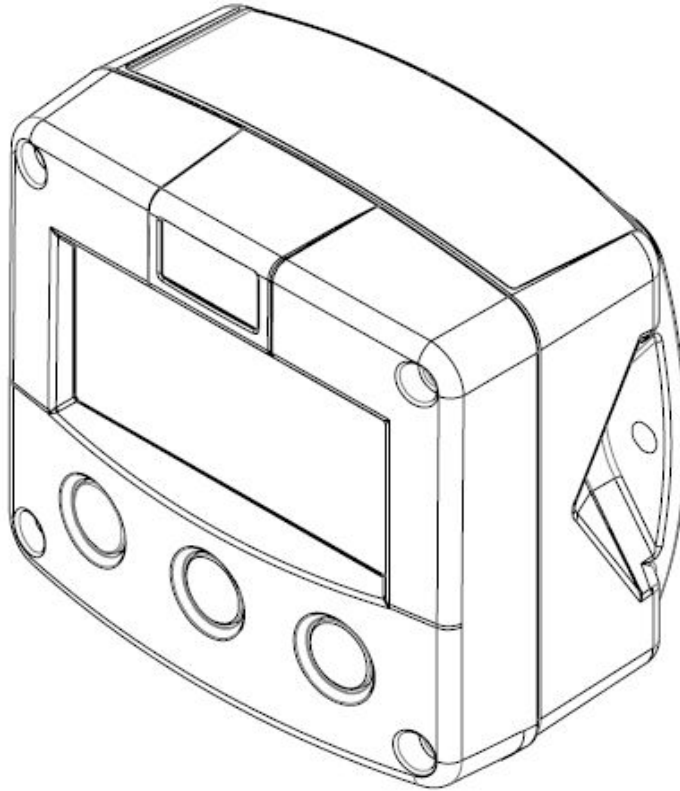


# **Wiring & Programming Instruction Manual**

*(Options: RW3-2 or RW3-3 & DR-1)*

**FLOWRATE INDICATOR / TOTALIZER  
WITH HIGH / LOW FLOWRATE ALARMS**



**Signal input flowmeter: 4-20mA (non-linear or linear)**  
**Alarm Output: One flowrate alarm**  
**Optional: Backlighting Amber and Green**



## 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: FB03.03xx  
Software version: 03.02xx  
Manual: M17Rev A Wiring & Programming Instructions Option RW3-2 & DR-1  
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# CONTENT MANUAL

Safety Instructions.....	2
Safety rules and precautionary measures.....	2
About the operation manual.....	3
Contents manual.....	4
1. Introduction.....	5
1.1. System description of the display.....	5
2. Operational.....	6
2.1. General.....	6
2.2. Control panel.....	6
2.3. Operator information and function.....	7
3. Configuration.....	9
3.1. Introduction.....	9
3.2. Programming SETUP-level.....	9
3.2.1. General.....	9
3.2.2. Overview functions SETUP-level.....	10
Explanation of SETUP-functions.....	13
1 – Total.....	14
2 – Flowrate.....	15
3 - Alarm	
4 – Display.....	16
5 – Power management.....	16
6 – Flowmeter.....	17
6 Flowmeter Continued.....	19
7– Others.....	19
4. Installation.....	20
4.1. General directions.....	20
4.2. Installation / surrounding conditions.....	20
4.3. Installing the hardware.....	21
4.3.1. Terminal connectors with power supply.....	21
5. Maintenance.....	23
5.1. General directions.....	23
5.2. Repair.....	23
5.3. Calibration Procedure.....	23
Appendix A: Technical specification.....	24
Appendix B: Problem solving.....	27
Index of this manual.....	28
List of figures in this manual.....	28
Configuration setting list.....	29
Housing Dimensions.....	30
Meter Dimensions – 7000 Series (Horizontal) #7019.....	31
Meter Dimension – 8000 Series (Horizontal) #7020.....	32
Meter Dimension – 7000 Series (Vertical) #7017.....	33
Meter Dimension – 8000 Series (Vertical) #7018.....	34

# 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 the monitoring of the flowrate for high / low values.

### Flowmeter input:

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

One flowmeter with a passive 4-20mA signal output can be connected to the display. The display is powered by a 2-wire loop powered transmitter and 24Vdc supply 24Vdc supply not included use option PS-24.

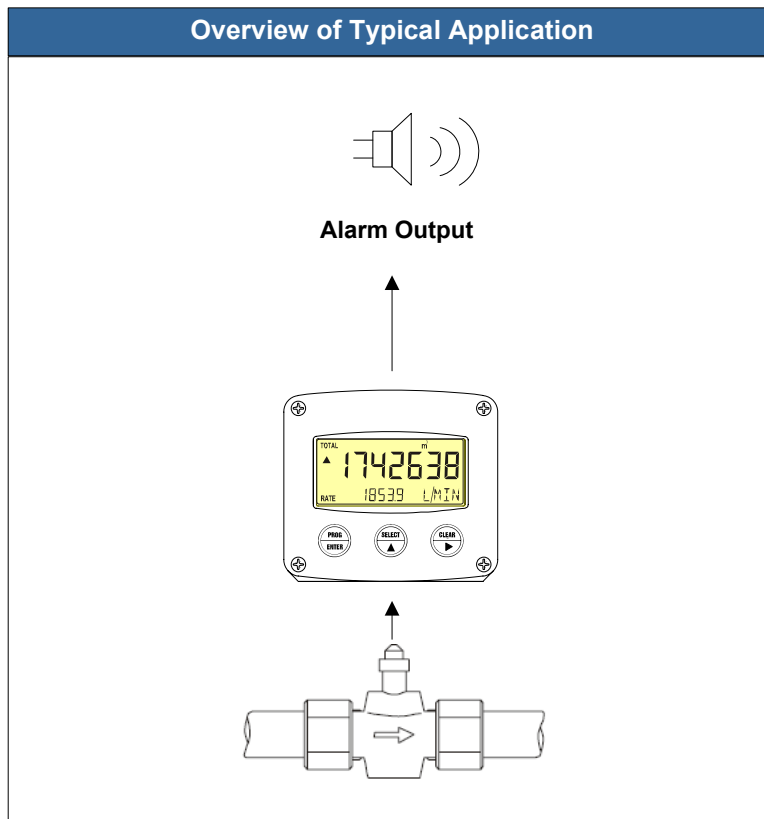


Fig.1: Typical application

### 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.

## 2. OPERATIONAL

### 2.1 GENERAL

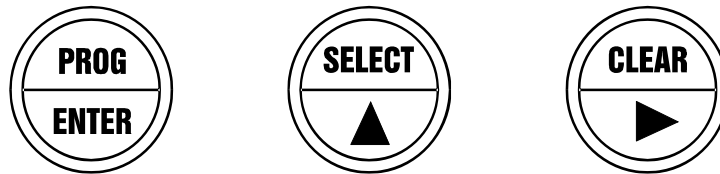


The digital display may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed. Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.

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.

## Programming the flowrate alarm values

**Note:** This function might not be accessible due to a configuration setting.

When the SELECT-key is pressed a few times, following flowrate alarm values are displayed.

- Low flowrate alarm: enter here 40 L/min for example
- High flowrate alarm: enter here 200 L/min for example

To change the alarm value, the following procedure must be executed:

- a) Press PROG: the word "PROGRAM" will flash or a pass code will be requested,
- b) Use ► to select the digits and ▲ to increase that value,
- c) Confirm the new alarm value by pressing ENTER.



Fig. 4: Example of display information during programming minimum flowrate.

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during 3 seconds: the former value will be installed.

### ▪ Flowrate alarm

When the actual flowrate is outside the allowed range, an alarm message will be displayed indicating the type of alarm: "LO RATE", "HIGH RATE".

### ▪ 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. 5: 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.



Caution !

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

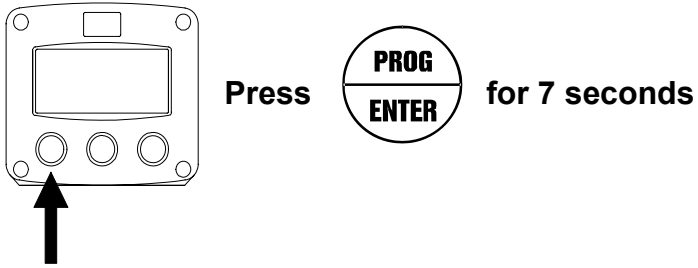
Configuration of the display is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ▲▼ will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternately, if no keys are pressed for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



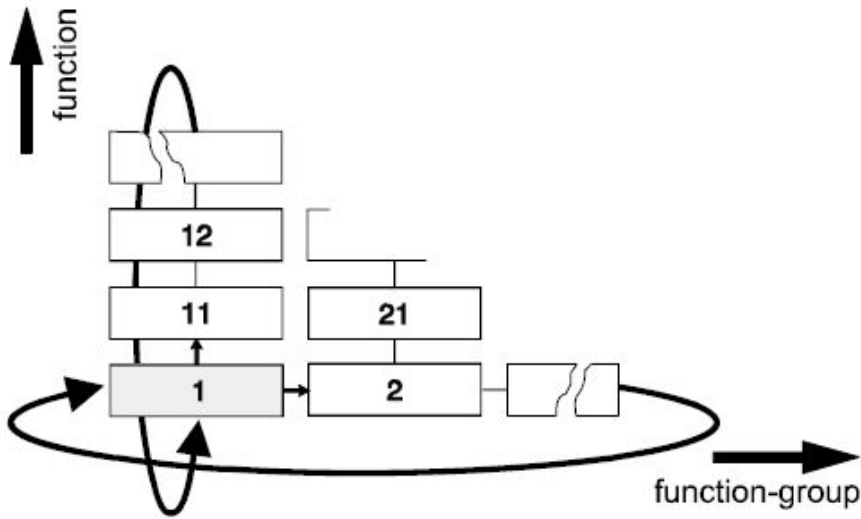
Note !

**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:

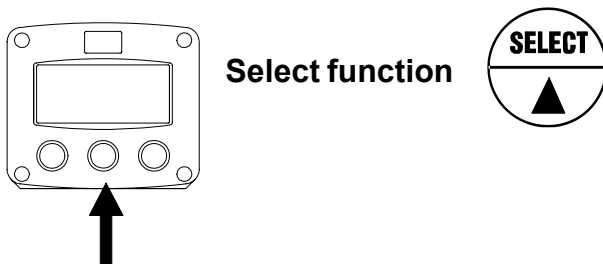
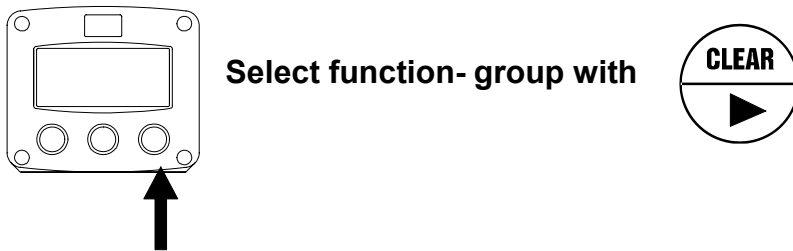


### 3.2.2. Matrix structure SETUP-level:



### SCROLLING THROUGH SETUP-LEVEL

SET-UP is divided into several function groups and functions.

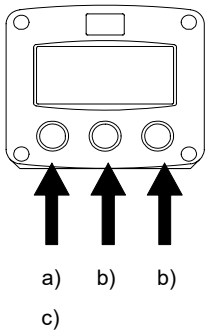


Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures.

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) 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.

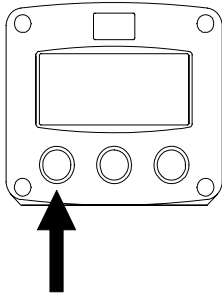
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for 3 seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note !

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

To return to OPERATOR-level:



Press  for 3 seconds

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	DECIMALS 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 UNIT	sec – min – hour – day
23	DECIMALS	0 – 1 – 2 – 3 (Ref: displayed value)
24	SPAN	0.000001- 9,999,999 unit / time unit
25	DECIMALS SPAN	0 – 6
<b>3</b>	<b>Alarm</b>	
31	FLOWZERO	default – no relays - ignore
32	ALARM LOW	0000.000 – 9,999,999
33	ALARM HIGH	0000.000 – 9,999,999
34	DELAY ALARM LOW	0.1 – 999.9 seconds
35	DELAY ALARM HIGH	0.1 – 999.9 seconds
36	ALARM OUTPUT	high – low – both – off
<b>3</b>	<b>DISPLAY</b>	
41	FUNCTION	total-flowrate
42	SET ALARM	operator - setup
43	BACKLIGHT (optional)	off – green – amber
44	BACKLIGHT ALARM	off – on – flash
45	BL. BRIGHTNESS	1-5
<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	00 – 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>PULSE OUTPUT</b>	
61	PULSE WIDTH	0.001 – 9.999 sec
62	DECIMALS	0 – 1 – 2 – 3
63	IMPULSE PER	X – quantity
<b>7</b>	<b>OTHERS</b>	
71	TYPE / MODEL	
72	SOFTWARE	N/A
73	SERIAL NO.	
74	PASS CODE	0000 – 9999
75	TAG NUMBER	0000000 – 9999999

<b>1 – TOTAL</b>	
<b>MEASUREMENT UNIT 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 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 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 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>

<b>2 – FLOWRATE</b>	
<p>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.  <i>The display update time for flowrate is one second or more.</i></p>	
<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 – 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. 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;">000000 – 111111.1 – 22222.22 – 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 – ALARM

*With these settings, it is determined how the flowrate will be monitored and the functionality of the transistor / relay output (terminals 7-8) be determined.*

<b>FLOW ZERO</b> <b>31</b>	<p>When the <u>flowrate is zero</u>, then it is possible to ignore or disable the flowrate monitoring. The following settings can be selected:</p> <p><b>DEFAULT:</b> in case of a low-flowrate alarm and zero flow, it will switch the alarm output and indicate the alarm on the display.</p> <p><b>NO RELAY:</b> in case of a low-flowrate alarm and zero flow, it won't switch the alarm output but will indicate the alarm on the display only.</p> <p><b>IGNORE:</b> in case of a low-flowrate alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.</p>
<b>ALARM VALUE LOW FLOWRATE</b> <b>32</b>	<p>The low alarm is set with this setting. An alarm will be generated as long as the flowrate lower as this value: With value 0.0 this function is disabled.</p>
<b>ALARM VALUE HIGH FLOWRATE</b> <b>33</b>	<p>The high alarm is set with this setting: An alarm will be generated as long as the flowrate higher as this value: With value 0.0 this function is disabled.</p>
<b>DELAY TIME ALARM LOW FLOWRATE</b> <b>34</b>	<p>An alarm generated by SETUP 32 "low" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.</p>
<b>DELAY TIME ALARM HIGH FLOWRATE</b> <b>35</b>	<p>An alarm generated by SETUP 33 "high" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.</p>
<b>ALARM OUTPUT TRANSISTOR / RELAY</b> <b>36</b>	<p>One transistor or relay output is available to transit the alarm condition. Assign with this function the type of alarm to be transmitted: low flowrate alarm, high flowrate alarm or both alarms. The function is disabled with the selection of "off".</p>

### 4 – DISPLAY

<b>FUNCTION</b> <b>41</b>	<p>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.</p>
<b>SET ALARM</b> <b>42</b>	<p>This function determines if the flowrate alarm values can be set at both operator level and SETUP-level or SETUP-level only. If SETUP has been selected, the alarm values are still visible for the operator but cannot be</p>



	changed.
The functions below will only affect the optional backlight.	
<b>BACKLIGHT (OPTION)</b> 43	If a LED backlight has been supplied, the color can be selected. Following selections are available:  OFF – GREEN – AMBER
<b>BACKLIGHT ALARM</b> 44	In case the display generates a flowrate alarm, the backlight can be set to change to red. Following selections are available:  <b>OFF:</b> during flowrate alarm the color is according to setting 43  <b>ON:</b> during flowrate alarm the color is red.  <b>FLASH:</b> during flowrate alarm the color flashes red and the color as per setting 43
<b>BRIGHTNESS (OPTION)</b> 45	The density of the backlight can be set in following range:  1 – 5  One is the minimum and five is the maximum brightness.

## 5 – 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> 41	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:  FAST – 1 sec – 3 sec – 15 sec – 30 sec – off  Example battery life-time:  <i>Battery life-time with FAST update: about 3 years</i> <i>Battery life-time with 1 sec update: about 5 years</i>  <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.
<b>BATTERY-MODE</b> 42	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 !

## 6 – 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 >>>>				

## 6 – FLOWMETER (CONTINUED)

<b>CUT-OFF 53</b>		<p>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 cab be programmed is the range 0.0-99.9%. Examples:</p>		
Function (setup 51)	Span (setup 13/24)	Required Cut-off	Cut-Off (setup 53)	Required Output
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>TUNE MIN/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. This function will measure the real output value at flow zero. <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>TUNE MAX/20mA</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. This function will measure the real output value at maximum flow. <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>		

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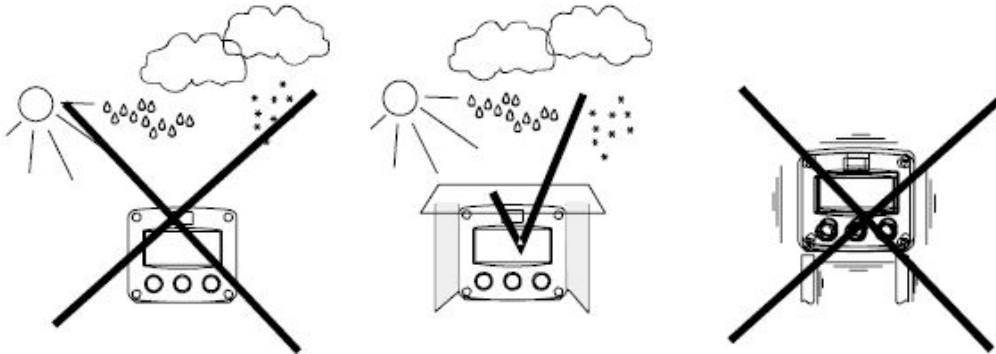
7-OTHERS	
<b>TYPE OF MODEL</b> 71	N/A
<b>VERSION SOFTWARE</b> 72	N/A
<b>SERIAL NO.</b> 73	N/A
<b>PASS CODE</b> 74	All SETUP-value can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
<b>TAGNUMBER</b> 75	N/A

## 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 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:** 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**

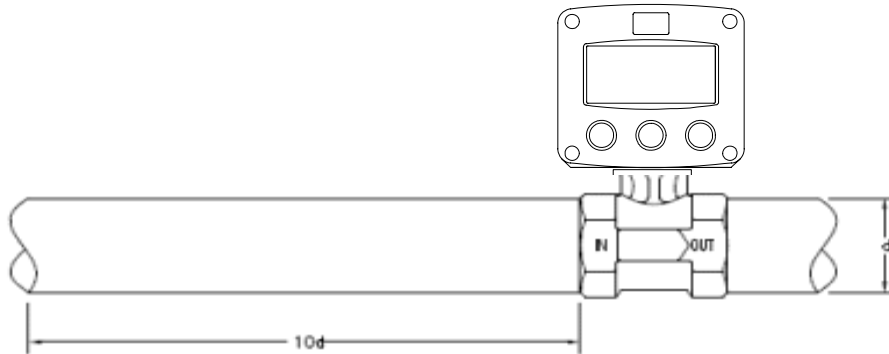


Fig. 5: Installation and straight run requirements

#### 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 4-20mA input is provided, reference figure 7 for customer connection using 24Vdc power supply pin #1 negative and pin #2 positive:

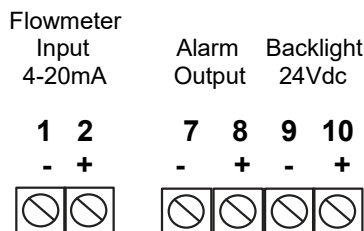


Fig. 6: Overview of terminal connectors and options  
(Backlighting requires 24Vdc supply)

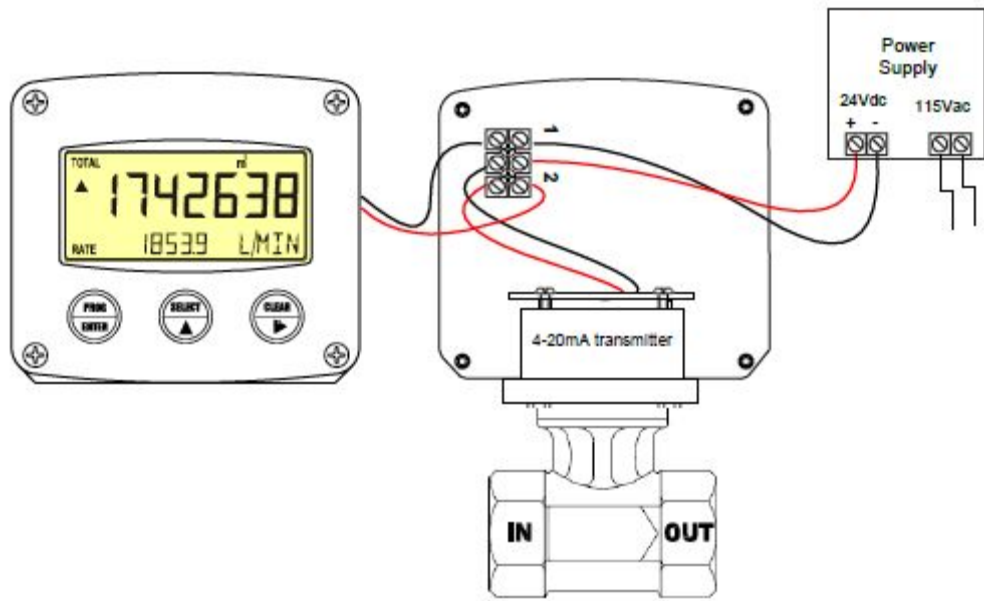


Fig. 7: Wiring connection for RW3-2 or RW3-3 w/Alarm option

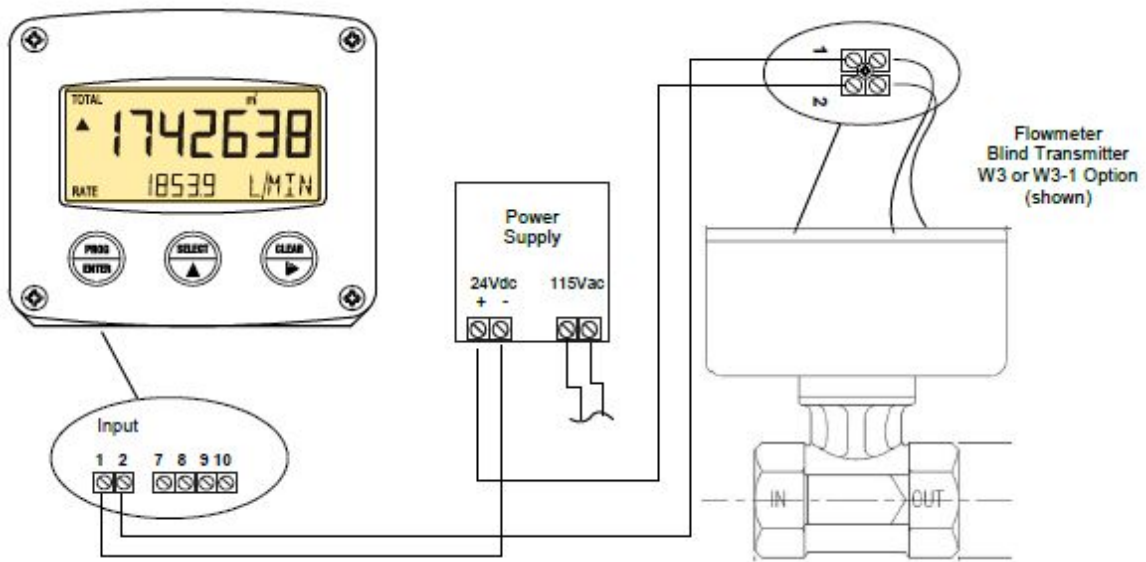
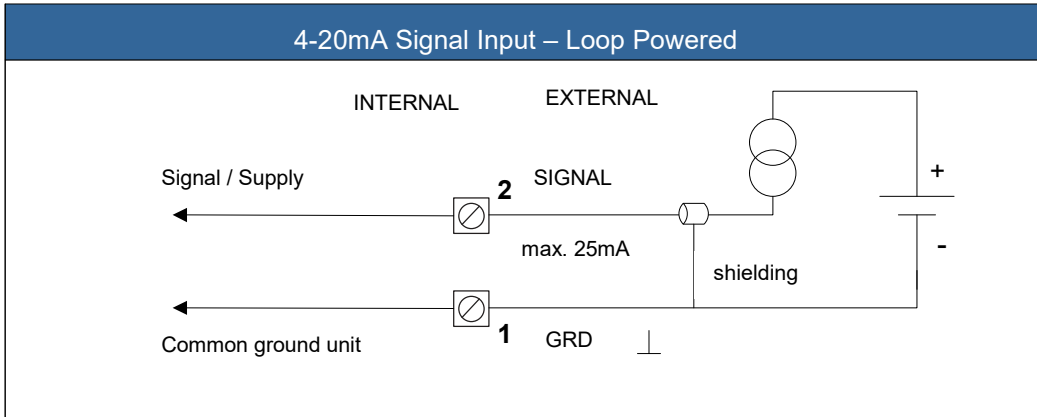


Fig. 8: DR-1 w/Alarm Option Connection to W3 or W3-1 (shown)

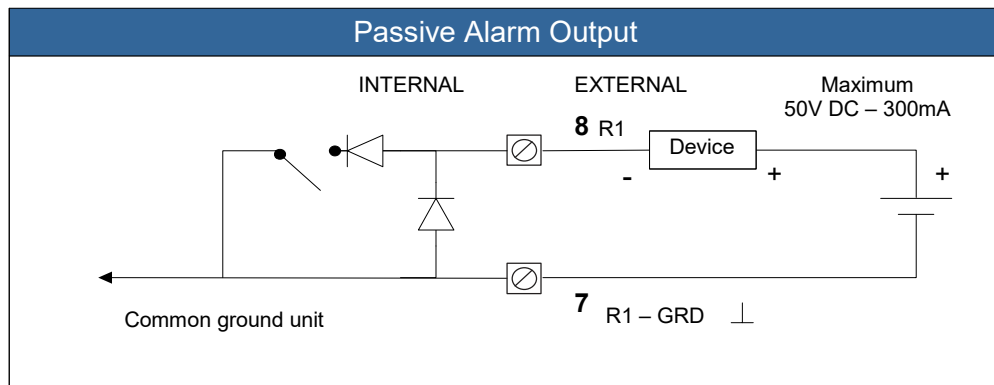
### Terminals 1 – 2: Flowmeter Input / Power Supply

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



### Terminals 7 – 8: Alarm Output

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





## 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 users 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. **WARNING:** Do not adjust span unless you are certain that the meter is reading incorrectly. Adjustment pots are marked Z (zero) and S (span) RW3-2 only.

### 5.3 CALIBRATION PROCEDURE – RW3-2 (non-linear 4-20mA signal)

Adjust zero pot (Z) to reads 4.00mA  $\pm$  0.02mA at no flow. Establish a known flow rate as close to 95% of F.S. as practical. Set span pot (S), span is set using the following formula:  $I = 16 Q^2 + 4.00$ ; where I = current output mA, Q = decimal % of full scale.

Output is proportional to the flow rate squared. Square root extraction is required on the receiving device.

<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>4.64</b>	<b>70</b>	<b>11.84</b>
<b>30</b>	<b>5.44</b>	<b>80</b>	<b>14.24</b>
<b>40</b>	<b>6.56</b>	<b>90</b>	<b>16.96</b>
<b>50</b>	<b>8.00</b>	<b>95</b>	<b>18.44</b>
<b>60</b>	<b>9.76</b>	<b>100</b>	<b>20.00</b>

Fig. 9

#### 5.4 CALIBRATION PROCEDURE – RW3-3 (linear 4-20mA signal)

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

Fig. 10

#### 5.5 CONNECTING A MULTIMETER – 4-20mA SIGNAL CHECK

Connect the positive lead from the 24Vdc supply to the mA plug on the volt meter, connect the negative lead from terminal #1 (digital display) to the COM plug on the volt meter.

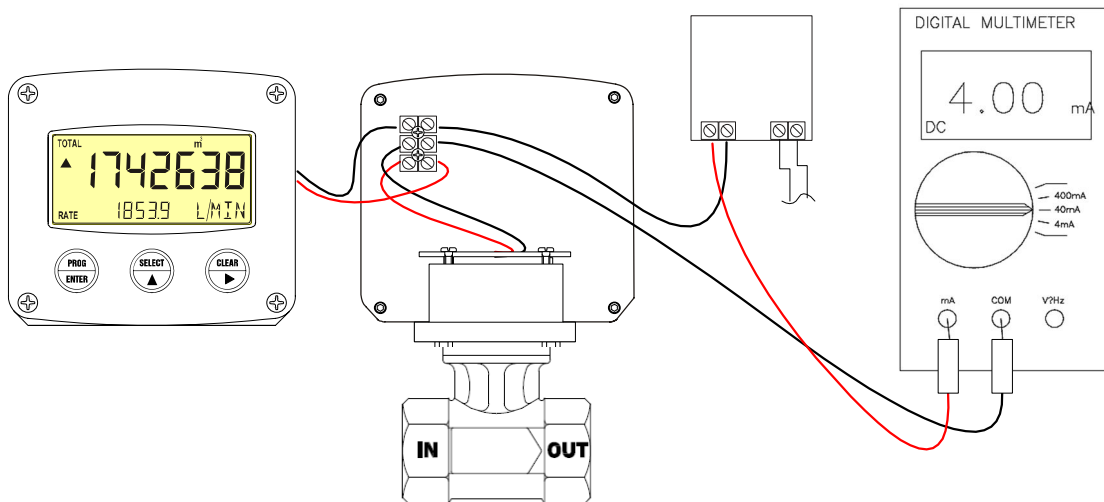


Fig. 11

## 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)	Tri-color configurable LED-Backlight-green, amber with red flashing during alarm. Intensity adjustable from keyboard.

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 +178°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

INPUT	
Flow Meter	
Type	4-20mA signal based on differential pressure

OUTPUT	
Alarm Output	
Function	High / Low or high and low alarm.
	One passive transistor output – not isolated. Load max. 50V DC – 300mA.

OPERATIONAL	
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> <li>• Alarm values low – high flowrate</li> <li>• Alarm values can be entered (this function can be disabled)</li> </ul>

Total	
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

Accumulated Total	
Digits	7 digits
Units / Decimals	According to selection for total

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

Alarm Values	
Digits	7 digits
Units / Decimals	According to selection for flowrate.
Time Units	According to selection for flowrate.
Type alarm	Low and high flowrate alarm, delay time alarm and configurable alarm output

## DP Sensor Specification:

Electrical	
DP Sensor	
Output Signal	2-wire loop powered 4-20mA DC (RW3-2 non-linear) - (RW3-3 linear)
Response Time	(10% - 90%) ≤ 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	≤ 0.5mV / MPa
Insulation Resistor	100MΩ, 100VDC

Construction	
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)

Environment Condition	
Position Effect	Deviate 90° from any orientation, zero change ≤ 0.2% F.S.
Vibration Effect	≤ 1% at 3gRMS, 30 – 2000Hz
Impact	≤ 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
Working Temp. Range	-40 ~ 120			°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.

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

Check:

SETUP 22 / 25: are the span and time unit correct.

The pass code is unknown:

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

Range error

Range error (LO RANGE or HI RANGE): the input value is at least 5% above or below the calibrated measurement range SETUP 54, 55. Do recalibrate the input if desired.

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

The alarm condition will almost certainly be handled internally and if all mentioned values still appear correct, no intervention by the operator is needed. If the alarm occurs more often or stays active for a longer time, please contact your 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. 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.

The meter does not require routine lubrication or service of any kind. Keep the interior of the meter housing clean and free of dust, moisture, oils or corrosive materials which may attack the exterior and eventually damage the internal components.

## INDEX OF THIS MANUAL

Accumulated total	7	Loop powered	21
Actual settings	28	Low current	18
Backlight	16	Low battery	7, 8
Color	16	Main-function	10
Density	16	Maintenance	23
Battery life time	16	Manual version	3
Clear total	7	Model	17
Configuration	9	Operational	6
Contents	4	Operator level	7
Display	16	Pass code	26
Function	16	Problem solving	26
Display update time	16	Pulse output	19
Flowmeter	17	Pulse length / period time	19
Flowrate	15	Range error	8,26
Decimals	15	Rate / total	7
Decimals span	15	Serial number	28
Measuring unit	15	Setup-level	9
Span	15	Software version	3
Time unit	15	Sub function	10
Functional description	5	Tag number	19
Keys	6	Technical specification	24
High current	18	Terminal connectors	21
Input loop powered	21	Total	14
Installation	20	Decimals	14
Decimals span	14	Measuring unit	14
Span	14	IP classification	20

## LIST OF FIGURES IN THIS MANUAL

Fig. 1:	Typical application for the display.....	5
Fig. 2:	Control panel.....	6
Fig. 3	Example of display information during process.....	7
Fig. 4:	Example of low-battery alarm.....	8
Fig. 5:	Installation and site selection requirement.....	21
Fig. 6:	Overview of terminal connectors and options.....	21
Fig. 7:	Wiring connection RW3 option.....	22
Fig. 8:	Wiring connection DR-1 & W2 / W3 option.....	22
Fig. 9:	Flow to current output chart (4-20mA non-linear signal).....	23
Fig. 10:	Flow to current output chart (4-20mA linear signal).....	24
Fig. 11:	Connecting a Multimeter.....	24

LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE:	DATE:

TOTAL	Enter factory settings here		
11 unit			
12 decimals		22222.22	
13 span		/ sec	/ sec
14 decimals span			

FLOWRATE	Enter factory settings here		
21 unit			
22 time unit			
23 decimals		22222.22	
24 span		/ unit	/ unit
25 decimals span		0	

DISPLAY	Enter factory settings here		
31 function		total	
32 backlight		off	
33 brightness		5	

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

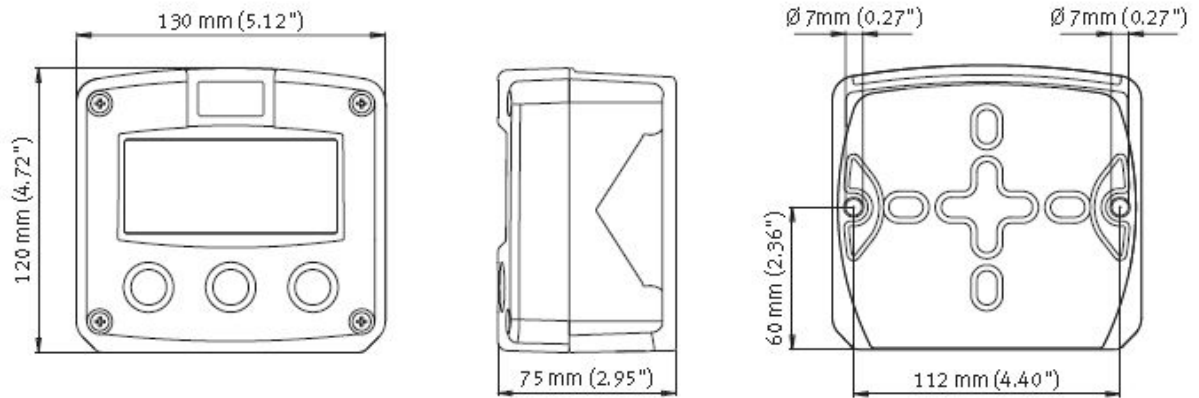
FLOWMETER	Enter factory settings here		
51 formula		square root	
52 filter		01 (off)	
53 cut-off %		15%	
54 cal. low-4mA		4.00mA	
55 cal. high-20mA		20.0mA	

PULSE OUTPUT	Enter factory settings here		
61 pulse width		off	
62 decimals		off	
63 pulse per		off	

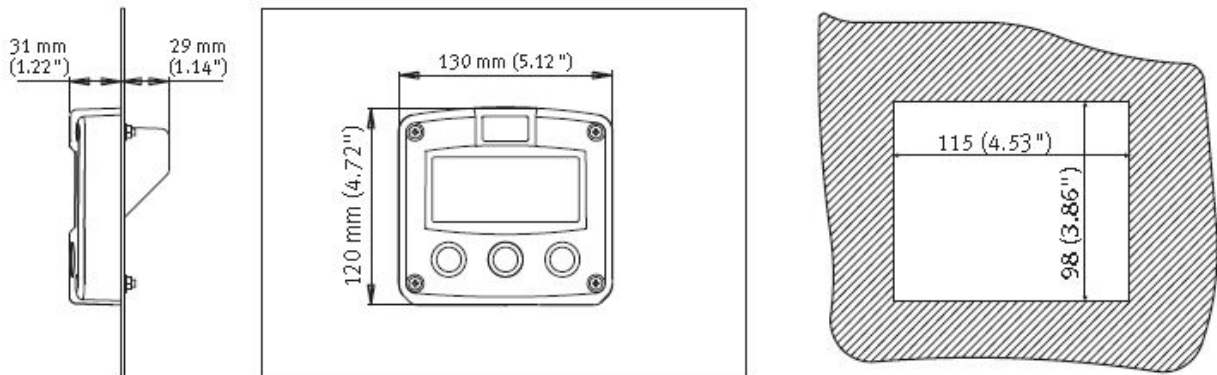
OTHERS	Enter factory settings here		
71 model			
73 serial number			
74 pass code			



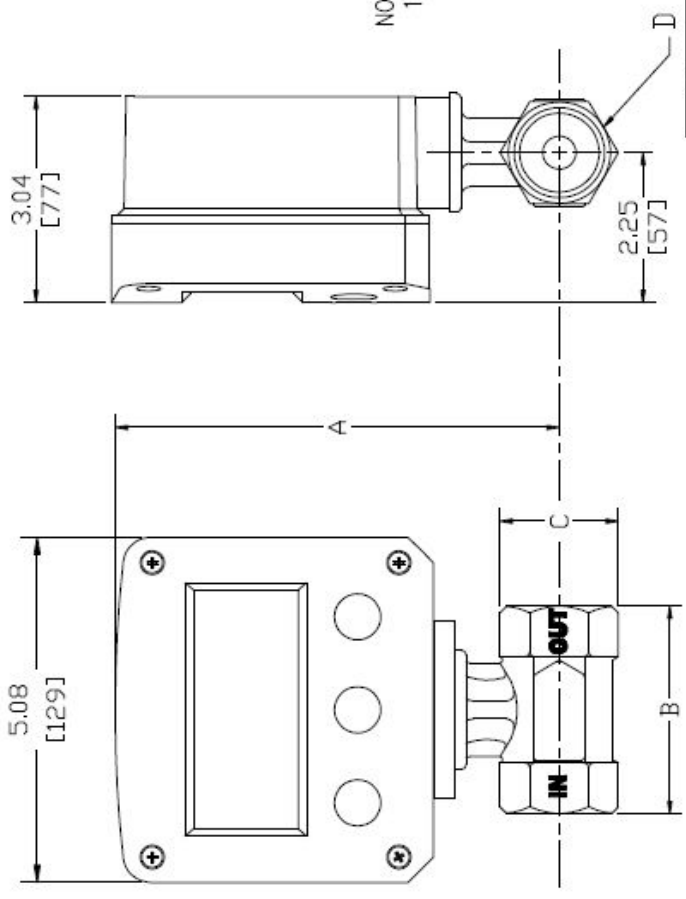
## RW3 (no mounting holes) & DR-1 Housing:



## 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. & CANADIAN DIMENSIONS ARE IN INCHES  
 DIMENSIONS ARE IN MILLIMETERS  
 TOLERANCES: ± \_\_\_\_\_  
 FINISHES: \_\_\_\_\_  
 SURFACE FINISH: \_\_\_\_\_  
 DATE: 8/17/00  
 SCALE: 1:1  
 DRAWING NO. 7019  
 REV. B

**RCM** ROBERT CALDWELL METERING, INC.  
 110 MASON CIRCLE  
 CONCORD, CA. 94520

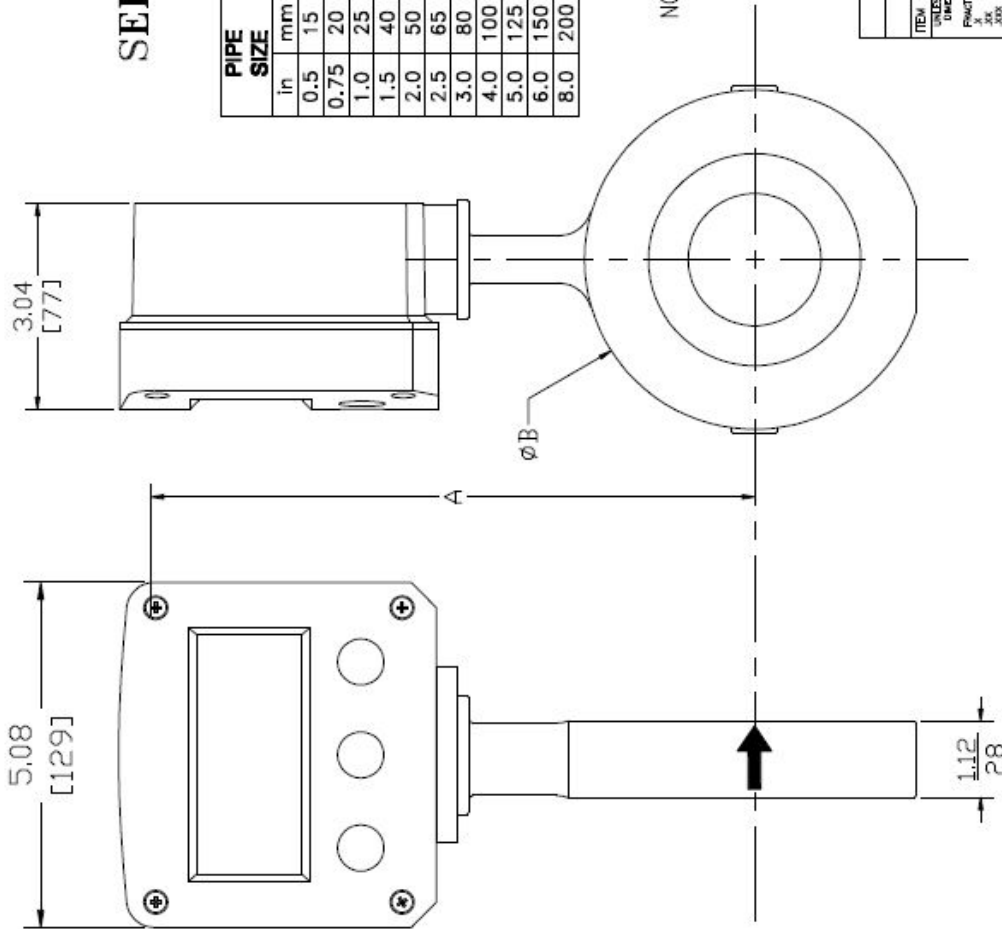
**SERIES 7000 FLOWMETER  
 BOTTOM MOUNT  
 RW3 ASSEMBLY**

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

# SERIES 8000

## DIMENSION

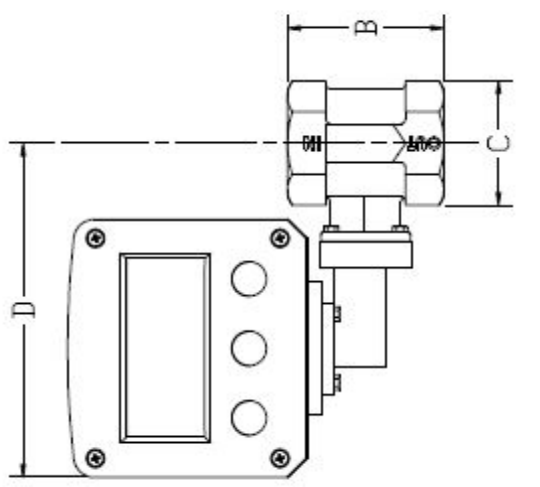
PIPE SIZE	A		BRONZE B		SST B	
	in	mm	in	mm	in	mm
0.5	15	7.23	1.69	43	1.62	41
0.75	20	7.67	1.95	51	2.00	51
1.0	25	7.86	2.00	60	2.38	60
1.5	40	8.42	2.14	79	3.00	76
2.0	50	8.61	2.19	95	3.75	95
2.5	65	9.15	2.32	108	4.25	108
3.0	80	9.48	2.41	127	5.00	127
4.0	100	10.56	2.68	156	6.00	152
5.0	125	10.97	2.79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

REV	DATE	BY	CHKD	REVISIONS
A	08/15/17	WAS		INITIAL DESIGN
B	08/15/17	WAS		REVISION
C	08/15/17	WAS		1 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

RCM  
SERIES 7000 FLOWMETER HOUSING-BODY VERTICAL ASSEMBLY RWS

RCM  
110 WARE CENTER  
LITTLETON, CO. 80120

RCM  
SERIES 7000 FLOWMETER HOUSING-BODY VERTICAL ASSEMBLY RWS

REV 1.1 08/15/17

