

MXL-INSTPRM
REV 2
03/20



TYPE PRM 4-20 mA REGISTER

INSTRUCTION MANUAL



- *Analog Output (4-20mA)*

To the Owner

Please read and retain this instruction manual to assist you in the operation of this product.

This Instruction Manual provides instruction guide on the operation and programming of the type PRM.

Should you require further assistance please contact you local Macnaught representative.

Macnaught offer a comprehensive set of web based support materials to compliment our product range. Access the website by scanning the QR code.



WWW.MACNAUGHT.COM

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INTRODUCTION

FUNCTIONS AND FEATURES

The model PRM is a microprocessor driven instrument designed to transmit 4 - 20 mA (analog signal) proportional to the flow rate. This product is equipped with glass reinforced polypropylene housing and offers IP67 environmental protection.

CONFIGURATION OF THE UNIT

The PRM has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your PRM according to your specific requirements. It includes several important features, such as K-factors, measurement units etc. 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 not only for easy programming but also to display the analog signal in terms of milliamperes (4 - 20 mA) and its percentage.

MOUNTING EXAMPLE

Mounting on MX meter body



Mounting on wall mount bracket



DISPLAY EXAMPLES



INSTALLATION

The display has a unique M-lock mounting feature. It can be installed on

- MX meter body
- MX wall mount bracket

To install, secure the display on the cam and rotate quarter turn clock-wise (90 degrees)

To uninstall, hold the display and rotate quarter turn anti clock-wise (90 degrees)



There are no tools required to install/ remove the display

WARRANTY

For warranty terms & conditions, visit <https://www.macnaughtusa.com/warranty>

TECHNICAL SPECIFICATIONS

GENERAL

Display

Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant
Digits	Seven 12mm (0.47") and seven 8mm (0.31"). Various symbols and measuring units
Refresh Rate	4 - 20 mA: Once per second

Enclosure

General	Polypropylene housing with Polycarbonate window, EPDM gaskets. UV stabilized
Control keys	Two industrial micro-switch keys. UV-resistant keypad.
IP Classification	IP67
Cable entry	(2) x M12 * 1.5
Backlight	No
Ex approvals	No

Temperature

Operational	-20°C to +80°C (-4°F to +176 °F)
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Power supply options

External	24 VDC
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Terminal connections

Type	Terminal strip. Wire max. 1mm ²
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Data protection

Type	Backup of all settings are stored in flash memory
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Environment

Electromagnetic compatibility	Compliant ref: EN 61326-1:2006, EN61010-1:2001
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DISPLAY

Analog Signal

Displayed Function	4 - 20 mA, 0 - 100 %
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INPUT

Input

Input	Reed switch (from flow meter)
Frequency	0.01 Hz – maximum 120 Hz
K-Factor	0000.001 - 9,999.999 pulses per Litre

OUTPUT

Analog Output

Function	This function transmits flow rate
Type	4 - 20 mA, passive, loop powered
Power Supply	24 VDC
Accuracy	10 bit resolution. Error < 0.05% - update 8 times a second Software function to calibrate 4.00 mA and 20.00 mA levels precisely within set-up



Note !

This register requires an external power supply to operate.

SET-UP FUNCTIONS

1 Meter			
1.1	*K-Factor (Pulses per Litre)	0000.000 to 9999.999	'1' or as per factory
2 Analog Output 1 (Basic Setup)			
2.1	Low Flow - 4mA	0000.000 - 9,999,999 (unit / time)	0
2.2	High Flow - 20mA	0000.000 - 9,999,999 (unit / time)	99999
2.3	Unit	L - m3 - UKGAL - USGAL - UKbbl -USbbl - OILbbl	L
2.4	Time	Sec - Min - Hour	Min
3 Analog Output 2 (Advance Setup)			
3.1	Low Calibration - 4mA	0 - 9999	633
3.2	High Calibration - 20mA	0 - 9999	3214
3.3	Calculation	Per 1 - 255 pulses (Default 10)	10
3.4	Cut-off	0.0 - 999.9 seconds (Default 10)	30.0
4 OTHERS			
4.1	Type	PRM	-
4.2	Software Version	xx.xx.xx	-
4.3	Serial No.	xxxxxxx	-



The K-Factor in 1.1 must be entered in pulses per litre (PPL). Entering the k-factor in pulses per gallon (PPG) will result in inaccurate readings. Refer to page 9 for detailed instructions on entering the k-factor.



Note !

***The k-factor in 1.1 MUST ALWAYS be entered in pulses per LITRE, regardless of units in 2.3.**

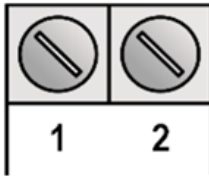
EXPLANATION OF SET-UP FUNCTIONS

1 METER		
1.1	*K-Factor (Pulses per Litre)	<p>With the K-factor, the flow meter pulse signals are converted to a flow rate. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p>The setting allows a K Factor with up to 3 decimal places and 4 whole numbers e.g. 1234.123</p> <p>Please note that the K-Factor entered in 1.1 must be in pulses per litre (PPL). Entering the k-factor in pulses per gallon (PPG) will result in inaccurate readings. Refer to page 9 for detailed instruction on entering the k-factor.</p>
2 Analog Output 1 (Basic Setup)		
2.1	Minimum Flow rate	<p>Enter here the flow rate at which the output should generate 4 mA - in most applications at flow rate "zero".</p> <p>Note: Units will be automatically picked from sections 2.3 and 2.4.</p> <p>Important: In an event if the actual flow rate goes further below than the program value, the unit will not generate less than 4 mA. As an example, if 2.1 is set at 10 ltr/min and the actual flow rate goes down up to 9 ltr/min, or even lower, the unit will still generate 4mA.</p> <p>An easy way to tackle this is to program this value a little lower, say for example, 9.5 ltr/min, this way it can be detected that the actual flow rate is below required minimum rate.</p>
2.2	Maximum Flow rate	<p>Enter here the flow rate at which the output should generate 20 mA - in most applications at maximum flow.</p> <p>Note: Units will be automatically picked from sections 2.3 and 2.4.</p> <p>Important: In an event if the actual flow rate goes further high than the program value, the unit will not generate higher than 20 mA . As an example, if 2.2 is set at 100 ltr/min and the actual flow rate goes high up to 101 ltr/min, or even higher, the unit will still generate 20 mA.</p> <p>An easy way to tackle this is to program this value a little higher, say for example, 100.5 ltr/min, this way it can be detected that the actual flow rate is above required maximum rate.</p>

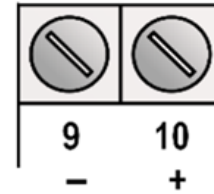
2.3	Unit	<p>This determines the measurement unit for flow rate.</p> <p>The following units can be selected:</p> <p style="text-align: center;">L - m3 - UKGAL - USGAL - UKbbl –USbbl - OILbbl</p>
2.4	Time Period	<p>This determines the time unit for flow rate</p> <p>The following units can be selected:</p> <p style="text-align: center;">/SEC (Second) - /MIN (Minute) - / HR (Hour)</p>
3 Analog Output (Advanced Setup)		
3.1	Calibration/ Tuning (4mA)	<p>When the display reaches the minimum flow rate (as defined in 2.1), the analog output should be precisely 4mA. However, this value might differ slightly due to external influences for example temperature or loop characteristics etc. In this case, 3.1 can be used to tune to 4mA precisely.</p> <p>Note: This is a tuning parameter and only to be used if required.</p> <p>Warning: Before tuning the signal, be sure that the analog signal is not being used for any application.</p> <p>How to Tune: Once you are in the SETUP PROG mode, ± 4 mA can be tuned to exact 4 mA by incrementing/ decrementing the digits on the LC display. The tuning is directly active and immediate. Press and release 'P' and 'S' buttons simultaneously to save changes.</p> <p>Note: If required, the analog output can be programmed 'up-side-down'. In that case, 4 mA represents the maximum flow rate and 20 mA represents the minimum flow rate.</p>
3.2	Calibration/ Tuning (20mA)	<p>When the display reaches the maximum flow rate (as defined in 2.2), the analog output should be precisely 20 mA. However, this value might differ slightly due to external influences for example temperature or loop characteristics etc. In this cae, 3.2 can be used to tune to 20 mA precisely.</p> <p>Note: This is a tuning parameter and only to be used if required.</p> <p>Warning: Before tuning the signal, be sure that the analog signal is not being used for any application.</p> <p>How to Tune: Once you are in the SETUP PROG mode, ± 20 mA can be tuned to exact 20mA by incrementing/ decrementing the digits on the LC display. The tuning is directly active and immediate. Press and release 'P' and 'S' buttons simultaneously to save changes.</p> <p>Note: If required, the analog output can be programmed 'up-side-down'. In that case, 4 mA represents the maximum flow rate and 20 mA represents the minimum flow rate.</p>
3.3	Calculation	<p>The flow rate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flow rate will be. The maximum value is 255 pulses.</p> <p>Note: the lower the number of pulses, the higher the power consumption of the unit will be .</p> <p>Note: for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.</p> <p>Note: for high frequency application (above 1kHz) do program a value of 100 or more pulses.</p>
3.4	Cut-off	<p>With this setting, you determine a minimum flow requirement thresh-hold, if during this time less than XXX-pulses (setup 3.3) are generated, the flow rate will be displayed as zero.</p> <p>The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).</p>

TERMINAL CONNECTORS

Sensor Input



Analog Output



Terminals 1 - 2

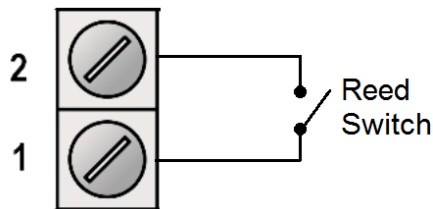
Sensor input (from flow meter)

The unit can only accept a Reed switch input, this sensor has been selected as the most common sensor.

The 2 position terminal block is not polarity conscious so the reed switch wires can be connected in any order.



These terminals come connected from factory. No further connections are required by end-user.

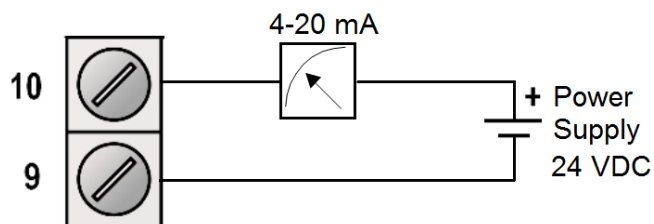


Connecting any other type of sensor could cause damage to the unit

Terminals 9 - 10

Analog Output

The unit generates 4 - 20 mA proportional to the flow rate. The output is passive and loop powered. Below is the typical drawing.



The unit requires 24 VDC to operate. Terminal 9 is (-) and terminal 10 is (+).

PROGRAMMING SET-UP LEVEL

This chapter describes the daily use and programming of the PRM Digital Register. The instructions are meant for users / operators.

MODES OF OPERATION

RUN mode: This is the normal operating mode. **RUN** icon on the screen represents this mode.

SETUP mode: This mode is to view settings. **SET-UP** icon on the screen represents this mode.

SETUP PROG mode: This mode is to modify settings. **SET-UP** **PROG** icon on the screen represents this mode.

FUNCTION OF THE BUTTONS

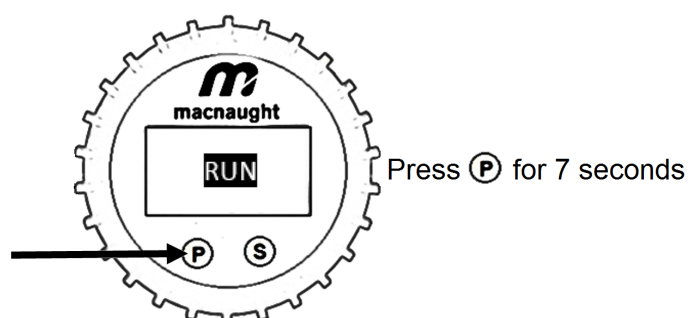
Below are the functions of 'P' and 'S' buttons during different modes of operation.

Mode	P	S	P S (Press and release simultaneously)
RUN	Toggle screens; 4 - 20 mA and its percentage (%) Access to Setup mode	Toggle screens; 4 - 20 mA and its percentage (%)	
SETUP	Toggle sub-functions Access to Run mode	Toggle main-functions	Access to Setup-Prog mode (while in a sub-function)
SETUP PROG	Apply a new value to a sub-function	Apply a new value to a sub-function	Save changes

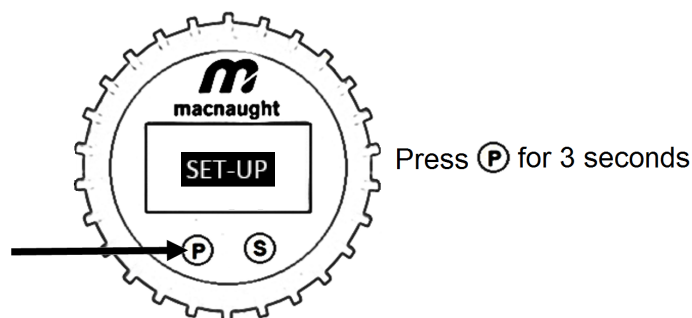
Setup mode is reached by pressing the 'P' button for 7 seconds; at which time, setup will be displayed on the LC display. In order to return to the Run mode, 'P' will have to be pressed for 3 seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit setup mode automatically.

Setup can be reached at all times while the display remains fully operational.

ENTERING INTO SETUP MODE



EXITING FROM SETUP MODE



Once programming is done, visit the parameters again to make sure the changes are saved correctly.

K-FACTOR PROGRAMMING

HOW TO FIND A K-FACTOR OF YOUR METER

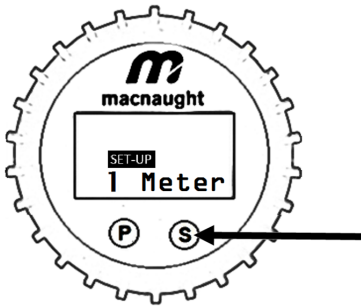
The K-factor could be found on either of;

- Flow meter's body
- Flow meter's test report
- Contact Macnaught providing the Serial Number of the flow meter

PROGRAMMING K-FACTOR IN THE DISPLAY

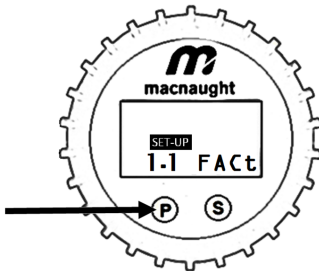
Always enter the K-factor in **pulses per LITRE (PPL)**. Entering the k-factor in pulses per gallon (PPG) will result in inaccurate readings.

Follow below steps to enter the k-factor if you are in RUN mode



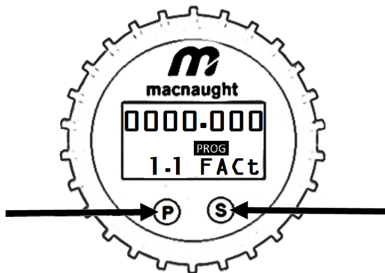
Press **P** for 7 seconds.

This will enter into Setup model



Press **P**

This will show sub-function 1.1 'FACT (i.e. K-factor)'



Press and release **P** and **S** simultaneously

This will enter in programming mode. The screen show **PROG** and the left most digit start flashing

Press **P** to change the numeric value and press **S** to move to the next digit.

Once the k-factor is entered, press and release **P** and **S** simultaneously. This will save the changes.

Press **P** for 3 seconds to go to the Run mode

PPG to PPL Conversion

If the flow meter's body or test report shows the k-factor in pulses per gallon (PPG), it needs to be converted into pulses per LITRE (PPL) first.

Divide the PPG k-factor by **3.7854** to convert into PPL.

As an example: If the PPG k-factor is 136.70, the PPL k-factor is 36.112

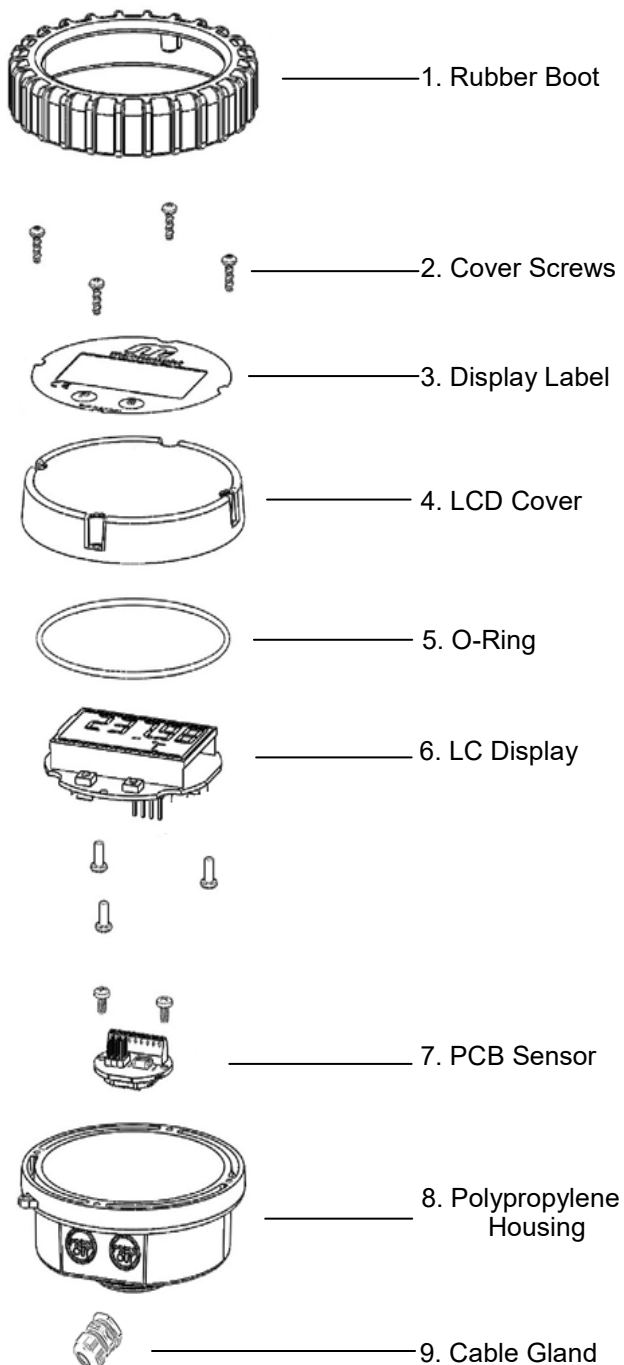


Note! **The display accepts k-factor in pulses per LITRE only** Once the programming is done, visit the parameters again to make sure the changes are saved correctly

The unit will be programmed in the factory with the meter specified K-factor value and flow rates as per below details;

Model	Flow range (Litres)	Flow range (US Gallons)
MX06	0.5 - 100 L/hr	0.13 - 26.4 G/hr
MX09	15 - 500 L/hr	4 - 132 G/hr
MX12	2 - 30 L/min	0.5 - 8 G/min
MX19	3 - 80 L/min	0.8 - 21 G/min
MX25	6 - 120 L/min	1.6 - 32 G/min
MX40	10 - 250 L/min	2.64 - 66 G/min
MX50	15 - 500 L/min	4 - 130 G/min
MX75	20 - 733 L/min	5 - 194 G/min
MX100	120 - 1200 L/min	31.7 - 317 G/min

EXPLODED VIEW



ORDERING CODE

Part Number	Item Description
MXD-MS	Display (4-20 mA Signal Generator)
MXS-WMB	Wall mount bracket
PRM-RMP	Display + Wall mount bracket



Wall mount bracket is required for remote installation

SERVICE KITS

Kit Part Number	Item Description	Item Number
MXS-PCB-RH	PCB Sensor Board	7
MXS-PCB-PR	PCB Sensor Board	7
	PP Housing	8
MS1279S	Display Label	3
MS685S	Cable gland - M12	9
MXS-DIS-PRM	Cover Screws	2
	Display Label	3
	LCD Cover	4
	O-Ring	5
	LC Display	6

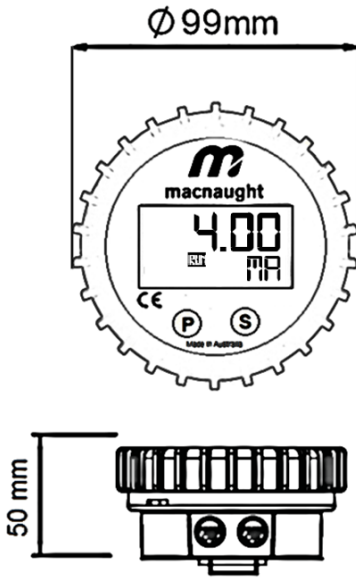


Note !

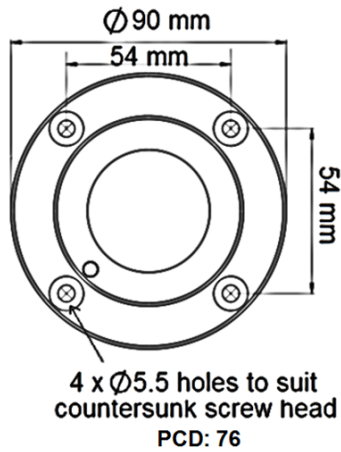
PCB Sensor Board has 1 x Reed switch and 1 x Hall effect sensor as standard (unless a special board is requested)

DIMENSIONS

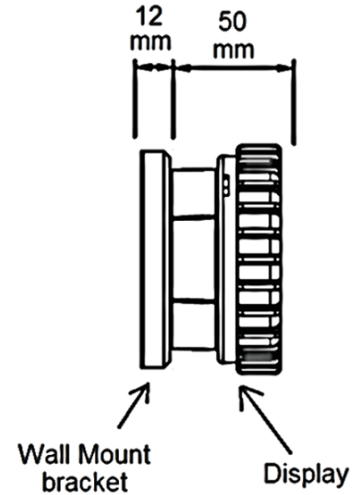
Display



Wall Mount bracket



Display with Wall Mount bracket



TROUBLESHOOTING

DISPLAY GENERATES INCORRECT OUTPUT

Check the k-factor. Make sure the decimals are taken care of. It should be in pulses per litre.

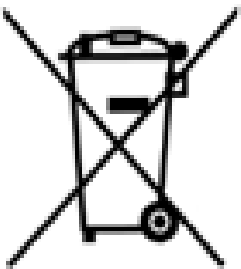
DISPLAY SHOWS NO OUTPUT/BLIND

Check the wiring between the PCB sensor board (Item no 7) and LC display board (Item no 6). Check for loose connections and clean the terminals if required. Replace the PCB sensor board if wiring and programming are ok.

Check if the power supply and PLC are connected to terminal 9 and 10 with correct polarity.

If wires are connected as per instructions and still display is not working, please replace display with a new one or contact Macnaught.

WEEE Directive - Waste Electrical and Electronic Equipment



The WEEE Directive requires the recycling of waste electrical and electronic equipment in the European Union.

Whilst the WEEE Directive does not apply to some of Macnaught's products, we support its policy and ask you to be aware of how to dispose of this product.

The crossed out wheeled bin symbol illustrated and found on our products signifies that this product should not be disposed of in general waste or landfill.

Please contact your local dealer national distributor or Macnaught Technical Services for information on product disposal.

NOTES

For your record, it is advisable to note down any changes in the parameters

PO/ Reference no: _____

Flow Meter model: _____

Flow meter Serial: _____

1	Meter	Default value	Date: __/__/____ Enter your settings here	Date: __/__/____ Enter your settings here
1.1	*K-Factor (Pulses per Litre)	0000.000 to 9999.999	'1' or as per factory settings	
2 Analog Output 1 (Basic Setup)				
2.1	Low Flow - 4mA	0000.000 - 9,999,999 (unit / time)	0	
2.2	High Flow - 20mA	0000.000 - 9,999,999 (unit / time)	99999	
2.3	Unit	L - m3 - UKGAL - USGAL - UKbbl - USbbl - OILbbl	L	
2.4	Time	Sec - Min - Hour	Min	
3 Analog Output 2 (Advanced Setup)				
3.1	Low Calibration - 4mA	0 - 9999	633	
3.2	High Calibration - 20mA	0 - 9999	3214	
3.3	Calculation	Per 1 - 255 pulses (Default 10)	10	
3.4	Cut-off	0.0 - 999.9 seconds (Default 10)	30.0	



Macnaught Americas
614 South Ware Boulevard
Tampa Florida USA, 33619

T: +1813 628 5506
E: info@macnaughtusa.com
W: www.macnaughtusa.com