power failure.

### Display information:

The unit has a large transfective LCD with all kinds of symbols and digits to display measuring units based on application specification when ordered.

Flowrate and total can be displayed either with the small 8mm digit or with the 17mm digits. A backup of the total and accumulated total in EEPROM memory is made every minute. Modbus communication RS485.

## 2. OPERATIONAL

### 2.1 GENERAL

The digital display 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 display. This instruction is meant for users / operators.

### 2.2 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. It is also used to gain access to SET-UP-level; read chapter 3.



This key is used to SELECT accumulated total. The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



Press this key twice to CLEAR the value for the total. The arrow-key ► is used to select a digit after PROG has been pressed or to configure the unit; please read chapter 3.

## 2.3 OPERATOR INFORMATION AND FUNCTIONS

In general, the display will always act at Operator level. The information displayed depends upon the SETUP-setting. The signal processed by the connected flowmeter is measured by the display in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be refreshed quickly for 30 seconds, after which it will slow-down again.



*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. 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. It is possible to display flowrate only with the large 17mm digits; in this instance press the SELECT-key to read the total.

When “\_\_\_\_\_” is shown, then the flowrate value is too high to be displayed. The arrows ▲▼ indicate the increase / decrease of the flowrate trend.

### Clear total

The value for total can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text “PUSH CLEAR” is displayed. To avoid re-initialization of total DOES NOT influence the accumulated total.

### Display accumulated total

When the SELECT-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, or 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*

#### Range error

As soon as the input value is 5% outside the calibrated measuring range, “ALARM” will be displayed. Meanwhile, the calibrated value will be displayed. After pressing the SELECT key, the reason of the alarm will be displayed: “LO RANGE” or “HI RANGE”.

#### Alarm 01-03

When “ALARM” is displayed, press the SELECT key to display the reason of the alarm: 1-3. Please 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.



Mounting, electrical installation, start-up and maintenance of the 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 display 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. The housing may only be opened by trained personnel. Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.

### 3.2 PROGRAMMING SETUP-LEVEL

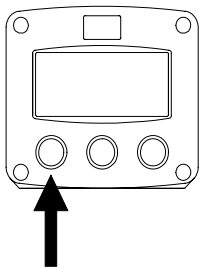
#### 3.2.1 GENERAL

Configuration of the display 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. Alternately, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the display remains fully operational.



**Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied. All digital display is pre-calibrated from the factory per model selected no additional calibration is required. Contact the factory for calibration details if required.

To enter SETUP-level:

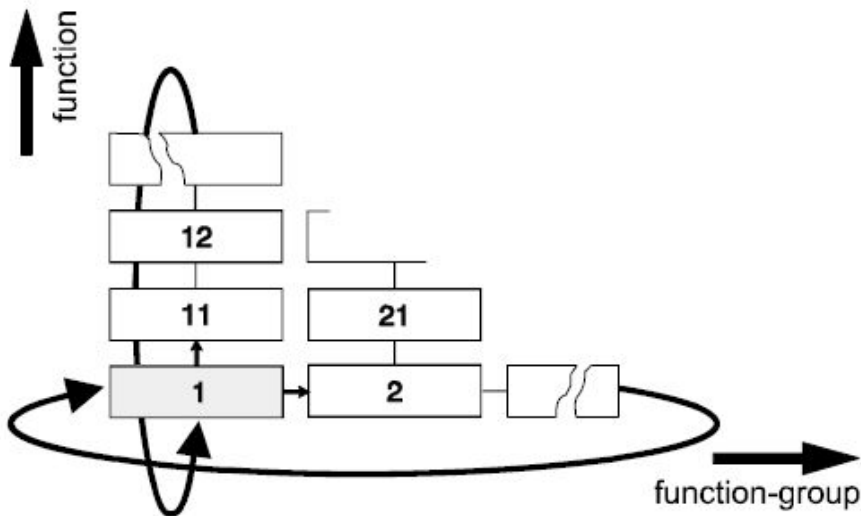


Press



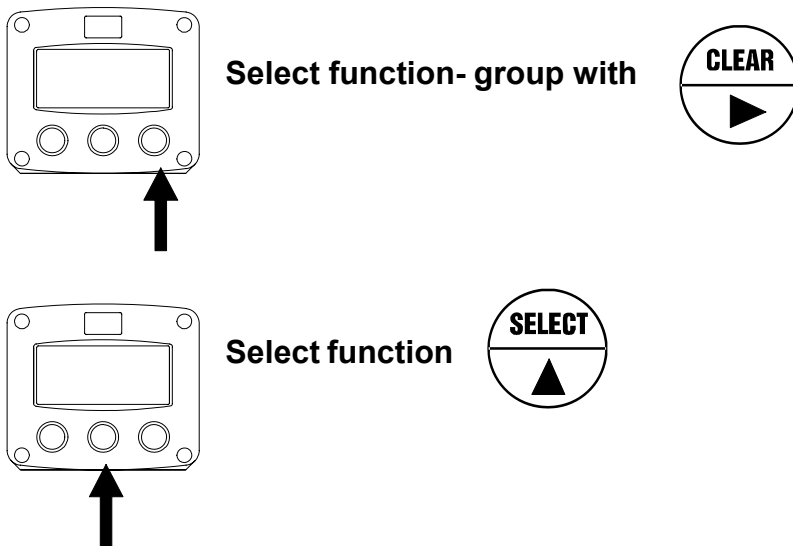
for 7 seconds

### 3.2.2. Matrix structure SETUP-level:



### SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:



SETUP is divided into several function groups and functions.

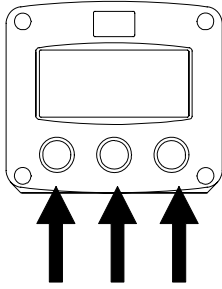
Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures.

The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.



After selecting a sub-function, the next main function is selected by scrolling through all “active” sub-functions (e.g. 1 ▲, 11 ▲, 12 ▲, 13 ▲, 14 ▲, 1 ►, 2 ►, 3 ►, 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) b) b)  
c)

a) Press briefly:  PROGRAM will start to flash

b) Select or enter value  with and / or 

c) Press  to continue the value / selection

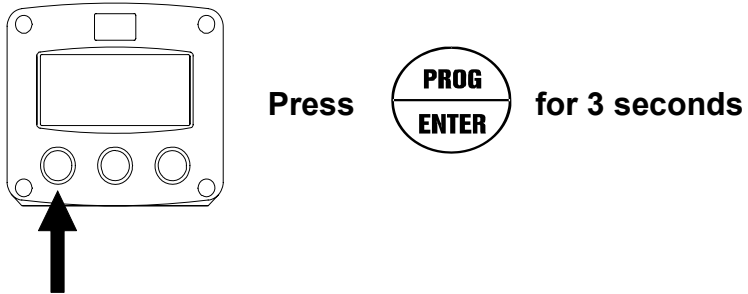
To change a value, use ► to select the digits and ▲ to increase that value  
If the new value is invalid, the increase-sign ▲ or decrease-sign ▼ will be displayed while you are programming.

To select setting, ▲ is used to select in one direction and ► 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 3 seconds: the PROG-procedure will be left automatically and the former value reinstated.

**Note:** alterations will only be set after ENTER has been pressed! Otherwise the former value will be reinstated.

To return to OPERATOR-level:



In order to return to the operator level, PROG will have to be pressed for 3 seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.

<b>SETUP FUNCTIONS AND VARIABLES</b>			
<b>1</b>	<b>TOTAL</b>		
	11	UNIT	L – m3 – kg – lb – GAL – USGAL – bbl – no units
	12	DECIMALS	0 – 1 – 2 – 3 (Ref: displayed value)
	13	SPAN	0.000001- 9,999,999 unit / second
	14	DECS SPAN	0 – 6
<b>2</b>	<b>FLOWRATE</b>		
	21	UNIT	mL – L – m3 – mg – g – kg – ton – GAL – bbl – lb – cf – REV- no unit – scf – Nm3 – NL – P
	22	TIME	sec – min – hour – day
	23	DECIMALS	0 – 1 – 2 – 3 (Ref: displayed value)
	24	SPAN	0.000001- 9,999,999 unit / time unit
	25	DECS SPAN	0 – 6
<b>3</b>	<b>DISPLAY</b>		
	31	FUNCTION	total-flowrate
	32	BACKLIGHT	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	FORMULA	interpolation, square root
	52	FILTER	01 – 99
	53	CUT-OFF	0.0 – 99.9%
	54	CALIBRATE LO	default – calibrate – calibrate set
	55	CALIBRATE HI	default – calibrate – calibrate set
<b>6</b>	<b>ANALOG</b>		
	61	OUTPUT	disable – enable
	62	RATE-MIN	flowrate 000.000 – 999,999 unit/time unit
	63	RATE-MAX	flowrate 000.000 – 999,999 unit/time unit
	64	CUT-OFF	0.0 - 9.9%
	65	TUNE MIN- 4mA	0 - 9,999
	66	TUNE MAX-20mA	0 - 9,999
	67	FILTER	01 - 99
<b>7</b>	<b>PULSE OUTPUT</b>		
	71	WIDTH	0.001 – 9.999 sec
	72	DECIMALS	0 - 1 - 2 - 3
	73	AMOUNT	00000.001 – 9,999,999
<b>8</b>	<b>COMMUNICATION</b>		
	81	SPEED	1200 – 2400 – 4800 – 9600
	82	ADDRESS	1 – 255
	83	MODE	ASCII – RTU - off
<b>9</b>	<b>OTHERS</b>		
	91	TYPE / MODEL	N/A
	92	SOFTWARE	N/A
	93	SERIAL NO.	N/A
	94	PASSWORD	0000 – 9999
	95	TAG NUMBER	0000000 – 9999999

<b>1 – TOTAL</b>	
<b>MEASUREMENT UNIT</b> <b>11</b>	<p>SETUP- 11 Determines the measurement unit for total, accumulated total and pulse output. The following units can be selected:</p> <p style="text-align: center;">L – m3 – kg – lb – GAL – USGAL – bbl – no units</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the Span 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 style="text-align: center;">0000000 – 111111.1 – 22222.22 – 3333.333</p>
<b>SPAN</b> <b>13</b>	<p>With the span, the flowmeter signal is converted to a quantity. The <u>span for Total</u> is determined on the basis of the measurement unit (setting 11) and the <u>flowrate per second at 20mA</u>. Enter the span in whole numbers (decimals are set with SETUP 14). The more accurate the span, the more accurate the functioning of the system will be:</p> <p>Example 1    Calculating the Span.  <i>Let us assume that the flowmeter generates 20mA at a rate of 652.31 USGAL per hour, the Selected unit is barrels. There are 42 gallons In one barrel; so the rate is 652.31/42 is 15.53119 barrels/hour.  This is 0.0043142 barrels/second, which is the Span. Enter for SETUP-13: "004314" and for SETUP-14 "6".</i></p> <p>Example 2    Calculating the Span.  <i>Let us assume that the flowmeter generates 20mA at a flowrate of 2,481.3 Liters/minute and The selected unit is "cubic meter/m3". The rate per second is 2,481.6÷60 is 41.355 L/sec. This is 0.041355 m3/sec., which is the span. Enter for SETUP- 13: "041355" and for SETUP-14-decimals span "6".</i></p>
<b>DECIMALS SPAN</b> <b>14</b>	<p>This setting determines the number of decimals for the Span. (SETUP 13). The following can be selected:</p> <p style="text-align: center;">0 – 1 – 2 – 3 – 4 – 5 – 6</p> <p>Please note that this function influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 12)!</p>

## 2 – FLOWRATE

The settings for total and flowrate are entirely separate. In this way, different units of measurement can be used each e.g. cubic meters for total and liters for flowrate.

*The display update time for flowrate is one second or more.*

<b>MEASUREMENT UNIT</b> <b>21</b>	<p>SETUP- 21 determines the measurement unit for flowrate. The following units can be selected:</p> <p>mL – L – m3 – mg – g – kg – ton – GAL – bbl – lb – cf – REV- no unit – scf – Nm3 – NL – P</p> <p>Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the Span has to be adapted as well; the calculation is not done automatically.</p>
<b>TIME UNIT</b> <b>22</b>	<p>The flowrate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).</p>
<b>DECIMALS</b> <b>23</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 style="text-align: center;">00000 – 1111.1 – 2222.22 – 3333.333</p>
<b>SPAN</b> <b>24</b>	<p>With the span, the flowmeter signal is converted to a quantity. The <u>span for flowrate</u> is determined on the basis of the <u>selected measurement unit and time unit</u> at 20mA. Enter the span in whole numbers (decimals are set with SETUP 25). The more accurate the span, the more accurate the functioning of the system will be:</p> <p>Example 1    Calculating the span for flowrate.  <i>Let us assume that the flowmeter generates 20mA at a flowrate of 2,481.3 Liters/minute, the selected unit is "Liters" and time unit "minute". The span is 2481.3. enter for SETUP- 24: "2481.3" And for SETUP- 25 – decimals span "2".</i></p> <p>Example 2    Calculating the span for flowrate.  <i>Let us assume that the flowmeter generates 20mA at a flowrate of 652.31 USGAL per hour, the Selected unit is USG and the time unit is minute. The span is 652.31/60 minutes is 10.87183 (GPM). Enter for SETUP- 24: "108718" and for SETUP-25 "4".</i></p>
<b>DECIMALS SPAN</b> <b>25</b>	<p>This setting determines the number of decimals for the Span. (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 function influences the accuracy of the Span indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 23)!</p>

### 3 – DISPLAY

<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 backlight.	
<b>BACKLIGHT (BRIGHTNESS)</b> <b>32</b>	If a LED backlight has been supplied, the color can be selected. Following selections are available: <p style="text-align: center;">OFF – GREEN – AMBER</p> The density of the backlight can be set in following range: 0 (off) – 20% - 40% - 60% - 80% - 100% (full brightness)

### 4 – POWER MANAGEMENT

When used with the internal battery option, the user can expect reliable measurement over a long period of time. The display has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:	
<b>LCD NEW</b> <b>41</b>	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is <u>strongly advised</u> to select a slow refresh rate. Please understand that NO information will be lost; the input signal will be processed and the output signal will be generated in the normal way. The following can be selected: <p style="text-align: center;">FAST – 1 sec – 3 sec – 15 sec – 30 sec – off</p> Example battery life-time: <p style="text-align: center;"><i>Battery life-time with FAST update: about 3 years</i>  <i>Battery life-time with 1 sec update: about 5 years</i></p> <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 switched on as soon as a button has been pressed.</p>
<b>BATTERY-MODE</b> <b>42</b>	The unit has two modes: operational or shelf. 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, the power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.



Note !



## 5 – FLOWMETER

<b>SIGNAL 51</b>	<p>The display can process the 4-20mA signal in two ways:</p> <p>Interpolation: the signal is processed linear</p> <p><b>R = S x I</b></p> <p>Square root: for differential pressure</p> <p><b>R = S √ I</b></p> <p>Where:</p> <p>R = Rate: the calculated flowrate</p> <p>S = Span: the maximum flowrate at 20mA. The span is programmed with setting 24 for flowrate and setting 13 for total.</p> <p>I = Input: the scaled analog value; in these formulas value 0 (zero) for 4mA and 1 (one) for 20mA.</p>			
<b>FILTER 52</b>	<p>The analog output signal of a flowmeter does mirror the actual flow. This signal is measured several times a second by the display. The value measured is a “snap-shot” of the real flow as it will be fluctuating. With the help of this filter a stable and accurate reading can be obtained while the filter level can be set to a desired value. The filter principal is based on three input values: the filter level (01-99), the last measured analog 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 there response times are indicated:</p>			
<b>FILTER VALUE</b>	<b>RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE TIME IN SECONDS</b>			
	<b>50% Influence</b>	<b>75% Influence</b>	<b>90% Influence</b>	<b>99% Influence</b>
<b>01</b>	filter disabled	filter disabled	filter disabled	filter disabled
<b>02</b>	0.3 seconds	0.5 seconds	1.0 seconds	1.8 seconds
<b>03</b>	0.5 seconds	1.0 seconds	1.5 seconds	3 seconds
<b>05</b>	1.0 seconds	1.8 seconds	2.8 seconds	5.3 seconds
<b>10</b>	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
<b>20</b>	3.5 seconds	7.0 seconds	11 seconds	23 seconds
<b>30</b>	5.3 seconds	10 seconds	17 seconds	34 seconds
<b>50</b>	8.8 seconds	17 seconds	29 seconds	57 seconds
<b>75</b>	13 seconds	26 seconds	43 seconds	86 seconds
<b>99</b>	17 seconds	34 seconds	57 seconds	114 seconds
Continued next page >>>>				

## 5 – FLOWMETER (CONTINUED)

<b>CUT-OFF 53</b>		To ignore e.g. leakage of the flow or vibration, a low-flow cut-off can be set as percentage over the full range of 20mA. When the analog value is less then required with this setting, the signal will be ignored. The cut-off value should be set at 15% of full scale to avoid drifting. Examples:		
<b>Function (setup 51)</b>	<b>Span (setup 13/24)</b>	<b>Required Cut-off</b>	<b>Cut-Off (setup 53)</b>	<b>Required Output</b>
interpolation	450 L/min	25 L/min	$25/450 \times 100\% = 5.5\%$	$16mA \times 5.5\% + 4mA = 4.88mA$
square root	450 L/min	25 L/min	$(25/450)^2 \times 100\% = 0.3\%$	$16mA \times 0.3\% + 4mA = 4.05mA$
<b>CALIB-LO / 4mA 54</b>		<p>With this setting it is possible to calibrate the input value for 4mA as the signal from the flowmeter might not be exact 4.0mA at flowrate zero.</p> <p>This function will measure the real output value at flow zero.</p> <p><i>Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</i></p> <p>After pressing PROG, three settings can be selected:            CALIBRATE: with this setting, the input will be calibrated with the actual 4mA value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.            DEFAULT: with this setting, the manufacturer's value is re-installed.            CAL SET: to select the last calibrated value.</p>		
<b>CALIB-HI / 20mA 55</b>		<p>With this setting it is possible to calibrate the input value for 20mA as the signal from the flowmeter might not be exact 20.0mA at maximum flowrate.</p> <p>This function will measure the real output value at maximum flow.</p> <p><i>Warning: be very sure that the offered signal is correct before the calibration is executed as this function has major influences on the accuracy of the system!</i></p> <p>After pressing PROG, three settings can be selected:            CALIBRATE: with this setting, the input will be calibrated with the actual 4mA value. After pressing enter, CAL SET will be displayed as soon as the calibration is completed. From that moment, the analog value must be more than the calibrated value before the signal will be processed.            DEFAULT: with this setting, the manufacturer's value is re-installed.            CAL SET: to select the last calibrated value.</p>		

## 6 – ANALOG (OUTPUT)

A linear analog 4-20mA signal is generated according to the flowrate with a 10 bits resolution. The setting for flowrate (SETUP-2) influences the analog output directly. The relationship between rate and analog output is set with the following function.

<b>DISABLE/ENABLE 61</b>	The analog output can be disabled.
<b>RATE MIN 62</b>	Enter here the flowrate at which the output should generate the minimum signal (4mA) at flowrate “zero”. The number of decimals displayed depends upon SETUP 23. The time and measuring units (L/min for example) are dependent upon SETUP 21 and 22 but cannot be displayed.
<b>RATE MAX 63</b>	Enter here the flowrate at which the output should generate the maximum signal (20mA) at maximum flow. The number of decimals displayed depends upon SETUP 23. The time and measuring units (L/min for example) are dependent upon SETUP 21 and 22 but cannot be displayed.
<b>CUT-OFF 64</b>	To ignore leakage of the flow a low cut-off can be set as a percentage of the full range flow. Lowest % possible set at 10% of F.S. flow.
<b>TUNE MIN/4mA 65</b>	<p>The initial minimum analog 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 style="text-align: center;">Before tuning the signal, be sure that the analog signal is not being used for any application!</p> <p>After pressing PROG, the current will be about 4mA. The current can be increased / decreased with the arrow keys and is <u>directly active</u>. Press ENTER to store the new value.</p> <p>Remarks: The analog output value can be programmed “up-side-down” if desired, so 20mA at maximum flowrate for example!</p>
<b>TUNE MAX/20mA 66</b>	<p>The initial maximum analog 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 style="text-align: center;">Before tuning the signal, be sure that the analog signal is not being used for any application!</p> <p>After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow keys and is <u>directly active</u>. Press ENTER to store the new value.</p> <p>Remarks: The analog output value can be programmed “up-side-down” if desired, so 4mA at maximum flowrate for example!</p>
Continued next page>>>	

6 – ANALOG (OUTPUT) (CONTINUED)				
<b>FILTER 67</b>				
<b>FILTER VALUE</b>	<b>RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE TIME IN SECONDS</b>			
	<b>50% Influence</b>	<b>75% Influence</b>	<b>90% Influence</b>	<b>99% Influence</b>
<b>01</b>	filter disabled	filter disabled	filter disabled	filter disabled
<b>02</b>	0.1 second	0.3 second	0.5 second	0.9 second
<b>03</b>	0.3 second	0.5 second	0.8 second	1.5 seconds
<b>05</b>	0.5 second	0.9 second	1.4 seconds	2.6 seconds
<b>10</b>	0.9 second	1.8 seconds	2.8 seconds	5.5 seconds
<b>20</b>	1.8 seconds	3.5 seconds	5.6 seconds	11 seconds
<b>30</b>	2.6 seconds	5.1 seconds	8.5 seconds	17 seconds
<b>50</b>	4.4 seconds	8.6 seconds	14 seconds	29 seconds
<b>75</b>	6.5 seconds	13 seconds	22 seconds	43 seconds
<b>99</b>	8.6 seconds	17 seconds	28 seconds	57 seconds

7 – PULSE OUTPUT	
One transistor or mechanic relay output is available as scaled pulse output according to the accumulated total.	
<b>WIDTH 71</b>	The pulse width determines the time that the output will be switched; in other words the pulse length. The minimum time between the pulses is as long as the period time (50/50 duty cycle). <b>Note:</b> <i>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 the pulses will be missed due to buffer-overflow, so it is advised to program this setting within its range!</i>
<b>DECIMALS 72</b>	This setting determines the decimal position for setting 73. <b>Note:</b> The measuring unit is according to setting 11 (for total)
<b>AMOUNT 73</b>	According to the measurement unit setting 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.

8 – COMMUNICATION	
The function 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 for Modbus communication protocol description and details.	
<b>SPEED 81</b>	For external control, the following communication speeds (braudrates) can be selected: 1200 – 2400 – 4800 – 9600 baud
<b>ADDRESS 82</b>	This bus address can vary from 1 - 255
<b>MODE 83</b>	Communication protocol is Modbus ASCII or RTU mode. Select off to disable this communication function.

## 9 – OTHER

<b>MODEL 91</b>	Type of model.
<b>S-VERSION 92</b>	Software version.
<b>SERIAL NO. 93</b>	Serial number.
<b>PASSWORD 94</b>	All SETUP values can be pass code protected.
<b>TAG NO. 95</b>	Tag number.

### 4. INSTALLATION

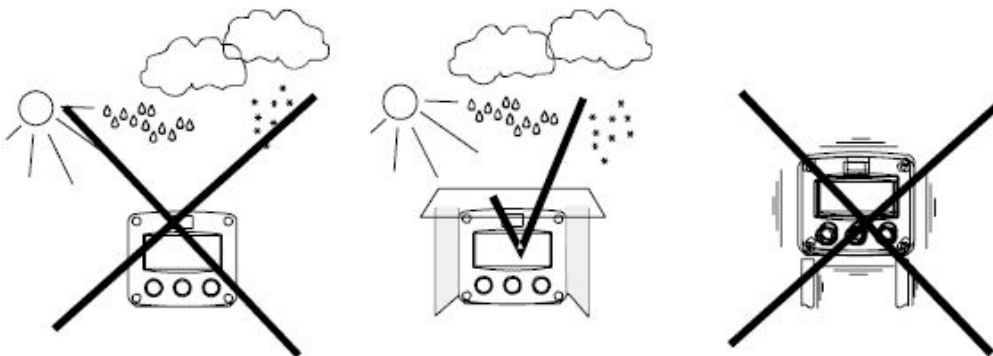
#### 4.1 GENERAL DIRECTIONS



Caution !

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 digital display 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 diagram. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has 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.

#### 4.2 INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the casing into account. Even an IP67 (NEMA4X) casing should NEVER be exposed to strongly varying (weather) conditions. When panel-mounted, the unit is IP65 (NEMA4X)! 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 display on a solid structure to avoid vibration. Select a site which is convenient for viewing. Note that the display can be ordered in any orientation at 90 degree increments and must be returned if the orientation needs to be changed for proper viewing. The site selection should provide at least 10 pipe diameters of straight meter size pipe between the flow meter inlet and any upstream fittings such as elbows, tee and valves. There are no special requirements for the downstream connection to the flow meter.



Note !

**Note:** Avoid placing the flow meter where it will be subjected to water hammer. Take care when removing the display from the back cover wires are connected between the display and flow transmitter. The digital display is powered by an external 24Vdc power supply provided by the user.

**Note:** That the flow meters are calibrated based on schedule 40 pipe ID connection. Tubing and hoses do not have the same ID as pipe and should be transitioned to pipe at least 10 pipe diameters upstream of the flow meter to achieve rated accuracy. **Important: Protect from freezing liquids**

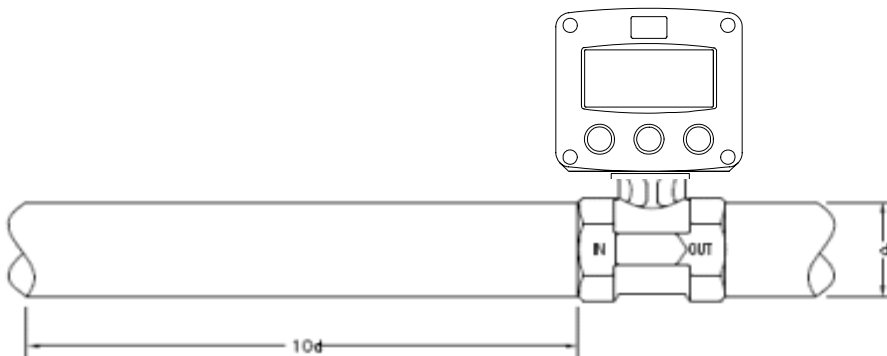


Fig. 5: Installation and straight run requirements

#### 4.3 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).

Separate cable glands with effective IP67 (NEMA4X) seals for all wires. Unused cable entries: ensure that you fit IP67 (NEMA4X) plugs to maintain ratings.

### 4.3.1 TERMINAL CONNECTION WITH POWER SUPPLY

The following terminal connectors are available (4-20mA input included) pin 9 & pin 10:

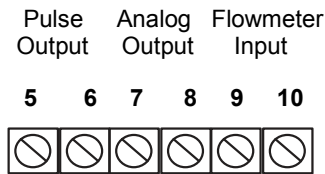
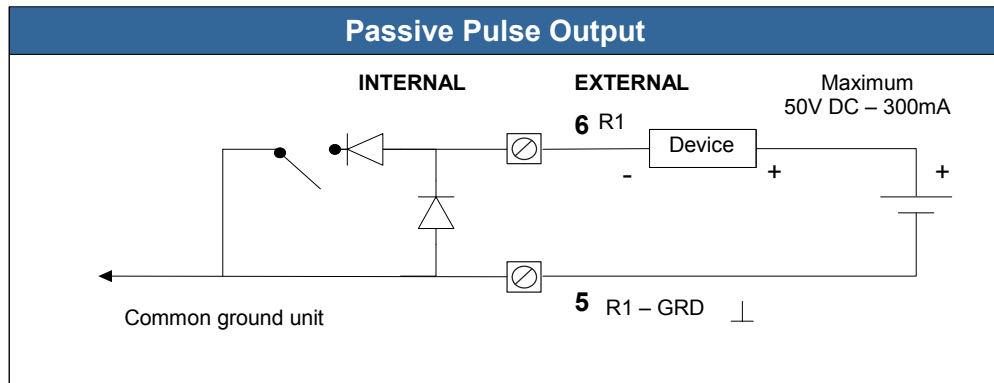


Fig. 6: Overview of terminal connectors pin 9 & pin 10 pre-wired from 4-20mA sensor.

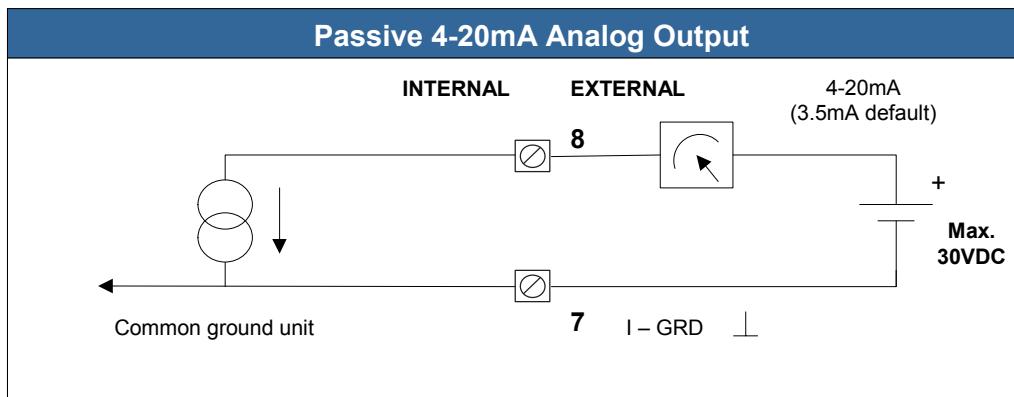
#### Terminals 5 – 6: Pulse Output

A passive transistor output maximum driving capacity 300mA @ 50V DC



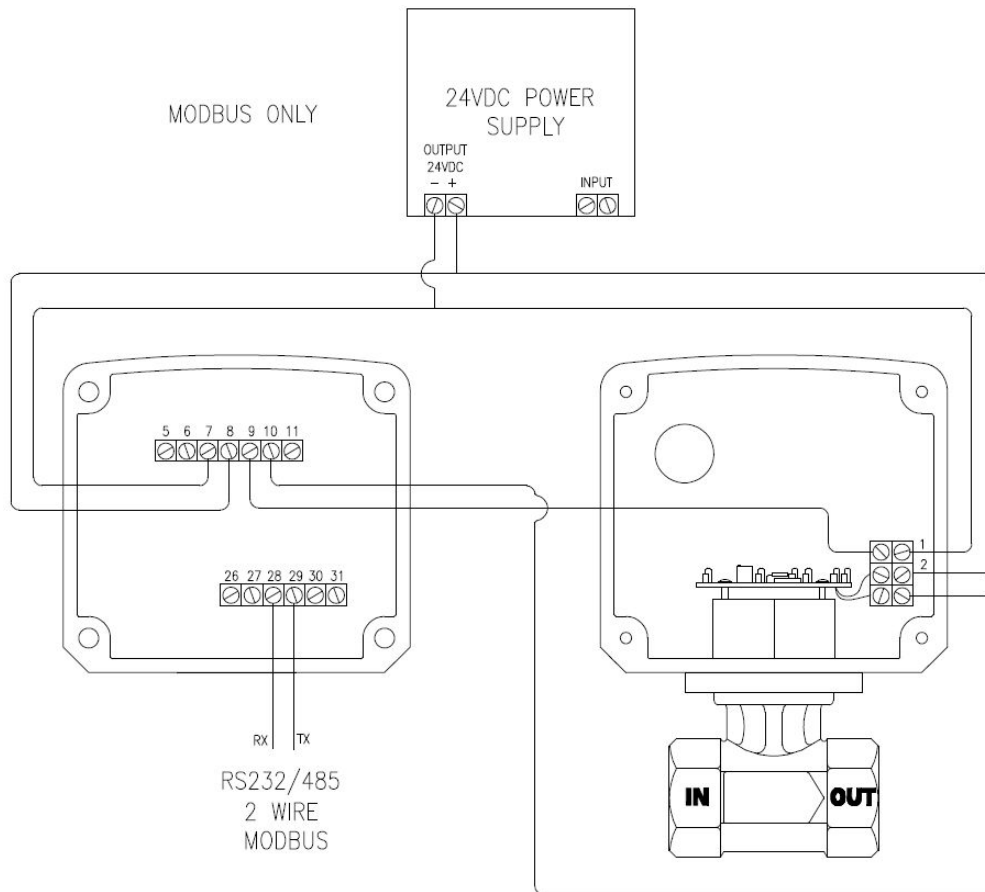
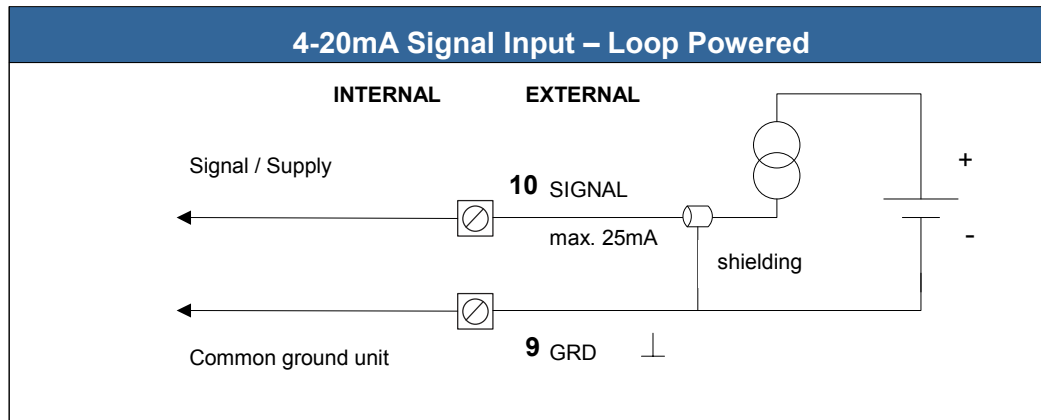
#### Terminals 7 – 8: 4-20mA Analog Output

A passive 4-20mA signal proportional to the flowrate is available.



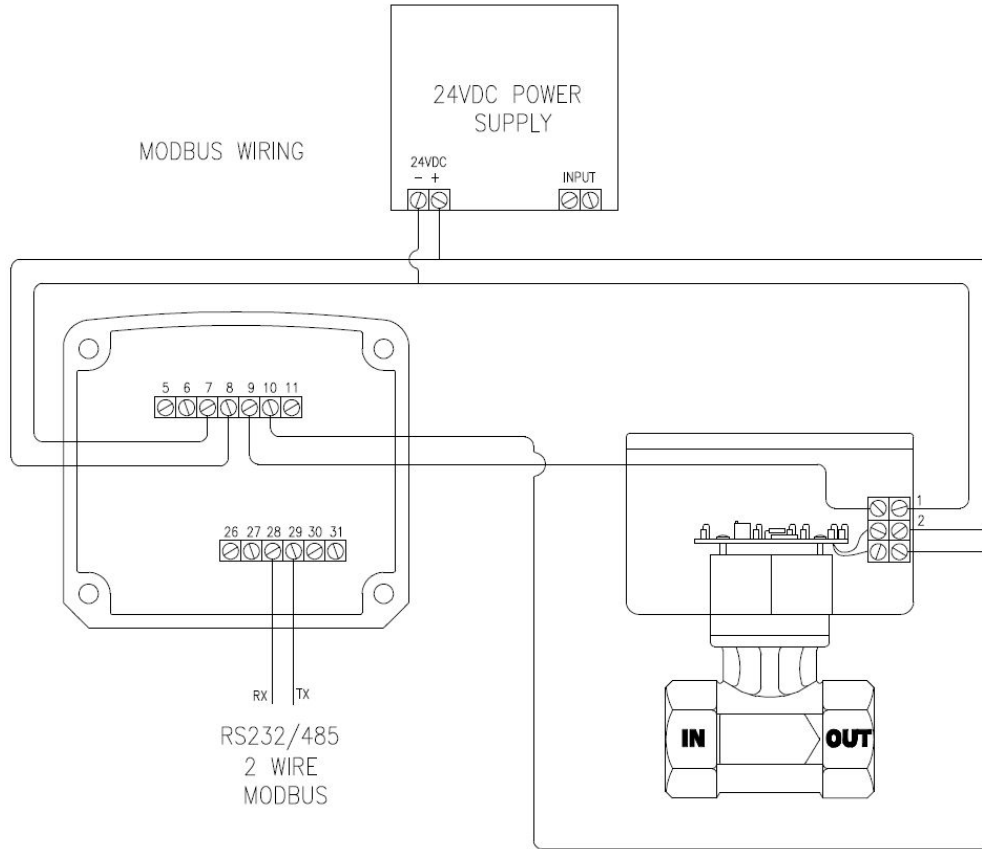
**Terminals 9 – 10: Flowmeter Input / Power Supply**

A 4-20mA signal is provided the signal will be processed 4 times a second with 16 bits accuracy.

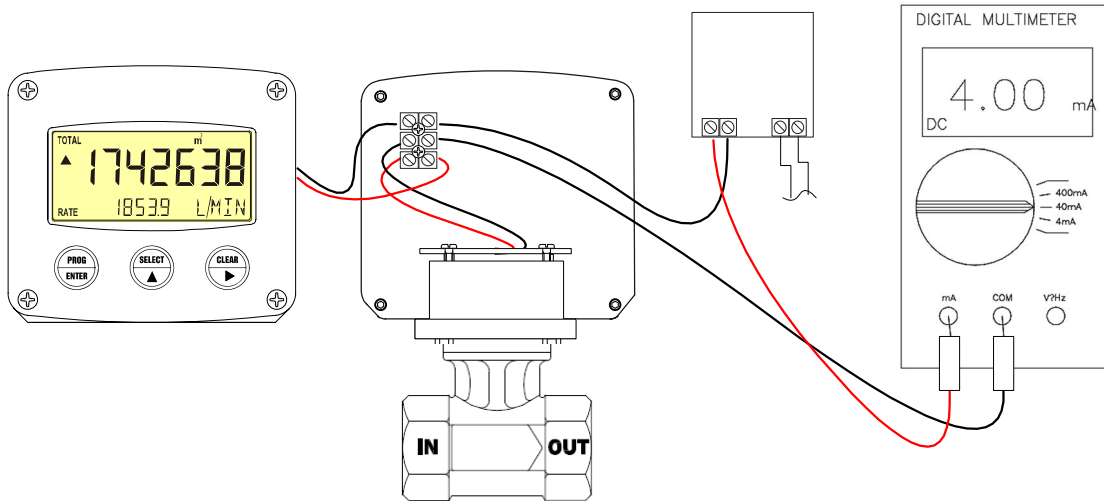


*Fig. 7 Wiring Connection RW3-4 w/Modbus RS485 Communication Protocol, requires two pairs of wire one pair to pins #1 & #2 and one pair to pins #7 & #8 from 24VDC.*





**Fig. 8: Wiring Connection Remote DR-1 Digital Display (W3 or W3-1 option shown)**



**Fig. 9: Multimeter connection to check 4-20mA signal**

## 5. MAINTENANCE

### 5.1 GENERAL DIRECTIONS

The display 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 display 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. Moisture will result in damage to the electronics.

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 span alterations check factory programming against model number.

The indication for low battery will be displayed.

### 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. To return meter for repair contact your supplier for an RMA before returning digital display.

### TEST EQUIPMENT

Using a Fluke 9600A digital multimeter or equivalent. Connect multimeter in series with current loop.

### 5.3 CALIBRATION PROCEDURE – OUTPUT CALCULATION

Using the following formula:  $I = 16X + 4.00$ ; where I = current output in mA, X = decimal % of full scale, output signal is linear with flow rate.

<b>% Flow to Output Chart</b>			
<b><u>% FS</u></b>	<b><u>Current Output</u></b>	<b><u>% FS</u></b>	<b><u>Current Output</u></b>
<b>20</b>	<b>7.20</b>	<b>70</b>	<b>15.20</b>
<b>30</b>	<b>8.80</b>	<b>80</b>	<b>16.80</b>
<b>40</b>	<b>10.40</b>	<b>90</b>	<b>18.40</b>
<b>50</b>	<b>12.00</b>	<b>95</b>	<b>19.20</b>
<b>60</b>	<b>13.70</b>	<b>100</b>	<b>20.00</b>

Fig. 9

## APPENDIX A: TECHNICAL SPECIFICATIONS

GENERAL	
Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant
Digits	Seven 17mm (0.67") and eleven 8mm (0.31") various symbols and measuring units.
Refresh rate	User definable: 8 times/sec – 30 secs.
Backlight (optional)	Transflective LCD w/green backlight. Power supply required 12-24VDC, power consumption 1 watt max.

Enclosure	
General	GRP (Glass Reinforced Polyamide) enclosure with polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-resistant silicone keypad.

Operating Temperature	
Operational	-40°C to +80°C (-40°F to +176°F)

Power Consumption	
Type	Input loop powered from 4-20mA signal input. Voltage drop max. 2.6Vdc.
Power Supply	20-30Vdc Power consumption max. 1 Watt

Terminal Connection	
Type	Removable plug-in terminal, wire max. 1.5mm and 2.5mm

Data Protection	
Type	EEPROM backup of all settings. Data retention at least 10 years.
Pass Code	Configuration settings can be pass code protected.

Environment	
Electromagnetic Compatibility	Compliant ref: EN 61326 (1997), EN 61010-1 (1993)
Low voltage directive	Compliant ref: EN 60950

<b>INPUT</b>	
Flowmeter	
Type	4-20mA signal based on differential pressure

<b>OUTPUT</b>	
Pulse Output	
Function	Scaled pulse output – max frequency 500Hz. One passive transistor output – not isolated. Load max. 50V DC – 300mA.
Analog Output	
Function	Passive 4-20mA output – output loop powered 24VDC power supply required

<b>Communication</b>	
Function	Reading display information, reading / writing all settings
Protocol	Modbus ASCII or RTU
Speed	1200 – 2400 – 4800 – 9600 baud
Addressing	Maximum 255 addresses
Type	RS485 2-wire

<b>OPERATIONAL</b>	
Operator Functions	
Displayed Functions	<ul style="list-style-type: none"> <li>• Total and/or flowrate</li> <li>• Total and accumulated total</li> <li>• Total can be reset to zero by pressing CLEAR-key twice</li> </ul>

<b>Total</b>	
Digits	7 digits
Units	L, m3, GAL, USGAL, KG, lb, bbl, no unit
Decimals	0 – 1 – 2 or 3
Note	Total can be reset to zero by pressing CLEAR-key twice

<b>Accumulated Total</b>	
Digits	11 digits
Units / Decimals	According to selection for total

Flowrate	
Digits	7 digits
Units	mL, L, m3, GAL, KG, Ton, lb, bl, cf, RND, ft3, scf, Nm3, NI, ical – no units
Decimals	0 – 1 – 2 or 3
Time Units	/sec - /min - /hr - /day

## DP Sensor Specification:

<b>Electrical</b>	
DP Sensor	
Output Signal	2-wire loop powered 4-20mA DC (linear signal)
Response Time	(10% - 90%) $\leq$ 1 ms
Electrical Connection	100mm silicon rubber flexible wires
Max. Static Pressure	20MPa (diaphragm burst pressure), 2.76MPa, 400psig (pressure sensor assembly)
Zero Drift / Static Pressure	$\leq$ 0.5mV / MPa
Insulation Resistor	100M $\Omega$ , 100VDC

<b>Construction</b>	
Material	
Housing	Brass H62 or Stainless Steel 316L (dependent on meter construction)
Diaphragm	Stainless Steel 316L
Pin	Silicon rubber flexible wires
O-Ring	Viton™ (pressure sensor only)
Media Compatibility	The gas or liquid which is compatible with stainless steel, Viton™ seal and material of construction (flow meter)

<b>Environment Condition</b>	
Position Effect	Deviate 90° from any orientation, zero change $\leq$ 0.2% F.S.
Vibration Effect	$\leq$ 1% at 3gRMS, 30 – 2000Hz
Impact	$\leq$ 1% at 100g, 10ms
Cycle Life	1 x 10 <sup>8</sup> pressure cycles

Specification*	Min.	Typ.	Max.	Units
Accuracy		≤ ±0.5%FS	≤ ±0.5%FS	
Zero Thermal Error		±1.0	±1.2	%FS, @ 25°C
Span Thermal Error		±1.0	±1.2	%FS, @ 25°C
Compensated Temp. Range	0 ~ 50			°C
Operating Temp. Range	-10 ~ 80			°C
Storage Temp. Range	-40 ~ 120			°C
Long Term Stability		±0.3	±0.5	%FS / year
*Testing at basic condition				

## APPENDIX B: PROBLEM SOLVING

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

### Analog output does not function properly:

Check:

- SETUP 61 – is the function enabled?
- SETUP 62 / 63 – are the flow levels programmed correctly?
- Connection of the external power supply according to the specifications.

### Pulse output does not function:

Check:

- SETUP 71 – pulse per “x” quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 72 – amount; is the external device able to recognize the selected amount?

### Flowrate displays “0 / zero” while there is flow (total is counting):

Check:

- SETUP 22 / 25 – is the span and time unit correct?

### The password is unknown:

If the password is not 1234; contact your supplier.

### Alarm

When the flag starts to blink an internal alarm condition has occurred. Press the “select button” several times to display the 4-digit error code. The codes are:

- 0001: irrecoverable display-data error: data on the display might be corrupted.
- 0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.
- 0003: error 1 and error 2 occurred simultaneously
- 0004: Initialization error: the initialization may have caused an error.
- 0008: Analog input error: the input signal may have caused an error.

The code displayed can be a total of one or more errors. Code 0012 can be 0008+0004. If the alarm occurs more often or stay active for a longer time, please contact the supplier.

### **Output Malfunction**

If the display does not indicate a rate and total the problem maybe a plugged pressure which prevents the differential pressure sensor (transducer) from providing the 4-20mA signal to the display. If the pressure sensor is plugged the unit will need to be returned for extensive cleaning and/or replacement.

### **Pressure Port Cleaning**

Remove the housing from the body by removing the four screws. Remove the pulsation snubbers from the body by inserting a wood screw into the hole in the pulsation snubbers and gently pull out. Clean the passages in the body and snubbers using a probe and/or compressed air to free debris and sediment. Replace with new snubbers.

If you are unable to clean without further disassembly, the flow meter should be returned to the supplier for repair.

Reassemble the flow meter housing to the body. Take care to properly seat the two inner o-rings before tightening the screws. Improper assembly can result in a leak and possible damage to the electronics.

## **APPENDIX C: COMMUNICATION VARIABLES**

### **GENERAL**

The tables below show the various variables that can be used for communication. Currently the functions supported are function 3 Read Holding Register (4X references) and function 16 Preset Multiple Registers (4X references). The shown communication variables, indicated by the column VAR, show protocol addressed in decimal representation, followed by its hexadecimal representation (0x0000). When the PLC address is required (4X references typically used by PLC's), please add a value of 40001 to the protocol address e.g. reading the serial number with PLC – based addressing means reading  $165 + 40001 = \text{register } 40166$ .

Variables spanning multiple registers use 'little-endian' data representation. This means that the lowest register holds the least significant word of the variable. Although most Modbus masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.

Following example shows how data represented and how this calculation can be accomplished:

*For total – value of 158928, the following register data has been received by the Modbus master:*

*register 566 = 0x6CD0 = 27856*

*register 567 = 0x0002 = 2*

*register 568 = 0x0000 = 0*

*If we interpret this as a long integer value, its value would be: 0x0000.0002.6CD0 = 158928. For additional information regarding using the Modbus device, please read the 'General Modbus Communication Protocol' and Modbus Troubleshooting Guide'.*

## RUN VARIABLES

VAR	RUNTIME VALUES	REGs	R / W	TYPE	VALUE / REMARKS
572 0x23C	flowrate	2	r	unit32	0...9999999 Representation: unit, time, decimals depending on variables 48,49, 50
566 0x236	total	3	r	unit48	0...99999999999 Representation: unit, decimals depending on variables 32, 33
560 0x230	accumulated total	3	r	unit16	Bitfield: 0x0001 = Display error 0x0002 = EEPROM error 0x0004 = EEPROM initialization error 0x0008 = Analog error

Reading flowrate 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 displayed 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 and a “total decimals” of 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 in a single write action. Writing any other value will result in the reply of an error message.

## SETUP VARIABLES

VAR	TOTAL	REGs	R / W	TYPE	VALUE / REMARKS
32 0x020	unit	1	r/w	unit8	0 = none      1 = L      2 = m3 3 = kg      4 = lb      5 = gal 6 = usgal      7 = bbl
33 0x021	decimals	1	r/w	unit8	0...3
34 0x022	span	3	r/w	unit32	1...9999999 Representation: 0.000001...9999999 depending on variable 54: decimals span
37 0x025	decimal span	1	r/w	unit8	0...6
VAR	FLOWRATE	REGs	R / W	TYPE	VALUE / REMARKS
48 0x030	unit	1	r/w	unit8	0 = mL      1 = L      2 = m3 3 = mg      4 = g      5 = kg 6 = ton      7 = gal      8 = bbl 9 = lb      10 = cf      11 = rev 12 = none      13 = scf      14 = NM3 15 = NL      16 = p
49 0x031	time unit	1	r/w	unit8	0 = sec      1 = min      2 = hour 3 = day
50 0x032	decimals	1	r/w	unit8	0...3



51 0x033	span	3	r/w	unit32	1...9999999 Representation: 0.000001...9999999
54 0x036	decimal span	1	r/w	unit8	0...6
<b>VAR</b>	<b>DISPLAY</b>	<b>REGs</b>	<b>R / W</b>	<b>TYPE</b>	<b>VALUE / REMARKS</b>
64 0x040	display function	1	r/w	unit8	0 = total      1 = flowrate
67 0x043	backlight brightness	1	r/w	unit8	0 = off      1 = 20%      2 = 40% 3 = 60%      4 = 80%      5 = 100%
<b>VAR</b>	<b>POWER MAN.</b>	<b>REGs</b>	<b>R / W</b>	<b>TYPE</b>	<b>VALUE / REMARKS</b>
80 0x050	LCD update time	1	r/w	unit8	0 = off      1 = 1sec      2 = 3sec 3 = 15sec      4 = 30sec      5 = off
81 0x051	battery mode	1	r/w	unit8	0 = operational      1 = shelf

VAR	FLOWMETER	REGs	R / W	TYPE	VALUE / REMARKS
98 0x062	formula	1	r/w	unit8	0 = linear      1 = square root
99 0x063	filter	1	r/w	unit8	1...99
100 0x064	cut-off	2	r/w	unit8	0...999 Representation: 0.0 – 99.9%
102 0x066	calibrate low	1	r/w	unit8	0 = calibrate set      1 = calibrate      2 = default
103 0x067	calibrate high	1	r/w	unit8	0 = calibrate set      1 = calibrate      2 = default
<b>VAR</b>	<b>ANALOG OUTPUT</b>	<b>REGs</b>	<b>R / W</b>	<b>TYPE</b>	<b>VALUE / REMARKS</b>
112 0x070	analog output	1	r/w	unit8	0 = disable      1 = enable
113 0x071	minimum rate	2	r/w	unit32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
116 0x074	maximum rate	2	r/w	unit32	0...9999999 Representation: unit, time, decimals depending on variables 48, 49, 50
119 0x077	cut-off percentage	1	r/w	unit8	0...99 Representation: 0.0 – 9.9%
120 0x078	tune minimum rate	1	r/w	unit16	0...9999
122 0x07A	tune maximum rate	1	r/w	unit16	0...9999
127 0x07F	filter	1	r/w	unit8	0...99
<b>VAR</b>	<b>PULSE OUTPUT</b>	<b>REGs</b>	<b>R / W</b>	<b>TYPE</b>	<b>VALUE / REMARKS</b>
133 0x085	impulse width	1	r/w	unit16	0...9999999 Representation: 0.001 – 9.999sec
129 0x081	impulse quantity decimals	1	r/w	unit8	0...3
130 0x082	pulse per X quantity	2	r/w	unit32	1...9999999 Representation: 0.000001...9999999 depending on variables 130, 32

VAR	COMMUNICATION	REGs	R / W	TYPE	VALUE / REMARKS
144 0x090	speed (braudrate)	1	r/w	unit8	0 = 1200      1 = 2400      2 = 4800 3 = 9600
145 0x091	Modbus address	1	r/w	unit8	1...255
146 0x092	Modbus mode	1	r/w	unit8	0 = off      1 = RTU      2 = ASCII
VAR	OTHER	REGs	R / W	TYPE	VALUE / REMARKS
160 0x0A0	model number	1	r	unit16	0...9999
173 0x0AD	model suffix	1	r	char	Representation: ASCII character
162 0x0A2	firmware version	2	r	unit32	0...9999999
165 0x0A5	serial number	2	r	unit32	0...9999999
168 0x0A8	password	1	r	unit16	0...9999
170 0x0AA	tag number	2	r/w	unit32	0...9999999

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LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE:	DATE:

1-TOTAL	Enter factory settings here		
11 unit	L		
12 decimals	0000000		
13 span	001600/sec	/ sec	/ sec
14 decimals span	0		

2-FLOWRATE	Enter factory settings here		
21 unit	L		
22 time unit	/sec		
23 decimals	0000000		
24 span	001600/sec	/ unit	/ unit
25 decimals span	0	0	

3-DISPLAY	Enter factory settings here		
31 function	total	total	
32 backlight	100%	off	
33 brightness		100%	

4-POWER MANAGEMENT	Enter factory settings here		
41 LCD-new	1 sec.	1 sec	
42 mode	operate	operational	

<b>5-FLOWMETER</b>	Enter factory settings here		
51 formula	interpolation	square root	
52 filter	01 (off)	01 (off)	
53 cut-off %	00.0%	10%	
54 cal. low-4mA	default	4.00mA	
55 cal. high-20mA	default	20.0mA	

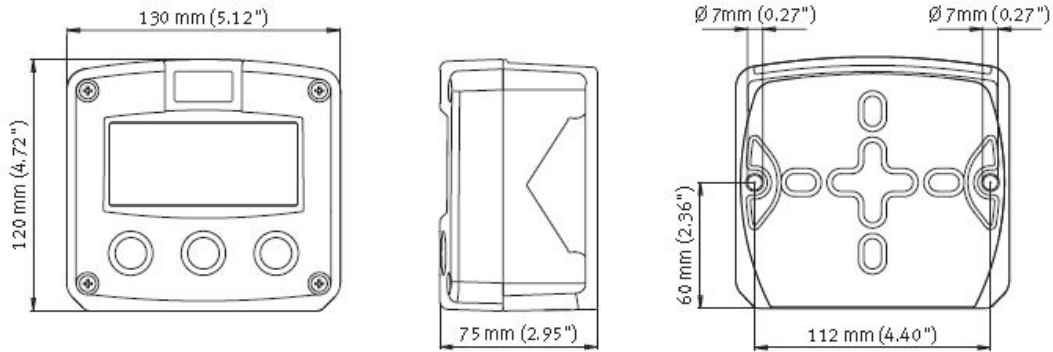
<b>6-ANALOG OUTPUT</b>	Enter factory settings here		
61 output	disable	Enable	
62 rate min. (4mA)	0000000	0	
63 rate max. (20mA)	9999999		
64 cut-off percentage	0.0%	2.0	
65 tune min. (4mA)	0208		
66 tune max. (20mA)	6656		
67 filter	01 (off)	01 (off)	

<b>7-PULSE OUTPUT</b>	Enter factory settings here		
71 pulse width	0.000		
72 decimals	0		
73 pulse per	0001000		

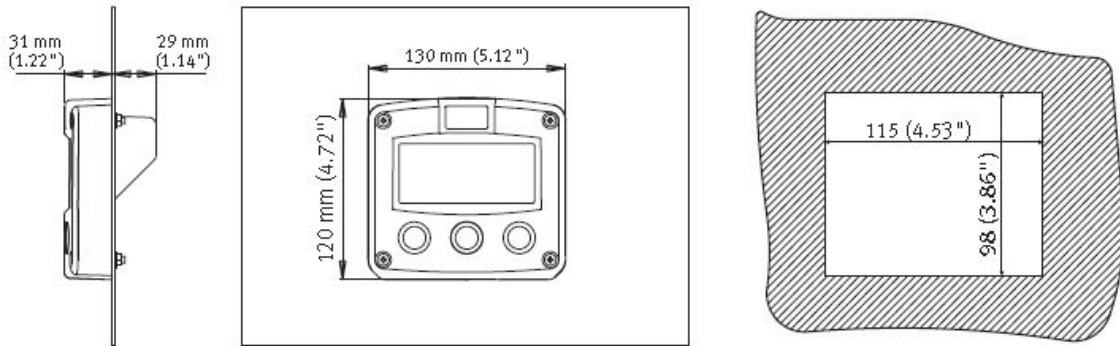
<b>8-COMMUNICATION</b>	Enter factory settings here		
81 speed (baud-rate)	9600	9600	
82 address	1	1	
83 mode	BUS-RTU	BUS-RTU	

<b>9-OTHERS</b>	Enter factory settings here		
91 model	N/A		
92 software version	N/A		
93 pass code	N/A		
94 serial number	0000		
95 tag number	0000000		

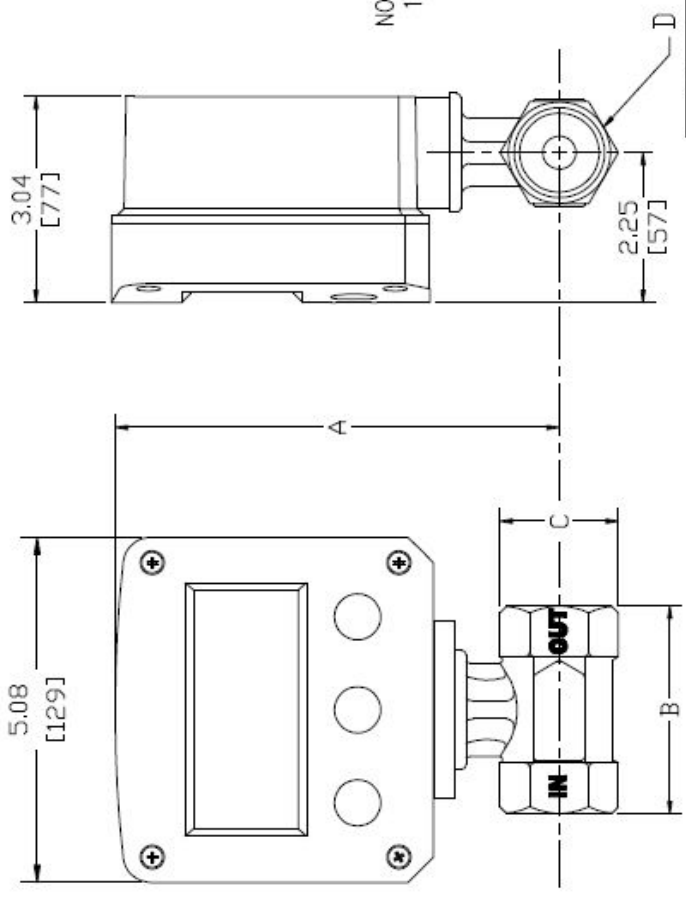
### RW3 (no mounting holes) & DR-1 Housing:



### Panel Mount:



REV	DATE	BY	CHECK	REVISIONS
A				INITIAL DESIGN
B				1" HEX 1.88 WAS 1.75



NOTES:  
1. DIMENSION FORMAT IS  $\frac{\text{in}}{\text{mm}}$

**SERIES 7000  
SST**

PIPE SIZE	DIMENSION									
	A	B	C	D						
0.25	08	5.81	148	3.06	78	1.06	27	1.06	27	sq
0.5	15	5.81	148	3.06	78	1.06	27	1.06	27	sq
0.75	20	6.53	165	2.70	69	1.50	38	1.50	38	rnd
1.0	25	6.55	166	2.77	70	1.75	44	1.75	44	rnd
1.5	40	7.00	178	3.27	83	2.38	60	2.38	60	rnd
2.0	50	7.41	188	3.27	83	3.0	76	3.0	76	rnd
3.0	80	8.09	205	4.36	111	4.62	117	4.00	102	rnd

**SERIES 7000  
BRONZE**

PIPE SIZE	DIMENSION				D					
	A	B	C	D						
0.25	08	6.56	167	3.06	78	1.50	38	1.25	32	hex
0.5	15	6.56	167	3.06	78	1.50	38	1.25	32	hex
0.75	20	6.56	167	3.06	78	1.50	38	1.25	32	hex
1.0	25	6.75	172	3.06	78	1.88	48	1.50	38	hex
1.5	40	7.00	178	3.06	78	2.50	64	2.12	54	hex
2.0	50	7.41	188	3.19	81	3.19	81	2.75	70	hex
3.0	80	8.09	205	4.19	106	4.62	117	4.00	102	hex

ITEM NO. \_\_\_\_\_ DESCRIPTION OF MATERIALS \_\_\_\_\_ QTY. \_\_\_\_\_  
 U.S. MFG. CO. \_\_\_\_\_  
 DIMENSIONS ARE IN INCHES \_\_\_\_\_  
 TOLERANCES: \_\_\_\_\_  
 FINISHES: \_\_\_\_\_  
 SURFACE FINISH: \_\_\_\_\_  
 DATE: 8/11/00  
 SCALE: 1:1  
 DRAWING NO. 7019  
 REV. B

**RCM** ROBERTSON CONSTRUCTION MATERIALS  
 110 MASON CIRCLE  
 CONCORD, CA. 94520

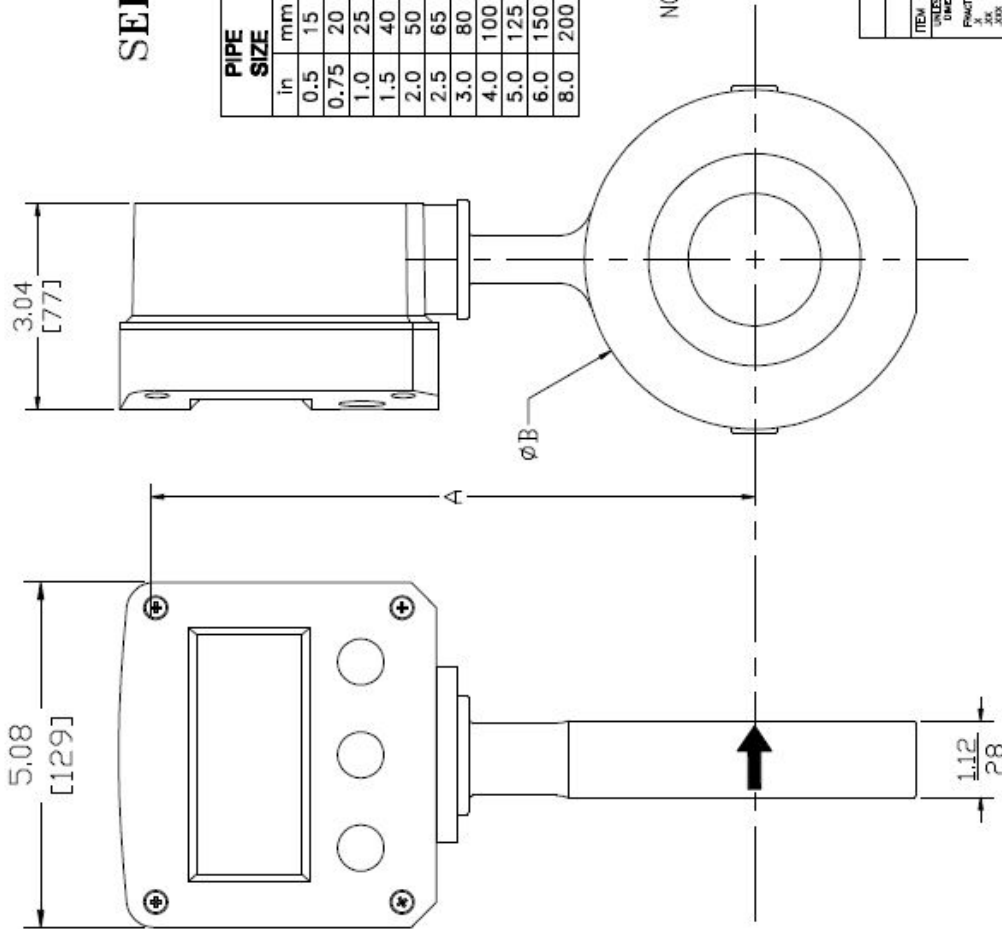
**SERIES 7000 FLOWMETER  
 BOTTOM MOUNT  
 RW3 ASSEMBLY**

REV.	DATE	BY	CHECK	REVISIONS
A	8/11/00			INITIAL DESIGN

# SERIES 8000

## DIMENSION

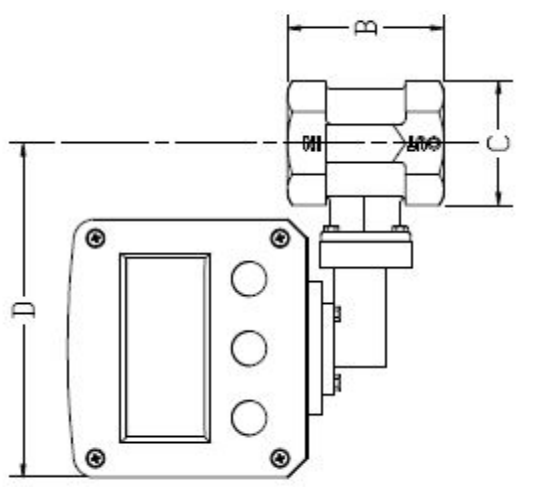
PIPE SIZE	A		BRONZE B		SST B		
	in	mm	in	mm	in	mm	
0.5	15	7.23	1.69	43	1.62	41	
0.75	20	7.67	1.95	51	2.00	51	
1.0	25	7.86	2.00	60	2.38	60	
1.5	40	8.42	2.14	3.12	79	3.00	76
2.0	50	8.61	2.19	3.75	95	3.75	95
2.5	65	9.15	2.32	4.25	108	4.25	108
3.0	80	9.48	2.41	5.00	127	5.00	127
4.0	100	10.56	2.68	6.13	156	6.00	152
5.0	125	10.97	2.79	7.38	187	7.00	178
6.0	150	11.66	2.96	8.38	213	8.00	203
8.0	200	12.91	3.28	10.38	264	10.00	254



NOTES:  
1. DIMENSION FORMAT IS  $\frac{\text{in}}{\text{mm}}$

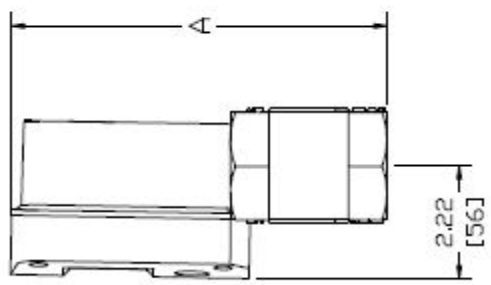
ITEM	QTY.	DESCRIPTION OF MATERIALS	QTY.
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES			
<b>RCM</b> Industrial Flow, Inc. 110 MASON CIRCLE CONCORD, CA. 94630			
SERIES 8000 FLOWMETER			
BOTTOM MOUNT			
RW3 ASSEMBLY			
DATE	8/11/00	SCALE	1:1
REV.		SHEET NO.	7020
REV.			RD A

REV	DATE	BY	CHKD	REVISION
A	08/15/13	WJ	WJ	INITIAL DESIGN
B	08/15/13	WJ	WJ	REVISION
C	08/15/13	WJ	WJ	T HEX 1.00 WAS 1.75



**SERIES 7000  
SST**

PIPE SIZE	DIMENSION									
	A		B		D					
In	mm	In	mm	In	mm	In	mm			
0.25	08	7.38	187	3.06	78	1.06	27	7.58	193	sq
0.5	15	7.38	187	3.06	78	1.06	27	7.58	193	sq
0.75	20	7.20	183	2.70	69	1.50	38	7.58	193	rnd
1.0	25	7.24	184	2.77	70	1.75	44	7.58	193	rnd
1.5	40	7.49	190	3.27	83	2.38	60	7.58	193	rnd
2.0	50	7.49	190	3.27	83	3.0	76	7.58	193	rnd
3.0	80	8.05	204	4.36	111	4.62	117	7.58	193	rnd



**SERIES 7000  
BRONZE**

PIPE SIZE	DIMENSION									
	A		B		D					
In	mm	In	mm	In	mm	In	mm			
0.25	08	7.34	186	3.06	78	1.50	38	6.58	167	hex
0.5	15	7.34	186	3.06	78	1.50	38	6.58	167	hex
0.75	20	7.34	186	3.06	78	1.50	38	6.58	167	hex
1.0	25	7.34	186	3.06	78	1.88	48	6.65	169	hex
1.5	40	7.34	186	3.06	78	2.50	64	6.58	167	hex
2.0	50	7.41	188	3.19	81	3.19	81	6.58	167	hex
3.0	80	7.91	201	4.19	106	4.62	117	6.58	167	hex

REV	DATE	BY	CHKD	REVISION
A	08/15/13	WJ	WJ	INITIAL DESIGN
B	08/15/13	WJ	WJ	REVISION
C	08/15/13	WJ	WJ	T HEX 1.00 WAS 1.75

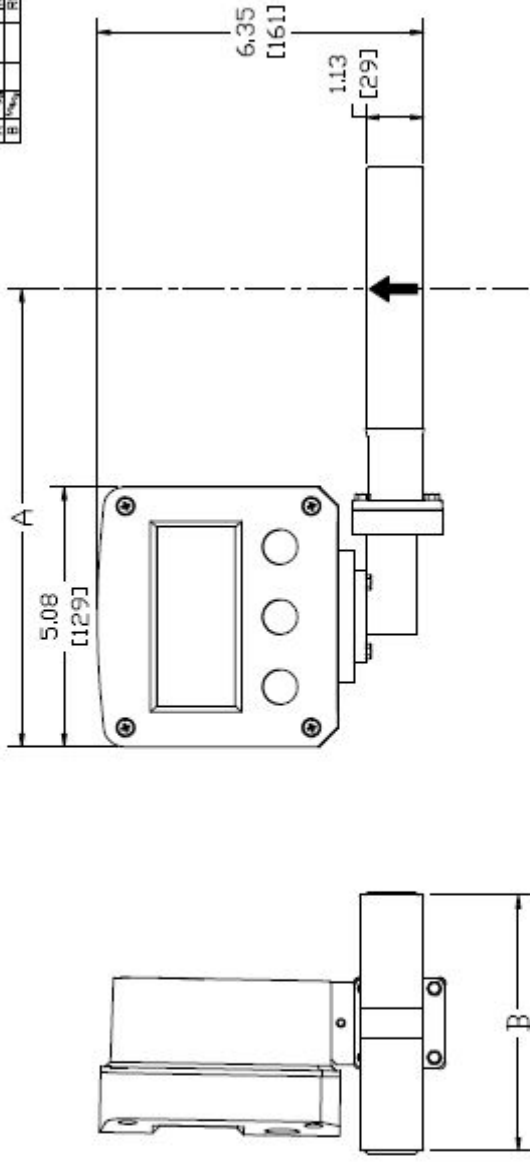
RCM  
SERIES 7000 FLOWMETER HOUSING-BODY VERTICAL ASSEMBLY RWS

REV	DATE	BY	CHKD	REVISION
A	08/15/13	WJ	WJ	INITIAL DESIGN
B	08/15/13	WJ	WJ	REVISION
C	08/15/13	WJ	WJ	T HEX 1.00 WAS 1.75

RCM  
SERIES 7000 FLOWMETER HOUSING-BODY VERTICAL ASSEMBLY RWS



DR	DATE	CHECK	APPROVED
A		INITIAL DESIGN	
E		REVISION	



**SERIES 8000**

PIPE SIZE	BRONZE		STAINLESS STEEL						
	A	B	A	B					
in	mm	in	mm	in	mm				
0.5	15	6.77	172	1.69	43	7.99	203	1.62	41
0.75	20	7.20	183	2.00	51	8.31	211	2.00	51
1.0	25	7.39	188	2.38	60	8.52	216	2.38	60
1.5	40	7.95	202	3.12	79	9.09	231	3.00	76
2.0	50	8.14	220	3.75	95	9.22	234	3.75	95
2.5	65	8.64	204	4.25	108	9.72	247	4.25	108
3.0	80	9.01	229	5.00	127	10.10	257	5.00	127
4.0	100	10.08	256	6.13	156	11.23	285	6.00	152
5.0	125	10.48	266	7.38	187	11.73	298	7.00	178
6.0	150	11.20	284	8.38	213	12.23	311	8.00	203
8.0	200	12.65	321	10.38	264	13.48	342	10.00	254

RW3-4, DR-1 w/Modbus  
 DESCRIPTION OF MATERIALS  
 QTY.  
**FCM**  
 139 MAINS CIRCUIT  
 CONCORD, CA, USA  
 SERIES 8000 FLOWMETER  
 HOUSING-BODY VERTICAL  
 ASSEMBLY RW3  
 1:1  
 7/21/18