PULSAR

MEASUREMENT

dBi Series (HART COMMUNICATION PROTOCOL)

Intelligent Transducer

Instruction Manual

dBi SERIES (PROFIBUS PA) (SECOND EDITION REV 2)

October 2024

Part Number M-560-0-002-2P

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The dBi shown on the cover of this manual is used for illustrative purposes only and may not be representative of the actual dBi supplied.

CONTACT

For technical support, please contact:

Europe: **supporteurope@pulsarmeasurement.com**
Outside Europe: **supportnorthamerica@pulsarmeasurement.com**
If you have any comments or suggestions about this product, please contact:
Europe: **europe@pulsarmeasurement.com**
Outside Europe: **northamerica@pulsarmeasurement.com**
Pulsar Measurement website: **www.pulsarmeasurement.com**

United States	**Canada**	**United Kingdom**
11451 Belcher Road South Largo, FL 33773 888-473-9546	16456 Sixsmith Drive Long Sault, Ont. K0C 1P0 855-300-9151	Cardinal Building, Enigma Commercial Centre Sandy's Road, Malvern WR14 1JJ 00 44 (0)1684 891371

CONTENTS

CHAPTER 1: START HERE...

Congratulations on your purchase of a Pulsar dBi PA Series Intelligent Transducer 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: Look for this icon throughout your Pulsar Measurement manual to find helpful information and answers to frequently asked questions.

Additional Information

> **Additional Information**
> At various parts of the manual, you will find sections like this that explain specific things in more detail.

About the dBi Series (HART) Intelligent Transducer

Functional Description

The dBi Series Intelligent Transducer 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 gives unrivalled performance in echo discrimination and accuracy in a loop powered device.

Easy calibration and maintenance free "fit and forget" performance mean that you can install the dBi Series Intelligent Transducer Level Monitoring System rapidly and with confidence, with calibration being achieved either using a HART programmer/calibrator, or via a PC utilising the Pulsar interface and software.

The dBi Series Intelligent Transducer 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.

dBi Series Intelligent Transducer comes in four models:

1. dBi 3 with a range from 0.125m (0.41 feet) to 3.00m (9.84 feet).

2. dBi 6 with a range of 0.3m (0.98 feet) to 6.00m (19.69 feet).

3. dBi 10 with a range of 0.3m (0.98 feet) to 10.00m (32.81 feet).

4. dBi 15 with a range of 0.5m (1.64 feet) to 15.00m (49.213 feet).

All models can be mounted via a rear, 1" BSP/NPT, thread (Standard) with a model with alternative front thread mounting being available, in addition to this flange mount and PVDF options are also available. See **Chapter 2 Installation** for further details.

All model types are available for use in hazardous area installations with Ex ia ATEX certification.

> **Important Notice**
> The **dBi Series (PROFIBUS PA) Intelligent Transducer** must be connected to a Profibus network, it is unable to be used in any other way.

Product Specification

PHYSICAL

Dimensions & Mounting	**dBi3:** 77mm dia x 134mm high (3 x 5.31 inch) Rear thread 1" BSP/NPT **dBi6 & dBi10:** 86mm dia x 121 high (3.38 x 4.75 inch). Rear thread 1" BSP/NPT **dBi15:** 86mm dia x 134 mm high (3.38 x 5.32 inch). Rear 1" BSP/NPT
Weight	**dBi3:** 1kg (2.2lbs), **dBi6:** 1.2kg (2.7lbs) **dBi10:** 1.3kg (2.9lbs), **dBi15:** 1.4kg (3.1lbs)
Enclosure material/description	Valox 357
Transducer cable requirements	2 core screened. Integral cable length 5, 10, 20 or 30m

ENVIRONMENTAL

Enclosure protection (all models)	IP68
Temperature Compensation	Internal temperature sensor, ± 0.5ºC
Max. & min. temperature (electronics)	-40 ºC to +80 ºC (-40ºF to 176ºF)
CE UKCA Approval	See EU & UK Declaration of Conformity
ATEX / UKEx	II 1 G Ex ia IIC T4 Ga & II 1 D Ex ia IIIC T130°C Da Tamb -40°C to +80°C & FISCO Field device

PERFORMANCE

Measurement Range	**dBi3:** 0.125m (0.41 ft.) to 3.00m (9.84 ft.) **dBi6:** 0.3m (0.98 ft.) to 6.00m (19.69 ft.) **dBi10:** 0.3m (0.98 ft.) to 10.00m (32.81ft.) **dBi15:** 0.5m (1.64 ft.) to 15.00m (49.213 ft.)
Accuracy/Repeatability	**dBi3:** 2mm (0.08 inch) **dBi6:** 4mm (0.16 inch) **dBi10:** 3mm (0.12 inch) up to 6m (20ft.) range 6mm (0.24 inch) over 6m range **dBi15:** 5mm (0.2 inch) up to 10m (33ft.) range 10mm (0.39 inch) over 10m range
Frequency	**dBi3**: 125kHz **dBi6**: 75kHz **dBi10**: 50kHz **dBi15**: 41kHz
Beam Angle	**dBi3, dBi6 & dBi10: <10º** **dBi15: <8º** (all beam angles are inclusive**,** but give an effective beam angle of <3º)
Update Time	1 – 2 seconds at 20mA current loop

OUTPUTS

Communication Protocol	Profibus PA profile 3.02, Class A with I&M functionality

PROGRAMMING

PC programming (via PA modem)	Pulsar PAPC. Loop powered from PC or laptop via modem
Program security	Via passcode
Programmed data integrity	Via non-volatile RAM
PC Setup and monitoring	Compatible with Win 7, Win 8 and Win 10

SUPPLY

Power supply	20mA 18-24V DC
Power	Bus powered, per IEC 61158-2; 20mA (general purpose or I.S version)

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

EU & UK Declaration of Conformity

DoC ref. 001002

EU & UK DECLARATION OF CONFORMITY

P U L S A R   dBi-HART range.

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

Relevant legislation;	2014/35/EU	SI 2016/1101	LVD, safety regulations & amendments.
	2014/30/EU	SI 2016/1091	EMC directive, regulations & amendments.
	2014/34/EU	SI 2016/1107	ATEX directive, UKEx regulations & amendments.
	2011/65/EU	SI 2012/3032	RoHS directive, regulations & amendments.

Manufacturer	Pulsar Process Measurement Ltd
Address	Cardinal Building, Enigma Commercial Centre, Sandy's Road, Malvern, Worcestershire, WR14 1JJ, UK.
Apparatus	DC powered level measurement sensor utilising ultrasonic technology.
Models	dBi-3, dBi-6, dBi-10, dBi-15, Exia & Exmb versions.
Equipment type	Measurement and process control.
Standards applied	EN61010-1:2010+A1:2019 Safety requirements for electrical equipment for measurement, control & laboratory use.
	EN61326-1:2013 Electrical equipment for measurement, control & laboratory use, EMC requirements.
	EN60079-0:2012+A11:2013 Explosive atmospheres. Equipment general requirements, ATEX.
	EN60079-0:2018 Explosive atmospheres. Equipment general requirements, UKEx.
	EN60079-11:2012 Explosive atmospheres. Equipment protection by intrinsic safety 'i'.
	EN60079-18:2015+A1:2017 Ex. atmospheres. Equip. protection by encapsulation 'm'.
Certification body	Element Materials Technology Ltd., EMT. IECEx EMT18.0005X
Approved body	Element Materials Technology Ltd., #0891. EMA 21UKEX0039X, EMA21UKEX0038X
Notified body	Element Mat.Tech.Rotterdam B.V., #2812. EMT 18ATEX0014X, TRAC 12ATEX0023X

I declare that the apparatus named above has been tested and complies with the relevant sections of the above referenced standards & legislation.

Signed for and on behalf of;

1st December 2021
Rev. 1.4

Name & function: Tim Brown, electronics engineer.   Pulsar Process Measurement Ltd.

CE 2813

UKCA 0518

CHAPTER 2 INSTALLATION

Unpacking

> **Important Notice**
>
> 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 Measurement.

Power Supply Requirements

The dBi Series Intelligent Transducer must be connected to a Profibus network to function.

For use in hazardous areas they must be connected via a suitable interface/barrier meeting the following specification: ATEX approved barrier: Uo=≤28V, Io=≤250mA, Po=≤2.5W or FISCO: Uo=≤17.5V, Io=≤380mA, Po=≤5.32W.

The compact one-piece construction of the dBi Series Intelligent Transducer can be mounted easily using either the 1"BSP/NPT rear mounting thread or the integral 1.5" or 2" BSP/ NPT, nose thread, dependent on model. When choosing a location to mount the dBi Series Intelligent Transducer, bear in mind the following:

- The ultrasonic signal path should be free of falling material and obstructions such as pipes, beams etc.
- The dBi 3 should be mounted at least 12.5cm (0.41 feet) above the maximum level of the material and be perpendicular to the surface. While the dBi 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. And the dBi 15 should be mounted at least 50cm (1.64 feet) above the maximum level of the material and again should be perpendicular to the surface.
- The ambient temperature is between -40ºC and 80ºC.
- There should be no high voltage cables or electrical inverter wiring near the transduce cabling.

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

Dimensions

The dimensions of the dBi Series Intelligent Transducer are shown below:

Rear Thread Mount

Front Thread Mount

dBi 3

1.5" Thread
(49mm (1.93")

65mm (2.6")

160mm (6.3")

77mm ø (3")

dBi 6 & dBi 10

2" Thread
(61mm (2.40")

65mm (2.6")

160mm (6.3")

77mm ø (3")
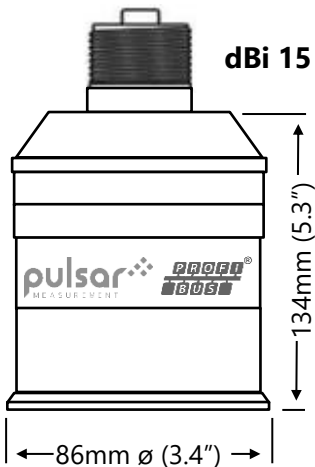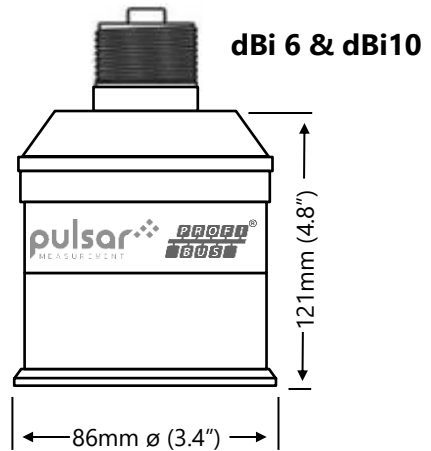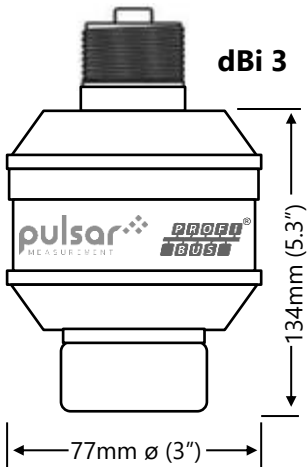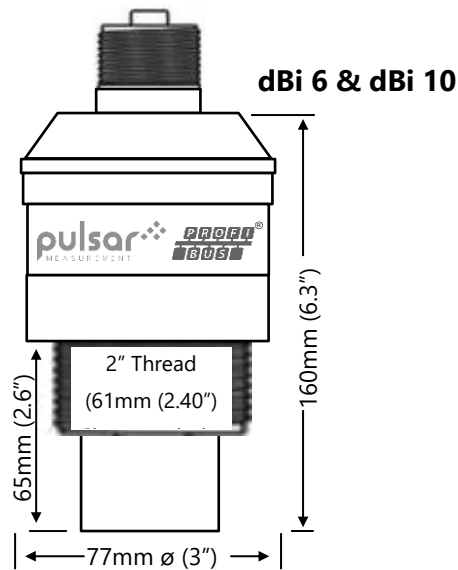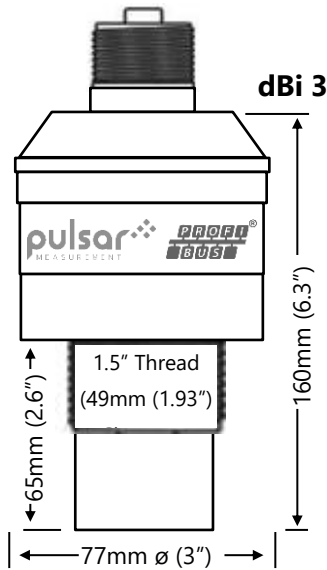
Outdoor and Open Vessel Installation

The dBi Series Intelligent Transducer can be simply mounted on a bracket, suitable for the application and secured using either the 1" BSP/NPT rear thread or via the 1½" or 2" front thread, dependant on model.

Care should be taken to ensure that the dBi Series Intelligent Transducer is not installed in direct sunlight, 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.

DBI MODEL	RANGE	L = BLANKING
dBi 3	3 metres (9.84 feet)	125mm (0.41 feet)
dBi 6	6 metres (19.69 feet)	300mm (0.98 feet)
dBi 10	10 metres (32.18 feet)	300mm (0.98 feet
dBi 15	15 metres (49.21 feet)	500mm (1.64 feet)

'L' (Blanking) should, as a minimum be at least that as detailed in the table above but can be greater if required.
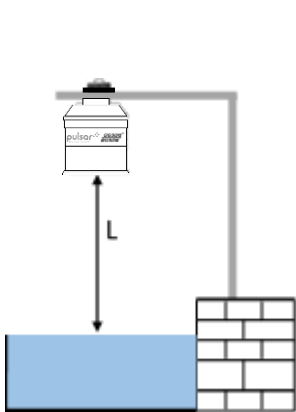
Mounted via Rear 1"BSP/NPT Thread
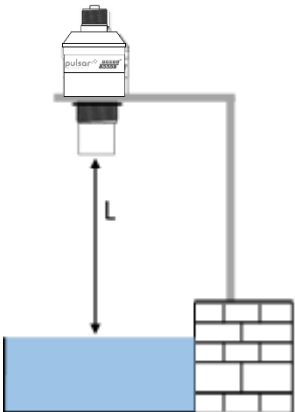
Mounted via optional Front Thread

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 dBi Series Intelligent Transducer can be simply screwed into a flange and secured using the rear 1" BSP/NPT rear thread or via the 1½" or 2" front thread, dependant 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 dBi Series Intelligent Transducer and the connection to the vessel.

Standpipe Installations

When mounting the dBi Series Intelligent Transducer 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	
mm	inches	mm	inches
80	3	220	8
100	4	300	12
150	6	420	16
200	8	560	22
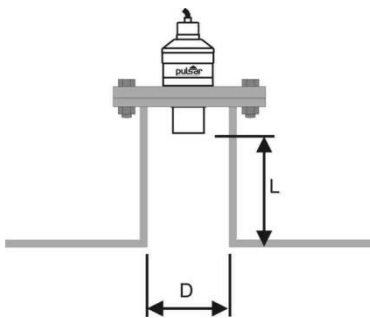
dBi Flange mounted via Front Thread
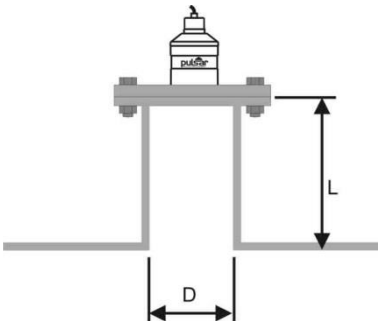
Optional Flange Mounted dBi

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. 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 45°.
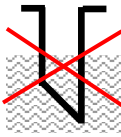
The maximum level (100% of Span) is inside the Blanking Distance.
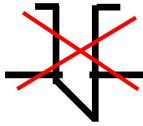
Pipe should be free of obstructions such as weld seams.

Correct standpipe installation

When using the dBi Series Intelligent Transducer to measure 'aggressive, materials such as 'alkaline' and 'acids' it is recommended that either a PVDF or an optional PTFE faced Flanged Transducer is used. Please consult Pulsar for full availability of options.

Cable

The dBi Series Intelligent Transducer comes with a fitted integral cable, if this cable is extended then the total capacitance must not exceed the limits for the voltage applied.

The dBi transducers cable is a twisted pair with overall cable screen. The twisted pair are red and black, connect the red to B +ve and the black to A – ve. The screen should go to Earth.

> **Important Notice**
> In the case of the Ex mb version the cable is fitted with an over current protection device in the form of a fuse, please note that **under no circumstances should this fuse be removed**. The fuse must be fitted in the non-hazardous area.

Preparation for Operation

Before switching on, check the following:

- ✓ The dBi Series Intelligent Transducer is mounted correctly.
- ✓ The power supply is correctly installed.
- ✓ The unit is correctly wired to your Profibus PA network

Maintenance

There are no user serviceable parts inside your dBi Series Intelligent Transducer, 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.

Hazardous Area Installation

Information specific to Hazardous Area Installation

Reference European ATEX Directive 2014/34/EU, Annex II, 1.0.6. And UK ATEX Directive SI 2016:1107 – Schedule 3A, Part 1

The following instructions apply to equipment covered by certificate number EMT18ATEX0014X (Ex ia) & TRAC 12ATEX0023X (Ex mb). EMA21UKEX0039X (Ex ia) & EMA21UKEX0038X (Ex mb).

1. The equipment may be used with flammable gases and vapours with apparatus groups IIC, IIB, and IIA with temperature classes; T1, T2, T3, T4 maximum ambient temperature range -40ºC to +80ºC.

2. The equipment is only certified for use in ambient temperatures in the range -40ºC to +80ºC and should not be used outside this range

3. Installation shall be carried out in accordance with the applicable code of practice by suitably trained personnel

4. Repair of this equipment shall be carried out in accordance with the applicable code of practice.

5. Certification marking as detailed in drawing number: **D-804-0957-B** (Ex ia) & **D-804-0994-A** (Ex mb). UK Ex ia **D-804-1410-A** and UK Ex mb **D-804-1411-A**

6. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive Substances - e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.
Suitable Precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

7. The certificate number has an 'X' suffix that indicates that the following special condition of certification applies;
   In the case of dBi transducer range, due to the housing and labels being non-conductive plastic care needs to be taken with regards electrostatic charge. The equipment shall not be installed if the conditions are conducive to the build-up of electrostatic charge. Additionally, the equipment should only be cleaned with a damp cloth.
   With the dBi Ex mb version a 100mA, 1500A breaking capacity fuse must be fitted in the positive lead of the cable. The product is shipped with this fuse in the cable, visible through the heat shrink at the wire end of the cable

8. The manufacturer should note that, on being put into service, the equipment must be accompanied by a translation of the instructions in the language or languages of the country in which the equipment is to be used and by the instructions in the original language.

Hazardous Area Specific Power Supply and barrier Requirements

The dBi PROFIBUS PA transducer operates on a Profibus PA network and should be connected in accordance with ATEX and FISCO standards.

In the case of Ex ia version the unit must be powered from an approved barrier with the following limits:

Uo <= 28V, Io <=250mA, Po <= 2.5W

The FISCO variant is deemed safe when connected to FISCO barriers:

Uo=≤17.5V, Io=≤380mA, Po=≤5.32W

The dBi transducers cable is a twisted pair with overall cable screen. The twisted pair are red and black, connect the red to +ve and the black to –ve. The screen should go to signal ground.

CHAPTER 3 HOW TO USE YOUR DBI PROFIBUS PA SENSOR

The dBi PROFIBUS PA Intelligent Transducer can only be used on a Profibus PA network.

It is available as a 3, 6, 10 or 15m maximum range device, the maximum span details are shown below:

	DBI 3	DBI 6	DBI 10	DBI 15
(Empty) 0% of Span Distance from dBi Face in metres	3.000	6.000	10.000	15.000
(Full) 100% of Span Distance from dBi Face in metres	0.125	0.300	0.300	0.500

Accessing Parameters

To view or change parameters values one of the following methods must be used:

Profibus Network

The dBi PROFIBUS PA transducer can be addressed/setup via a Profibus master.

dBi PROFIBUS PA modem and PAPC software

If you have purchased a dBi PROFIBUS PA modem, then you will have received the PC software called PAPC. This combination will allow you to configure, diagnose and update the firmware of any of dBi Profibus PA range.

The modem is connected to the PC via USB, this powers the modem and the dBi Profibus PA transducer, when connected, via the two spring terminals.

The modem appears on the PC as a serial port and if you look in Device Manager on the PC for "USB Serial Port (COM 'X')" in PORTS (COM & LPT) you will find the COM port you are using. When you open PAPC for the first time go into SETUP from the top menu and set COM port to COM 'X'('X' is the value found from device manager).

All parameters can be accessed and changed via Profibus PA modem and the PAPC software.

The modem is simple to use and has the following:

- Mini USB connector on top to connect to a PC

- Sprung terminals on top to connect your dBi Profibus PA transducer

- Switch – Off, Normal or Boot. 'Off' switches off the power to the transducer, 'Normal' is for use with PAPC for setup/diagnostics and 'Boot' for upgrading the firmware.

- Power LED – Green is on if the USB is connected

- Boot LED – Red On when the switch is in Boot position

- Normal Led – Green 'On' when the switch is in Normal position

- Data Led – Green is on when data is flowing between the Modem and the dBi Profibus PA transducer.
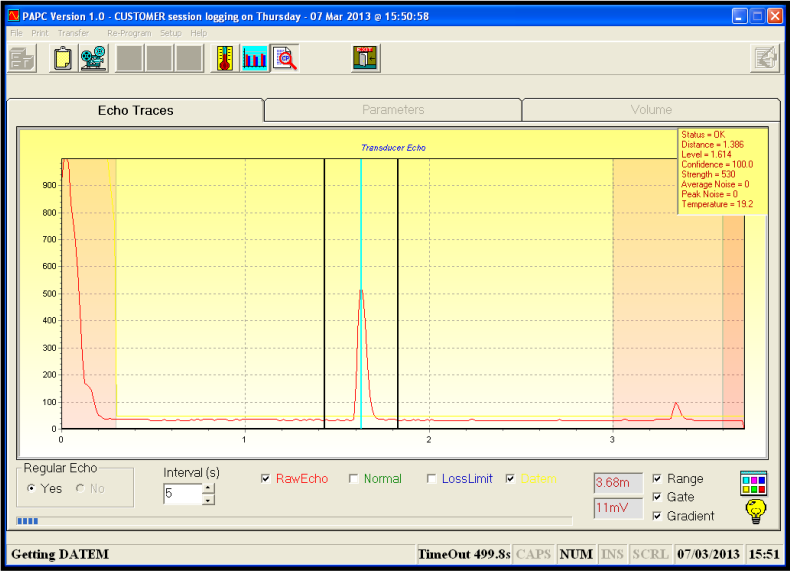
Display of the targeted echo on the Echo trace.

Parameter Tab

Volume Tab

Parameter Defaults

Factory Defaults

> **Important Notice**
>
> When first installing the dBi Series Intelligent Transducer, 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.

Once you are satisfied with the installation, and the dBi Series Intelligent Transducer 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 any programming, required for the intended application. It is sensible to program all the required parameters at the same time. The system will be then set-up.

CHAPTER 4 GETTING RESULTS FROM YOUR DBI SENSOR

This chapter explains how to undertake the various functions of your dBi Series Intelligent Transducer. 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 dBi Series Intelligent Transducer 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 dBi Series Intelligent Transducer 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.

Setting Security Passcodes

A passcode is used to protect parameter entries and will be required when accessing parameters with certain PC Software's. You can set a new passcode to prevent anyone changing any of your settings within your dBi Series Intelligent Transducer. The default **passcode** is **1997**, but this may be changed as follows.

> **Important Notice**
>
> The passcode is also used for remote access using certain PC Software's, so if this is being used, be sure to ensure any additional equipment using this feature is changed accordingly.

Changing the Passcode

You can set the **passcode** to any number from 0000 to 9999. To do this, 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 access parameter **P930**, which is the factory defaults parameter, change the value to **1** and **ENTER**, all parameters, except for the mA trims, will be restored to the factory settings (including the DATEM trace) and on completion.

Checking the Information Specific to your dBi Intelligent Transducer

There are some parameters dedicated to each individual dBi Series Intelligent Transducer, 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 dBi Series Intelligent Transducer, the following parameters can be used. Select parameter **P926** to view the identity of the current software **revision** or **P928** for the **serial number** of the unit.

CHAPTER 5 PARAMETER LISTING AND DESCRIPTION

Application

Operation

P101 Transducer Type

This parameter is read only and indicates the transducer in use:

OPTION	DESCRIPTIONS
1= dBi3	dBi 3m Transducer
2 = dBi6	dBi 6m Transducer
3 = dBi10	dBi 10m Transducer
4= dBi15	dBi 15m Transducer

P102 Material

This parameter should be set to the type of material being monitored.

OPTION	DESCRIPTIONS
1 = Liquid (Default)	Use for liquids and flat solid materials
2 = Solid	Solid material that is heaped or at an angle
3 = Closed Tank	Use for closed tanks or domed roofs.

P104 Measurement Units

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

OPTION	DESCRIPTIONS
1 = metres (Default)	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: dBi 3 = 3.00m (9.84 feet), dBi 6 = 6.00m (19.69 feet), dBi 10 = 10.00m (32.81 feet)** and **dBi 15 = 15.00m (49.21 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 dBi 3 = 2.875m (9.43 feet), dBi 6 = 5.70m (18.70 feet), dBi 10 = 9.70m (31.82 feet)** and **dBi 15 = 14.5m (47.57)**

P107 Near Blanking

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 dBi Series Intelligent Transducer being used. It should not be set to less than this figure but can be increased.

DBI VERSION	NEAR BLANKING DISTANCE
dBi 3 metre	Default Blanking Distance = 0.125m (0.41 ft)
dBi 6 metre	Default Blanking Distance = 0.3m (0.98 ft)
dBi 10 metre	Default Blanking Distance = 0.3m (0.98 ft)
dBi 15 metre	Default Blanking Distance = 0.5m (1.64 ft)

P108 Far Blanking

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.
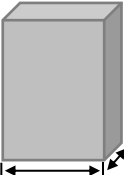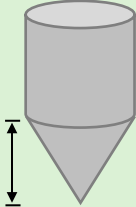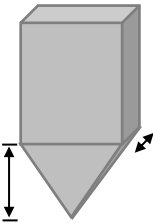
Volume
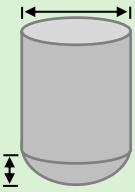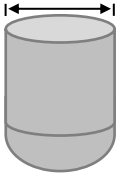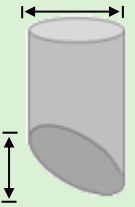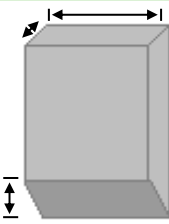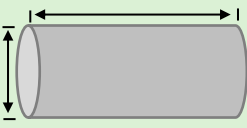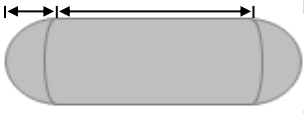
Conversion
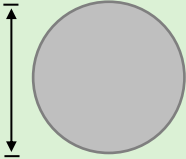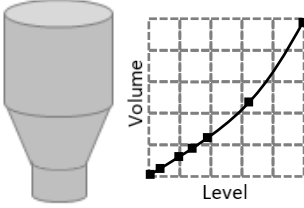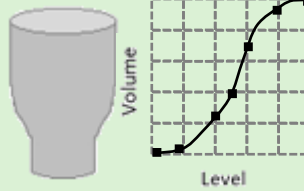
P600 Vessel Shape

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 DESCRIPTION	DIMENSIONS
	P600 = 0 (**Default**) Cylindrical Flat Base	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	Height of base, Width and Breadth of Rectangle

VESSEL SHAPE	P600 VALUE DESCRIPTION	DIMENSIONS
	P600 = 4 Parabola Base	Cylinder diameter and height of bottom
	P600 = 5 cylindrical half sphere	Cylinder diameter
	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 and section, and tank length

VESSEL SHAPE	P600 VALUE DESCRIPTION	DIMENSIONS
	P600 = 10 Sphere	Sphere diameter
	P600 = 11 Universal linear	No dimensions required as level, and volume breakpoints are used
	P600 = 12 Universal curved	No dimensions required as level, and volume breakpoints are used

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 and are entered **Measurements Units** (**P104**).

VESSEL SHAPE	P601	P602	P603
P600 = 0 Cylindrical flat base	Cylinder Diameter	Not required	Not required
P600 = 1 Rectangular flat base	Not required	Width of rectangle	Breadth of rectangle
P600 = 2 Cylindrical cone base	Height of base	Width of rectangle	Not required
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 required
P600 = 5 Cylindrical half sphere base	Cylinder diameter	Not required	Not required
P600 = 6 Cylindrical flat sloped base	Height of base	Cylinder diameter	Not required
P600 = 7 Rectangular flat sloped base	Height of base	Width of rectangle	Breadth of rectangle
P600 = 8 Horizontal cylinder flat ends	Length of cylinder	Cylinder diameter	Not required
P600 = 9 Horizontal cylinder parabolic ends	Length of cylinder	Cylinder diameter	Length of one end
P600 = 10 Sphere	Sphere diameter	Not required	Not required

P604 Calculated Volume

This parameter displays the maximum volume that has been calculated by the dBi 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 you wish to display, for volume conversion. It is used in conjunction with **P607** (**maximum volume**), and the units are shown on the display (subject to P810). 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 (Default)	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**
9 = lbs (pounds)	Volume will be totalised in **lbs** (**pounds**)

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 dBi 5, 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**).

Breakpoints

P610-P641 Level/Volume Breakpoints

These parameters are used to create a profile of the vessel when **P600**=**11** (**universal linear**) or **P600**=**12** (**universal curved**). You should enter breakpoints in pairs, a reading for level and its corresponding volume. The more pairs you enter, the more accurate the profile will be. In the case of universal linear, then enter the level/volume at each of the points where the vessel changes shape. In the case of the universal curved, enter values around each arc tangent, as well as at the top and bottom.

You must enter at least two pairs, and you can enter up to 32 pairs.

Universal Linear (P600=11)

This volume calculation creates a linear approximation of the level/volume relationship and works best if the vessel has sharp angles between each section.
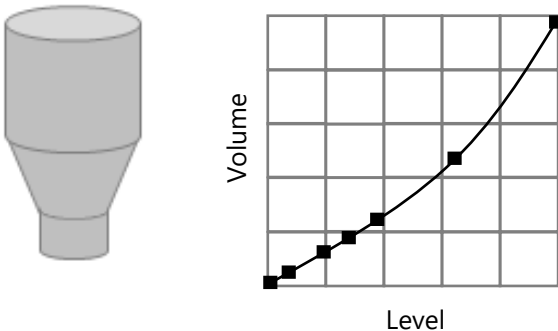
You should enter a level/volume breakpoint for each place where the vessel changes direction, and numerous where the section is slightly curved (mostly linear but has got a small arc). You can enter any number of pairs between 2 and 32.

Universal Curved (P600=12)

This volume calculation creates a curved approximation of the level/volume relationship, and works best if the vessel is non-linear, and there are no sharp angles.
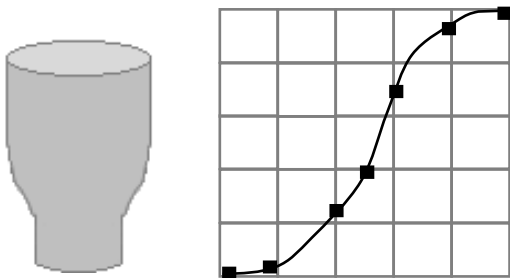
You should enter 2 level/volume breakpoints at the minimum and maximum levels, and several for each place where the vessel has got an arc. You can enter any number of pairs between 2 and 32.

Tables

P696 Reset Breakpoints

This parameter allows the resetting, to the default value, of all previously set breakpoints (P610-673), without having to access them individually. When it is necessary to reset or amend breakpoints this can be achieved by directly accessing the desired parameter (P610-641) and changing as required.

P697 Number of Breakpoints Set

This parameter allows you to review the number of breakpoints that have been set, without the need to access each individual one in turn, this is a "Read Only" parameter and no values can be entered.

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 (0% of Span)

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 echo trace.

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

Compensation

P841 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.

P842 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 **P844**.

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)

P844 Fixed Temperature

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

P847 Temp Cal

This parameter sets the temperature calibration, in degrees centigrade to be used if **P842 (Temperature Source**) =1. **Default = 0°C**

P849 Num Temp Average

This parameter is used to set the averaging process of temperature measurements. **Default = 30 cycles**

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 **20°C**.

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 0°C. 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.

OPTION	DESCRIPTION
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.

Stability

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)**

Filters

P881 Fixed Distance

This parameter determines the width of gate to be used in tracking an echo and under normal circumstances will not require changing, but it can be increased in the cases where the surface is moving extremely fast (more than 10m/min) to ensure smooth processing of the changing level.

P882 Process Filter

The process filter determines how many seconds before the medium is taken of the readings to output as the read value. The options are.

OPTION	DESCRIPTION
1 = Fast	Every reading is output.
2 = Medium 5	The medium readings over 5 seconds
3 = Medium15 (Default)	The medium readings over 15 seconds
4 = Medium30	The medium readings over 30 seconds
5 = Medium60	The medium readings over 60 seconds
6 = Medium90	The medium readings over 90 seconds
7 = Slow	The medium readings over 2 minutes

P884 Peak Percentage

When P102 = 2 (Solids), this parameter can be used to determine the point at which the measurement is taken, within the established gate of the selected echo, to compensate for any error that maybe caused by "angles of repose" presented by the way the material settles. Please consult Pulsar, for further information and assistance on changing the value of this parameter.

System

Important Notice

> Parameters 926, 927 and 928 do not affect how the unit performs, but details contained in them may be required, by Pulsar, when making technical enquiries.

Password

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.

System Information

P926 Software Revision

This parameter will display the current software revision.

P927 Hardware Revision

This parameter will display the current hardware revision. It is read only and cannot be changed.

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, Set P930 to 1.

DATEM

P020 Set DATEM

This parameter allows DATEM to be reset to its default value. To reset DATEM to its default value set parameter value to 1, the trace will then be set to its default value and then update as normal.

P021 Set Dist.

Allows the user or service personnel to determine which echo is to be displayed. On start-up, if the unit displays an incorrect reading, then simply enter the distance from the transducer to the required level and, if an echo is present at this point, the Gate will establish itself around the chosen echo, DATEM will update in front of the Gate and reference out any other unwanted echoes.

It should be noted that DATEM will reset to default values whilst performing this function, and reform itself once it has selected an echo.

Enter distance from **the face of transducer to the target** in units of measurement P104

Values: Min. 0.000, Max. 99.00

P905 Peak Clearance

This parameter is used to set the "**height**" above which the DATEM trace will "stand-off" from around unwanted echoes such as obstructions. Please consult Pulsar for further information and assistance on changing the value of this parameter.

P906 Side Clearance

This parameter is used to set the "**distance**" by which the DATEM trace will "stand-off" from around unwanted echoes such as obstructions. Please consult Pulsar for further information and assistance on changing the value of this parameter.

CHAPTER 6 PROFIBUS PA COMMUNICATION

PA Communication

This chapter describes all of the remote operation of Pulsar dBi Profibus PA transducers. It is a Class A, Profile 3.02 device which fully supports Class 1 master for cyclic and acyclic communications and Class 2 for acyclic services. Full details of Profibus PA protocols and Profile specification can be obtained from PROFIBUS International at www.profibus.com.

GSD File

To configure a Profibus PA master, a GSD file will be needed. The GSD file (Puls0D20.gsd) is available for download from the support page of our web site at https://pulsarmeasurement.com/en/dbi-profibus

Profibus Address

The Profibus device is shipped with address 125 as default. The address can be set via a PA Modem without the Profibus network or via a PLC using Set_Slave_Address services

Bus Termination

Bus termination should be terminated at both ends of the network cable. Refer to PROFIBUS PA User and Installation Guidelines (order number 2.092), available from https://www.profibus.com/

Loop Power

Pulsar dBi Profibus Transducer operates at constant current of 20mA with FISCO model

Cyclic Communication and Condensed Status

When regular input information is required, user needs to set up cyclic communication data. The standard FBOUT (slot 1, index 10) will return 5 bytes of data, a floating point value (4 bytes) and a status (1 byte)

Floating Point			Status	
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5

The first 4 bytes are the floating point (IEEE) presentation of the primary

variable. The last byte is the condensed status byte as defined below:

QUALITY	STATUS	DESCRIPTION
BAD		
	0x00	Bad – non-specific
	0x23	Proxy determines that device does not communicate
	0x24-0x27	Bad – passivated (diagnostic alert inhibited)
	0x28-0x2B	Configured fail safe value is used accompanied by this status. No further diagnostic events are mapped to the Slave_Diag service.
	0x3C-0x3F	Bad – maintenance alarm (diagnostics available)
UNCERTAIN		
	0x4B	Uncertain – substitute set Caused by a PV or simulated value with status BAD-maintenance alarm, more diagnosis available or BAD-function check. Caused by a communication loss or initiate fail safe state. Affect status of output parameter FB_OUT
	0x4F	Uncertain – initial value. Default value as long as no measured value is available or until diagnostic is made that affects the value and its according status
	0x68-0x6B	Uncertain –maintenance demanded Output value is potentially invalid. Short-term maintenance is needed to guarantee the availability

QUALITY	STATUS	DESCRIPTION
UNCERTAIN		
	0x73	Uncertain-simulated value starts Indicates the start of a simulation. Mode changes from AUTO to MAN. This status will remain active for 10 seconds • After enabling the simulation • After setting FB to MAIN mode • After a restart (e.g. Power down cycle) if the simulation is enabled or the FB is in MAN mode • After passivation is cleared if the simulation is enabled or the FB is in MAN mode In MAN mode, the status remains until subsequent write command overwrites the OUT value after the 10 seconds are expires. In the case of simulation mode, the written status is buffered and appears in the OUT value after 10 seconds. However, the new written SIMULATE parameter with its status can be read out before the 10 seconds will expire
	0x74-0x77	Uncertain-simulated value ends (limit apply) Indicates the end of a simulation. Simulation of a measured value is disabled or input FB changes from MAN to AUTO. This status remains for 10 seconds after simulation ends. While this status is active there is no reliable measurement value. Actual measured value and its status are updated afterwards
	0x78-0x7B	Uncertain-process related, no maintenance The device's conditions are out of the specified operating range. The value may have reduced quality or accuracy
GOOD		
	0x80	Good-ok
	0x81-0x8E	Good (limit check applies), update events This status remains active for 20 seconds.

QUALITY	STATUS	DESCRIPTION
GOOD		
	0xA0-0xA3	Good-initial fail safe (limit check applies)
	0xA4-0xA7	Good-maintenance required (limit applies) Value is valid. Maintenance is recommended within a medium-term period
	0xA8-0xAB	Good-maintenance demanded (limit applies) Value is valid. Maintenance is strongly recommended within a short-term period
	0xBC-0xBF	Good-function check (limit applies) Device performs internal function check without influencing the measurement process. Value is valid

Cyclic Diagnostics

Cyclic diagnosis is available via the GET_DIAG message with SAP 50 indication. During DPV0 cyclic data exchange, the device may inform the master when an error occurs. The master then initiates a Diagnosis request. The reply may contain two parts. The first part is normal diagnostics, and the second part is extended diagnostics.

The diagnosis information is specified in Profile 3.02 as followed:

BYTE	BIT	DIAGNOSIS	DESCRIPTION
1	0....7		Reserved
2	0		Reserved
	1		Reserved
	2		Reserved
	3	Warm Start	Set after power on or factory reset.
	4	Cold Start	Set after factory reset.
	5	Maintenance	Maintenance required
	6		Reserved
	7	Ident Violation	Set to 1 if Ident_Number of PB does not match IDENT_SELECTOR. If IDENT_SELECTOR=127 (adaptation mode) then the diagnosis bit is cleared.

BYTE	BIT	DIAGNOSIS	DESCRIPTION
3	0	Maintenance alarm	Failure of device
	1	Maintenance demanded	Maintenance demanded
	2	Function check	Device is in function check mode or in simulation or under local control e.g. maintenance
	3	Invalid process	The process do not return a valid measurement. No maintenance
	4....7		Reserved
4	0....6		Reserved
	7		0: no more information available 1: more diagnosis information is available in DIAGNOSIS_EXTENSION

Acyclic Communication

Pulsar Profibus PA device can support up to two simultaneous connections by a Class 2 Master (C2 connection) and one connection by a Class 1 Master (C1 connection).

For a Class 1 Master to read parameters from the sensor, it needs to address the slot and absolute address of the parameter. Full list of device addresses can be found in Chapter 8 with reference to the block indices.

To get the absolute address for any parameter, add the index offset for the appropriate block to the relative index for that parameter. The parameter takes the slot number of the located block.

Extended Diagnostics

The extended diagnostics of the Pulsar Profibus PA consists of 4 bytes which are triggered by the following conditions:

BYTE 3	BYTE 2	BYTE 1	BYTE 0
Bit 63 …… Bit 32	Bit 31 ...... Bit 16	Bit 15 ...... Bit 8	Bit 7 ...... Bit 0

BYTE	BIT	DIAGNOSIS	SET	RESET
0	0	Loss of returned echo	Echo Loss	Echo found
	1	Transducer fault	Hardware error	Hardware Fix
	2	-		0
	3	Temperature out of range	T<-40 or T>85	T>-40 & T<85
	4	-		0
	5	Failed safe	Failure of 2 mins	Failure fix
	6	-		0
	7	-		0
1	8	-		0
	9	Supply voltage low	Supply too low	Supply fix
	10	-		0
	11	Warm start	After warm start	After 10 secs
	12	Cold start	After cold bott	After 10 secs
	13	Maintenance required		0
	14	-		0
	15	Ident violation	Wring ident	Fix identification
2	0....7		Reserved	0
3	0....7		Reserved	0

CHAPTER 7 PROFIBUS PA MODULE LISTS

Module 1: Measurements (integer)

VARIABLE NAME	DATA TYPE	UNIT
Level	16-bit unsigned integer	mm
Distance	16-bit unsigned integer	mm
Calculated volume	16-bit unsigned integer	m^3
Percentage volume	16-bit unsigned integer	x 0.01 %

Module 2: Measurements (integer)

VARIABLE NAME	DATA TYPE	UNIT
Level	32-bit float	MU (see note 1)
Distance	32-bit float	MU (see note 1)
Calculated volume	32-bit float	VU (see note 2)
Percentage volume	32-bit float	%

Module 3: Measurements (integer)

VARIABLE NAME	DATA TYPE	UNIT
Temperature	8-bit byte	Degree Celsius
Status	8-bit byte	
Echo confidence	8-bit byte	%
Echo strength	8-bit byte	x 10 mV (dB)
Echo HALL	8-bit byte	x 10 mV (dB)
Average noise	8-bit byte	x 10 mV (dB)
Peak noise	8-bit byte	x 10 mV (dB)

Important Notice

1) MU denotes Measurement Unit as programmed in P104

2) VU denotes Volume Unit as programmed in P604

CHAPTER 8 ASYNCHRONOUS DATA MAP

Directory

SLOT	INDEX	VALUE	DESCRIPTION
1	0	0 1 1 6 1 3	Description Header 0-Directiry ID (not use) 1-Revision number 1-Number of entries 6-Directory entries 1-First composite list 3-Number of composite lists
1	1	1,4,0,1 1,5,0,1 1,6,0,1 0,16,0,52 1,110,0,109 1,16,0,88	**List Directory** Index Offset No. of blocks 1 4 1 (1 PB, at index 4) 1 5 1 (1 TB. At index 5) 1 6 1 (1 FB, at index 6) Slot Index No. of parameters 0 16 52 (Physical block) 1 110 109 (Transducer block) 1 16 88 (AIFB block)

Physical Block: PB

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
0	Block Object	r		Reserved	
				Block object	
				Parent Class	
				Class	
				DD Reference	
				DD Revision	
				Profile	
				Profile Revision	
				Execution Time	
				Number of Parameters	
				Index of View 1	
				Number of views	

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
1	Target Mode	r	Y	Reserved	
2	Mode Block	r/w	Y	Block object	
3	Alarm Summary	r/w	Y	Parent Class	
4	SW Revision	r/w	Y	Class	
5	HW Revision	r/w	Y	DD Reference	
6	Manufacturer ID	r		DD Revision	
7	Device ID	r	Y	Profile	
8	Serial Number	r		Profile Revision	
9	Diagnosis	r	Y	Execution Time	
10	Diagnosis Extension	r	Y	Number of Parameters	
11	Diagnosis Mask	r	Y	Index of View 1	
12	Diagnosis Ext Mask	r	Y	Number of views	
13	Device Certification	r		Unsigned Integer (2)	
14	Security Locking	r		ASCII (32)	
15	Factory Reset	r		Unsigned Integer (2)	
16	Descriptor	r		Unsigned Integer (1)	
17	Device Message	r		Unsigned Integer (1)	
18	Installation Date	r/w	Y	Unsigned Integer (3)	
19	PROFIBUS Ident	r/w	Y	ASCII (8)	
20	Reset Counter	r/w	Y	ASCII (16)	
21	Self Check	r/w	Y	ASCII (16)	
22	Target Mode	r/w	Y	Unsigned Integer (2)	
24	Mode Block	r	Y	ASCII (16)	
51	Alarm Summary	r/w	Y	ASCII (16)	92
52	SW Revision	r/w	Y	Unsigned Integer (4)	

Physical Block View Object

IND	NAME	ACC.	STRUCTURE
1	ST Revision	R	Unsigned Integer (2)
6	Mode Block	R	Unsigned Integer (3)
7	Alarm Summary	R	ASCII (8)

Analogue Input Function Block: AIFB

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
0	Block Object	r		Reserved	
				Block object	
				Parent Class	
				Class	
				DD Reference	
				DD Revision	
				Profile	
				Profile Revision	
				Execution Time	
				Number of Parameters	
				Index of View 1	
				Number of views	
1	ST Revision	r	Y	Unsigned Integer (2)	
2	Tag	r/w	Y	ASCII (32)	
3	Strategy	r/w	Y	Unsigned Integer (2)	
4	Alert Key	r/w	Y	Unsigned Integer (1)	
5	Target Mode	r/w	Y	Unsigned Integer (1)	
6	Mode Block	r		Unsigned Integer (3)	
7	Alarm Summary	r	Y	ASCII (8)	
8	Batch Information	r/w	Y	ASCII (10)	
10	OUT	r/w		Float (4)	
				Unsigned Integer (1)	
11	PV Scale	r/w	Y	Float (8)	
13	Linear Type	r/w	Y	Unsigned Integer (1)	

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
14	Channel	r/w	Y	Unsigned Integer (2)	
16	Failsafe Time	r/w	Y	Float (4)	808
17	Failsafe Mode	r/w	Y	Unsigned Integer (1)	809
19	Limit Hysteresis	r/w	Y	Float (4)	
21	Upper Limit Alarm	r/w	Y	Float (4)	
23	Upper Limit Warning	r/w	Y	Float (4)	
25	Lower Limit Warn	r/w	Y	Float (4)	
27	Lower Limit Alarm	r/w	Y	Float (4)	
30	Fail HiHi Alarm	r		BYTE (16)	
31	Fail Hi Alarm	r		BYTE (16)	
32	Fail Lo Alarm	r		BYTE (16)	
33	Fail LoLo Alarm	r		BYTE (16)	
34	Simulate	r/w	Y	BYTE (6)	
45	Enable Code	r/w	Y	Unsigned Integer (1)	921
46	Passcode	r/w	Y	Unsigned Integer (2)	922
47	Vessel Shape	r/w	Y	Unsigned Integer (1)	600
48	Volume Conv 1	r/w	Y	Float (4)	601
49	Volume Conv 2	r/w	Y	Float (4)	602
50	Volume Conv 3	r/w	Y	Float (4)	603
51	Volume Unit	r/w	Y	Unsigned Integer (1)	605
52	Correction Factor	r/w	Y	Float (4)	606
53	Maximum Volume	r/w	Y	Float (4)	607
54	Calculated Volume	r/w	Y	Float (4)	604
55	Reset Breakpoints	r/w	Y	Unsigned Integer (1)	696
56	No of Breakpoints	r	Y	Unsigned Integer (1)	697
57	Level 1	r/w	Y	Float (4)	610
58	Volume 1	r/w	Y	Float (4)	611

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
58	Volume 1	r/w	Y	Float (4)	611
59	Level 2	r/w	Y	Float (4)	612
60	Volume 2	r/w	Y	Float (4)	613
61	Level 3	r/w	Y	Float (4)	614
62	Volume 3	r/w	Y	Float (4)	615
63	Level 4	r/w	Y	Float (4)	616
64	Volume 4	r/w	Y	Float (4)	617
65	Level 5	r/w	Y	Float (4)	618
66	Volume 5	r/w	Y	Float (4)	619
67	Level 6	r/w	Y	Float (4)	620
68	Volume 6	r/w	Y	Float (4)	621
69	Level 7	r/w	Y	Float (4)	622
70	Volume 7	r/w	Y	Float (4)	623
71	Level 8	r/w	Y	Float (4)	624
72	Volume 8	r/w	Y	Float (4)	625
73	Level 9	r/w	Y	Float (4)	626
74	Volume 9	r/w	Y	Float (4)	627
75	Level 10	r/w	Y	Float (4)	628
76	Volume 10	r/w	Y	Float (4)	629
77	Level 11	r/w	Y	Float (4)	630
78	Volume 11	r/w	Y	Float (4)	631
79	Level 12	r/w	Y	Float (4)	632
80	Volume 12	r/w	Y	Float (4)	633
81	Level 13	r/w	Y	Float (4)	634
82	Volume 13	r/w	Y	Float (4)	635
83	Level 14	r/w	Y	Float (4)	636
84	Volume 14	r/w	Y	Float (4)	637
85	Level 15	r/w	Y	Float (4)	638
86	Volume 15	r/w	Y	Float (4)	639

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
87	Level 16	r/w	Y	Float (4)	640
88	Volume 16	r/w	Y	Float (4)	641

Function Block View Project

IND	NAME	ACC.	STRUCTURE
1	ST Revision	r	Unsigned Integer (2)
6	Mode Block	r	Unsigned Integer (3)
7	Alarm Summary	r	ASCII (8)
8	Batch	r/w	ASCII (10)

Transducer Block: TB

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
0	Block Object	r		Reserved	
				Block object	
				Parent Class	
				Class	
				DD Reference	
				DD Revision	
				Profile	
				Profile Revision	
				Execution Time	
				Number of Parameters	
				Index of View 1	
				Number of views	
1	ST Revision	r	Y	Unsigned Integer (2)	
2	Tag	r/w	Y	ASCII (32)	
3	Strategy	r/w	Y	Unsigned Integer (2)	
4	Alert Key	r/w	Y	Unsigned Integer (1)	
5	Target Mode	r/w	Y	Unsigned Integer (1)	
6	Mode Block	r		Unsigned Integer (3)	
7	Alarm Summary	r	Y	ASCII (8)	

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
9	PV Unit	r/w			
10	SV Value (Volume)	r			
11	SV Unit				
12	Distance	r			
13	Measurement Unit	r/w	Y	Unsigned Integer (2)	104
18	Measurement Offset	r/w	Y	Float (4)	851
32	Temperature	r		Float (4)	
34	Max Temperature	r/w		Float (4)	
35	Min Temperature	r/w		Float (4)	
36	Temperature Source	r/w	Y	Unsigned Integer (1)	852
37	Fixed Temperature	r/w	Y	Float (4)	854
53	Echo Confidence	r		Unsigned Integer (1)	
54	Echo Strength	r		Unsigned Integer (2)	
55	Echo HALL	r		Unsigned Integer (2)	
56	Average Noise	r		Unsigned Integer (2)	
57	Peak Noise	r		Unsigned Integer (2)	
58	Transducer Status	r		Unsigned Integer (1)	
60	Set DATEM	r/w	Y	Unsigned Integer (1)	20
61	Select Peak	r/w	Y	Float (4)	21
62	Update DATEM	r/w	Y	Unsigned Integer (1)	71
63	Break Point	r/w	Y	Float (4)	43
64	Slope	r/w	Y	Unsigned Integer (1)	44
65	Outside Count	r/w	Y	Unsigned Integer (2)	47
66	Scale First	r/w	Y	Unsigned Integer (1)	49
67	Echo Source	r/w	Y	Unsigned Integer (1)	67
68	Ring Down Loss	r/w	Y	Unsigned Integer (1)	41
69	Near Loss	r/w	Y	Unsigned Integer (1)	81
70	Far Loss	r/w	Y	Unsigned Integer (1)	82

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
71	Loss Change	r/w	Y	Float (4)	83
72	Mid Loss	r/w	Y	Unsigned Integer (1)	84
73	Transducer Type	r/w	Y	Unsigned Integer (1)	101
74	Empty Level	r/w	Y	Float (4)	105
75	Span	r/w	Y	Float (4)	106
76	Near Blanking	r/w	Y	Float (4)	107
77	Far Blanking	r/w	Y	Unsigned Integer (2)	108
78	Start Point	r/w	Y	Float (4)	109
79	Middle Point	r/w	Y	Unsigned Integer (1)	110
80	End Point	r/w	Y	Float (4)	111
81	Sound Velocity	r/w	Y	Float (4)	860
82	Fill Damping	r/w	Y	Float (4)	870
83	Empty Damping	r/w	Y	Float (4)	871
84	Fixed Distance	r/w	Y	Float (4)	881
85	Process Filter	r/w	Y	Unsigned Integer (1)	882
86	Sensitivity	r/w	Y	Unsigned Integer (1)	905
87	Side Clearance	r/w	Y	Float (4)	906
88	Echo Info	r		Unsigned Integer (125)	
89	Echo Raw 1	r		Unsigned Integer (125)	
90	Echo Raw 2	r		Unsigned Integer (125)	
91	Echo Raw 3	r		Unsigned Integer (125)	
92	Echo Raw 4	r		Unsigned Integer (125)	
93	Echo Normalised 1	r		Unsigned Integer (125)	
94	Echo Normalised 2	r		Unsigned Integer (125)	
95	Echo Normalised 3	r		Unsigned Integer (125)	
96	Echo Normalised 4	r		Unsigned Integer (125)	
97	Echo Datem 1	r		Unsigned Integer (125)	
98	Echo Datem 2	r		Unsigned Integer (125)	
99	Echo Datem 3	r		Unsigned Integer (125)	

IND	NAME	ACC.	SETUP	STRUCTURE	PAR
100	Echo Datem 4	r		Unsigned Integer (125)	
101	Echo Loss 1	r		Unsigned Integer (125)	
102	Echo Loss 2	r		Unsigned Integer (125)	
103	Echo Loss 3	r		Unsigned Integer (125)	
104	Echo Loss 4	r		Unsigned Integer (125)	
105	Material Type	r/w	Y	Unsigned Integer (1)	102
106	Temperature Cal	r/w	Y	Unsigned Integer (1)	857
107	Num Temp Average	r/w	Y	Unsigned Integer (2)	859
108	Peak Percent	r/w	Y	Unsigned Integer (1)	884
109	Measurement Unit	r/w	Y	Unsigned Integer (1)	104
100	Echo Datem 4	r		Unsigned Integer (125)	
101	Echo Loss 1	r		Unsigned Integer (125)	
102	Echo Loss 2	r		Unsigned Integer (125)	
103	Echo Loss 3	r		Unsigned Integer (125)	
104	Echo Loss 4	r		Unsigned Integer (125)	
105	Material Type	r/w	Y	Unsigned Integer (1)	102

Transducer Block View Object

IND	NAME	ACC.	STRUCTURE
1	ST Revision	R	Unsigned Integer (2)
6	Mode Block	R	Unsigned Integer (3)
7	Alarm Summary	R	ASCII (8)

CHAPTER 8 TROUBLESHOOTING

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

POSSIBLE CAUSES	ACTION
Transducer not firing.	Check power supply
Unit indicates a "L0E" situation.	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 obtained for current level.	Measure actual distance from transducer face to surface of material. Access **P21**, via PAPC Software type in the **measured distance**, and **Set Parameter.**
Material level is consistently incorrect by the same amount.	Check empty level (P105) correctly entered.

Important Notice

For any other troubleshooting assistance, please consult your local Pulsar distributor.

CHAPTER 9 DISPOSAL

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.

www.pulsarmeasurement.com

SUPPORT@PULSARMEASUREMENT.COM