IMP+

INSTRUCTION MANUAL

IMP+ (FOURTH EDITION REV 4)

February 2020

Part Number M-080-0-004-4P

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Chapter 1 Start Here

Congratulations on your purchase of a Pulsar ɪᴍᴘ+ Level Monitoring System. This quality system has been developed over many years and represents the latest in high technology ultrasonic level measurement and control.

It has been designed to give you years of trouble-free performance, and a few minutes spent reading this operating manual will ensure that your installation is as simple as possible.

About this Manual

It is important that this manual is referred to for correct installation and operation.

There are various parts of the manual that offer additional help or information as shown:

Tips

TIP

**At various parts of this manual you
will find tips to help you.**

Additional Information

Additional Information

At various parts of the manual, you will find sections like this that explain specific items in more detail.

About the ɪ́ᴍᴘ+ Level Monitoring System

Functional Description

The ɪ́ᴍᴘ+ level monitoring system is a highly developed ultrasonic level measurement system which provides non-contacting level measurement for a wide variety of applications in both liquids and solids. Its unique design allows for both 3 wire and 2 wire (loop powered) configuration all within the same unit.

Easy calibration and maintenance free "fit and forget" performance mean that you can install the ɪ́ᴍᴘ+ Level Monitoring System rapidly and with confidence. Two relays which can be configured for either alarm or control functions, with fully programmable setpoints are provided when connected as a 3-wire device, together with fault condition being indicated by the mA output on both the 2 and 3 wire mode.

The ɪ́ᴍᴘ+ operates on the principle of timing the echo received from a measured pulse of sound transmitted in air and utilises "state of the art" echo extraction technology.   The ɪ́ᴍᴘ+ comes in three models: IMP 3 with a range from 0.20m (0.66 feet) to 3.00m (9.84 feet), IMP 6 with a range of 0.3m (0.98 feet) to 6.00m (19.69 feet) and IMP 10 with a range of 0.3m (0.98 feet) to 10.00m (32.81 feet).

The ɪ́ᴍᴘ+ can show **level**, **space, distance**, on the display. The relays can be programmed to give an 'ON' and 'OFF' point for external control. There is a 4-20 mA output (non-isolated in 3 wire mode) that can be connected to a remote chart recorder or PLC, to monitor level, space or distance, dependant on the measurement mode selected, and provides a 'fault condition' alarm of either 3.5mA or 22mA.

The ɪ́ᴍᴘ+ lid has an integral LCD display and 4 buttons which are used for programming purposes when in Program Mode and as hot keys providing additional information whilst in Run Mode.

Product Specification

Physical	
Dimensions	O/A height 186mm (5.24 inches x O/A diameter 133mm (7.32 inches)
Mounting	1.5" BSP/NPT (IMP3 and 6 models) 2" BSP/NPT (IMP10)
Weight	Nominal 1kg
Cable entry	2 off cable glands 4.5 – 10mm. (torque to 2NM)

Environmental	
IP Rating	IP67
Min & Max Temperature (Ambient)	-40 to +65°C (-40 to 149°F)
Min & Max Temperature (Transducer)	-40 to +80°C (-40 to 176°F)

Approvals	
CE Approval	See EU Declaration of Conformity

Performance	
Beam Angle	<10° inclusive
Operating frequency	Imp 3 125kHz, Imp 6 75kHz, Imp 10 41kHz
Range	Imp 3 0.2 – 3m (0.66 – 10ft) Imp 6 0.3 – 6m (0.98 – 20ft) Imp 10 0.3 – 10m (0.98 – 33ft)
Digital echo processing	
Accuracy	± 0.25% or 6mm (0.24 inches) whichever is greater
Resolution	± 0.1% or 2mm (0.08inches) whichever is greater
4-20mA output	Resolution 5µA
Temperature compensation	via internal temperature sensor (± 0.5°C accuracy)
Response time	Power up to stable reading = 10 seconds
2-wire configuration (isolated):	Passive 4-20mA output
Current output	3.5 – 22mA
3-wire configuration (non-isolated):	0-10V analogue output Active and passive 4-20mA outputs Backlit LCD display 2 off SPDT relays rated 1A 30V DC/AC
Power consumption with relays energised	<60mA (less 12mA/relay not energised)

Programming	
PC programming	via RJ11 port to RS232 using IMP PC software
On-board programming	via the 4 button keypad and 4-digit LCD display

Pulsar Process Measurement Limited operates a policy of constant development and improvement and reserve the right to amend details as necessary.

EU DECLARATION OF CONFORMITY

PULSAR Imp series

This declaration of conformity is issued under the sole responsibility of the manufacturer

Relevant Directive(s)	2014/30/EU - EMC Directive and its amending directives
	2011/65/EU - RoHS Directive and its amending directives
Manufacturer's Name	Pulsar Process Measurement Ltd
Manufacturer's Address	Cardinal Building, Enigma Business Commercial Centre, Sandy's Road, Malvern, Worcestershire, WR14 1JJ, UK
Apparatus	Pulsar Imp, Imp Lite, Imp i.s.
Type of Equipment	Measurement and process control
Standards Applied	EN 61326:2013 Equipment class, industrial

Signed	Date:
PR Allan	20th June 2017
Name: Jeff Allan (BSc.) Engineer	Rev 3.2
Pulsar Process Measurement Ltd	

Unpacking

Important Information

All shipping cartons should be opened carefully. When using a box cutter, do not plunge the blade deeply into the box, as it could potentially cut or scratch equipment components. Carefully remove equipment from each carton, checking it against the packing list before discarding any packing material. If there is any shortage or obvious shipping damage to the equipment, report it immediately to Pulsar Process Measurement Limited.

Power Supply Requirements

The **IMP+** operates from a DC supply of 11 –30V and will typically draw less than 0.06A.

> *All electronic products are susceptible to electrostatic shock, so follow proper grounding procedures during installation.*

The compact one-piece construction of the **IMP+** can be mounted easily using the integral nose thread (1.5" or 2" BSP/ NPT, dependent on model).

When choosing a location to mount the Imp, bear in mind the following:

- For access to the LCD display and programming buttons it is recommended that you mount it in an area which is easily accessible.

- The ultrasonic signal path should be free of falling material and obstructions such as pipes, beams etc.

- The IMP 3 should be mounted at least 20cm (0.66 feet) above the maximum level of the material and be perpendicular to the surface. Whilst the IMP 6 and 10 should be mounted at least 30cm (0.98 feet) above the maximum level of the material and be perpendicular to the surface.

- The ambient temperature is between -20ºC and 65ºC.

- There should be no high voltage cables or electrical inverters close by.

Dimensions

The dimensions of the IMP+ are as shown below.
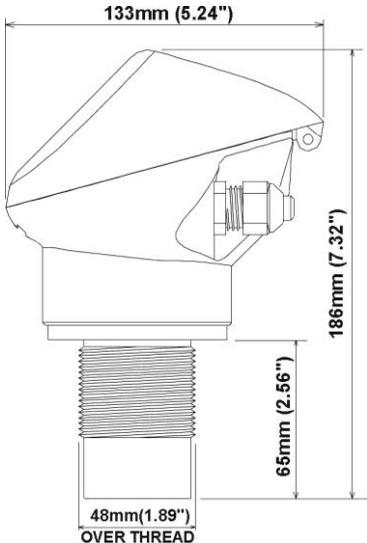
1.5" BSP/NPT – IMP 3 & 6
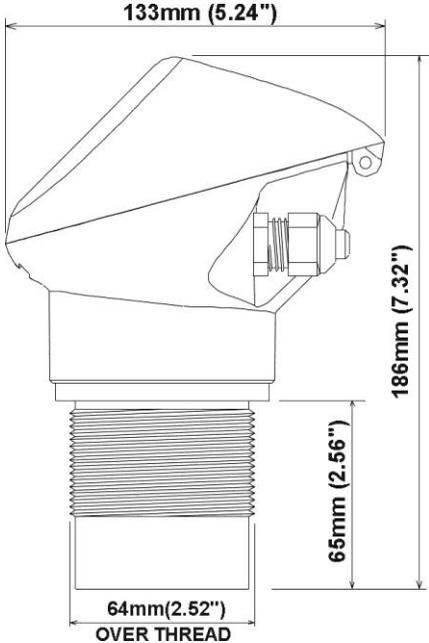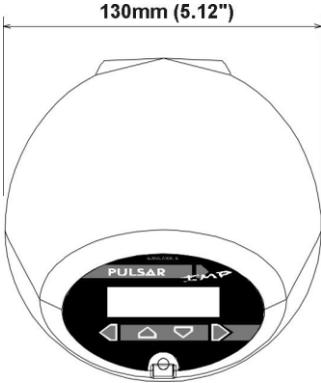
2" BSP/NPT – IMP 10
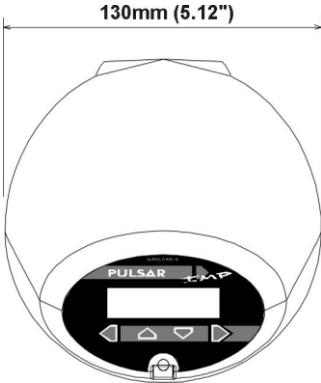
Outdoor and Open Vessel Installation

The ɪᴍᴘ+ can be simply mounted on a bracket, suitable for the application and secured using the thread located at the top of the transducer (2"BSP/NPT).

Care should be taken to ensure that the ɪᴍᴘ+ is not installed in direct sunlight, in order to avoid errors in the measurement of ambient temperature.

Attention should also be taken, when mounting the unit, to ensure that strong windy conditions are avoided, wherever possible, to prevent abnormal operation.
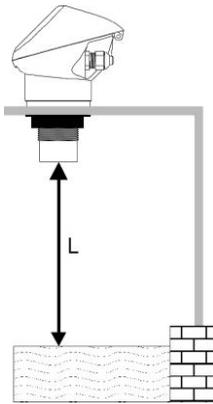
ɪᴍᴘ+ Model	Range	L = Blanking
Imp 3	3 metres (9.84 feet)	200mm (0.66 feet)
Imp 6	6 metres (19.69 feet)	300mm (0.98 feet)
Imp 10	10 metres (32.18 feet)	300mm (0.98 feet)

"L" should as a minimum be at least that as detailed in the table above but can be greater if required.

Closed Vessel Installation

"L" should as a minimum be at least that as detailed in the table above but can be greater if required. The ɪᴍᴘ+ can be simply screwed into a flange and secured using the thread located at the top of the transducer (1.5" or 2"BSP/NPT, dependent on model).

Where possible use a flange made of a synthetic material such as PVC, in cases where a metal flange is used it is advisable to fit a suitable gasket between the flange of the ɪᴍᴘ+ and the connection to the vessel.

Standpipe Installations

When mounting the **IMP+** to a standpipe care should be taken to ensure that the standpipe is of sufficient diameter with reference to its length, see the table below for details:
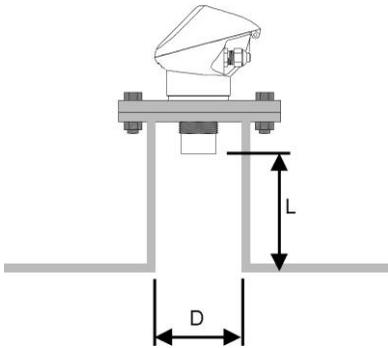
Dia. (D)		Max. Length (L)	
mm	inches	mm	inches
80	3	220	8
100	4	300	12
150	6	420	16
200	8	560	22

When using a standpipe, fixed to the top of a vessel, ensure that the open end of the standpipe is clear of any obstructions such as weld seams, gaskets etc. in order to avoid unwanted signal returns.

If using standpipes which extend into the vessel, beyond the blanking distance, but not as far as the empty level, then the open end of the standpipe should be cut to an angle of 45º.

The maximum level (100% of Span), is inside the blanking distance

Pipe should be free of obstructions such as weld seams

Correct standpipe installation

Important Information

If the equipment is installed or used in a manner not specified in this manual, then the protection provided by the equipment may be impaired.

Cable Entry

The IMP+ Series has two M16 cable entries, fitted with a suitable gland, to ensure moisture protection is maintained.

Terminal Connection Details

The IMP+'s unique design allows for both 3 wire and 2 wire (loop powered) configuration within the same unit the terminal connections for both configurations are as detailed below. Wiring details are also given on the terminals under the access cover.

2 Wire (loop powered)
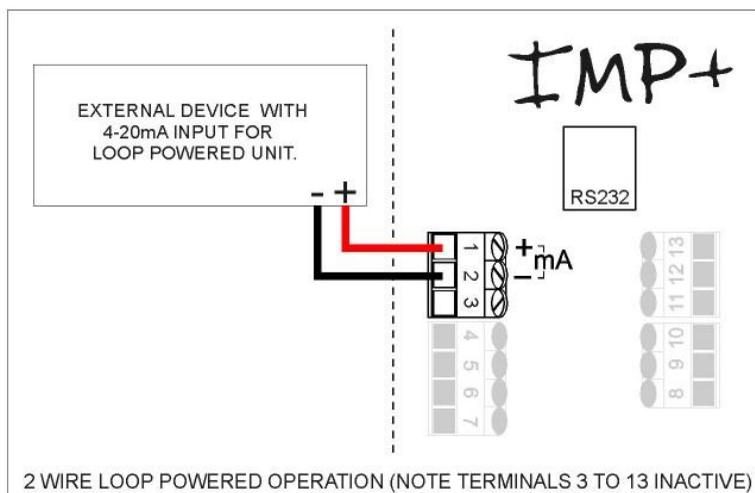
3 Wire

Source mode - the **power** for the **loop** is **supplied** by the IMP+

EXTERNAL DEVICE WITH 4-20mA INPUT

IMP+

RS232

11-30 VDC POWER SUPPLY
+ -

1
2   — mA out (SOURCE)
3   —

11-30 VDC

4   +
5   +

UNIT WITH VOLTAGE INPUT + 6   +
                         - 7   -

0-10V out

11 12 13
RLY2

8 9 10
RLY1

RELAYS ARE ONLY SUITABLE FOR USE WITH VOLTAGES LESS THAN 30V 1A.

Terminals 2, 3 & 7 are internally connected

3 WIRE OPERATION IMP 4-20mA OUTPUT IN SOURCE MODE
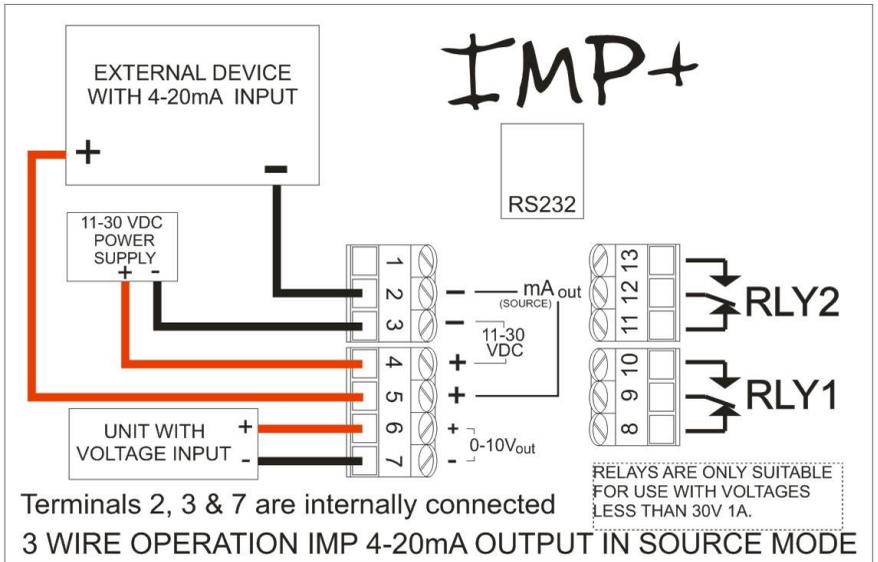
Terminal Connections

2 Wire

Terminal 1   + ve: Direct Current (DC) input (11-30VDC)

Terminal 2   - ve: Current Output (4-20mA)

Loop Resistance

For two wire operation, the maximum cable resistance allowable can be calculated from the graph below. For example, if an **IMP+** were supplied from 24v connected as a 2 wire unit (4-20mA only), the maximum total cable resistance is 590 ohms, for a typical 77 ohm /km cable this would mean a maximum cable length of 590/77 = 7.6km, remember this total cable resistance, so this figure has to be divided by 2 to give 3.8km max distance.
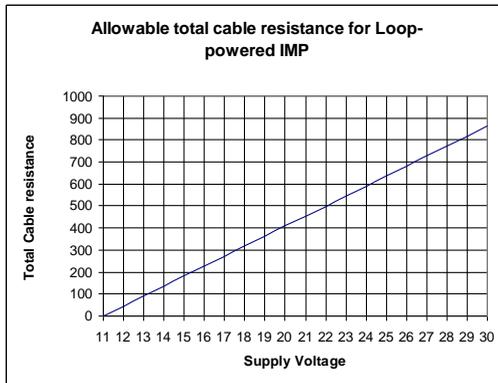
Maximum cable resistance vs supply voltage for 2 wire mode.
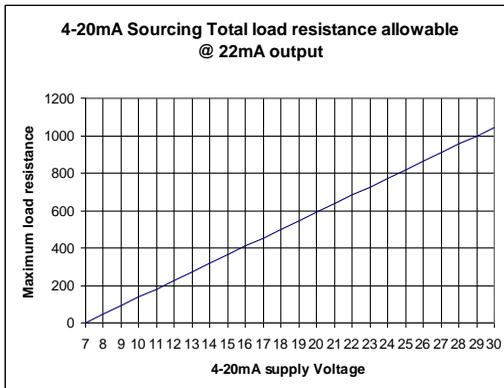
Maximum cable resistance vs supply voltage for 3 wire mode.

3 Wire

Terminal 1: + ve Current Output (4 – 20mA SINK MODE)
(NOT USED IN SOURCE MODE)

Terminal 2 : - ve ground (4-20mA SINK MODE)

Terminal 3: - ve: Direct Current (DC) input (11-30VDC)

Terminal 4: + ve: Direct Current (DC) input (11-30VDC)

Terminal 5: + ve Current Output (4 – 20mA SOURCE MODE)

Terminal 6: + ve: 0-10V output (P842 = 1) or 0-5V output (P842 = 0)

Terminal 7: - ve: 0-10V output (P842 = 1) or 0-5V output (P842 = 0)

Terminal 8: Relay 1 Normally Open (N/C) Contact (De-energised)

Terminal 9: Relay 1 Common

Terminal 10: Relay 1 Normally Closed (N/O) Contact (De-energised)

Terminal 11: Relay 2 Normally Open (N/C) Contact (De-energised)

Terminal 12: Relay 2 Common

Terminal 13: Relay 2 Normally Closed (N/O) Contact (De-energised)

Important Information

If the equipment is installed or used in a manner not specified in this manual, then the protection provided by the equipment may be impaired.

Preparation for Operation

Before switching on, check the following:

✓ The **ᴵᴹᴾ⁺** is mounted correctly.

✓ The power supply is correctly installed.

Maintenance

There are no user serviceable parts inside your **ᴵᴹᴾ⁺**, if you experience any problems with the unit, then please contact Pulsar Process Measurement for advice.

To clean the equipment, wipe with a damp cloth. Do not use any solvents on the enclosure.

Operating the Controls

Display

Whilst in the Run Mode, the 4-digit LCD, by default, will display the current level reading in metres, the display will also alternate between the reading and "LOE" when a fault condition (Loss Of Echo) is detected. When in the Program Mode the display is used to read information on the Menu Options and the values entered.

There are two operating modes for your ᴵᴹᴾ⁺, **Run Mode** and **Program Mode**.

Run Mode

This mode is used once the ᴵᴹᴾ⁺ has been set up in program mode. It is also the default mode that the unit reverts to when it resumes operation after a power failure.

When the ᴵᴹᴾ⁺ is switched on for the first time, it will display, in metres, the distance from the transducer face to the target.

After programming is complete, any relay outputs that are set will operate when the level reaches the relevant setpoint.

Program Mode

This mode is used to set up the ᴵᴹᴾ⁺ or change information already set, this is achieved by using the 4 push buttons located below the display.

Entering a value for each of the menu options that are relevant to your application provides all the programming information.

Button Functions

There are 4 push buttons located under the display. Their name and functions are as follows:

Button	Run Mode	Program Mode
ESC ◄	Displays details of unit Serial No. and Software Version	Used to Navigate out of the Menu System and return to Run Mode. Also used to Cancel a Parameter Value entered in error.
UP ▲	Displays Current Temperature	Used for Navigating around Menu System and Increasing Menu Option Values.
DOWN ▼	Displays Current Echo Strength (dB's)	Used for Navigating around Menu System and Decreasing Menu Option Values.
ENTER ►	Displays current mA output	Used to confirm an action such as entering a Menu Option or Enter a Parameter Value.

How to Access Program Mode

To access the **Program mode,** press the "**ESC**" and "**Enter**" button simultaneously, where upon the display will show **PASS** on the LCD display briefly, to prompt you to enter the password, the display will now show **0000**, and the left hand digit will flash.

By using the UP and DOWN keys to increment or decrement the digit, and the ENTER key to shift the flashing digit to the next position. Assuming the passcode is the default 1997, then you should enter this.

The ESC key can be used to go back to the previous digit. Finally, when you have selected all digits pressing the ENTER key again will input the selected pass code to the ⲧMP⁺; if successful the display will show APP (Application).

If, however you input the wrong pass code the ⲧMP⁺ LCD display will show Fail for 2 seconds and will revert back to run mode.

Using The Menu System

The menu system has been designed to make the changing of parameters very simple. Once in the **Program Mode** the display will show a line of text that displays the menu system. Pressing the **Up** and **Down** buttons will scroll the display between the menu items, (as shown below, starting at APP).
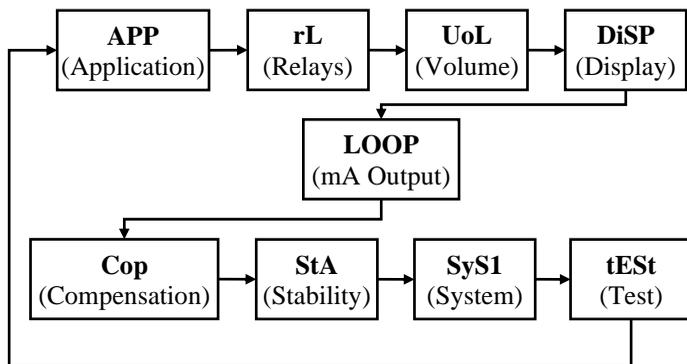
As you press the UP and DOWN buttons to scroll left and right between the menu options, you can press ENTER at any time to select a specific menu which will then take you to the parameters within the selected menu.

Once you have reached the relevant menu, scroll through the parameters, and enter the necessary information. To enter the information, use the UP and DOWN keys to increment or decrement the digit, and the ENTER key to shift the flashing digit to the next position, once you have completed entering the value required pressing the ENTER button again will save the value.

When you have finished, press CANCEL to go back to the previous level. When you have reached the top level, then the ⊥MP+ will ask for confirmation before allowing you to go back into run mode. This is done by pressing ENTER at the display prompt.

Parameter Defaults

<u>**Factory Defaults**</u>

> **Factory Defaults**
>
> When first installing the **ɪMP+**, or subsequently moving or using the unit on a new application, before proceeding to program the unit for its intended application it is recommended that you ensure that all parameters are at their default values by completing a **Factory Defaults P930,** as described in Chapter 5 **Parameter Guide**.

When you first switch the **ɪMP+** on, it will be reading the **distance** from the face of the transducer to the material surface. It will be indicating in **metres**, as shown on the display. All relays are set OFF.

TIP

In some applications, it is simplest to empty the vessel, take a reading from the Imp for distance and then setup the empty level to this figure.

Once you are satisfied with the installation, and the **ɪMP+** is reading what you would expect in terms of distance from the face of the transducer to the material level, then you can proceed with programming, for the intended application. It is sensible to program all of the required parameters at the same time. The system will be then set-up.

Note that the span is automatically calculated from the empty level, so the empty level should be entered first.

This chapter explains how to undertake the various functions of your ℐℳP+. Where specific parameters are used, consult Parameter Guide in Chapter 5.

Setting up Your Application

Empty Distance

Empty Distance (P105) is the distance from the face of the transducer to the material at the bottom of the vessel.

Span

Span (P106) is the distance from the empty level (0% full) to span (100% full).

Near and Far Blanking

Near blanking (**P107**) is the distance from the face of the transducer that the Imp will not record a level nearer than. A typical reason to increase this from the default value would be if you wish to ignore close in obstructions.

Far blanking (**P108**) is the distance (as a percentage of empty level) beyond the empty level that the Imp will read, the default is plus 20% of empty level. If you wish to monitor further than the **empty level**, then increase this figure, so that the **empty level** plus the **far blanking** figure (as % of empty level) is greater than the surface being measured, within the capability of the transducer being used.

Using the 4-20 mA Output

The mA output can be used to monitor remotely what the ℐℳP+ is showing, so it can be displayed remotely, integrated into a PLC, or used to generate a record using a chart recorder or similar.

By default, the ℐℳP+ will provide a 4-20 mA output that represents what is displayed on the Imp, but these parameters can be overwritten as follows.

By default, the 4-20 mA will represent the empty level (4mA) and 100% of the operational span (20mA), but you may wish to only represent a section of the operational span. For example, the application may have an operational span of 6 metres, but you may only wish to represent empty level to 5 metres. If so, change **P834 (Low Value)** to **0**, and **P835 (High Value)** to **5.0.**

If the device connected to the mA output is out of calibration, and cannot be calibrated, then the low and high current levels can be trimmed by altering **P838 (Low Trim)** and **P839 (High Trim)**. To do this, simply enter the value that ensures that 4 mA or 20 mA respectively are shown on the remote device. You can use the left/right menu keys to alter the value until the correct reading is shown on the remote device, rather than typing in a value.

Using the Relays

All relay related parameters are prefixed with a **2****.

The second digit of the three-figure parameter number denotes the relay number as follows:

<div align="center">

2 **1*** parameters for Relay 1

2**2*** parameters for Relay 2

</div>

The third digit selects specific parameters for the setting up of the relays, which can be selected individually and results in the following parameter numbers for each relay.

<div align="center">

Relay 1   21**0** to 21**8**

Relay 2   22**0** to 22**8**

</div>

Each relay can be configured in any of the options shown below, and usually has two associated set-point values with it (e.g. level) for ON and OFF.

> **Note**
>
> When relays are programmed to act as Level Alarms relay setpoints are set in relation to the level of the material in the vessel, irrespective of the setting of the mode of operation (P100).

You first need to decide which relays are to be used as alarms. The **first parameter** for each relay determines the **type** the relay will be (i.e. **not in use, alarm** or **control.**), and what the further relay parameters, applicable to your selection, represent. Each of these types will now be described.

There are three **types** that each relay, individually, can be set to, for example, consider **Relay 1**, you can select parameter **P210** from the following options:

0 = Not in Use   **r**elay will remain in the de-energised condition.

1=Alarm: relay will de-energise to set the alarm "ON".

2=Control   relay will energise to set the control "ON".

Alarm Relay Set-up

The alarm relays are de-energised to turn the alarms "ON" and energised to turn the alarms "OFF". In this way, loss of power will ensure that the alarm is activated.

To set an **alarm** relay, set the **first parameter** for the relay to equal **1**. For example:

Setting **Relay 1** for alarm purposes **P210 = 1**

Setting **Relay 2** for alarm purposes **P220 = 1**

The **second parameter** for each relay determines the **function** of the alarm relay, using the example of **Relay 1**, the **alarm function** can be selected from the options available in parameter **P211**.

For full details of all available alarm options please refer to *P211, 221 Relay Function… **If P210, 220 = 1(Alarm)*** tables in Chapter 5.

The **third parameter**, and the **fourth parameter** for each relay set the **Alarm** "**ON**" and "**OFF**" points. For a *high alarm* then set "**ON**" **higher than** "**OFF**". For *low alarm* then set "**ON**" **lower than** "**OFF**". Using the example of **Relay 1 P213** and **P214** set the "**ON**" and "**OFF**" points.

For example, using **Relay 1**

High Alarm	Low Alarm
P213 "ON" Setpoint	**P213** "ON" Setpoint
Higher than	Lower than
P214 "OFF" Setpoint	**P214** "OFF" Setpoint

Control Relay Set-up

The control relays are energised to turn the control "ON" (start process function), and de-energised to turn the control "OFF" (stop process function). In this way, loss of power will ensure that the pumps are turned "OFF".

To set a **control** relay, set the **first parameter** for the relay to equal 2. For example:

  Setting **Relay 1** for control purposes **P210 = 2**

  Setting **Relay 2** for control purposes **P220 = 2**

The **second parameter** for each relay determines the **function** of the control relay, using the example of **Relay 1**, the **control function** can be selected from the options available in parameter **P211**.

For full details of all available alarm options please refer to *P211, 221 Relay Function... **If P210, 220 = 2(control)** tables in Chapter 5.

The **third parameter** and **fourth parameter** are set to determine the switch points for the **control** relay. The **control** functions are started and stopped at the "**ON**" and "**OFF**" setpoints. To set a *control down* function (reduce level) then set "**ON**" **higher than** "**OFF**". To set a *control up* function (increase level) then set "**ON**" **lower than** "**OFF**".

  For example, using Relay 1

Control Down	Control Up
P213 "ON" Setpoint	**P213** "ON" Setpoint
Higher than	Lower than
P214 "OFF" Setpoint	**P214** "OFF" Setpoint

Loss of Echo Set-up

When a relay is assigned to Loss of Echo (LOE) or fault condition, it will be set as an alarm relay which will be de-energised to turn the alarm (LOE) "ON" and energise to turn the alarm (LOE) "OFF". In this way, loss of power will ensure that the alarm is activated.

To set a **LOE alarm** relay, set the **first parameter** for the relay to equal **1** and set the second parameter to 4
Example: Setting **Relay 1** for LOE Alarm purposes, set **P210** to **1** and then set **P211** to **4.**

  When a relay is assigned to LOE no further parameters are required.

Other Relay Parameters

Fail-safe Mode

Your **IMP+** has a general fail-safe parameter **P808**. This parameter will determine what state (level) both the **display** and the **relays** will assume in the case of a **fault** condition (**Loss Of Echo**).

The fail-safe values for **P808** are as follows: **1= Hold** last known value, **2=** Fail **High, 3=** Fail **Low**.

Setting Security Passcodes

A passcode is used to switch the **IMP+** from **Run Mode** into **Program Mode**.

You can set a new passcode to prevent anyone changing any of your settings within your **IMP+**. The default **passcode** is **1997**, but this may be changed as follows.

Additional Information

The passcode is also used for remote access using the RS232, so if this is being used, be sure to ensure any additional equipment using this feature is changed accordingly.

Using A Passcode

If you don't want to use a passcode, you can disable it as follows. First, enter **Program Mode** and go to the **SyS1** (System) menu. Select **P921** which is the **passcode enable** parameter.

As shown on the display, setting the passcode enable to '**0**' will **disable** it, or '**1**' will **enable** the use of passcode.

Additional Information

If the use of a passcode has been disabled, then you can move straight into Program Mode from Run Mode by pressing the ESC and ENTER button simultaneously.

Changing the Passcode

You can set the **passcode** to any number from 0000 to 9999. To do this, enter **Program Mode** and go to **SyS1** (System) menu. Select **P922** which is the **Passcode** parameter which can be changed as required.

Resetting Factory Defaults

If you need to restore parameters to their original factory settings, then enter **Program Mode** go to the **SyS1** (System) menu and **ENTER**. Using the UP and DOWN buttons, go to parameter **P930**, and **ENTER**, **P930** is the factory defaults parameter, change the value to **1** and **ENTER** , all parameters, with the exception of the mA trims, will be restored to the factory settings (including the DATEM trace) and on completion Stor (Store) will be displayed after which you can ESC out of this parameter and continue programming the ɪMP⁺ for the required application.

Checking the Information Specific to your ɪMP⁺

There are some parameters dedicated to each individual ɪMP⁺, such as the software revision and the unit's serial number.

Checking the Software Revision and Serial Number

If you need to identify the serial number of the unit or the current level of software in your ɪMP⁺, whilst in **Run Mode** press the **ESC** button and the serial number along with the software revision will be displayed. Alternatively enter **Program Mode** and select **SyS1 (**System**)** menu and **ENTER**. Select parameter **P926** to view the identity of the current **software revision** or **P928** for the **serial number** of the unit.

Using the RS232 Serial Interface

The RS232 serial interface is used to communicate between the ɪMP⁺, and a PC using the optional Pulsar IMP PC software, this software is used to obtain information from the ɪMP⁺ so that echo traces can be viewed, parameters can be uploaded, downloaded and saved.

To do so, the settings for communications control are set as follows and cannot be changed: **baud rate 19,200**, **8 data bits**, **no parity**, **1 stop bits**.

Connection between the ɪMP⁺ and the PC is made via RJ11 connector located under the lid of the ɪMP⁺.

> **Note**
> When ɪMP⁺ is wired as a 2-wire device connecting to the RS232 RJ11 port will cause the ɪMP⁺ to draw 20mA, this is necessary to ensure correct operation of the RS232.

Parameter Listing

This chapter describes all of the parameters contained within the IMP+.

Application (APP) Menu

P100 Mode of Operation

This parameter sets the mode of operation, when in run mode, and can be set to one of the following:

Option	Description
1= **Distance (Default)**	Display shows the distance from the transducer face to the surface.
2= Level	Display shows how full the vessel is.
3= Space	Display shows how empty a vessel is.
4= Volume	Display shows volume of material in the vessel

P104 Measurement Units

This parameter sets the units you want to use for programming and display

Option	Description
1 = metres	All units of measure are **METRES**
2 = cm	All units of measure are **CENTIMETRES**
3 = mm	All units of measure are **MILLIMETRES**
4 = feet	All units of measure are **FEET**
5 = inches	All units of measure are **INCHES**

P105 Empty Level

This parameter is to be set to the maximum distance from the face of the transducer to the empty point, in **P104 Measurement Units**. Note this value affects span as well, so should be set before span. **Default: IMP 3 = 3.00m (9.84 feet), IMP 6 = 6.00m (19.69 feet)** and **IMP 10 = 10.00m (32.81 feet)**.

P106 Span

This parameter should be set to the maximum distance from the **Empty Level** (**P105**) to the maximum material level. It is automatically set to be equal to the **Empty Level** (**P105**) less the **Near Blanking** distance (**P107**), when you set the empty level. **Default IMP 3 = 2.80m (9.19 feet), IMP 6 = 5.70m (18.70 feet)** and **IMP 10 = 9.70m (31.82 feet).**

P107 Near Blanking Distance

This parameter is the distance from the face of the transducer that is not measurable and is pre-set to the minimum value dependant on the version of ꟾMP+ being used. It should not be set to less than this figure but can be increased.

ꟾMP+ Version	Near Blanking Distance
IMP 3 metre	Default Blanking Distance = 0.2m (0.66 feet)
IMP 6 metre	Default Blanking Distance = 0.3m (0.98 feet)
IMP 10 metre	Default Blanking Distance = 0.3m (0.98 feet)

P108 Far Blanking Distance

This is the distance (as a **percentage** of empty level) beyond the empty point that the unit will be able to measure, and the **default** is pre-set to **10%** of the empty level.

If the surface being monitored can extend beyond the **Empty Level** (**P105**) then the far blanking distance can be increased to a maximum of 100% of empty level.

This parameter is always entered as a % of empty level.

Relay (rL) Menu

P210 (Relay 1), P220 (Relay 2) - Relay Type

This parameter defines what type each relay should be, see the table below for available options.

Option	Description
0= **Not in Use (Default)**	Relay not programmed.
1= Alarm	Relay is programmed as an alarm relay, which will **de-energise ON**, and **energise OFF**. This will ensure an alarm is raised if the power fails to the unit.
2 = Control	Relay is programmed as a control relay, which will energise ON, and de-energise OFF.

Alarms
P210 (Relay 1), P220 (Relay 2) =1 (Alarm)

P211 (RL1), P221 (RL2) - Relay Function

This parameter defines what **function** the **alarm** will respond to as follows.

Option	Description
0= Off (Default)	Relay will not operate.
1= Level	Alarm is based on the level in the vessel, and the type of level alarm (P2**1**2, 2**2**2) and two setpoints must be set (P2**1**3, 2**2**3 & P2**1**4, 2**2**4). Setpoints are entered in Display Units or % of span as referenced to Empty Level [*].
4= Loss of Echo	Alarm is raised if the **Failsafe Timer** (**P809**) expires. No setpoints are required.

P213 (Relay 1), P223 (Relay 2) - Relay "ON" Setpoint

This parameter determines the "**ON**" point for the alarm and should be set as follows, in **Measurement Units P104**

High Alarm	Low Alarm
P213/P223 "**ON**" Setpoint	**P213/P223** "**ON**" Setpoint
Higher than	**Lower than**
P214/P224 "OFF" Setpoint	P214/P224 "OFF" Setpoint

P214 (Relay 1), P224 (Relay 2) - Relay "OFF" Setpoint

This parameter determines the "**OFF**" point for the alarm and should be set as follows, in **Measurement Units P104**

High Alarm	Low Alarm
P214/ P224 "**OFF**" Setpoint	**P214/ P224** "**OFF**" Setpoint
Lower than	**Higher than**
P213/P223 "ON" Setpoint	P213/P223 "ON" Setpoint

LOE (Loss Of Echo))

No setpoints are required when relays are used as LOE (Loss Of Echo)

Control

P210 (Relay 1), P220 (Relay 2) =2 (Control)

P211 (Relay 1), P221 (Relay 2) - Relay Function,

This parameter defines whether the **general control** relay function is currently "ON" or "OFF".

General Control	Description
0= Off (Default)	Relay is always de-energised.
1= On	Control is based on the level in the vessel. All general controls are used to assist each other (run at the same time) and each general control has its own "ON" and "OFF" setpoints.

P213 (Relay 1), P223 (Relay 2) - Relay "ON" Setpoint

This parameter determines the "**ON**" point for the control relay and should be set as follows, in **Measurement Units P104**

Control Down	Control Up
P213/P223 "**ON**" Setpoint	**P213/P223** "**ON**" Setpoint
Higher than	**Lower than**
P214/P224 "OFF" Setpoint	P214/P224 "OFF" Setpoint

P214 (Relay 1), P224 (Relay 2) - Relay "OFF" Setpoint

This parameter determines the "**OFF**" point for the control relay and should be set as follows, in **Measurement Units P104**

Control Down	Control Up
P214/ P224 "**OFF**" Setpoint	**P214/ P224** "**OFF**" Setpoint
Lower than	**Higher than**
P213/P223 "ON" Setpoint	P213/P223 "ON" Setpoint

Volume (UoL) Menu

P600 Vessel Shape

This parameter determines which vessel shape is used when utilising "Volume Conversion".

The choices are as shown in the table below, along with the **dimensions** that are required to be entered (**P601**-**P603**).
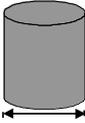
Vessel Shape	P600 Value	Dimensions Required
	P600=0 Cylindrical Flat base (Default)	Cylinder diameter
	P600=1=Rectangular Flat base	Width and Breadth
	P600=2 Cylindrical Cone base	Cylinder diameter and height of bottom
	P600=3 Rectangular Pyramid base	Width and Breadth of rectangular section and height of bottom
	P600=4 Cylindrical Parabola base	Cylinder diameter and height of bottom
	P600=5 Cylindrical Half-sphere base	Cylinder Diameter
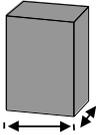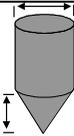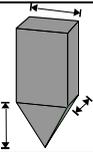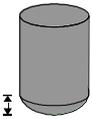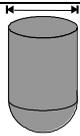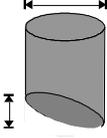
Vessel Shape	P600 Value	Dimensions Required
	P600=6 Cylindrical Flat sloped base	Cylinder diameter and height of bottom
	P600=7 Rectangular Flat sloped base	Width and Breadth of rectangular section and height of bottom
	P600=8 Horizontal cylinder with flat ends	Cylinder diameter and tank length
	P600=9 Horizontal cylinder with parabolic ends	Cylinder diameter, length of one end section, and tank length
	P600=10 Sphere	Sphere diameter
	P600=11 Universal Linear	No dimensions required, level and volume breakpoints used. **Entered via IMP PC**
	P600=12 Universal Curved	No dimensions required, level and volume breakpoints used. **Entered via IMP PC**
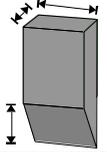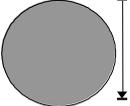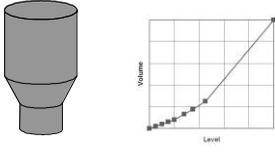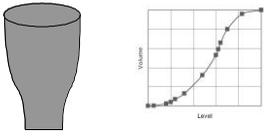
P601-P603 Vessel Dimensions

These three parameters are used to enter the dimension required to calculate the volume. The dimensions required are as shown below.

Vessel Shape	P601	P602	P603
P600=0 Cylindrical Flat base	Cylinder Diameter	Not Used	Not Used
P600=1 Rectangular Flat base		Width of rectangle	Breadth of rectangle
P600=2 Cylindrical Cone base	Height of base	Cylinder Diameter	
P600=3 Rectangular Pyramid base	Height of base	Width of rectangle	Breadth of rectangle
P600=4 Cylindrical Parabola base	Height of base	Cylinder Diameter	Not Used
P600=5 Cylindrical Half-sphere base	Cylinder Diameter	Not Used	Not Used
P600=6 Cylindrical Flat sloped base	Height of base	Cylinder Diameter	Not Used
P600=7 Rectangular Flat sloped base	Height of base	Width of rectangle	Breadth of rectangle
P600=8 Horizontal cylinder with flat ends	Length of Cylinder	Cylinder Diameter	Not Used
P600=9 Horizontal cylinder with parabolic ends	Length of Cylinder	Cylinder Diameter	Length of one end section
P600=10 Sphere	Sphere Diameter	Not Used	Not Used

P604 Calculated Volume

This parameter displays the maximum volume that has been calculated by the ᴖMP+ and is a Read Only parameter. The volume displayed will be shown in cubic meters and is the total volume available between **empty level** (**P105**) and 100% of **span** (**P106**).

P605 Volume Units

This parameter determines the units that will be used in calculating volume conversion. It is used in conjunction with **P607** (**maximum volume**), please note that there is no provision for the volume unit's descriptor to be shown on the display.

The choices are:

Option	Description
0 = No Units	Volume will be totalised with **no units**
1 = Tons	Volume will be totalised in **Tons**
2 = Tonnes	Volume will be totalised in **Tonnes**
3 = Cubic metres	Volume will be totalised in **cubic metres**
4 = Litres	Volume will be totalised in **litres**
5 = UK Gallons	Volume will be totalised in **UK Gallons**
6 = US Gallons	Volume will be totalised in **US Gallons**
7 = Cubic feet	Volume will be totalised in **cubic feet**
8 = Barrels	Volume will be totalised in **barrels**

P606 Correction Factor

This parameter is used to enter a correction factor, when required, such as the specific gravity of the material so that the volume calculated is relative to the actual amount of material that can be contained between **empty level** (**P105**) and 100% of **span** (**P106**). **Default = 1**

P607 Max Volume

This parameter displays the actual maximum volume that has been calculated by the ɪMP+, i.e. **P604 Calculated Volume x P606 Correction Factor**, and is a Read Only parameter. The volume displayed will be shown in **P605 Volume Units** and is the total volume available between **empty level** (**P105**) and 100% of **span** (**P106**).

Display (DiSP) Menu

P800 Display Units

This parameter determines whether the reading displayed is in **Measurement Units** (**P104**), or as a **percentage of span.**

Option	Description
1 = **Measured (Default)**	Display is in **Measurement Units** (P104)
2 = Percentage	Display is in **percentage** of span.

P801 Decimal Places

This parameter determines the number of decimal places on the reading during run mode.

Minimum = 0 (No decimal places), Maximum 3 = (3 decimal Places)
Default = 2

P808 Fail-safe Mode

By default, if a fail-safe condition occurs, then the display, relays and the mA output are held at their last **known** values until a valid reading is obtained.

If required, then you can change this so that the unit goes to **high** (100% of span), or **low** (empty) as follows:

Option	Description
1 = **Known (Default)**	Remain at the last **known** value
2 = High	Will fail to the **high** value (100% of Span).
3= Low	Will fail to the **low** value (empty)

— *P840 mA Output Fail-safe*

P809 Fail-safe Time

In the event of a fail-safe condition occurring the failsafe timer determines the time before fail-safe mode is activated. **Default = 2.00 mins**

If the timer activates, the unit goes into **fail-safe**, as determined by **P808**, (**Display** and **P840** (**mA Output**). When this happens, you will see the message "**LOE**!" on the display.

When a valid measurement is obtained then the display, relays and mA output will be restored and the timer is reset.

mA Output (LOOP) Menu

P834 mA Low Level

This parameter sets, in **Measurement Units (P104)**, the value of 'level', 'distance' or 'space', depending on the selected **Mode of Operation (P100)**, at which 4mA will occur.

P835 mA High Level

This parameter sets, in **Measurement Units (P104)**, the value of 'level', 'distance' or 'space', depending on the selected **Mode of Operation (P100)**, at which 20 mA output will occur**.**

P838 mA Low Trim

If the device you are connected to is not calibrated, and not showing the low value, then you can trim it using this parameter. You can either type in the offset directly or use the arrow keys to move the output up and down until you get the expected result on the device that is connected.

P839 mA High Trim

If the device you are connected to is not calibrated, and not showing the high value, then you can trim it using this parameter. You can either type in the offset directly or use the arrow keys to move the output up and down until you get the expected result on the device that is connected.

P840 mA Fail-safe Mode

This parameter determines what happens to the mA output in the event of the unit going into fail-safe mode. The **default** is to do the same as the **system fail-safe** (**P808**), but this can be overridden to force the mA output to an independent fail-safe mode as follows:

Option	Description
0 = Default	mA output will fail as per **P808**.
1 = Hold	mA output will retain its last known value.
2 = Low	mA output will fail to its **low** condition. **3.5mA**
3 = High	mA output will fail to its **high** condition. **22mA**

P842 Voltage Output

This parameter will determine the **range** of the **voltage output**. The voltage output will **automatically** be **scaled** to represent the **Span** P106 where **0volts** represents 0% (**empty**) and maximum voltage **5** or **10 volts**, depending on range selected, will represent 100% (**full**).

Option	Description
0 = 5 volts	Voltage output range will be 0 - 5volts.
1 = 10 volts	Voltage output range will be 0 - 10volts.

Additional Information

In the event of a **failsafe** condition **occurring**, the **voltage output** will fail in accordance with the **Failsafe Mode P808**

Compensation (CoP) Menu

P851 Measurement Offset

The value of this parameter is added to the measured distance, in **Measurement Units** (**P104**).

This Offset will be added to the level, as derived from the transducer, and will affect everything including the reading on the display, the relay setpoints and the mA output.

P852 Temperature Source

This parameter determines the source of the temperature measurement. By **default,** it is set to internal (transducer) (**P852=1**), which will automatically detect the temperature from the transducer. If for any reason, no temperature input is received, then the **Fixed Temp** value is used, as set by **P854**.

The temperature source can be specifically set as follows:

Option	Description
1 = **Internal (Default)**	Always uses temperature reading from transducer.
3 = Fixed	Always uses fixed temperature (P854)

P854 Fixed Temperature

This parameter sets the temperature, in degrees centigrade to be used if **P852** (**Temperature Source**) = **3**. **Default = 20ºC**

P860 Sound Velocity

This option allows for the velocity of sound to be changed according to the atmosphere the transducer is operating in. By **default,** the velocity is set for **342.72m/sec** which is the speed of sound travelling in air at a temperature of **20ºC**.

The table below gives details of the velocity of sound in various gaseous atmospheres. In all cases the velocity indicated is that in a 100% gaseous atmosphere at 0ºC. In atmospheres less than 100% it may be necessary to check the level indicated at near empty and near full and compare with the actual level, several times, then adjust the **Sound Velocity** accordingly to obtain an accurately displayed reading.

Gas	Sound Velocity
Chlorine	206 m/sec
Argon	308 m/sec
Oxygen	316 m/sec
Air	331.5 m/sec
Ammonia	415 m/sec
Methane	430 m/sec
Helium	435 m/sec
Neon	965 m/sec

P645 Vapour Temperature Compensation

The sound velocity in air increases or decreases at a uniform rate of 60cm/sec. per ºC, however in atmospheres other than air it will change at a different rate.

This option allows the rate of change in cm/sec. per ºC to be set according to the atmosphere and temperature present. The level indicated, should be compared with the actual level, several times, then **Vapour Temperature Compensation** adjusted accordingly, to obtain an accurately displayed reading. **Default = 60 cm/sec. per ºC**

Stability (StA) Menu

Damping

Damping is used to damp the display, to enable it to keep up with the process but ignore minor surface fluctuations.

P870 Fill Damping

This parameter determines the maximum rate at which the unit will respond to an increase in level. It should be set slightly higher than the maximum vessel fill rate. **Default = 10.000 metres/minute (32.81 feet/minute)**

P871 Empty Damping

This parameter determines the maximum rate at which the unit will respond to a decrease in level. It should be set slightly higher than the maximum vessel empty rate. **Default = 10.000 metres/minute (32.81 feet/minute)**

System (SyS1) Menu

The following three parameters do not affect how the unit performs, but details, contained in them, may be required, by Pulsar, when making technical enquiries.

P921 Enable Code

Enables the passcode (**P922**), which means the passcode must be entered to go into program mode. If **disabled** (set to **0**), then no passcode is required, and pressing ESC and ENTER button simultaneously will allow entry into the program mode.

P922 Passcode

This is the passcode that must be used to enter program mode. The **default** is **1997**, but this can be changed to another value.

P926 Software Revision

This parameter will display the current software revision.

P928 Serial Number

This parameter will display the serial number of the unit.

P930 Factory Defaults

This parameter resets all parameter values to the original Factory Set values that were installed when the unit was tested, before despatch to you.

To **reset** parameters, enter **1** and press **ENTER**, all parameters, with the exception of the mA trims, will be restored to the factory settings (including the DATEM trace) and on completion Stor (Store) will be displayed after which you can ESC out of this parameter and continue programming the IMP+ for the required application.

Test (tESt) Menu

P991 Hard Test

When this parameter is selected, the unit will test the following in turn.

- **Relays**. Press the **UP** button for **Relay 1** and the **DOWN** for **Relay 2**, the relay will change state each time the key is pressed. If you press any other key, other than a valid relay number, then the test will end.

- **Display**. All the segments on the LCD and the backlight are lit up, so you can see if they all work. Press the **ENTER** button, to end the test.

- **Keys**. You should press each button, to confirm it works, with a counter showing how many more buttons you have to press. Press **ESC** last, as this will show if all keys were pressed or not. If they were not, then an error message is displayed.

P992 mA Out Test

This parameter will allow you to force a specified current on the mA output, to test the equipment that it is connected to, and to make sure the unit is working correctly. The figure you enter will be generated by the mA output.

This section describes many common symptoms, with suggestions as to what to do.

Symptom	What to Do
Display blank, transducer not firing.	Check power supply
Display shows "L0E".	No valid echo being received and unit has gone into fault condition. Check material level is not out of range, sensor is perpendicular to material surface.
Incorrect reading being displayed for current level.	Measure actual distance from transducer face to surface of material. Enter Program Mode and access **SyS1** menu, go to **P21**and press **ENTER** type in the **measured distance**, press **ENTER**, wait until "**Stor**" is displayed and return to Run Mode, display should now update to correct reading.
Material level is consistently incorrect by the same amount.	Check empty level (P105) correctly entered.

Incorrect disposal can cause adverse effects to the environment.

Dispose of the device components and packaging material in accordance with regional environmental regulations including regulations for electrical \ electronic products.

Transducers

Remove power, disconnect the Transducer, cut off the electrical cable and dispose of cable and Transducer in accordance with regional environmental regulations for electrical \ electronic products.

Controllers

Remove power, disconnect the Controller and remove battery (if fitted). Dispose of Controller in accordance with regional environmental regulations for electrical \ electronic products.

Dispose of batteries in accordance with regional environmental regulations for batteries.

EU WEEE Directive Logo

This symbol indicates the requirements of Directive 2012/19/EU regarding the treatment and disposal of waste from electric and electronic equipment.

Notes