Level and Flow Measurement

pulsar®

PROCESS MEASUREMENT

Welcome:

Pulsar ® Process Measurement has, since 1997, led the way in non-contacting ultrasonic level and flow measurement technology.

As a pioneer of digital echo processing through patented DATEM software, and an innovative manufacturer of the new generation of ultrasonic devices, Pulsar has taken the measurement technique into new areas, new applications where non-contacting measurement could not previously have been contemplated. In doing so, Pulsar has developed a superb product range which allows engineers to select exactly the instrument to meet their needs, whether that is for sophisticated monitoring and control of a sump or lift station with several pumps; high accuracy, high stability open channel flow measurement including Class 1 MCERTS approval; remote contents monitoring of a multitude of sites with SMS messaging protocol; distributed control of a process plant or just for simple alarms on a single tank.

Reliable, well engineered point level measurement instruments, process protection devices and the exceptional Sludge Finder 2 interface monitor complete the range, along with software and accessories to help you get the best from the equipment.

We pride ourselves on our attention to detail and customer service. From your first contact with our office through to final set up of your equipment, Pulsar's staff are dedicated to the success of your project, offering advice, consultation and support to ensure that you get the best possible results.

Pulsar's development was recognised with the award of the prestigious Queen's Award for Enterprise: Export Achievement 2009. You can buy Pulsar equipment anywhere in the world secure in the knowledge that it is supported by probably the best distributor network in the industry.

MALVERN HQ

U.S.A. HQ

Institute of Water's National Innovation Award

Pulsar's engineers won this prestigious Institute of Water Product Award in 2014 for their unique Flow Pulse flow monitoring sensor - recognising the hard work of the R&D engineers developing real solutions to real-world problems

Queens Award

The Queen's Awards for Enterprise have been described as 'the knighthoods of business'. Pulsar were honoured in 2009 in the 'Export Achievement' category, recognising the way that Pulsar have always seen global business as central to their development, building partnerships with customers and distributors throughout the world.

Contents:

Winner
Chamber Business Awards 09
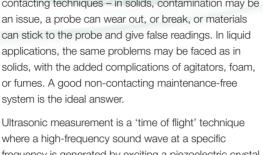International Business of the Year 2009
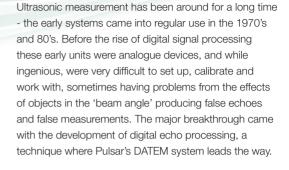
Continuous Level Measurement:

There are many good reasons for monitoring and controlling level and flow of materials, from simple stock control through to sophisticated control of critical process levels and measurement of flows for environmental monitoring.

Just as there are many good reasons for measuring materials, there are good reasons for using non-contacting techniques – in solids, contamination may be an issue, a probe can wear out, or break, or materials can stick to the probe and give false readings. In liquid applications, the same problems may be faced as in solids, with the added complications of agitators, foam, or fumes. A good non-contacting maintenance-free system is the ideal answer.

Ultrasonic measurement is a 'time of flight' technique where a high-frequency sound wave at a specific frequency is generated by exciting a piezoelectric crystal, usually positioned above the material level to be measured. This sound wave is reflected from the target material and re-excites the crystal, providing a signal that is analysed by a "transceiver". Knowing the speed of sound, the time delay between excitation and re-excitation is translated into a distance. Often, this basic data is displayed as something more meaningful to the user, for example a measurement of level or volume based on the overall dimensions and shape of the vessel.
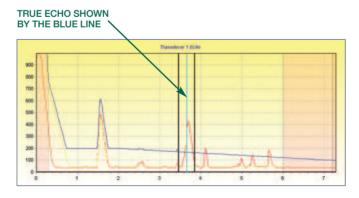
Ultrasonic measurement has been around for a long time - the early systems came into regular use in the 1970's and 80's. Before the rise of digital signal processing these early units were analogue devices, and while ingenious, were very difficult to set up, calibrate and work with, sometimes having problems from the effects of objects in the 'beam angle' producing false echoes and false measurements. The major breakthrough came with the development of digital echo processing, a technique where Pulsar's DATEM system leads the way.

DATEM – Digital Adaptive Tracking of Echo Movement

Pulsar Process Measurement's DATEM system identifies the correct echo using a range of parameters, then tracks it, so no matter what competing echoes there are in the vessel, the correct echo is followed throughout. The system will even follow material level through grids or gratings, something that would have been unthinkable using the older analogue systems, or even the earlier digital algorithms, which still relied on the size of the echo or whether it was "first". The 'beam angle', so important to early systems, is now almost irrelevant despite echoes from significant obstructions.

IMERYS

WITH DATEM, EVEN MEASUREMENTS THROUGH IRON GRIDS LIKE THIS ARE POSSIBLE

TRUE ECHO SHOWN BY THE BLUE LINE

ECHO TRACE

USING Pulsar SOFTWARE, IT IS POSSIBLE TO SEE HOW THE SYSTEM 'ZEROES IN' ON THE TRUE ECHO FOR ULTRA-RELIABLE PERFORMANCE.

pulsar
Transducers

Standard Range

A range of compact high acoustic output, non contacting transducers designed for liquids or solids level measurement use. All have ATEX EEx m as standard for use in zone 1 flammable atmospheres.

Threaded Range
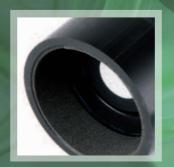
These incorporate the performance features of the standard products, but additionally offer a front thread mount option to suit threaded nozzles or flanged tank entries.

Accessories

Various transducer options can be provided to suit specific applications, such as submergence shields, foam faced transducers, sanitary flanges, blind flanges and a choice of transducer mounting brackets.

Features

- Encapsulated ATEX EEx m II T6 for zones 1 and 2 as standard
- On NPT threaded versions, FM/FMC Class I, Div 1, Group A, B, C and D. Class II, Div 1, Group E, F and G. Class III.
- I.S. ATEX EEx ia IIC T6 for zone 0 (option)
- Integral temperature compensation
- Narrow beam angles
- Robust IP 68/NEMA 6P
- PZT ceramic transducer element
- Standard 2 or 3 core screened cable extensions to 1000m
- High acoustic power output
- Patented

Pulsar's main dB series of non contact ultrasonic transducers offer compact, robust measurement and an innovative approach to transducer design.

Previously, users had a choice between high-voltage, frequency dependent transducers that were susceptible to electrical noise and needed special, protected interconnecting cables, and weak, low-power transducers that had good hazardous area performance but performed poorly in any but the simplest application.

The dB range has changed all that, creating a compact, low power transducer design that can be I.S. certified and uses standard interconnecting cables, yet produces extremely high acoustic power to give exceptional results in a wide variety of challenging situations.

(all beam angles defined as 3dB or half power inclusive)

Team a dB transducer with any of Pulsar's Ultra, FlowCERT, Zenith, Quantum or Blackbox control units to create the perfect solution for your application. All transducers have flammable atmosphere approval as standard.

Standard transducer bodies are made from Valox 357 PBT with a special foam radiating face. Some are available with both body and sealed front face in PVDF for corrosive applications.

dB3 – short range solids and liquids measurement
Range – 125mm – 3m (0.41ft-10ft), 125kHz, 19mm (0.75in) diameter radiating face, <10º beam angle. All dB3 versions are fitted with a shallow drip shield.

dBMACH3 – short range for accurate open channel flow measurement
Range – 0 - 2.425m (0-7.95ft), 125kHz fitted with cone and sun shield (see p8)

dB6 – short range solids and liquids measurement
Range – 300mm – 6m (0.98ft-20ft), 75kHz, 30mm (1.18in) diameter radiating face, <10º beam angle.

dBS6 – short deadband version, solids and liquids measurement
Range 200mm – 6m (0.66ft-20ft), at 50kHz, 45mm (1.78in) radiating face, <10º beam angle.

dB10 – solids, powders and liquids measurement
Range – 300mm – 10m (0.98ft-33ft), 50kHz, 45mm (1.78in) diameter radiating face, <10º beam angle.

dB15 – narrow beam transducer for solids, powders and liquids
Range – 500mm – 15m (1.64ft-50ft), 41kHz, 60mm (2.36in) diameter radiating face, <8º beam angle.

dB25 – narrow beam, mid-range transducer for solids, powders and liquids
Range – 600mm – 25m (1.97ft-82ft), 30kHz, 78mm (3.07in) diameter radiating face, <6º beam angle.

dB40 – narrow beam, long range transducer for solids, powders and liquids
Range – 1.2 – 40m (3.94ft-130ft), 20kHz, 160mm (6.30in) diameter radiating face, <5º beam angle.

dB50* – narrow beam, long range transducer for solids, powders and liquids
Range – 2m - 50m (6.56ft-164ft), 20kHz, 160mm (6.30in) diameter radiating face, <5º beam angle.

ALL BEAM ANGLES ARE INCLUSIVE, BUT GIVE AN EFFECTIVE BEAM ANGLE OF <3 DEGREES ON OUR CONTROLLERS. RANGE ON POWDERS AND SOLIDS DEPENDS ON APPLICATION.
* dB50 - not ATEX (flammable atmosphere) approved, and works with modified Ultra 3 and Ultra 5 controllers only

Transducers:
Flanged Transducers

Flanged transducers

Flange options are available for dB3, dB6, dB10 and dB15 transducers, ANSI or DIN specification, all featuring full PTFE coating on the process wetted side. Various flange sizes are available. Maximum vessel pressure on flanges is 0.5bar (7psi). See technical specifications for more details. These incorporate the performance features of the standard products, but additionally offer a front thread mount option to suit threaded nozzles or flanged tank entries.

These integral flange options are available with the standard family of transducers, up to the dB15 size.

Features

- **Full PTFE face on flange**
- **ATEX and optional FM/FMC flammable atmosphere units**
- **I.S. Intrinsically Safe versions available**
- **Rugged construction and IP68**

UNDERSIDE OF THE FLANGED TRANSDUCER

FLANGED TRANSDUCERS SHOWN ON TANKS

Transducer Options:

Foam Face

A foam faced option is available for all the standard range transducers to provide more acoustic power output in dry, dusty environments. This higher acoustic power output increases return echo strength in these dry applications. Not available on dB3 versions.

Submergence Shield

A shield can be fitted to keep the transducer face clean and dry in applications at risk of submergence. In case of submergence the controller can be asked to fail high, low or hold the last reading. When the level drops back below the shield it allows the controller to resume operation with a clean transducer face. The shield can be fitted to the dB3, dB6, dB10 and dB15 dB25 standard transducers. Note: All dB3 transducers are fitted with a shallow drip shield.

dBMACH3 – high accuracy open channel flow transducer

Featuring unique sun and submergence shields, the dBMACH3 transducer is designed specifically for open channel flow applications. dBMACH3 is the first ultrasonic transducer with zero effective blanking distance beyond the nose cone, allowing it to be sited as little as a few mm from the high flow level. One of the critical factors affecting ultrasonic accuracy is the measurement distance, so by minimising this distance, accuracy is maximised. Operating at 125kHz frequency the transducer provides high resolution and accuracy. Essential in open channel flow applications. The dBMACH3 is used with Ultra 3 or 5 and TWIN when in open channel flow mode, or can be paired with FlowCERT all of which provide a typical accuracy of ±1mm. Range: 0 - 2.425m. Operating temperature -30ºC to +90ºC (-22ºF to +194ºF)

Sanitary Flanged Transducers

For standard transducer from dB3 to dB10 an option of a sanitary flange construction exists. The flange has a full face PTFE (dB3) or PVDF seal for use in hygienic applications. The flange is available in 2" or 3" (on dB3) and 3" on the dB6 and dB10 units. These flanges allow Tri-Clamp fittings to be used onto tanks or vessels.

Transducers:
Threaded Range

dB3, dB6 and dB10 transducers are available with threaded noses for easy mounting. dB3 and dB6 models feature 1.5 inch universal thread while dB10 has a 2" universal thread. Standard transducer bodies are made from Valox 357 PBT with a special foam radiating face. All are available in optional PVDF version for corrosive applications. All performance parameters of the transducers remain unchanged.

dB3 – solids, powders and liquids measurement to 3m (10ft)
Range 0.125 - 3m (0.49ft-10ft), 125kHz operating frequency, <10º beam angle (-3dB inclusive).

dB6 – solids, powders and liquids measurement to 6m (20ft)
Range 0.3 - 6m (0.98ft-20ft), (0.2m deadband option available at 50kHz) 75kHz, <10º beam angle.

dB10 – solids, powders and liquids measurement to 10m (33ft)
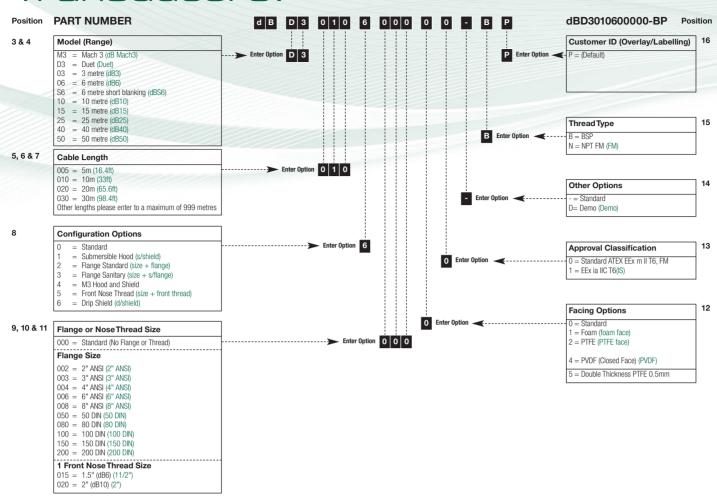Range 0.3 - 10m (0.98ft-33ft), 50kHz <10º beam angle.

All
Operating temperatures dB3/dBMACH3: -30ºC to +90ºC (-22ºF to +194ºF), and for all others: -40ºC to +90ºC (-40ºF to +194ºF) (Hazardous area versions +75ºC (+167ºF) max.)
ATEX (Ex II 2GD EEx m II T6 Tamb=-40ºC to +75ºC) as standard, ATEX (Ex II 1GD EEx ia IIC T6 Tamb=+40ºC to +75ºC) I.S. intrinsically safe optional, all are IP68.

FM approved Ex-proof FM/FMC, Class I, Div. 1, Grp. A, B, C, D; Class II, Div. 1, Grp. E, F, G Optional Intrinsically Safe ATEX EEx ia IIC T6.

Features
- Universal 1.5" or 2" BSP/NPT nose thread
- ATEX and optional FM/FMC flammable atmosphere units
- PVDF version option for corrosive applications
- I.S. approval versions available
- Rugged IP 68

STANDARD
TRANSDUCER FACE

PVDF BUILD OPTION

ALL BEAM ANGLES ARE INCLUSIVE, BUT GIVE AN EFFECTIVE BEAM ANGLE OF <3 DEGREES ON OUR CONTROLLERS. RANGE ON POWDERS AND SOLIDS DEPENDS ON APPLICATION.

Transducers:

Position	PART NUMBER															Position
		d	B	D3	0 1 0	6	0 0 0	0	0	-	B	P		dBD3010600000-BP	

3 & 4

Model (Range)

M3	=	Mach 3 (dB Mach3)
D3	=	Duet (Duet)
03	=	3 metre (dB3)
06	=	6 metre (dB6)
S6	=	6 metre short blanking (dBS6)
10	=	10 metre (dB10)
15	=	15 metre (dB15)
25	=	25 metre (dB25)
40	=	40 metre (dB40)
50	=	50 metre (dB50)

Enter Option **D3**

5, 6 & 7

Cable Length

005	=	5m (16.4ft)
010	=	10m (33ft)
020	=	20m (65.6ft)
030	=	30m (98.4ft)

Other lengths please enter to a maximum of 999 metres

Enter Option **010**

8

Configuration Options

0	=	Standard
1	=	Submersible Hood (s/shield)
2	=	Flange Standard (size + flange)
3	=	Flange Sanitary (size + s/flange)
4	=	M3 Hood and Shield
5	=	Front Nose Thread (size + front thread)
6	=	Drip Shield (d/shield)

Enter Option **6**

9, 10 & 11

Flange or Nose Thread Size

000	=	Standard (No Flange or Thread)

Flange Size

002	=	2" ANSI (2" ANSI)
003	=	3" ANSI (3" ANSI)
004	=	4" ANSI (4" ANSI)
006	=	6" ANSI (6" ANSI)
008	=	8" ANSI (8" ANSI)
050	=	50 DIN (50 DIN)
080	=	80 DIN (80 DIN)
100	=	100 DIN (100 DIN)
150	=	150 DIN (150 DIN)
200	=	200 DIN (200 DIN)

1 Front Nose Thread Size

015	=	1.5" (dB6) (1 1/2")
020	=	2" (dB10) (2")

Enter Option **000**

Customer ID (Overlay/Labelling) — 16

P = (Default)

Enter Option **P**

Thread Type — 15

B = BSP
N = NPT FM (FM)

Enter Option **B**

Other Options — 14

- = Standard
D = Demo (Demo)

Enter Option **-**

Approval Classification — 13

0 = Standard ATEX EEx m II T6, FM
1 = EEx ia IIC T6 (IS)

Enter Option **0**

Facing Options — 12

0 =	Standard
1 =	Foam (foam face)
2 =	PTFE (PTFE face)
4 =	PVDF (Closed Face) (PVDF)
5 =	Double Thickness PTFE 0.5mm

Enter Option **0**

Technical Specification: **PULSAR** dB Transducers

DATA APPLICABLE TO ALL TRANSDUCERS

Operating temperature range:	dB3/dBMACH3: -30°C to +90°C (-22°F to +194°F) and for all others: -40°C to +90°C (-40°F to +194°F) (Hazardous area versions +75°C (+167°F) max.)
Hazardous area approval:	Standard ATEX EEx m II T6 or optional EEx ia IIC T6 (FM/FMC approved available). NB: Not dB50
Ingress protection (IP) rating:	IP68 to BS EN 60068-2-17 : 1995 and BS EN 60529 (Nema 6P available)
Integral cable length:	Standard 5, 10, 20 or 30 metres
CE Approvals:	EMC tested to BS EN 50081-1 : 1992 for emissions and BS EN 50082-2 : 1995 for immunity Electrical safety tested to BS EN 61010-1 : 1993
Bump, shock and vibration:	To BS EN 60068-2-29, BS EN 60068-2-27 and BS EN 60068-2-6

HOUSING DETAILS

	Housing material	Housing diameter mm/inch	Housing height mm/inch	Mounting connection
dB3:	Valox 357 *PBT	78mm / 3.07"	115mm / 4.52"	BSP or 1" NPT
dB6†:	Valox 357 *PBT	86mm / 3.39"	106mm / 4.17"	BSP or 1" NPT
dB10†:	Valox 357 *PBT	86mm / 3.39"	106mm / 4.17"	BSP or 1" NPT
dB15:	Valox 357 *PBT	86mm / 3.39"	122mm / 4.8"	BSP or 1" NPT
dB25:	Valox 357 *PBT	105mm / 4.13"	142mm / 5.59"	BSP or 1" NPT
dB40 & dB50:	Valox 357 *PBT	205mm / 8.07"	223mm / 8.77"	BSP or 1" NPT

OPTIONAL FLANGES - All have PTFE full face on process side

Flanges:	ANSI	2"	3"	4"	6"	8"	DIN	50	80	100	150	200	Sanitary	2"	3"
dB6:		✔	✔	✔	✔	✔		✔	✔	✔	✔	✔			✔
dB10:		✔	✔	✔	✔	✔		✔	✔	✔	✔	✔			✔
dB15:			✔	✔	✔	✔			✔	✔	✔	✔			

OPTIONS

Facings:	Closed cell soft foam for increased power in dry dusty environments PTFE standard on all flanged transducers for chemical compatibility
Submergence shield:	For continuous operation in applications at risk of submergence
Beam aiming kit:	Recommended for easy transducer aiming in solids applications (drawing available on request)

† Available in optional PVDF body material (Polyvinylidine fluoride)   *PBT - Polybutylene terephthalate

Accessories:

Various transducer mount options can be provided to suit specific applications, such as blind flanges and a choice of transducer mounting brackets.

Cable Options

Transducer cable lengths are supplied as a standard in 5m, 10m, 20m or 30m. Longer lengths can be supplied as required in 10m steps. It is important to note that the supplied transducer cable may be extended by using standard 2 or 3 core screened cable for up to 1000m or beyond if needed. No separation is required between transducer and other cables as they are not susceptible to cross talk and significant costs can be saved on site.

Aiming Kit

Pulsar's robust and effective aiming kit allows the transducer to be aimed towards the material draw off point at the bottom of the silo or tank, ensuring that the returning echo is as strong as possible and that the ultrasonic system is able to measure right down to the true empty point of the silo. The location of the aiming kit should be as far away from the fill point as possible to avoid seeing falling material. It should be aimed to coincide with the material's angle of repose, ensuring a more powerful signal return to the transducer. The rotational ball mechanism allows up to 20 degrees off vertical and 360 degrees of rotation.
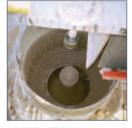
WE RECOMMEND THE INSTALLATION OF AN AIMING KIT WHEN MEASURING SOLIDS MATERIAL.

Features

- Allows rotation to suit silo conditions
- Coincide with angle of repose of material being measured
- Follow material level down to draw off point
- Easy aim and lock system

AIMING KIT ON A CRUSHER APPLICATION

Blind Flanges

A range of blind PVC flanges with central 1" BSP or NPT hole is available. These are for mounting transducers within a standpipe or tank using rear thread or dB3 front thread mounting. These available in 2", 3", 4" and 6" ANSI or DIN 80, DIN 100, DIN 150 and DIN 200 patterns.

Features

- Selection of DIN or ANSI patterns
- Excellent corrosion resistance
- Choice of 1", 1.5" and 2" Universal centre thread

1/5" OR 2" UNIVERSAL CENTRE THREAD FLANGES AVAILABLE

Brackets:

Angled Bracket

Pulsar Fixed Angle Transducer Bracket

Fixed angle bracket made from steel with a BZP (bright zinc passivate) coat. Ideal for mounting against a wall where there is an under-hang under a manhole or similar. 2 x 14mm holes allow rigid fixing into a vertical surface using suitable bolts.
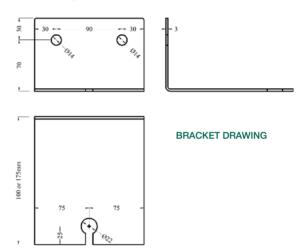
65mm (2.56in) reach p/n dBA0004
Bracket size is 100L x 100W x 150Hmm (3.9L x 3.9W x 5.9Hin).

150mm (5.9in) reach p/n dBA0005
Bracket size is 175L x 100W x 150Hmm (6.9L x 3.9W x 5.9Hin).

BRACKET DRAWING

Pulsar Fixed Angle Bracket for IMP and Transducers p/n 080A0008

Designed to allow fastening to a vertical wall or hatch where clear access to the target is available. Made of 'Hot Dipped Galvanised' steel with 2 x 14mm holes for wall fixing and a 22mm hole and slot for a transducer adaptor to mount through. It has both a 61mm dia hole and a 49mm dia hole to mount the IMP3 or IMP6. Bracket size is 340L x 150W x 100Hmm.

Pulsar Fixed Angle Bracket for Temperature Compensation Probe and dB/dBi Transducer p/n dBA0006

Designed to allow fastening to a vertical wall or hatch where clear access to the target is available. The bracket is made from 'Hot Dipped Galvanised' steel with 4x12mm holes for wall fixing, a 22mm hole and slot for the transducer adaptor and a 40mm hole to mount a remote temperature sensor and sunshield. Bracket size is width 200mm (7.9in) x height 102mm (4in) x length 250mm (9.8in).

Brackets:
Pulsar Hinged Transducer Bracket p/n dBA0003

Pulsar's hinged transducer bracket is an easy-mounting solution for any of the dB series transducers, providing a stable method of positioning a transducer above an application. The bracket is made from hot dipped galvanised steel and is hinged to allow the transducer to be swivelled up for cleaning or to allow access. The transducer can then be returned to the original position with no need to recalibrate.

The dB series transducer is mounted to one of the 22mm holes in the bracket using the 1" to 20mm adaptor provided. If one of the inner holes is used and the excess bracketry removed, the retaining thro-nut with the steel pull cable attached easily slides to a new position. The bracket is supplied with the plastic channel seal.

Features
- Rugged construction
- Galvanised or BZP coated
- Hinge allows easy lift cleaning
- Drain holes in channel prevent liquid build up
- Simple to fit on site

Bracket size:

Length: 716mm (2.35ft)
Mountings at:
223mm (0.73ft)
448mm (1.47ft)
663mm (2.18ft)
from wall

STEEL CABLE WITH KARABINER AND NON-SLIP CONNECTORS

HINGED BRACKET OVER A WET WELL

BRACKET DRAWING

PLATE 45 x 133mm
HOLES 14mmØ 90mm CENTRES

40 x 40 UNISTRUT

LIFTING CABLE

PLASTIC COVER

3 off 22mmØ HOLES TO MOUNT TRANSDUCER

110.5
233
448
663
716

UNDERSIDE VIEW

DATEM Software:

Ultrasonic level measurement and DATEM digital echo processing Digital Adaptive Tracking of Echo Movement

Features

- Superb echo discrimination

- Most accurate ultrasonic level measurement system in the world

- Easy application set-up

- Locks onto the true echo, ignores interference from other signals

- Trouble free operation

As a technique, ultrasonic level measurement has been around for decades, working on the 'time of flight' principle that if you know the speed of sound, then the time that a sound pulse takes to travel from a transducer and back again may be used to calculate the distance that pulse has travelled. Divide by two and you have the distance to the 'target'.

Early analogue instruments, while they were fine for simple applications, were easily 'confused', they had to be carefully set up and the path to the target had to be clear and unobstructed, because the success of the measurement depended on the true echo returning from the target being 'louder' than any competing echo. As time went on, more sophisticated digital echo processing allowed for more discrimination of echoes, but still depended on blocking out competing echo traces and using software to identify the true echo from among the competing traces.

Pulsar is a pioneer in ultrasonic level echo processing technology. As microprocessors have improved, Pulsar has continued to develop and improve echo processing software, so that it is now possible to make successful measurements in situations that would have been far beyond the units of even a decade ago. Pulsar's echo discrimination system, DATEM, works on the basis that it first identifies the true, moving echo from the background noise, then follows it, ignoring all of the competing echoes as it does, so DATEM allows Pulsar equipment to work in a cluttered sewage wet well, or in a noisy stone silo, an agitated tank or even through a grid. DATEM also looks for echoes within a very small frequency range, which helps to make it especially good at ignoring both acoustic and electrical noise. The high power of Pulsar's dB series transducers makes sure that all the echoes from an application can be easily monitored. The end result is highly reliable level measurement in applications which previously could not be considered.

19m STORM TANK WITH WET WELL AT BASE

BLOCKED CHUTE DETECTION OVER 1.2m

WET WELL 6m WITH LADDER AND FLOAT

WET WELL 4.5m WITH LADDER AND FAT RING

pulsar
Ultra Range

Ultra 3

Ultra sophistication in a smart package, Ultra 3 combines reliable non-contacting ultrasonic level and volume measurement, high specification pump control and open channel flow measurement to international standards. Three control or alarm relays, optional data logging, Pulsar's world-leading DATEM echo processing software and a choice of wall, fascia, panel or 19" rack mounting.

Ultra 5

Ultra 5 continues where Ultra 3 leaves off, maintaining the same reliability, flexibility and menu-driven programming simplicity, with two extra relays, extra features for advanced pump control, differential level and open channel flow, plus the option of RS485 digital communication and 4–20 mA input.

UltraTWIN

Two independent ultrasonic systems in one unit. Each channel is user-configurable to operate in any combination of: a full function open channel flow monitor calculating flow rate to BS ISO standards, a pump control system or as a level and volume monitoring unit for liquids or solids, calculating volumes and providing alarms. UltraTWIN features six relays configurable for either channel as well as four digital inputs and 2 x 4-20mA outputs.

Ultra Range:
Ultra 3

Ultra 3 combines several full-function, world-beating ultrasonic level measurement instruments into one. Pulsar engineers have created devices that can be simply configured by the user to provide top-drawer performance . Through the use of ULTRA WIZARD, an integrated high level software configuration tool, you choose your application and the Ultra unit leads you through the set-up process for that specific operation. Full control functions are available: open channel flow is calculated to BS ISO 1438 and 4359. Pump control features are built into Ultra 3, and an extensive set of volume calculations and linearisation facilities are available for a tank or silo level measurement task.

Ultra 3 benefits from DATEM, the world's most advanced echo processing software, for reliable level measurement.

Level

Perfect for the wide range of level measurement applications in solids and liquids found in the food, pharmaceutical, chemical, power generation and many more industries. In level measurement configuration, Ultra 3 has three control relays and a measurement range from 125mm to 40m.
Note: A 'modified' Ultra 3 controller will power the dB50 which is available as an option.

Volume

Ultra 3 features pre-programmed tank shape conversion for a wide variety of standard tank shapes including: cylindrical, rectangular, cone base, pyramid base, sloped base, horizontal including parabolic ended tanks and spherical. Unusual shapes are also accommodated through the 32 point linearisation function.

Display:

- 8 digit on-board totaliser
- 6 digit display of flowrate or head
- Bar indicator displaying head or flow

Pump control

Pulsar pump control units are used throughout the global water and waste industries. Ultra 3 gives you sophisticated pump control on changing level or rate of level change to provide:

- **Power on delay,** allows to delay switching on pumps when power resumes.
- **Pump start delay,** allows delay switching on pumps after another has started.
- **Fixed duty assist**
- **Fixed duty back up**
- **Alternate duty assist**
- **Alternate duty back up**
- **Duty back up and assist**
- **Service ratio duty assist**
- **Service ratio duty back up**
- **FOFO (alternate first on first off duty assist)**

Open Channel Flow

Ultra 3 in open channel flow mode provides non-contacting, maintenance free flow measurement and control in a wide range of flumes and weirs by calculating flow from the measured head preceding a primary element. Flow calculation to BS ISO 1438 and 4359. Three control relays for control choices.

A data logging board is an optional extra with RS485 connection and large data log capability together with Profibus DP V0 and V1 or Modbus communications.

PANEL MOUNT OPTION

19" RACK MOUNT OPTION

Panel and 19" rack mount versions are calibrated by means of an Infra-Red communicator or via Ultra PC software. One communicator can calibrate any number of controllers.

WALL MOUNT ULTRA 3 and 5

Ultra Range:
Ultra 5

Ultra 5 offers the ultimate flexibility in ultrasonic control and measurement. Like Ultra 3, Ultra 5 is user-configurable to measure level or volume, provide advanced pump control or measure open channel flow to BS ISO 1438 and 4359. Over and above the facilities offered by Ultra 3, Ultra 5 gives you the ultimate flexibility of: five assignable relays with extra alarm options such as pump efficiency; extra pump control functions including pump run-on and pump exercising; storm and aeration control; differential control using two transducers, the addition of further relays in OCM applications.

Ultra 5 benefits from DATEM, the world's most advanced echo processing software, for reliable level measurement.

Features

- Solids or liquids level measurement
- Linearisation for tank shapes
- Advanced pump control choices
- Pump efficiency alarm
- Optional 4 - 20mA input
- Wide choice of flumes and weirs in OCM
- Easy prompt set up
- DATEM software

Level

All the features of the Ultra 3 with 2 additional relays. Offers optional 4 - 20mA input for a pressure transmitter or similar.

Volume

All the features of the Ultra 3 with 2 additional control/alarm relays.

Pump control

Ultra 5 in pump control configuration is a premium specification ultrasonic pump control unit offering many standard features. Advanced control functions include:

- **Pump run-on**, allowing the user to set both the run-on interval and the duration, for periodic pumping past the off point to remove solids from pump stations.

- **Pump exercising,** causes pumps to come on when a period of non operation has occurred, idle time and exercise time can be set.

- **Start point variation,** reduces material build up on the walls at the 'normal' level by setting a band in which the switch point varies.

- **Storm control feature** permits the identification of a storm condition and operate any relay with specific points being set to accommodate needs during a storm, and the ability to disable other relays during the storm if required.

- **Aeration control** activates on elapsed time (since pumps ran), in little used well. Introduces air to reduce well gases.

- **Flush valve control** activates a re-circulation valve for a specific time based on pump cycle frequency, Prevents solids settling.

Data logs

- Running total of individual pump running hours.
- Running total of individual pump starts
- Running total of individual pump run-ons.

Differential

Ultra 5 offers further sophistication with the inclusion of differential level capability using two transducers. With one upstream and the other downstream of a screen or penstock, an alarm or control signal is initiated as the difference between the level exceeds a user-defined limit to automatically operate the cleaning mechanism.

FASCIA MOUNT OPTION

Open Channel Flow

All the features of the Ultra 3 with 2 additional relays. With the additional step/time control for use with a penstock.

A data logging board is an optional extra with RS485 connection and large data log capability together with Profibus DP V0 and V1 or Modbus communications.

FASCIA MOUNT REAR VIEW

HAND-HELD INFRA RED PROGRAMMER USED WITH PANEL OR RACK MOUNT VERSIONS

17

UltraTWIN:

Features

- 2 independent channels
- Wall or Fascia mount options
- Datalogging option
- Easy prompt led set up
- 4 digital inputs assignable to other alarm functions

Twin-channel ultrasonic level/volume monitoring, pump control, open channel flow measurement or any combination of these.

Flexibility is the keyword for the UltraTWIN 2 channel ultrasonic system. Each channel is user-configurable to operate independently either as a full function open channel flow monitor calculating flow rate to BS ISO 1438 and 4359, a pump control system or as a level and volume monitoring unit for liquids or solids, calculating volumes and providing alarms. UltraTWIN is compatible with the full range of Pulsar's dB transducers, from the ultra-high resolution dBMACH 3 to the powerful 40m range dB40. Six relays configurable to either channel provide full alarm and control options.

Level/Volume measurement

Use the level/volume measurement setting and UltraTWIN provides everything you would get from the Pulsar Ultra 3 or Ultra 5 in level measurement mode. UltraTWIN in level/volume mode will calculate volumes based on a wide variety of standard tank shapes and is equally at home measuring liquids and solids.

Open Channel Flow measurement

When you select the Open Channel Flow option, you are getting the full power of Pulsar's flow measurement expertise, the choice of waste water companies and process industries worldwide to measure open channel flow within effluent treatment processes. Features include on-board totalisation and pulsed output. UltraTWIN provides outstanding accuracy when teamed with the high resolution accuracy of the dBMACH 3 transducer.

Pump Control

In pump control configuration, UltraTWIN provides all the power of the Pulsar Ultra 3. Extremely reliable level monitoring even in the most difficult applications, it also provides a wide range of sophisticated pump control routines to keep the application running perfectly. UltraTWIN also includes four digital inputs, making it possible to monitor the performance of other equipment, for example a no-flow signal from a pump can trigger an alarm without the need for a PLC.

Data logging/Digital Communications

A powerful data logging solution can be added to the UltraTWIN system. As a factory fit option, level and flow information is recorded and "date stamped" at user defined intervals to build up a complete picture of the changing situation on site. Information may be stored for up to a year, and easily downloaded to a computer through a standard RJ11 port. The data logging solution offers Pulsar's PC Ultra Log software package, which records and charts data and trends in an easily accessible form.

UltraTWIN may also be upgraded to include RS485 communications, operating the Modbus or Profibus DP V0 or V1 protocols.

UltraTWIN with dB10 and dB15 on 7m (23ft) and 10m (33ft) silos containing powder

Ultra Wizard:

A high level software configuration tool allowing the user to dedicate the device to a specific function.

Ultra Wizard is an on-board, menu-driven software tool that allows the user to quickly and simply set up an Ultra 3, 5 or UltraTWIN unit for a specific application.

Simply enter the programming code (1997) and Ultra Wizard leads the user through a set-up menu.
From the first question, do you want me to operate as:
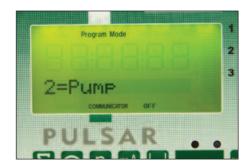
1. Level/volume controller, or

2. Pump controller, or

3. Open Channel Flow.

The user is led into a 'Quick Setup' menu specific to the application type that allows parameters such as empty and full distances and alarm/control relay settings to be entered. The majority of applications will then be 'ready to go', while it is easy to finish off the more demanding installations via further menus, refining the programming to add extra sophistication such as Ultra 5's advanced pump control routines.

The unique 'Quick Setup' allows a user to avoid time-consuming programming and reference to parameter numbers.

Features
- **Absolute flexibility**
- **User choice of function**
- **Lowers controller stockholding**
- **Simple to set up**
- **Units can be reprogrammed to suit changing applications**
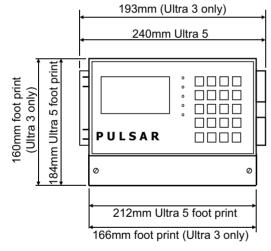
Product comparison:

Functions

Functions	Ultra 3				Ultra 5					Ultra TWIN				
	level	volume	pump control	open channel	level	volume	pump control	differential	open channel	level	volume	pump control	differential	open channel
Three control/alarm relays	•	•	•	•										
Five control/alarm relays					•	•	•	•	•					
Six control/alarm relays										•	•	•	•	•
Four digital inputs NO or NC										•	•	•	•	•
Compatible with all dB family transducers for 125mm to 40m (0.41ft-130ft) measurement range (X=db15max)	•	•	•	X	•	•	•	•	X	•	•	•	•	X
Compatible with dB50 transducer for 50m (164ft) measurement range	•	•	•											
High accuracy dBMACH3 transducer	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Liquids, solids and dusty applications	•	•	•	•	•	•	•	•	•	•	•	•	•	•
I.S. transducer (Ex II 1GD EEx ia IIC T6 Tamb = -40ºC to +75ºC) option	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Wall, fascia, panel and 19" rack mount versions (wall and facia only on UltraTWIN)	•	•	•	•	•	•	•	•						
Volumetric conversion (12 tank shapes)		•				•					•			
Alarm Functions on changing level to provide:														
High/Low level	•	•	•	•	•	•	•	•	•	•	•	•	•	•
In band/out of band	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Rate of fill and empty	•	•	•	•	•	•	•	•	•	•	•	•	•	•
High/Low temperature	•	•	•	•	•	•	•	•	•	•	•	•	•	•
System fail (loss of echo)	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pump efficiency							•							
Fill/empty control (initiate/stop)	•	•			•	•	•			•	•		•	
Differential control/alarm using two transducers								•					•	
Pump control functions:														
Fixed duty assist			•	•			•	•	•			•	•	•
Fixed duty backup			•	•			•	•	•			•	•	•
Alternate duty assist			•	•			•	•	•			•	•	•
Alternate duty backup			•	•			•	•	•			•	•	•
Duty backup and assist			•	•			•	•	•			•	•	•
Service ratio duty assist			•	•			•	•	•			•	•	•
Service ratio duty backup			•	•			•	•	•			•	•	•
FOFO (first on first off alternate duty assist)			•	•			•	•	•			•	•	•
Standby			•	•			•	•	•			•	•	•
Pump by time feature							•					•		
2 pump sets (4 pumps total)							•					•		
Advanced pump control functions:														
Pump run-on							•					•		
Power on/off delay							•					•		
Pump start/stop delay							•					•		
Pump exercising							•					•		
Pump start variation							•					•		
Storm control feature							•					•		
Aeration control							•					•		
Flush valve control							•					•		
Data logs:														
Pump running, run-on hours							•					•		
Number of pump starts							•					•		
Maximum and minimum recorded temperatures	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Optional datalogging board for expanded logging capacity and Modbus or Profibus connectivity	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Differential (using two transducers)								•					•	

	Ultra 3				Ultra 5					Ultra TWIN				
	level	volume	pump control	open channel	level	volume	pump control	differential	open channel	level	volume	pump control	differential	open channel
Open channel flow				•					•					•
Simple exponential (venturi, parshall, trapezoidal weir etc)				•					•					•
Selected primary element to BS3680, ISO1438 and 4359				•					•					•
Flumes: rectangular, u-throated				•					•					•
Thin plate weirs (standard V-notch)				•					•					•
Thin plate weirs: Rectangular and V-notch 90° and 60°				•					•					•
Other types (Palmer-Bowlus, H-flume etc)				•					•					•
Universal flow calculation (32 setpoints)				•					•					•
Penstock control using step time				•				•	•				•	•

WALL MOUNT

193mm (Ultra 3 only)
240mm Ultra 5
160mm foot print (Ultra 3 only)
184mm Ultra 5 foot print
PULSAR
212mm Ultra 5 foot print
166mm foot print (Ultra 3 only)

Unit Depth - 108mm

FASCIA MOUNT

165mm cut out
105mm cut out
122mm
PULSAR
200mm

Unit Depth - 108mm

RAIL TRUCK LEVEL FOR WATER SPRAY CONTROL

19" RACK MOUNT

128mm
PULSAR
51mm

PANEL MOUNT

63mm cut out
135mm cut out
128mm
144mm
PULSAR
61mm
72mm
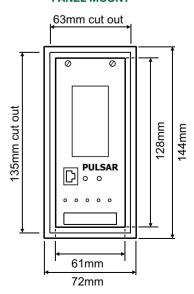
Unit Depth – 176mm

Technical Specification: Ultra Range

	Ultra 3	Ultra 5	Ultra Twin
Volt free contacts:	3 form C (SPDT) 5A, 240V ac	5 form C (SPDT) 5A, 240V ac	6 form C (SPDT) 5A, 240V ac
Outside dimensions (wall mount):	193 x 155 x 102mm (7.59 x 6.10 x 4.02in)	240 x 184 x 118mm (9.45 x 7.24 x 4.65in)	240 x 184 x 118mm (9.45 x 7.24 x 4.65in)
Cable entry:	8 cable entries 3 x PG11, 1 x PG9 underside 4 x PG11 at rear	10 cable entries 5 x PG11, 1 x PG9 underside 4 x PG11 at rear	10 cable entries 5 x PG11, 1 x PG9 underside 4 x PG11 at rear
Digital inputs:	n/a	n/a	4 normally open or normally closed, 24VDC supply

COMMON FEATURES	
Weight:	Nominal 1kg (2.2lbs)
Case material:	Polycarbonate, flame resistant to UL94-V2
Transducer cable:	Twin screened
Maximum separation:	1000m (3280ft)
Rack mount:	10HP x 160mm (6.29in) deep x 3U 128.5mm (5.06in) high (not UltraTWIN)
Panel mount:	72mm (7.87in) wide x 144mm (4.80in) high x 176mm (6.93in) deep (not UltraTWIN)
Fascia mount:	200mm x 122mm (7.87in x 4.80in) front x 108mm (4.25in) deep, 165mm x 105mm (6.50in x 4.13in) cutout
IP rating (wall mount):	IP65
Fascia mount:	IP64
IP rated panel mount (optional):	IP65
Max and min temp. (electronics):	-20°C to +55°C (-4°F to +131°F)
Flammable atmosphere approval:	Safe area: compatible with approved dB transducers (see transducer specification sheet)
CE Approval:	EMC approval to BS EN 50081-1: 1992 for emissions and BS EN 50082-2:1995 for immunity, and to BS EN 61010-1: 1993 for low voltage directive.
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330 (wall & fascia mount options only)
Accuracy:	±0.25% of measured range or 6mm, whichever is greater
Resolution:	dBMACH3 0.25mm, dB3 0.5mm, dB6 and dB10 1mm, dB15 1.5mm, dB25 2.5mm and dB40 5mm
Range:	Depending upon transducer, from 125mm to 40m (0.41ft to 130ft). 50m on modified Ultra 3 and Ultra 5. (0m to 2.5m (0 - 8.2ft) dBMACH3 for open channel flow)
Echo processing:	Patented DATEM (Digital Adaptive Tracking of Echo Movement)
Analogue output:	Isolated output 4-20mA or 0-20mA into 500Ω (user programmable and adjustable), 0.1% resolution
Digital output:	Full duplex RS232 via RJ11 port
Display:	6 digits plus 12 character text, plus bargraph with direction indicators, remote communicator identifier and program/run/test mode indicators
Remote programming:	Standard on rack and panel mount units via infra red communicator
On-board programming:	Standard on wall and fascia mount with integral keypad
PC Programming:	Via RS232 (RJ11 port)
Programming security:	Via password (user selectable and adjustable)
Programmed data integrity:	Via non-volatile RAM, plus backup
Power supply:	115V ac +5% -10% 50/60Hz, 230V ac +5% -10%, 18-36V dc

All Pulsar Ultra units must be mounted in a safe area. See transducer specification sheet for flammable atmosphere approval to suit.

Ultra PC Software:
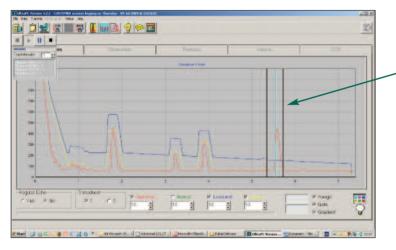
Ultra PC software is a powerful tool that fine tunes the Ultra series of controllers, helping the user get the best from their level or flow system.

Ultra PC can be used to record all the parameters for your applications, these may be saved to PC, disc or email. All programming parameters can be changed and downloaded to the instrument via your laptop or PC. The software may also be used to record echo profiles of your applications, these can be saved for your records or sent via e-mail back to Pulsar for analysis. Ultra PC can also record echo profiles, allowing them to be saved for your records or emailed to Pulsar for analysis. Events may be recorded and logged over long periods of time, creating an archive of level or flow variations.
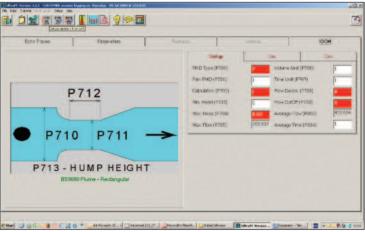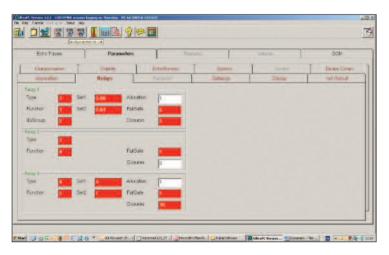
TRUE ECHO SHOWN BY THE BLUE LINE
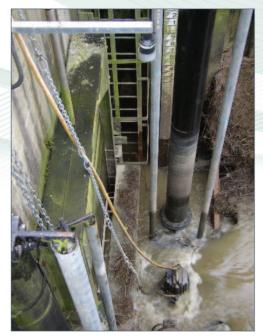
Pump Control:

7m (23ft) PUMP CONTROL

27m (89ft) STORM TANK 3 PUMPS DOWN CENTRAL WELL

4m (13ft) TIGHT WELL

3.5m (11ft) FOAMY WET WELL PUMP CONTROL

4m (13ft) WET WELL PUMP CONTROL AND HIGH FILL RATE

Differential Level:

5m (16ft) CANAL DIFFERENTIAL

9m (30ft) HARBOUR DIFFERENTIAL

1.5m (5ft) SCREEN DIFFERENTIAL

Open Channel Flow:

RECTANGULAR WEIR FLOW

AREA X VELOCITY IN A CHANNEL USING SPEEDY and dBS6

RECTANGULAR FLUME FLOW

RECTANGULAR WEIR and DUET TRANSDUCER

RECTANGULAR FLUME and dBMACH3

FLOW BOX WITH A V-NOTCH WEIR and dBMACH3

Volume Measurement:

CEMENT 12m (40ft)

FUEL OIL 9m (30ft)

CRUSHER CONTROL 1.8m (5.9ft)

CLINKER 14m (46ft)

CHEMICAL TANK WITH STANDPIPE 1.9m (6ft)

PLASTIC PELLET SILOS 18m (60ft)

pulsar

Specialist Ultrasonic Range

FlowCERT/DUET/Speedy

Pulsar's FlowCERT is a complete solution for high-accuracy measurement of open channel flows. Teamed with the temperature independent DUET transducer array, FlowCERT achieves the highest possible accuracy in flumes and weirs, achieving MCERTS Class 1, and includes 5 alarm or control relays and data logging facilities. For applications where no PMD exists, FlowCERT works with Pulsar's Speedy velocity sensor.

Zenith

Zenith is a full function pump station controller with six control relays and a host of sophisticated features including Tariff Guard, which saves energy costs by minimising pumping during high tariff periods, and seven digital inputs. A uniquely intelligent performance.

Quantum2 & Quantum3

Quantum 2 & Quantum 3 - the last word in intelligent pump station control.

Our Quantum family controllers work along with Pulsar's dB range of transducers to provide versatile and in-depth control with a choice of functionality.

Featuring ten digital outputs and seven digital inputs, together with Pulsar's Tariff Guard software (patented) and digital communications, Quantum controllers will provide alarms, including a unique alarm warning of 'time to spill' particularly in critical areas (patented), minimise pump usage in periods of high energy costs and reset tripped pumps automatically, so staff may never have to visit site just to reset a pump. Quantum 3 adds the ability to interface with up to four Flow Pulse non-invasive flow monitors.

FlowCERT:

High accuracy flow on weirs, flumes and area x velocity

Pulsar's FlowCERT system gives you everything you need for the industry's highest accuracy non-contacting ultrasonic measurement of open channel flows. Designed for flumes and weirs, FlowCERT gives temperature-independent, reliable measurement and logging facilities. It includes five alarm/control relays plus 4-20mA output, datalogging, digital input with the ability to accept a velocity sensor input for non PMD applications. Programming the unit is a simple, menu-driven process. MCERTs class 1 approval when used with DUET.

- **Five control/alarm relays**
  - Choice of transducers
  - I.S. transducer
    (EEx ia) option
  - Wall mounted

- **Alarm functions**
  - High/Low level
  - In band/out of band
  - Rate of level rise/fall
  - High/Low temperature
  - Loss of Echo

- **Data logs**
  (all date/time stamped)
  - Flow rate (variable time intervals)
  - Total flow (and daily totals etc)
  - Average flow rate
  - Temperature (max/min)
  - Echo confidence
    and more...

- **Flow totalisation and outputs**
  - Relay closure assignable to totalised flow
    for remote totaliser
  - Relay closure assignable for flow volume or
    time for a flow sampler
  - Ten days logged flow at 24 hour intervals
    recorded by date and accessible via the
    key pad.

- **Open channel flow elements**
  - Simple exponential (venturi, parshall, trapezoidal weir etc

- **Selected primary** element to BS 3680, ISO 1438:2008 & 4359:1983 etc.
  - Flumes: rectangular, u-throated
  - Thin-plate weirs (standard v-notch)
  - Thin-plate weirs (rectangular and
    v-notch 90° and 60°
  - Other international standards
    (Palmer-Bowlus, H-flume etc)

- **Universal flow calculation (32 setpoints)**

- **Penstock control using step time**

- **Option: Speedy velocity sensor for area x velocity (Q=VA calculation) in channels or pipes**

Features

- **Most accurate OCM in the world (MCERTs class 1)**

- **Can be used for Area x Velocity**

- **Easy prompt set up**

- **Large standard on board memory gives 1 year log at 10 min intervals**

- **Modbus and Profibus options**

- **Combined performance characteristic of 0.044% when used with DUET transducer. As tested for MCERTs Class 1 Certified Sira MC090154/00**

DUET:
Dual Ultrasonic Echo Transducer
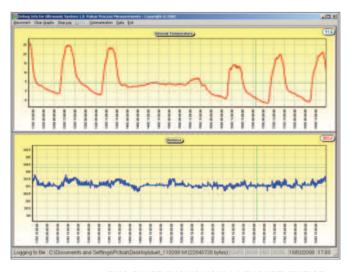
Features

- Unique patented non contacting transducer
- Insensitive to air temperature variations
- 300mm deadband
- MCERTs class 1 when used with FlowCERT

FlowCERT and Pulsar's unique twin-transducer DUET, provides the highest accuracy non-contact ultrasonic flow measurement system available.

The speed of sound varies with air density change; as the temperature varies, so does the time it takes for an echo to reflect from the target, and therefore the accuracy of the measurement is significantly affected. Temperature compensation of various types may help, but are heavily dependent upon good siting and are slow to respond. The air temperature gradient between the liquid surface and the air is often large and temperature sensors are not representative of the variation in air density. Only DUET features Pulsar's unique, patented, approach to the issue. Both transducers fire together.

By continuously monitoring the phase difference of the echoes, and because the distance between the transducer faces is known and constant, the speed of sound is continuously updated in real time on the process. The resulting accuracy and stability is exceptional.

THIS CHART SHOWS HOW A MEASUREMENT OF DISTANCE VARIES (LOWER TRACE) AGAINST CHANGES IN TEMPERATURE OVER THE PERIOD OF A WEEK. DESPITE TEMPERATURES RANGING FROM OVER 25°C DOWN TO -7°C, THE MEASUREMENT REMAINED EXTREMELY CONSTANT, WITHIN ±0.5MM, ON A RANGE OF 383.5MM.

Speedy:
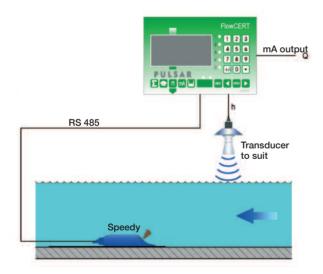
Liquid velocity sensor
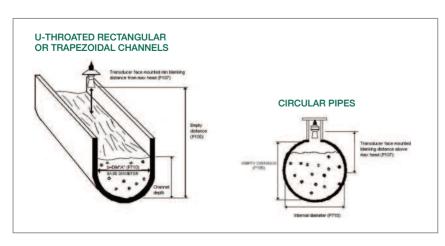
The latest version of Pulsar's popular "Speedy" velocity sensor, for use in channels, pipes or sections where no Primary Measurement Device (PMD) exists. New Speedy performs all its calculations internally, removing the need for a separate converter unit.

WEDGE SENSOR

Communication with the FlowCERT unit is via RS485, and Speedy can be mounted up to 250m from the FlowCERT controller. Speedy is available as a "wedge" sensor with a stainless steel base plate or as a pipe mounted sensor (pictured below).

U-THROATED RECTANGULAR OR TRAPEZOIDAL CHANNELS

CIRCULAR PIPES

PIPE INSERTION SENSOR

Speedy Interface:

Digital to analogue converter

Features

- **Allows Modbus or Profibus comms when using Speedy sensor**

- **Gives backwards compatibility to previous Speedy units**

Pulsar's Speedy Interface is a digital to analogue converter that works with the latest Speedy velocity sensor in two important ways. It frees up the RS485 output from a FlowCERT controller in applications where digital communications are required, and allows users of Pulsar's older equipment to upgrade to the latest Speedy sensor. It also provides the option of alarms based on flow velocity.

Pulsar's Speedy velocity sensor communicates digitally and is designed to connect to Pulsar's FlowCERT open channel flow monitor via FlowCERT's on-board RS485 interface board, where it provides the velocity measurement for velocity x head calculations of flow volume where no primary measurement device exists. However, there are some applications where external digital communications are required, for example to network flow measurements or to modify the programming of the unit. Speedy Interface converts the digital output of the Speedy doppler velocity sensor into a 4-20mA signal proportional to flow velocity, which can then be fed into the analogue input terminal on the FlowCERT controller. This then leaves the RS485 connection included in the FlowCERT unit free to be used for digital bus communications.

Speedy interface is easily configured using the integral keyboard, and includes a display of flow velocity. There are two on-board relays that can provide alarms or control signals on high or low flow velocity. The Speedy Interface is self-contained to the extent that it can be used without the FlowCERT controller where a simple alarm on flow velocity or a 4-20mA signal proportional to velocity is required.

Technical Specification: FlowCERT/DUET/Speedy

FLOWCERT CONTROLLER	
Volt free contacts:	5 form C (SPDT) 5A, 110V ac
Outside dimensions:	240 x 184 x 118mm (9.45 x 7.24 x 4.65in)
Cable entry:	10 cable entries - 5 x M20, 1 x M16 underside, 4 x 18mm (0.16 x 0.71in) at rear
Weight:	Nominal 1kg (2.2lbs)
Case material:	Polycarbonate, flame resistant to UL94-V2
IP rating:	IP65
Max and min temp. (electronics):	-20°C to +55°C (-4°F to +131°F)
Flammable atmosphere approval:	Safe area: compatible with approved dB transducers (see transducer specification sheet)
CE Approval:	EMC approval to BS EN 50081-1:1992 for emissions and BS EN 50082-2:1995 for immunity, and to BS EN 61010-1:1993 for low voltage directive.
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330
Echo processing:	Patented DATEM (Digital Adaptive Tracking of Echo Movement)
Analogue output x2:	Isolated output 4-20mA or 0-20mA into 500Ω (user programmable), 0.1% resolution
Serial output:	Full duplex RS232 via RJ11 port
Digital output:	RS485 conn for Modbus with Profibus DP V0 or V1 options
Display:	6 digits plus 12 character text, plus bargraph with direction indicators, remote communicator identifier and program/run/test mode indicators
Data logging:	Via RJ11 port has 256kb giving 1 year at 10 min intervals (needs ultralog PC software)
Programming:	Integral keypad. Also PC Programming via RS232 (RJ11 port) or RS485
Programming security:	Via password (user selectable and adjustable)
Programmed data integrity:	Via non-volatile RAM, plus backup
Power supply:	115V ac +5% -10% 50/60Hz, 230V ac +5% -10%, 18-36V dc

DUET	
Mode of operation:	Twin transducers, fixed distance apart, firing together
Transducer types:	2 x Pulsar dBMACH3, 125KHz frequency, beam angle 10° (@ -3dB)
Accuracy:	<1mm or MCERTS combined performance characteristic of 0.044% (Certificate number: Sira MC090154/00)
Range:	300mm - 2m (0.98ft-6.5ft) (from face of lower transducer)
Operating Temperature Range:	-30°C to +90°C (-22°F to +194°F) / +75°C (+167°F) for hazardous area / -20°C to +50°C (-4°F to +122°F) for MCERTs approval
Hazardous area:	ATEX EEx m IIT6 for Zone 1 and 2. FM/FMC available
Transducer cable:	Three core screened, can be extended with 2 or 3 core screened
Maximum separation:	500m (1640ft) from transducer to control unit

SPEEDY VELOCITY SENSOR	
Measurement principle:	Doppler (flow velocity). Flow velocity sensor with v measurement using Doppler principle and temperature measurement to compensate temperature effects on speed of sound.
Measurement frequency:	1MHz
Protection:	IP68
Operating temperature:	-20°C - +50°C (-4°F to +122°F)
Storage temperature:	-30°C - +70°C (-22°F to +158°F)
Operating pressure:	max 4bar (58psi)
Cable length:	10/15/20/30/50/100 metres pre-cut, extendable to max 250m (820ft)
Cable types:	LiC11Y 2x1.5 + 1x2x0.34
Cable diameter:	8.4mm ± 0.25mm (0.33in ± 0.01in)
Constructions:	Wedge sensor for installation on channel bottom Pipe sensor for installation using nozzle and cutting ring screw joint in pipes
Contacting materials:	Wedge sensor: Polyurethane, stainless steel 1.4571, PVDF, PA Pipe sensor: stainless steel 1.4571, Polyurethane, FEP coated cable
Measurement range:	-6m/s - +6m/s (-20ft/s to +20ft/s)
Zero point drift:	0 - absolutely stable zero point
Sonic lobe:	±5 degrees
Temp. measurement:	-20°C - +60°C ±0.5°C (-4°F to +140°F ± 32.9°F)
Accuracy:	1% of the measurement range or ±0.03m/s (±0.1ft/s)

Intelligent Pump Controllers:

Zenith, Quantum 2 and Quantum 3 (see comparison on page 36)

Features

Zenith

- **Advanced Pump Control features as standard**
- **Reduce capital costs by eliminating PLC on small sites**
- **Reduce panel depth and size**
- **Reduce power costs by intelligent use of lower tariff periods for pumping**
- **Monitoring of pumps or controls via the 7 digital inputs**
- **Easy prompt led menu system with clear back lit display**
- **RS232 with RS485 Modbus or Profibus DP V0/V1 options**
- **Totaliser volume throughput of well or station**
- **Small panel footprint and only 90mm inside projection**

Pulsar's Intelligent Pump Controllers allow users to introduce advanced and sophisticated control functions to pumping station control regimes without the need for additional PLC programming.

Zenith, Quantum 2 and Quantum 3 form a family of controllers that work along with Pulsar's dB range of transducers to provide versatile and in-depth control with a choice of functionality. See the comparison chart at the end of this section. What they have in common is Pulsar's superb echo processing software, DATEM, easy, prompt-led, set-up and the peace of mind that comes from many thousands of successful applications all over the world.

Among the advanced features built into Pulsar's Intelligent Pump Controllers:

Digital inputs allow the units to respond to no-flow conditions, and on Quantum 2 even to automatically reset pumps in case of failure, saving unproductive maintenance trips to site and freeing up staff time for more important work. Pulsar's Tariffguard routines, common to all controllers, ensure that energy costs are minimised through periods of maximum electricity tariff, while Quantum's 'time-to-spill' alarm protects critical pumping stations from uncontrolled overflow. Quantum 3 adds direct flow measurement by incorporating Pulsar's Flow Pulse non-invasive flow monitors to significantly increase options for throughput measurement and monitoring of equipment efficiency.

Intelligent Pump Controllers: Features

Power Cost Saving Feature (Tariff Guard)

Pulsar Intelligent Pump Controllers operate in a highly intelligent and predictive manner: the objective is to have a 'full' or 'empty' well as the tariff changes.
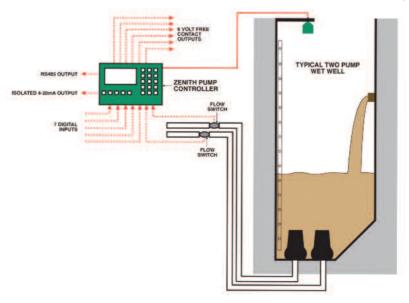
The liquid level and the inflow rate is continually measured and assessed in the well. Both these variables are then related to the time the next tariff charge occurs. If the next tariff change is for a higher cost rate, the well will be first filled to enable pump down immediately prior to the tariff change, this then provides maximum storage capacity in the well during the higher tariff period, once in the lower tariff cost period the level is pumped down as normal using the minimum number of pumps.

The level and inflow condition of the well is continuously monitored to optimise the liquid level and intelligently control the pumps according to the impending tariff change. By doing this, high tariff charge pumping may be reduced significantly, or avoided entirely, to provide real cost savings on pump energy charges, especially during higher energy cost periods.

Ten set points for tariff variations may be installed, these can be assigned per day, week, or other re-occurring periods to be site specific.

It is important to note that the normal pump on and off points are maintained, and that storm capacity is normally available.

Actual energy savings achieved will depend on the capacity of the wet-well, the frequency of the tariff changes, the size of the pumps and the relative tariff charges applied. However cost savings are usually significant.

These features may also be utilised for sites where noise at night or other environmental pressures require minimal pump activity which can be set by time of day/night.

Simple Calibration

Calibration is via the unique simple menu driven system, or if there are a number of typical pumping stations the unit may be assigned a factory set up routine to enable the operator to simply select 3 menu options as follows:

• **The pumping routine that is required**

• **Transducer type being used**

• **The working span required**

This saves time on site and also reduces the potential for any errors during the set up process. This also removes the necessity for other control devices or for complicated setup routines.

Digital Inputs

Intelligent Pump Controllers give the operator the ability to replace costly PLC control systems on simple pumping stations, providing many of the functions that would otherwise be provided by the PLC. Having 7 discrete digital inputs provides the ability to detect a no flow signal from a switch or other source, and then create an alarm output as well as taking the defective pump out of service whilst changing the duty of the pumps as a result. Pumps may be placed on over-ride or inhibit at any time via a digital input. Communication and resulting control is via outputs including volt free contacts, an isolated 4- 20mA signal and RS485.

Pulsar's controllers remove the necessity for other control devices by carrying out full control of a wetwell and providing the diagnostic feedback to enable confident management of a site.

Manual switches may be linked via the digital inputs enabling choices of pump overrides, to reset alarms or pumps back into service.

Volume Throughput

Conversion of the level measurement into stored volume throughput, with the ability to accommodate a variety of well shapes and to custom linearise for non standard wells is included. This feature is useful for monitoring local flow changes and for well capacity performance when part of an integrated flow system.

Convenient Installation

The fascia mount is a convenient size for panel front mounting. Having only a 90mm internal projection this package allows reduced panel or MCC sizes.

A rectangular cut-out with 4 holes to suit the rear fastening is convenient and easy to produce.

The rear of each unit has a stainless steel enclosure with clip on electrical connections giving safe and easy access to the power and control terminals to suit the specific site. The integral keypad on the IP64 front panel makes set-up easy and the back-lit display provides useful information during calibration and run mode.

The rear connectors include RS232 port local uploading and downloading of stored information via Pulsar Ultra PC software, part of PC Suite, and an RS485 connection for optional communication purposes.

INTELLIGENT PUMP CONTROLLER REAR PANEL

Superior Pumping Station Control:

Quantum 2 & Quantum 3

Features

Quantum 2

- Highly intelligent pump controllers
- Time to spill calculation and warning
- Automatically resets tripped pumps
- Second mA output for pumped flow rate (Quantum 2)
- Easy prompt led set up
- RS485 Modbus and Profibus DP V0 and V1 options
- 10 relay outputs and 7 digital inputs
- Pump efficiency alarm function
- Peak power tariff avoidance

Quantum 3
(additional features)

- Can assign a Flow Pulse to either a pump, a main outlet or stand-alone measurement
- 24VDC output supply capable of supplying 4 Flow Pulse units
- The 'level' hot key now also displays flow
- 'Burst and Block' now based on real flow
- Auxiliary display can now cycle through each Flow Pulse and display real flow
- Totaliser sums real throughput
- Universal power supply input of 22-28 VDC and 85-264 Vac

Quantum 2 and Quantum 3 take the intelligent pump control built into Zenith to a new level, with all the features of Zenith plus extra capabilities and advantages. Quantum provides alarms, including a unique alarm warning of 'time to spill' in critical areas, and resets tripped pumps automatically, so staff may never have to visit site just to reset a pump (pat. pending).

Quantum can be programmed to provide an alarm based on the time remaining before the station or well spills over. This is vital for utilities, who face the risk of prosecution if a station pollutes the local environment.

The likelihood of a 'spill' depends both on the rate of change of the level and the operating efficiency of the pumps, which can be affected by failure, blockage or underperformance. If a pump has failed, the rate of change may not be important, because the level may well creep up slowly to reach a dangerous level. More important is to know how much time remains before a critical high level, or an overspill level, is reached. Quantum takes all the inflow and outflow rates of the station together and calculates the time remaining before a spill, warning via Modbus register or any other protocol or relay closure for the site operators to take remedial action.
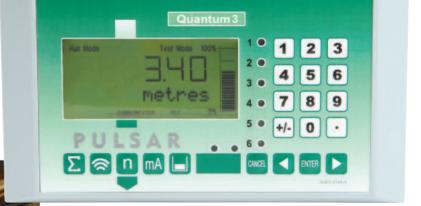
In addition to the 'time to spill' feature, Quantum is also a fully-featured pump controller, using Pulsar's unique non-contacting ultrasonic technology including DATEM digital echo discrimination to provide rock-solid performance and sophisticated level management. The Tariff Guard software built into Pulsar's Quantum (and Zenith) controllers monitors well inflow and outflow rates to override the normal on/off levels of the control unit to keep pump usage to an absolute minimum during the high tariff period.

Quantum's additional analogue output allows measurement of pumped volume through the station, in most cases providing a very low cost alternative to a magnetic flowmeter.

Quantum includes ten relays (digital outputs) and seven digital inputs. Digital inputs are used to detect the status of the pump trip circuit. If a pump has tripped, digital outputs can be assigned to provide a reset to the trip circuit (after a programmable time delay). Quantum counts the number of consecutive trips and the number of trips in a rolling 24 hour period. If any of these counts reach a predetermined maximum, the pump is considered to be faulty and the auto reset process is ceased. A digital output can be assigned to provide indication that a pump is faulty and site attendance is required.

The Quantum controllers have optional RS485 digital communications (Modbus and optional Profibus DP V0 and DP V1) allowing the status to be monitored and the unit to be programmed remotely. Additionally it has the option of a large on board data-logging facility (256kb).
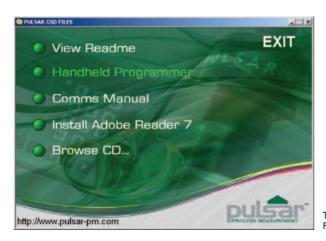
Quantum 3 adds the ability to interface with up to four Flow Pulse non-invasive flow monitors, so all flow-rate based alarms and control is based on measured rather than calculated flow.

FLOW PULSE

QUANTUM 3

Technical Specification: Zenith, Quantum 2 and Quantum 3

COMMON FEATURES UNLESS STATED - PHYSICAL:	
Weight:	Nominal 1kg (2.2lbs), Zenith; 1.3kg (2.9lbs), Quantum 2 and Quantum 3
Case material:	Stainless steel and polycarbonate, flame resistant to UL94 V0
Transducer cable requirements:	Twin screened
Maximum separation:	1000m (3280ft)
Fascia mount:	200mm x 112mm (7.87in x 4.41in) front, 165mm x 105mm (6.49in x 4.13in) cut-out

OPTIONS:	
Digital communications:	RS485 Modbus or Profibus DP V0 or V1

ENVIRONMENTAL:	
IP rating fascia mount:	IP64
Max. and min. temperature (electronics):	-20°C to +55°C (-4°F to +131°F)
Flammable atmosphere approval:	Safe area: compatible with approved dB transducers allowing installation to zone 0 (see transducer specification sheet)
CE approval:	EMC approval to BS EN 50081-1:1992 for emissions and BS EN 50082-2:1995 for immunity, and to BS EN 61010-1:1993 for low voltage directive.
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330 (Zenith only)
Power supply:	115V ac +5% -10% 50/60Hz, 220V ac +5% -10%, 18-36V dc (Q3 only: 85-263Vac, 50/60Hz, 22-28Vdc)

PERFORMANCE:	
Accuracy:	±0.25% of measured range or 6mm, whichever is greater
Resolution:	dBMACH3 0.25mm, dB3 0.5mm, dB6 and dB10 1mm, dB15 1.5mm, dB25 2.5mm and dB40 5mm
Range:	Depending upon transducer, from 125mm to 40m (0.41ft to 130ft)

ECHO PROCESSING:	
Echo processing:	Patented DATEM (Digital Adaptive Tracking of Echo Movement)

INPUT/OUTPUT:	
Volt-free contacts: Zenith	6 form "C" (SPDT) 5A, 220V ac
Volt free contacts: Quantum 2 and Quantum 3	10 in total; Relays 1-5 form C (SPDT) 5A, 220V ac, Relays 6-10 form C (SPDT) 3A, 220V ac
Digital inputs:	7 NO or NC with 24V dc internal supply, available max 20mA
Analogue output (adjustable), 0.1%:	Isolated output 4-20mA or 0-20mA into 500Ω (user programmable and adjustable) **NB: Two analogue outputs on Quantum 2 and Quantum 3**
Analogue input:	Isolated input for loop powered device
Serial output:	RS232 via RJ11 port
Display:	6 digits plus 12 character text, plus bargraph with direction indicators, remote Communicator identifier and program/run/test mode indicators

ANALOGUE INPUT:	
	4-20 mA source

PROGRAMMING:	
On-board programming:	Standard with integral keypad
PC programming:	Via RS232 (RJ11 port)
Programming security:	Via password (user selectable and adjustable)
Programmed data integrity:	Via non-volatile RAM, plus backup

TYPICAL SET-UP SCREEN FOR PROFIBUS GSD FILES

Product Comparison:

	Functions				
	Zenith		Quantum 2		Quantum 3	
	level	pump control	level	open channel	level	pump control
Six control/alarm relays	•	•				
Ten control/alarm relays			•	•	•	•
Compatible with dB family transducers for 125mm to 40m measurement range	•	•	•	•	•	•
Liquids and solids	•	•	•	•	•	•
I.S. transducer (EEx ia IIC T6) option	•	•	•	•	•	•
Fascia mount version only	•	•	•	•	•	•
24Vdc output capable of powering 4 Flow Pulse units					•	•
Alarm Functions on changing level to provide: *(see Ultra 5 specification)*						
Pump control functions: *(see Ultra 5 specification)*						
Advanced pump control functions:						
Tariff guard (high power cost avoidance)	•	•	•	•	•	•
Pump over-ride or inhibit via input	•	•	•	•	•	•
Digital inputs 7 off	•	•	•	•	•	•
Time to spill alarm			•	•	•	•
Pump auto-reset facility			•	•	•	•
Pump run-on	•	•	•	•	•	•
Power on/off delay	•	•	•	•	•	•
Pump start/stop delay	•	•	•	•	•	•
Pump exercising	•	•	•	•	•	•
Pump start variation	•	•	•	•	•	•
Storm control feature	•	•	•	•	•	•
Aeration control	•	•	•	•	•	•
Flush valve control	•	•	•	•	•	•
Flow Pulse assignment: pump, main outlet or stand-alone measurement					•	•
Data logs:						
Pump trip counts in 24 hrs	•	•	•	•	•	•
Pump running, run-on hours	•	•	•	•	•	•
Number of pump starts	•	•	•	•	•	•
Maximum and minimum recorded temperatures	•	•	•	•	•	•
Optional datalogging board for expanded logging capacity and Modbus or Profibus connectivity	•	•	•	•	•	•
Other:						
Differential (using two transducers)	•	•	•	•		
Penstock control on level difference	•	•	•	•		
Derived pumped volume measurement			•	•		
Measured pumped volume measurement using Flow Pulse					•	•
'Level' hot key also displays measured flow rate					•	•
Totaliser will sum the total real throughput rather than deriving from level measurement					•	•

pulsar

Sludge Finder 2

Sludge Finder 2:

Sludge interface monitor

Features

- Continuous single or dual channel level control choice

- High frequency gives high reliability long term

- Self cleaning transducer removes need for regular inspection

- SBR tank applications can be monitored

- Easy set up, via drop down menu on large clear display

- Unit can track two different echoes with one transducer and output two 4-20mA signals one for each interface

- Optional Radio Telemetry System

Pulsar's Sludge Finder 2 is a versatile, accurate and reliable solution to the problem of accurately measuring interface levels in primary or secondary settlement tanks and SBR systems. Operating ultrasonically through liquid, Sludge Finder 2 uses proven echo processing algorithms to identify the sludge interface level by state of the art digital echo processing techniques found only in this unit.

Sludge Finder 2's unique Viper transducer is immersed in the liquid, emitting a high frequency ultrasonic pulse down towards the sludge interface. The pulse reflects from the interface of the denser material back to the Viper transducer face. This echo is analysed by the controller unit providing a depth reading and an analogue output proportional to the height of the interface above the vessel bottom.

Multiple Tanks, Multiple Applications

Sludge Finder 2 will operate with one or two transducers: you can mix and match Sludge Transducers and Pulsar's main dB transducer range to give astonishing versatility. Manage two clarifiers/thickeners, or one clarifier plus an ultrasonic level application from a single unit, providing flexible, economical control and a single connection point for system interface.

Sludge Finder 2 features a microprocessor and a multifunction display showing blanket level, complete echo profile, alarm points, tank depth and multiple tank status.

RADIO TELEMETRY SYSTEM AVAILABLE AS AN OPTION

Use Sludge Finder 2 in:

- Primary and secondary settlement tanks
- Clarifiers and reactor clarifiers
- Stationary and travelling bridge applications
- Gravity thickeners
- DAF thickeners
- Sequential batch reaction tanks
- Industrial process thickeners

Output Options

Sludge FInder 2 features 4-20mA isolated outputs for each channel, with optional RS485 connection (Modbus or Profibus). Six control relays are included (5A rated), assignable to any channel. An optional Radio Telemetry System may be fitted with a 500m (1640ft) line-of-sight range. Up to 48 Nodes can be used using a 'Multihop' receiver installation.

The hygienic solution

Remote measurement with Sludge Finder 2 means you can put an end to tedious, time consuming, potentially unhygienic and hazardous manual measurements using gap switches or vacuum probes.

Self-cleaning transducer
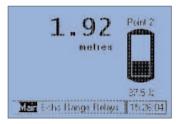
Sludge Finder 2 is designed to be maintenance free. Sludge Finder's Viper transducer is a single beam ultrasonic unit immersed just below the liquid surface. A wiper blade sweeps the transducer face, ensuring that it remains clean. The Viper transducer may be positioned up to 200m from the control unit and has a measurement range of 0.3 to 10m. Accuracy is 0.25% of the measured range. A tight 6° beam angle and sophisticated echo processing algorithms makes sure that Sludge Finder 2 deals with difficult tanks and rotating equipment with ease.

Sludge Finder 2:
Prompt led set-up
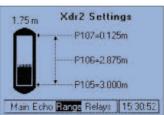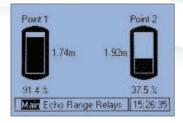
Easy installation and set-up

Sludge Finder 2 is simply installed and the transducer cable can be easily extended with twin pair screened cable. To program Sludge Finder 2, the operator enters operating parameters via a menu driven operator interface and the Sludge Finder 2 automatically tracks to the blanket interface. Sludge Finder 2's operator interface consists of several screens that make setting up the unit straightforward and communicates information about the process quickly, clearly and concisely.

TYPICAL SCREEN SHOTS THROUGH MENU
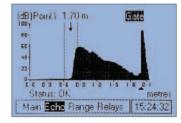
Features

- **Relay choices for alarm or pump control function**
- **Reliable monitoring down to 0.5% density**
- **Second transducer may be interface Viper transducer or an air transducer for liquids or solids level measurement**
- **200m separation distance between Viper and controller using standard cable**
- **Multiple Layer Tracking**
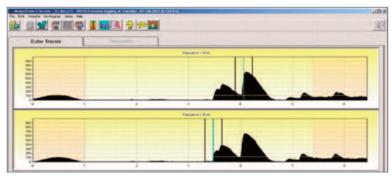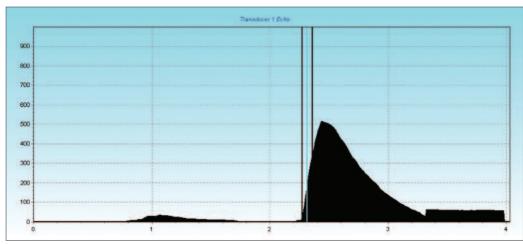
Sludge Finder 2 allows a user to set up two interface points to display, and to control the process via the echo profile returned from a single self-cleaning Viper transducer. One of the primary benefits is the ability to monitor sludge interface levels of differing densities.

This new feature could reveal a high level of FLOC spilling into the local water course, potentially causing pollution and a breach of consent at the same time as measuring and controlling the RAS layer in the normal way.

The unit can output two isolated 4-20mA signals, one for each interface.

TYPICAL PROFILE OF DUAL POINT

A TYPICAL ECHO PROFILE VIEWED ON OPTIONAL SLUDGE PC SOFTWARE

Sludge Finder 2:
Viper Transducer

Features

- **Keeps algae and other growth off the face**
- **Flexible transducer arm option, allows rotating bridges to be used**
- **Mounting bracket options available**

Self-cleaning transducer

The Viper transducer is designed to operate continually immersed in liquid, and features an oscillating wiper blade to keep the face free of algae or bacterial growth that could otherwise affect performance. The wiper also effectively clears air bubbles from the transducer face, while the 0.2mm gap between the wiper and the transducer face makes sure there is no wear between the surfaces.

The sweep action of the wiper discourages 'hair' build up, ensuring that the shaft does not lock up over time.
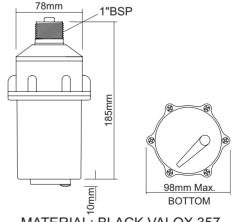
VIPER MOUNTED BEHIND SURFACE SKIMMER AND IN FRONT OF ROTATING BRIDGE

FRONT VIEW OF VIPER FACE SHOWING WIPER

VIPER TRANSDUCER ON CONDUIT WITH ROTATING BRIDGE

78mm
1"BSP
185mm
10mm
98mm Max.
BOTTOM
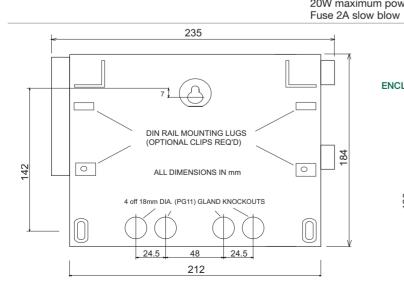
MATERIAL: BLACK VALOX 357
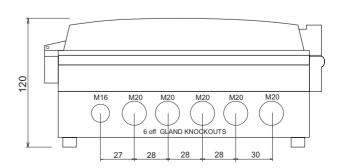
VIPER TRANSDUCER

Technical Specification: Sludge Finder 2

PHYSICAL:

Wall Mount:	
External dimensions:	235 x 184 x 120 mm (9.25 x 7.24 x 4.72in)
Weight:	Nominal 1 kg (3.3lbs)
Enclosure material/description:	Polycarbonate, flame resistant to UL94-5V
Cable entry detail:	10 cable entry knock outs, 5 x M20 and 1 x M16 underside, 4 x PG11 at rear
Transducer cable extensions:	2 x twisted pair 0.5mm^2 with overall screen
Maximum separation:	200m (656ft) from transducer to transceiver

ENVIRONMENTAL:

IP rating (Wall):	IP65
Max. and min. temp. (electronics):	-20C to +50C (-4F to +122F)
CE approval:	See EC Declaration of Conformity in the product manual
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330

SONAR (INTERFACE) PERFORMANCE:

Accuracy:	0.25% of the measured range or 10 mm (0.39in) (whichever is greater)
Resolution:	0.25% of the measured range or 10 mm (0.39in) (whichever is greater)
Max. range:	10m (33ft)
Min. range:	0.3m (0.98ft)

NB: Please refer to separate literature for dB transducer performance if using an 'air' application.

OUTPUTS:

Viper material:	Body in black Valox 357 with a 316 wiper blade and shaft
Analogue output:	2 off Isolated output (to 150V) of 4-20 mA or 0-20 mA into 1kΩ (user programmable and adjustable) 0.1% resolution
Serial output:	Half Duplex RS232
Volt free contacts:	6 form "C" (SPDT) rated at 5A at 115V AC
Display:	192 x 128 pixel illuminated graphical display. Fully programmable display options. Integral keypad with menu navigation keys
Radio Modem (optional):	4 – 20mA using wireless exempt frequencies
Maximum range:	500m (1640ft) line of site
Communication bus (optional):	RS485 Modbus RTU/ASCII or Profibus DP V0 or V1 (slave device)

PROGRAMMING:

On-board programming:	By integral keypad
PC programming:	Via RS232
Programming security:	Via passcode (user selectable and adjustable)
Programmed data integrity:	Via non-volatile memory

SUPPLY:

Power supply:	Universal 100 - 240VAC 50/60HzDC 22 - 28V 20W maximum power (typically 11W) Fuse 2A slow blow

ENCLOSURE DIMENSIONS AND KNOCKOUT DETAILS

Flow Pulse®:

Unique, non-invasive clamp-on flow monitor

Features

- Non-invasive, clamp-on
- Simple installation, no service interruption
- Use on all common pipe types, measures through corrugated or corroded pipes
- 4-20mA output
- Modbus RTU
- Self-contained, no external controller required to operate
- ATEX approval pending
- 2 versions depending on pipe diameter
- FM/FMC approval pending

Easily installed and simple to set up, Flow Pulse® uses an acoustic technique never before seen in flow monitoring to deliver reliable results across an amazing range of pipe materials and sizes. At a fraction of the installation cost of an equivalent magflow meter, Flow Pulse delivers repeatable flow monitoring.

Amazing new flow monitoring technology

Flow Pulse ® is a major leap forward in flow measurement - no need to break into a pipe, or to get any civils involved, just clamp a small sensor to the outside of a pipe and get reliable, repeatable flow monitoring straight away.

Virtually no installation costs, no interruption to service, clean and simple. Flow Pulse is simply fixed in place by a band (tools required = one screwdriver). A silicone coupling pad makes sure that the Flow Pulse makes a good acoustic contact to the pipe.

Flow Pulse uses a novel spread spectrum analysis technique never before used in flow monitoring. It incorporates a radical new Digital Signal Processing (DSP) approach that gives exceptional repeatability.

Flow Pulse produces a wide ultrasonic beam that is refracted by the pipe wall, as well as reflected by suspended particles in the flowing media.

Ultrasound is fired through the pipe wall at 90 degrees to the flow via a tangentially mounted high-output ceramic, then refracted at angles across the axis of the flow and subsequently reflected from bubbles, particles and vortices in all directions and at a wide range of frequencies. The wide, refracted, ultrasonic beam maximises the ultrasound energy captured from flowing particles. These multiple reflections are received back into the unit via a second high performance ceramic.

The returned signal is analysed using Flow Pulse's Refracted Spread Spectrum Analysis (RSSA) digital signal processing platform to derive flow information. RSSA analyses and integrates the received signals over a wide frequency range, then slices them for real-time analysis and flow rate calculation.

The digital platform also offers robust performance in the repeatability of measurement, as well as the flexibility to adapt to application requirement. For example, features such as damping and response time can be easily customised to suit.

Flow Pulse operates in a flow range from as little as 0.3m/s through to 4m/s (1 - 13 ft/sec), with a minimum particle size of 100μ and concentration of 200ppm or above (the equivalent of hard water).

Pipe material can be rigid plastic, stainless steel, mild steel or cast iron. Corrugated pipe is not an issue, and, as long as the silicone pad can fill in the irregularities, light corrosion will also give a good result.

Flow Pulse provides typical repeatability of ±5%.

Flow Pulse is a flow monitor not a flow meter and, while accuracy in some areas is excellent, accuracy results are both application and installation dependent.

RSSA - Developed

Pulsar have introduced two major innovations with the launch of Flow Pulse - firstly, of course, that the system is non-invasive, and secondly the new way that the mass of flow data is analysed. Pulsar call it Refracted Spread Spectrum Analysis (RSSA).

RSSA builds on Pulsar's track record of excellence in acoustic digital signal processing. Pulsar's non-contacting ultrasonic level and open channel flow measurement equipment has revolutionised the way that process and utility engineers view that technology, in large part down to the DATEM echo processing software on board. Similarly, Sludge Finder brought Pulsar's technical expertise to bear on the challenge of accurately and reliably measuring sludge blanket interface levels

SIMPLE INSTALLATION, MONITORING PUMP PERFORMANCE IN TWO-PUMP SEWAGE PUMPING STATION

Options and Outputs:

Flow Pulse ® operates as a stand-alone device, requiring 18-28VDC. It includes 1 volt-free programmable relay, provides scalable 4-20mA proportional to flow and connects to a PC via RS232 (see software below).

Optionally, Flow Pulse can interface directly with a dedicated wall mounted device, Flow Monitor, which can be either AC or DC supplied, providing the power and interface for the Flow Pulse via a 4-core cable.

Flow Monitor expands the capability of Flow Pulse, providing two relays that can be programmed as alarm (relay 1) or control (relay 2) for flow or velocity. Either relay can alternatively be programmed as a totaliser.

Flow Monitor also provides a mA output and on-board logging, including a daily total. Typical capacity is 36 days flow logging at 1 minute intervals (uses optional logging software).

Flow Monitor has an LCD display of flow rate and flow velocity (selectable), and is menu-programmable via a set of function keys.

Features
Flow Monitor

- Power for Flow Pulse 22-28V DC & Universal AC 85-264V
- Display for flow/velocity from single Flow Pulse Controller
- Setup of Flow Pulse sensor
- Two programmable relays for control and alarm
- mA Output of flow or velocity
- Daily and system / resettable totalisers
- Logging, setup and download via Optional Log Software

OPTIONAL FLOW MONITOR POWERS FLOW PULSE AND PROVIDES PROGRAMMING, ALARM AND FLOW LOGGING EXPANSION
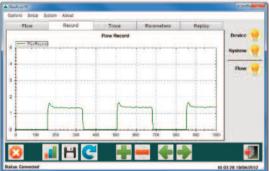
TOOLS NEEDED TO FIX FLOW PULSE IN PLACE: 1 SCREWDRIVER

Software:

To accompany Flow Pulse®, Pulsar have introduced Flow Pulse PC, software to control, set up and monitor Flow Pulse.

From here, users can see at a glance the flow rate in units of their choice, the application can be monitored in terms of signal strength and confidence, and the raw signal can be seen. The RS232 Modbus connection allows the Flow Pulse to be set up through an intuitive and straightforward set of parameters, while real-time flow information can be read and recorded.

Flow Pulse is simplicity itself to set up. All that is required once Flow Pulse is in position and powered is to provide the internal diameter. The rest of the set-up process is all about options and the way that the information is presented and recorded, especially if multi-drop Modbus RTU is in use.

'Signal Strength' (see screen shot opposite) is a measurement of the total strength of the returning echoes from the interior of the pipe. 'Confidence' is, as the term suggests, a measurement of how sure Flow Pulse is of the measurement and is an indication of the consistency of the flow rate. Confidence will increase the longer flow continues.

Flow Pulse PC is free-issued with Flow Pulse and requires no further licensing or equipment to run, other than an RS232 cable (available from Pulsar if required).

THE MAIN FLOW SCREEN GIVES 'AT A GLANCE' DISPLAY OF THE CURRENT FLOW RATE, WITH UNITS SELECTABLE.
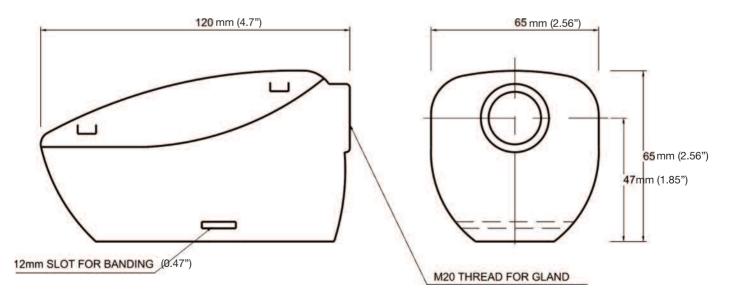
THIS SCREEN SHOT SHOWS A TYPICAL FLOW PULSE RECORD, WITH THE CHARACTERISTIC FLAT-TOP FLOW PATTERN.

Technical Specification: Flow Monitor

PHYSICAL:	
Wall Mount	
Outside dimensions:	130 x 150 x 60mm (5.12 x 5.9 x 2.36in)
Weight:	Nominal 0.65kg (1.4lbs)
Enclosure material/description:	ABS base with Polycarbonate lid flammability rating UL94HB
Cable entry detail:	Underside fitted with 3 x M20, nylon cable glands suitable for 6-12mm (0.24-0.47in) cable.
Sensor cable extensions:	4-core screened
Maximum separation:	100m (328ft)
ENVIRONMENTAL:	
IP rating (Wall):	IP66/67
Max. & min. temperature (electronics):	-20ºC to +50ºC (-4ºF to +122ºF)
CE approval:	EMC approval to BS EN50081-1:1992 for emissions and BS EN50082-2:1995 for immunity, and to BS EN61010-1:1993 for low voltage directive
PERFORMANCE:	
Max. range:	3m/s (10feet/sec)
Min. range:	0.3m/s (1foot/sec)
OUTPUTS:	
Analogue output:	Isolated active output (passive output optional) of 4-20mA or 0-20mA into 1KΩ (user programmable and adjustable) 0.1% resolution
Display:	2 x 12 alpha numeric
Serial port: 2 form "C" (SPDT) rated at 2A at 240V AC	RS232 for programming and data extraction Volt free contacts, number and rating
PROGRAMMING:	
Onboard programming (standard):	By integral keypad
Logging capacity:	256KB. Total logged period is dependent on the amount of information required to be data logged. Examples: Monitoring level and temperature every 15 minutes, memory capacity 546 days. Monitoring level, temperatures and echo strength every 5mins, memory capacity 182 days.
Remote programming (optional):	Via RS232 using optional hand held calibrator
Programming security:	Via passcode (user selectable and adjustable)
Programmed data integrity:	Via non-volatile RAM
SUPPLY:	
Power supply:	115V ac + 5% / -10% 50/60 Hz, 230V ac +5% / -10% 50/60 Hz,

Technical Specification: Flow Pulse ®

PHYSICAL:	
Weight:	Nominal 1.5kg (3.3lbs)
Case material:	Type 316 Stainless steel investment casting
Cable requirements:	multicore screened (2 for power, 2 for mA output and/or 3 for RS485)
Maximum cable length:	500m (547 yards) (minimum of 22VDC supply @ 500m)
Cable entry:	M20 x 1.5 gland
ENVIRONMENTAL:	
IP rating:	IP68
Max. and min. temperature:	-20°C to +70°C (-4ºF to 158ºF)
CE/EMC approval:	Complies with BS EN 61326-1:2006 for emissions and immunity
Power supply:	18-28 VDC, 125mA
APPLICATION:	
Repeatability:	±5% typical - application dependent
Pipe diameter:	30mm to 350mm (1.2 to 14 inch) (version 1) 30mm to 1250mm (1.2 to 49.2 inch) (version 2)
Velocity range:	0.3m/s to 4m/s (1-13 feet/sec)
Minimum particle size:	>100µ
Minimum particle concentration:	>200ppm
Pipe wall thickness	Metal or rigid pipe up to 20mm (0.8 inch) thick
Installation:	By means of a banding strap, using a silicone coupling pad applied to the base of the sensor and on the pipe.
ECHO PROCESSING:	
Echo processing:	RSSA Digital Signal Processing
INPUT/OUTPUT:	
Volt free contact:	1 volt free programmable relay
Analogue output:	4-20mA scalable
Digital communications:	RS 232 and RS485 Modbus RTU
PC software:	Flow Pulse PC included

120 mm (4.7")

12mm SLOT FOR BANDING (0.47")

65 mm (2.56")

65 mm (2.56")

47mm (1.85")

M20 THREAD FOR GLAND

Flow Pulse® is a registered trademark of Pulsar Process Measurement in the USA

dBi Series Transducers:

HART and Profibus PA Ultrasonic Transducers for Level Measurement

Features

- Self-contained
- Two wire
- Solids and liquids applications
- HART or Profibus PA
- DATEM digital echo processing
- Various mounting options
- ATEX Ex mb IIC T4 Zone 1 standard. Option of ATEX Zone 0 I.S.
- Use standard programming tools or Pulsar's dedicated PC system
- FM/FMC approval

Pulsar's new range of self-contained, intelligent non-contacting ultrasonic level measurement transducers make use of HART and Profibus PA communications protocols to make plant integration simple. Pulsar's dBi Series Transducers are self-contained and are programmed either via a PC or through a proprietary calibration unit. With a choice of four units with 3,6,10 or 15m range (10, 20, 33 or 49 ft), Pulsar's Intelligent Transducers take installation simplicity, convenience and accuracy to a new level.

Intelligent Transducers for Level Measurement

Self-contained non-contacting ultrasonic level measurement featuring a choice of HART or Profibus PA communications protocols, Pulsar's Intelligent Transducers set new standards in communications and convenience for reliable plant and field-based level measurement systems.

Pulsar's dBi Series Transducers are low-power devices featuring Pulsar's world-leading DATEM echo processing power for robust and reliable measurement from 125mm through to 15m (5 inches to 49 feet) depending on the unit chosen. Integration with plant systems and other equipment is straightforward. dBi Transducers support GSD, EDDL, FDT/DTM (available on request), making it easy to configure and calibrate the devices using standard PLC/HMI industry protocols, Pulsar's own software or on site multi-drop set up, providing options to program the transducers using either a standard interface or using Pulsar's programming parameters.

Intelligent Transducers are available as HART or Profibus PA devices in a range of models, and can be specified in various formats to suit the application, for example flanged, PTFE coated for corrosive applications, fitted with foam face or submergence shield and with threaded noses for easy installation. For solids applications, Intelligent Transducers are compatible with Pulsar's aiming kit for the best possible results and to measure right down to the draw-off point of a bin or silo.

Intelligent Transducers provide on-board conversion for volume with a number of pre-set tank shapes, plus the ability to curve-fit to non-standard shapes.
The output from the unit can represent distance, level, space, or volume.

Echo Processing

Both Transducer types feature Pulsar's world-leading DATEM echo processing software. DATEM, Digital Adaptive Tracking of Echo Movement, allows the system to zero in on the echo from true target and follow it as it moves up and down the vessel, ignoring the stationary echoes from other elements in the measurement path. Stanchions, chains and ladders, that cause many ultrasonic systems to fail, are no barrier to Pulsar equipment, allowing Pulsar Intelligent Transducers to give reliable and accurate measurement in applications where other manufacturers' equipment would not work.

dBi Transducers with HART protocol

Pulsar's dBi Series Intelligent Transducers featuring HART are typically programmed either via one of the several hand-held calibrators available, or via PC interface. Measurement is signalled either via 4-20mA proportional to the measured value or using the HART protocol, modulated tones on the 4-20mA (1200/2200hz). HART equipped transducers are approved to ATEX Zone 1 (Ex mb IIC T4/ Ex mb IIC T130°C) without requiring the use of a barrier. ATEX Zone 0 (Ex ia IIC T4/ Ex ia IIIC T130°C) optional, requires suitable barrier

dBi Transducers with HART are loop powered (3.8 - 22mA), IP68 for outdoor applications, temperature compensated for increased accuracy and make use of the HART Version 7 protocol, with individually addressable transducers. Alternatively, they can be programmed as stand-alone devices using a hand-held calibrator or PC to operate as low-power measuring devices, using HART as the mechanism for data collection. First boot is approximately 8 seconds, if a typical 15 minute boot interval is used, this becomes approximately 3.5 seconds. The dBi Transducers with HART will convert level to volume, with a library of typical tank shapes or a 16-point curve fit.

HART Registration Number: L2-06-1000-153

Programming

To set up dBi transducers with HART protocol using a PC you require the following:

A HART Modem and 250 ohm resistor: A proprietary HART modem can be used, or Pulsar can supply the Pulsar HART Modem that is fully compatible with dBi transducers. The resistor is placed in series with the power of the transducer to provide resistance during the set-up process.

PC Software:
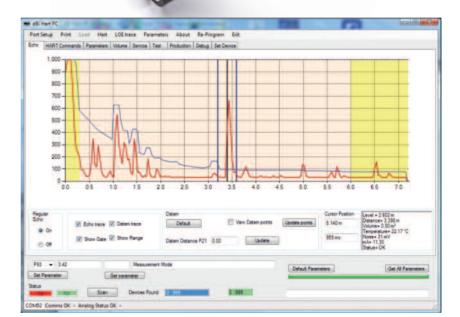
If you require set-up only: **Pulsar's HART PC Lite** free software is bundled with the dBi transducer or is available for download from www.pulsar-pm.com (click the 'support software' tab and download), and provides everything required for efficient set-up of the dBi transducer.

For complete control over set-up, installation, echo profile viewing, cloning and troubleshooting purchase Pulsar **PC Suite**, which includes HART PC along with other major Pulsar software packages. PC Suite is available as a free download for evaluation. Purchase a Pulsar 'dongle' to authorise continued usage after the evaluation period (see separate PC Suite literature for more details).

PULSAR HART MODEM

47

dBi Transducers with Profibus PA protocol
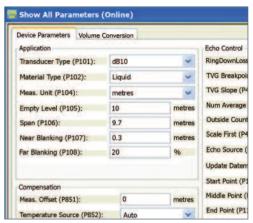
Pulsar use the high data speeds available with Profibus PA to provide full digital communications from a DATEM-enabled transducer. Complying fully with communications standards IEC 61158 and Profibus PA profile 3.0.2, dBi Series Transducers with Profibus provide very high resolution to give exceptional accuracy and a rapid response time of approximately 1 second.

Pulsar's dBi Transducers use Profibus PA Profile 3.0.2 with a low power consumption. Fixed current at 20mA. Fully potted to IP68 for outdoor applications. dBi Transducers are temperature compensated for increased accuracy and offer volume conversion to a variety of standard tank shapes or 16-point curve fit. Supports GSD, EDDL and FDT/DTM (available on request) drivers.

Programming

Using PLC/HMI with Profibus network that: a) supplies GSD Version 3.0 with pre-defined parameter blocks in cyclic or non-cyclic modes; b) supplies EDDL to provide full support for acquiring/logging of echo traces, diagnostics and full maintenance I&M functions according to IEC 61804-3 standards; c) supplies (on request) FDT/DTM direct to HMI software to provide enhanced diagnostic/commissioning capabilities.

Using Pulsar PC Software: Using Pulsar proprietary PC software with USB powered PA modem. The transducer can be operated and is fully functional from a laptop or desktop PC without an additional power supply, providing easy set-up.

ALL PARAMETERS VISIBLE AT A GLANCE (PARTIAL SCREEN SHOWN)

PULSAR PROFIBUS MODEM INCLUDES SOFTWARE

Standard Options

The dBi transducer range is available with the same set of options that have made the standard dB series so popular. dBi transducers are available with a host of mounting options: nose threaded or rear threaded, flange-mounted, faced with chemical resistant PTFE, or PVDF bodies, or fitted with a submergence shield. See the Transducer section for more information or check out the Pulsar Process Measurement website. Pulsar's mounting brackets make installation easy, and the Aiming Kit helps in solids applications to direct the transducer at the draw-off point of the silo or bin.
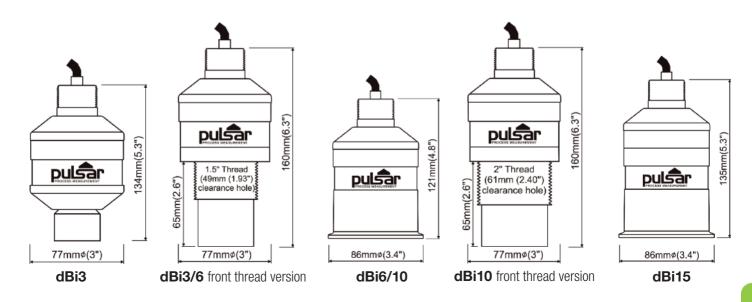
Technical Specification: dBi Transducers

COMMON FEATURES	
Weight:	**dBi3**: 1kg (2.2lbs), **dBi6**: 1.2kg (2.7lbs), **dBi10**, 1.3kg (2.9lbs), **dBi15**: 1.4kg (3.1lbs)
Dimensions and mountings:	**dBi3**: 77mm dia x 134mm high (3 x 5.31 inch). Rear thread 1" BSP/NPT
	dBi6 & dBi10: 86mm dia x 121mm high (3.38 x 4.75 inch). Rear thread 1" BSP/NPT
	dBi15: 86mm dia x 135mm high (3.38 x 5.32 inch). Rear 1" BSP/NPT

Performance characteristics: (NB beam angles at -3bB). All beam angles are inclusive but give an effective beam angle of <3º).	**dBi3**:	range 0.125 - 3m (5 inch to 10 feet)	frequency 125kHz	beam angle <10º
		Resolution	0.5mm (0.02 inch)	
		Accuracy	±0.25% of measured range or 6mm whichever is greater	
	dBi6:	range 0.3 - 6m (1 foot - 20 feet)	frequency 75kHz	beam angle <10º
		Resolution	1mm (0.04 inch)	
		Accuracy	±0.25% of measured range or 6mm whichever is greater	
	dBi10:	range 0.3 - 10m (1 foot - 33 feet)	frequency 50kHz	beam angle <10º
		Resolution	1mm (0.04 inch)	
		Accuracy	±0.25% of measured range or 6mm whichever is greater	
	dBi15:	range 0.5 - 15m (20 inch - 49 feet)	frequency 41kHz	beam angle <10º
		Resolution	1.5mm (0.06 inch)	
		Accuracy	±0.25% of measured range or 6mm whichever is greater	

Output:	4-20mA, resolution 1µA
Housing material:	Valox 357 PBT (Polybutylene terephthalate)
Temperature compensation:	Internal temperature sensor, +/- 0.5ºC/F
Transducer cable requirements:	Twin screened. Integral cable length 5, 10, 20 or 30m
Operating temperature range:	-40ºC to +80ºC process temperature (-40ºF to 176ºF)
Ingress protection:	IP68 to BS EN 60068-2-17:1995 and BS EN 60529 (Nema 6P available)
dBi TRANSDUCERS WITH HART PROTOCOL:	
Digital communications:	FSK (Frequency Shift Keying) modulation of 1200-2400Hz
Power :	10-28V dc, 4-20mA Average current 12mA. Typical wake-up power consumption on 15 minute cycle with average current 35µA hour
Hazardous area approval:	ATEX: Ex II mb IIC T4/ IIIC T130ºC standard, Ex ia IIC T4/ IIIC T130ºC Zone 0 optional
dBi TRANSDUCERS WITH PROFIBUS PA:	
Power :	Bus powered, per IEC 61158-2;20mA (general purpose or I.S. version) 20mA 18-24Vdc
Update time:	1-2 seconds at 20mA current loop
Programming:	Patent Pending PA modem; Simatic PDM, EDDL, FDT/DTM. PC interface 2-wire loop powered from PC or laptop. No external power supply required.
Outputs:	Profile 3.0.2, Class A with I&M functionality
Hazardous Area approval:	ATEX; Ex ia IIC T4/ Ex ia IIIC T130ºC Zone 0 and FISCO Field Device II 1 G Ex ia IIC T4/ II 1D Ex ia IIC T130ºC

All Beam Angles are Inclusive, but give an effective beam angle of <3 degrees.

dBi3	dBi3/6 front thread version	dBi6/10	dBi10 front thread version	dBi15

Blackbox Controllers:

Level measurement made simple

Features

- Compact low cost intelligent controllers

- Will operate on all dB transducers up to 40m range

- Solids, powders and liquids level measurement

- Separation from transducers up to 1000m using standard 2 core screened cable

All standard Blackbox units share a common IP67 enclosure with 3 cable glands fitted. A flashing LED indicates healthy operation. Programmed through PC using supplied software or Pulsar hand held programmer using RS232 via RJ11 port.

Blackbox130

Level

Non-contacting level measurement featuring a 4-20mA output, which can be supplied isolated or non isolated, proportional to level and two alarm or control relays.

Blackbox133

Level Control

Two control or alarm relays, with simple 0-5V output proportional to level to drive a local display. Simple 2 pump control with alternation is also included in the 133.

Blackbox134/135

Level Comms

Blackbox Level Comms retains the alarm relays of Blackbox 133, and adds an RS485 port for digital communications.

Modbus (code 134), Profibus DP V0 or V1 (model 135)

Blackbox136

Level CSO

Pulsar's blackbox 136 CSO is a sophisticated ultrasonic system specifically designed for use with batteries to provide non-contacting monitoring of level or overflow events, with exceptionally low power consumption to maximise battery life in remote locations. Also features on board data logging.
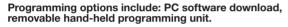
Blackbox Calibration:
Standard Blackbox range offers two set-up options

Blackbox units can be set up using Pulsar's Blackbox PC Software and optional interface cable, which links the Blackbox RJ11 RS232 port to the PC's serial or USB port. Part numbers PCLEAD-UP for USB connection and PCLEAD-SP if a serial connector is needed. The interface cable is common for all standard Blackbox units and is removed after programming, so only a single cable is required for multiple Blackbox controllers.

Blackbox units can also be set up using a hand-held programming unit (see right). Simple to operate and with a visual display of parameters entered, the hand-held programmer will program any of the Blackbox range and can be used for any number of controllers. The Blackbox unit will return to 'run' mode once the interface cable is removed.

Programming options include: PC software download, removable hand-held programming unit.
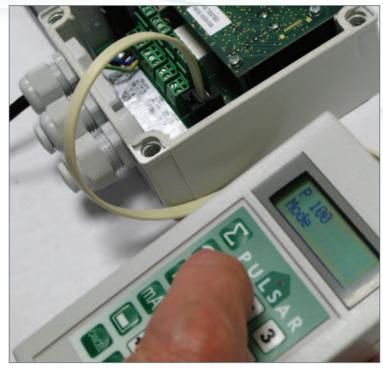
FOOD PROCESSING TANK LEVEL

MINERAL OIL TANK LEVEL

REMOVABLE HAND-HELD PROGRAMMING UNIT CONNECTED TO BLACKBOX

BLACKBOX PC SOFTWARE SUPPLIED ON A CD AND OPTIONAL CABLE CONNECTING FROM RJ11 TO PC

BLACKBOX ON MIXING TANKS WITH AGITATORS

Blackbox Display:

Blackbox with integral display - component non-contacting
level monitoring with integrated readout

Pulsar's integral display option extends the capability of the blackbox range, allowing users to locally program the unit and give a readout of level. Economical and simple to program and operate, users benefit from extremely accurate and reliable digital echo processing with access to the dB range of transducers, measuring from 125mm (0.41ft) right through to 40m (130ft).

The integral keypad and display is available for any unit in the blackbox range with the exception of the blackbox 136 CSO.

The integrated keypad and display means that you have complete flexibility in your control application, providing a local display for those applications that require local indication. Alternatively, blackbox with integral keypad and display provides an economical alternative for simple level measurement or control applications.

Blackbox units are compatible with Pulsar's complete range of transducers, giving a range extending from 125mm right through to 40m, on solids, powders or liquids. The Blackbox range benefits from DATEM (Digital Adaptive Tracking of Echo Movement) digital echo processing, providing unrivalled performance particularly on difficult applications.

SHOWS THE BLACKBOX DISPLAY IN SITU

Technical Specification: Blackbox Display

PHYSICAL	
Dimensions:	130mm x 150mm x 63.5mm (5.12in x 5.90in x 2.5in)
Weight:	Nominal 0.65kg (1.4lbs)
Enclosure:	ABS Base with polycarbonate lid
Programming:	integral keypad or RS232 interface using optional software or hand-held programmer

ENVIRONMENTAL	
Flammability rating UL94HB:	Fitted with 3 x M20 nylon cable glands for 6-12mm (0.24-0.47in) cable. IP rating: IP66/67
Electronics should be mounted in a safe area. Please see detailed specification for full details of EMC approvals etc.	
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330.
Max/min temperatures (electronics):	-20C to +55C (-4F to +131F)
Measurement range:	125mm - 40m (0.41ft -130ft) depending on transducer

PERFORMANCE	
Accuracy:	±0.25% of measured range or 6mm, whichever is the greater
Resolution:	dBMACH3 0.25mm, dB3 0.5mm, dB6 and dB10 1mm, dB15 1.5mm, dB25 2.5mm and dB40 5mm
Display:	2 x 12 alpha numeric (backlit)

ECHO PROCESSING	
Programming security:	Via Passcode (user selectable)
Outputs:	2 volt-free contacts, form "C" SPDT rated 2A at 220V AC, RS232 for programming and data
Comms:	RS232 via RJ11 port standard and optional RS485 providing digital communications by 134/5 units

Blackbox:
Modem

The ultimate distributed stock monitoring and control system, Blackbox Modem features a built-in GSM modem that provides SMS (text) messages in response to low level or re-fill points, meaning you can monitor stocks across a site, a city or a country – plan your transport efficiently, save time and money and most importantly, keep your customers happy.

Blackbox modem features superb digital echo processing to give reliable level measurement over anything from 125mm to 40m on solids, powders or liquids, making it perfect for measurement of almost any kind of bulk material.

"Blackbox modem" includes a GSM modem, which is simply configured via a PC set-up to provide a mobile phone SMS text message either when stocks reach a user configured "restock" point or at user-set intervals. That allows the supplier to plan properly for restocking, decide the most efficient routes for delivery vehicles in advance, and perhaps most importantly, avoid the dreaded "I've run out – can you be here in ten minutes?!" phone calls.

Blackbox modem is aimed at companies with distributed stocks of material that need replenishment on a regular basis, for example: cement silos in construction sites over a wide area, chemical tanks based on customers' premises and so on. Alternatively, Blackbox modem is ideal for large sites where it is important to maintain a stock level in strategic areas, or for environmental protection applications where high levels or overflow conditions are critical. The GSM modem can also act as a wireless connection to Pulsar's Blackbox PC software for diagnostics and programming.

Blackbox Modem is available in 4 versions:-

Modem Level 130: which also features a 4-20mA output for local display of level;

Modem Level Control 133: which offers two mechanical relays (Type C, 230V 2A SPDT) for alarm or control functions.

Modem Level Comms 134/5: with Modbus or Profibus DP V0 or V1 digital comms on board.

Two software packages are available - Blackbox PC, which provides set-up facilities for the Blackbox unit and allows the user to fully set up the unit, view echo profiles and perform diagnostic checks. SMS Server is specifically designed for collating SMS data from multiple units in the field. Use a Pulsar GSM modem at a PC to receive and record the data.

Features

- SMS text alert on level
- SMS server software monitors and logs many tanks for levels

SMS Server software

SMS Server shows you all your sites at a glance on your PC screen. A simple colour-coded mimic tells you when a site has reached a re-order point or is at a dangerously low level, so you can make the right decisions about restocking materials and programming vehicles for the best possible efficiency - saving time, resources, manpower and energy.

SMS Server is easy to set up and runs on a standard PC connected to the compact Pulsar GSM modem.

Blackbox Modem:

Blackbox with integrated GSM Modem

The system* is dependent on SIM card used; it can be either "data" enabled or standard SMS type (Voice/PAYG).

If the SIM card is standard voice type, the Blackbox Modem (1) can send SMS text messages on alarm to designated mobile phones, or customer can install Pulsar SMS server on a PC connected to a PC modem (2). The SMS server software can collect data and reports and present data in a graphical format, also this data can be saved into Excel format. This is a many to one connection.

If SIM card fitted on the remote site is a "data" type then, using Blackbox PC software on a local PC with modem (2), this allows getting and setting of parameters and getting traces, this is a one to one transparent connection from Blackbox PC software to the remote unit.

*Coverage dependent on network.

1: The modem is a quad band modem GSM 900/DCS 1800/GSM 850/PCS 1900 fitted in larger enclosure with Blackbox processor board and PSU.

2: The modem is a quad band modem GSM 900/DCS 1800/GSM 850/PCS 1900 fitted in larger enclosure with PSU.

RS232 serial lead to PC

Antenna Connection

PC end GSM Modem unit
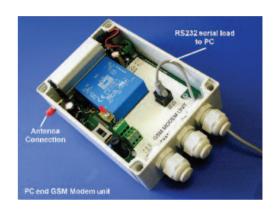
FIGURE 1: THE OPERATIONS OVERVIEW SCREEN

The bars here show the most recent levels for each "station". Green bars mean stock levels are OK, yellow show that level is below a warning threshold but above the alarm level, and red shows that levels are below an alarm threshold.
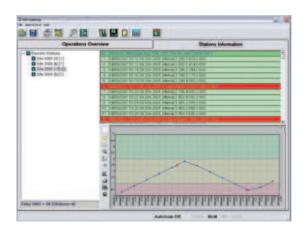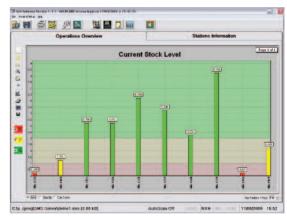
FIGURE 2: STATIONS INFORMATION SCREEN

More detailed information for each station is available here: the type of site, the number of reports received from each site, the number of alarms received are all displayed, and a graph showing the trend data from each station helps decisions to be made on restock frequency etc. All the data can be exported in .csv format for additional analysis or reporting in spreadsheets or other programs.

Technical Specification: Blackbox Modem

PHYSICAL:	
Enclosure:	polycarbonate lid, ABS base, IP66/67
Dimensions:	130mm x 180mm x 60mm (5.12in x 7.09in x 2.36in)
Power requirement:	30W max
Transducer:	compatible with the dB range of transducers, 125mm to 40m (0.41ft - 130ft) measurement range
Hazardous area:	Blackbox unit must be mounted in safe area, see transducers data for Zone approvals

Brief Specification: (NB: for full specification see Blackbox specification below):

Blackbox 136:
Level CSO

Pulsar's blackbox 136 CSO is a sophisticated ultrasonic system specifically designed for non-contacting monitoring of level or overflow events, with exceptionally low power consumption to maximise battery life in remote locations and built in data logger.

Blackbox 136 CSO provides a self-contained solution to level and event recording and with the ability to supply a voltage output to an external monitoring or telemetry outstation if required. Blackbox 136 CSO may be programmed to provide level measurement using the optional hand-held calibrator or using Blackbox PC calibrator software, a copy of which is supplied with the unit.

If data logging is a requirement, the optional CSO log software is available both to set up the unit and download and analyse the logged data. The software includes powerful graphing, data analysis, export and print functions so that the history of the site can be easily understood and displayed.

136 CSO may be set to read level continuously, or in order to prolong battery life, may be set to wake up to take readings at user-defined intervals (1-99 minutes). Each data record is internally logged and also supplied as a 0-5v output. On standby, 136 CSO is ready to be polled by an external data logger or telemetry outstation for the retrieval of information.

Wake up intervals may also be varied automatically. For instance, if the level approaches a critical point, the interval between measurements can be reduced on even set to run the system continuously so that more detailed records of the event are available. The new interval will be maintained until the level returns to normal values and then the system reverts back to the previous wake up interval.

Should a weir or other flow structure be available in the CSO then the Blackbox 136 can totalise 'spill volume' through this structure. Not only will the 136 CSO unit log the day, time and duration of any 'spill event' it logs the quantity too.

Flexibility and adaptability to specific site requirements are key features of the 136 CSO system.

Logging capacity for the Blackbox 136 CSO system is 256KB. The total logged period is dependent on the amount of information required to be data logged. Examples are: 1) Monitoring level and temperature every 15 minutes would result in a memory capacity of 569 days. 2) Monitoring level, temperature and echo strength every 5 minutes would result in a memory capacity of 163 days.

Features

- Low power with large internal data log
- Flexible and variable wake up periods
- Can be externally polled for logged data
- Battery life calculator included in CSO Log software

LEVEL CSO MOUNTED ON BATTERY PACK INSIDE A BOLLARD

Blackbox 136 Level CSO
Software
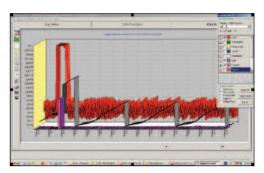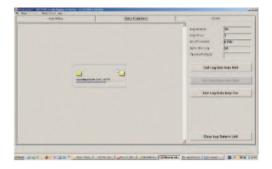
CSO log software is a powerful way to record and manage accumulated data. CSO log software provides both set-up of Blackbox 136 CSO units and the download and analysis of internally logged data for graphing and output. PC connection to the system is from a PC RS232 (COM) via the 136 CSO's on-board RJ11 port.

The 136 CSO unit may be completely calibrated, either in advance or on site. As with all Pulsar equipment, set up parameters are logical and intuitive. All you have to do is set up the physical dimensions of the application and tell the unit what you want to measure and how often. Data logging is flexible; you select the information you wish to log and the logging interval. The unit will let you know how many months storage is available and any aspect of measurement or logging may be adjusted to suit the reporting requirements. Depending on measurement frequency, 136 CSO is easily capable of recording twelve months of data and may be set so that new data overwrites the oldest where required.

Logged site data is downloaded to a PC file through the same cable connection used for programming. In addition, all programming parameters may be downloaded for backup or repeat set up (cloning).

The powerful graphical analysis tools in CSO log software put the story of the site at your fingertips. You can see how all your logged data has varied over time, clearly plotted and available to be "cut and pasted" into a word processor or other reporting program. A standard CSV file may be exported to a spreadsheet or data analysis package or archive.
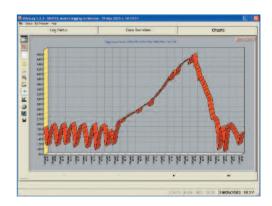
dB3 WITH DRIP SHIELD
MOUNTED IN CSO CHAMBER

Product Functions

	Blackbox				
	130 Level	133 Level Control	134 Level Comms	135 Level Comms	136 Level CSO
115/220 VAC	•	•	•	•	
10-28v DC	•	•	•	•	•
4-20mA o/p Max 1K	•				
0-5V o/p Min Load 10K		•			•
2 relays 220V, 2A Form C (SPDT)	•	•	•	•	
RS232 RJ11 port	•	•	•	•	•
RS485 Modbus			•		
RS485 Profibus DP V0 or V1				•	
Logging					•
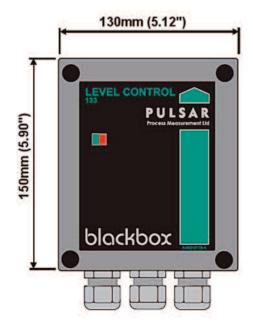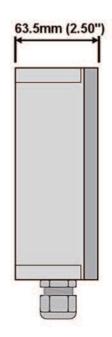
WATERPROOF CONNECTION (TO IP67) MOUNTED ON UNIT'S ENCLOSURE INSTEAD OF RJ11 PORT INSIDE.
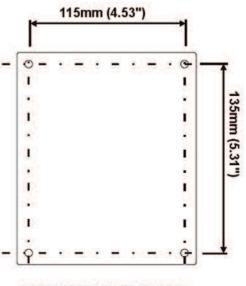
Technical Specification: Blackbox

PHYSICAL	
Weight:	nominal 0.65Kg (1.4lbs)
Enclosure:	ABS Base with polycarbonate lid, flammability rating UL94HB
Cable entries:	3xM20 nylon cable glands for 6-12mm cable, two 15mm x 35mm rear knockouts

ENVIRONMENTAL	
IP Rating:	IP66/67
Max/min temperature (electronics):	-20C to +55C (-4F to +131F)
Flammable atmosphere approval:	All blackbox units must be mounted in a safe area.
UL/C-UL:	UL Listed. UL Listed to Canadian safety standards. Certificate no. E257330

PERFORMANCE	
Accuracy:	±0.25% of the measured range or 6mm whichever is greater
Resolution:	dBMACH3 0.25mm, dB3 0.5mm, dB6 and dB10 1mm, dB15 1.5mm, dB25 2.5mm and dB40 5mm
Range:	Dependent on transducer. Nominally 125mm to 40m (0.41ft to 130ft) Compatible with all dB transducers

ECHO PROCESSING	
DATEM:	(Digital Adaptive Tracking of Echo Movement)
Programming security:	Via Passcode (user selectable)
Programmed data integrity:	Via non-volatile RAM

POWER SUPPLY
115V ac +5% / -10% 50-60Hz
230V ac +5% / -10% 50-60Hz
dc 10-28V
10W maximum power (typically 5W)

HAND HELD PROGRAMMER
Power supplied via Blackbox RS232 RJ11 connector

FUSES
50mA at 200 - 240V ac
100mA at 90 - 120V ac

Dimensions: Blackbox Standard

130mm (5.12")   63.5mm (2.50")   115mm (4.53")

150mm (5.90")   135mm (5.31")

FIXING HOLE CENTRES

pulsar

IMP

IMP Standard 2/3 Wire

The IMP range offers a combined transducer and controller in one self contained unit. Non-contact level measurement of liquids or slurries. Has a choice of 2 or 3 wire configuration. Up to 10m range

IMP I.S.

IMP is also available in I.S. configuration to ATEX and IECEx.
2 wire loop powered easy set up

IMP Lite

IMP Lite is a lower cost alternative to the standard 2/3 wire version. IMP Lite is 2-wire configuration, includes RJ11 and is not suitable for flammable atmosphere use

IMP PC Software

IMP PC software allows parameter access and echo trace viewing on screen.
This easy-to-use software package stores calibration details of each IMP

IMP:

Self-contained ultrasonic level measurement without compromise

Pulsar's IMP range is non-contacting ultrasonic level measurement without compromise. Compact, low-profile self contained units with the benefit of digital echo processing specially designed for IMP. Simple programming without affecting the IP rating via the integral keypad or using IMP PC, IMP's own PC software that lets you program the unit, view and download echo profiles and parameters.

There is an IMP to suit your application. 3m, 6m and 10m range versions are available and each can be wired for 2 wire or 3 wire operation. 2-wire Intrinsically Safe (I.S.) versions are also available. All IMPs feature LCD displays and digital temperature measurement and compensation. Imp also has 2 relay outputs as standard.

You can use IMP wherever you need reliable non-contacting level measurement: digital echo processing means IMP is perfect for slurries or liquids. Sumps, tanks, silos. Anywhere you need a display telling you the level, or an analogue output to interface with your site control system or drive a display.

When used on battery power for intermittent (wake-up) applications, IMP's high speed boot up of circa 3 seconds maximises battery life. For example, if an IMP were switched on every 15 minutes for a 3 second reading, average current is a mere 40µA.

Active and passive (sourcing and sinking) analogue outputs assist with system integration, especially when retro-fitting into older installations.

Standard IMP bodies are made from Valox 357 PBT. Some are available with front face in PVDF for corrosive applications.

Features

- Compact self contained level measurement
- Calibrate without compromising the IP67 rating
- Simple menu led set up
- High power and narrow beam angles

IMP ON CHEMICAL TANK

STANDARD IMP FACE

IMP ON A LIQUID LIME TANK

IMP Variants:

Features

- 1.5" universal thread (2" on IMP 10)
- Agitator avoidance as standard
- 200mm deadband on IMP 3
- PVDF Nose option

VARIANTS:	IMP 3	IMP 6	IMP 10
Range:	200mm - 3m (0.65ft-10ft)	300mm - 6m (0.98ft-20ft)	300mm - 10m (0.98ft-33ft)
2 / 3-wire configurable IMP:	11-30 volts dc / 4-key user interface / LCD adjustable backlit display Digital temperature measurement / 2 alarm relays (1A 30V) / IMP PC software download / Digital echo processing.		
2-wire I.S. IMP:	I.S. certificate to ATEX EEx ia IIC T4 and IECEx / 4-20mA loop powered / 4-key user interface / LCD display / Digital temperature measurement / Digital echo processing.		
2-wire IMP Lite:	2-wire configuration only. RJ11 port/ 4 key user interface/LCD display/ Digital temperature measurement/ 4-20mA loop powered/ Digital echo processing/ No flammable atmosphere approval.		

The full IMP range is available with the wetted parts in PVDF build alternative for corrosive or aggressive applications. The picture below shows a PVDF nose cone on an IMP 6 unit.

PVDF NOSE CONE OPTION

INSIDE OF I.S. IMP (ATEX and IECEx)

INSIDE OF STANDARD 2/3 WIRE IMP

INSIDE OF IMP LITE SHOWING RJ11 PORT

IMP ON A MIXING TANK

IMP Applications:
and IMP PC Software

IMP applications

You can use IMP wherever you need reliable non-contacting level measurement: digital echo processing means IMP is perfect for slurries or liquids. Sumps, tanks, silos. Anywhere you need a display telling you the level, or an analogue output to interface with your site control system or drive a display.

When used on battery power for intermittent (wake-up) applications, IMP's high speed boot up of circa 3 seconds maximises battery life. For example, if an IMP were switched on every 15 minutes for a 3-second reading, average current is 40µA (3 seconds "live" @ 12mA averaged over 15 minutes) .

The presence of active and passive (sourcing and sinking) analogue outputs assists with system integration, especially when retrofitting into older installations.

IMP PC

IMP PC is optional software that extends IMP's capabilities, allowing you to:

- **Download, analyse and store echo profiles.** A great way to see exactly what is happening in the application. Fine tuning for ultimate performance.
- **Set-up** IMP. All programming parameters are instantly visible in the IMP PC programming screens. Program the IMP unit on a desktop before installation, or clone a number of IMPs to save valuable time.
- **Updates.** Future-proof your IMP! Pulsar's policy of continuous improvement means that we never stop developing our products. IMP PC allows new firmware to be installed into your IMP units without even removing them from the application.
- **Flow measurement.** A flow curve may be added within IMP PC to configure for simple level to flow linearisation

Simple to install

The compact IMP is only 175mm high with a 130mm diameter. Cable glands are provided and IMP can be simply screwed into a 1.5" or 2" universal fitting (a 1.5" to 2" adaptor is available). High transducer power and tight beam angles, together with Pulsar's digital echo processing, makes IMP ideal for many "difficult" applications such as dusty or foamy environments, or where a tank has unavoidable intrusions. The integral display makes programming IMP is extremely straightforward. IMP can be completely set up, without compromising the IP rating, using the integral keypad alone with no need for a PC. Optional IMP PC software makes it easy to fine tune IMP's performance and "clone" any number of IMP units to the same settings if, for example, they are being used on a tank farm. Please note that PC interface is not included on I.S. IMP variants.

I.S.IMP Features
- **High Specification I.S. version**
- **Up to 10m range available**

IMP Lite Features
- **2-wire configuration**
- **RJ11 Port**
- **Up to 10m range available**

IMP PC DIAGNOSTICS

SPECIALLY DESIGNED IMP BRACKET IS ALSO AVAILABLE

IMP PC ECHO TRACE

61

Technical Specification: IMP

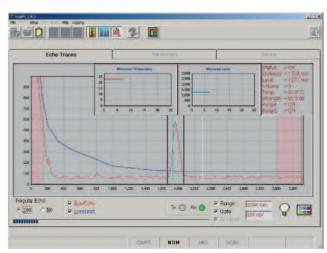| PHYSICAL:			
Dimensions:	175mm (6.89in) overall height x 130mm (5.12in) diameter		
Cable entry:	2 off 16mm (0.63in) cable glands 3.5 - 10mm (0.14-0.39in) cable dia.		
Mounting:	1.5" (3m (10ft) and 6m (20ft) range versions), 2" (10m version) universal thread - suits BSP and NPT, parallel and tapered		
Weight:	approximately 1Kg (2.2lbs)		
ENVIRONMENTAL:			
Temp range (process): Temp range (ambient):	-40ºC - +80ºC (-40°F to +176°F) -20ºC - +65ºC (-4°F to +149°F)		
IP Rating:	IP67		
VARIANTS:	**IMP 3**	**IMP 6**	**IMP 10**
Beam angle (-3dB half power):	<10º inclusive	<10º inclusive	<10º inclusive
Operating frequency:	125kHz	75kHz	41kHz
Measurement range:	0.2m-3m (0.66ft-10ft)	0.3m-6m (0.98ft-20ft)	0.3m-10m (0.98ft-33ft)
PERFORMANCE:			
Digital echo processing:			
Input voltage range:	11 - 30V (17 - 28V for I.S. version), 3.5 - 22mA		
Accuracy:	± 0.25% or 6mm (0.24in) (whichever is greater)		
Resolution:	± 0.1% or 2mm (0.08in) (whichever is greater)		
4-20mA outputs:	resolution 5μA (both active and passive outputs)		
Temperature compensation:	via internal temperature sensor (±0.5ºC accuracy) Level and volume conversion are installed allowing linearisation for tank shapes		
IMP MAY BE WIRED AS EITHER 2-WIRE OR 3-WIRE, GIVING THE FEATURES BELOW:			
2-wire configuration:	RS232 (RJ11 port) connection for diagnostics and software updates		
	4 digit LCD display		
	4 button keypad for parameter entry		
	Power consumption: 3.5 - 22mA		
	Passive 4-20mA output		
3-wire configuration (additional to 2-wire):	Backlit LCD display		
	0-10V analogue output		
	2 relays: single pole two way, 1A 30VDC/AC		
	Power consumption with relays energised <60mA (less12mA/relay not energised)		
	Active and passive 4-20mA outputs		
2-wire I.S. version:	Intrinsically safe to ATEX Ex II 1G EEx ia IIC T4 and IECEx. NB: I.S. IMP is identified by black cap to housing instead of green. Does not include RS232 interface.		
IMP Lite version:	11-30V supply, 3.5 - 22mA output, has RS232 (RJ11 port), 2-wire configuration, no flammable atmosphere approval		
PC Interface IMP PC:	All parameters can be accessed and changed through IMP PC software. Echo traces may be viewed on screen. NB: IMP I.S. does not offer this feature.		

IMP CONTROLLING SCREEN HEIGHT

IMP CONTROLLING GATE HEIGHT

IMP MONITORING IN A CSO CHAMBER
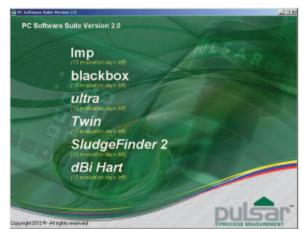
PC Software Suite:

Pulsar's PC Suite - interface for all your Pulsar equipment from a single installation

Pulsar's PC Suite now includes every major piece of Pulsar software in a single, convenient downloadable package. Activated by a security 'dongle' after the 30 day evaluation period, PC Suite can now be flexibly installed on as many PC's as required.

PC Suite is a simple download and install from the Pulsar website (see address below). PC Suite can be used to set up, calibrate, clone, or download data from the main range of Pulsar equipment. It includes Ultra PC, the popular and powerful set of tools that work with Pulsar's Ultra 3 and Ultra 5, plus the core control software for several other Pulsar controllers, including the two-channel UltraTWIN, self-contained IMP, component ultrasonic system Blackbox, Sludge Finder 2 sludge interface monitor and HART protocol dBi 'intelligent' transducers.

Newly introduced with the latest version of PC Suite is a security 'dongle', which simply plugs into a vacant USB port, providing an interface with whichever Pulsar unit is in use via its on-board RS232 socket and activating PC Suite.

The advantage of this approach is that in previous versions of Pulsar's software, only team members with registered software could use it, meaning that a PC might have to be effectively dedicated to the task of setting up, calibrating or investigating Pulsar equipment. Now, with PC Suite, a full set of Pulsar software tools can be installed on everyone's PC, activated as required using the dongle. Customers need only purchase as many dongles as there are users who may need to operate the software at the same time.

Download PC Suite from the Pulsar web site:
www.pulsar-pm.com/Support/SoftwareDownloads.aspx

Features

- **Software now instantly available for download**

- **Requires security 'dongle' to operate after 30 day evaluation period**

- **All main software omponents in one place**

SECURITY DONGLE

PC Software Suite:

What's included:

IMP PC

Set-up, program, calibrate, clone and configure IMP units.

Blackbox PC

Pulsar's Blackbox range is designed specifically to be set up from a PC or PLC. Create a programming template to easily set up multiple blackbox units, configure interfaces and outputs, and to download data, depending on the Blackbox unit in use.

Ultra PC

Complete control over Ultra units, Pulsar's popular and versatile fully-featured level and flow measurement controller. Set up single or several Ultra 3 or Ultra 5 units, view live DATEM echo processing traces and view data log information.

Twin PC
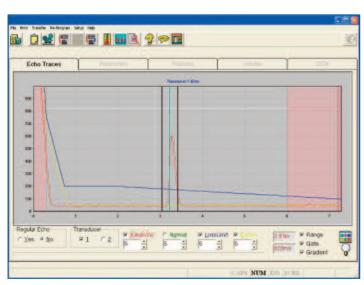
Exactly like the Ultra units, but controlling Pulsar's versatile two-channel device, UltraTWIN.

Sludge Finder 2 PC

Control, program and calibrate Pulsar's innovative and effective Sludge Interface monitor. Now including the capability to program separate RAS and FLOC levels. See interface level profiles and store level data.

dBi HART PC

Address and configure the HART version of Pulsar's dBi Intelligent transducer via a HART modem.

To order:
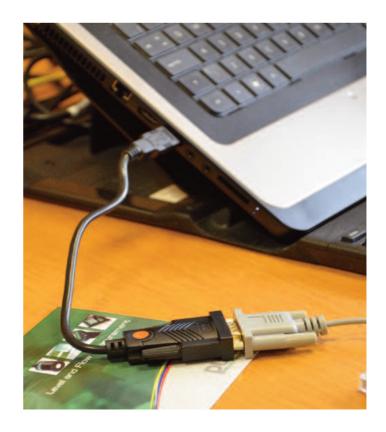
You can download PC Suite software directly from the Pulsar website. To purchase a dongle, contact Pulsar or their local representative and request Product Reference PCSUITE-D-PS to receive a disk copy of the software and the dongle.

TYPICAL ECHO TRACE

Note: *Flow Pulse PC Software is not included in the PC Software Suite package. Flow Pulse PC does not require a security dongle, instead a RJ11 USB lead is required.*

pulsar

Point Level Switches

Process Protection

Vibrating Probes:
200 Series

Features

- No moving parts to wear out
- Strong stainless steel construction
- Tip sensitive not affected by wall cling
- Sharp blade prevents material build up
- No calibration or adjustments needed
- High temperature 150°C option
- Rigid tube and cable extension versions
- Ex ia versions for dust and gas applications

The Pulsarpoint 200 series is a range of vibrating level switches for bulk solids applications. When solids material comes into contact with the vibrating probe, the frequency of oscillation changes. This is detected and a signal generated to provide a changing relay output.

May be used to signify a material level as being high, intermediate or low depending on configuration chosen.

The design of the sharp edged blade profile and the frequency of oscillation ensure that the probe is able to resist material build up, which may be associated with other tuning fork designs. This provides long trouble free operation.

Application

Effective management of material storage and flow prevents overflows, empty vessels, clogged or blocked chutes or conveyors. Costly or dangerous spillage, material waste or unnecessary maintenance may therefore be avoided.
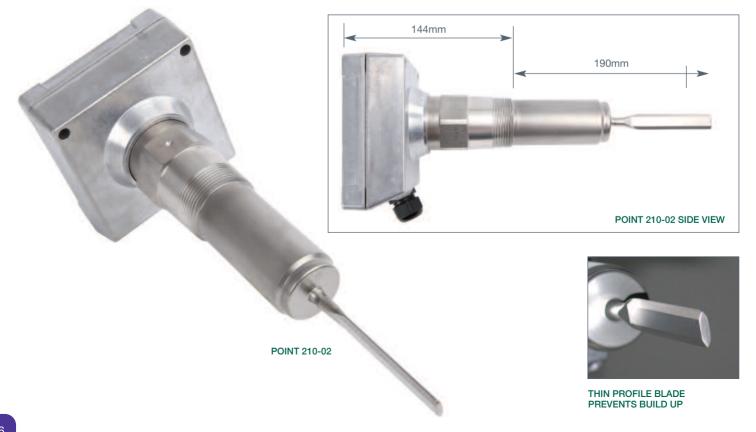
Typical applications may be found in the food, animal feed, pharmaceutical, chemical, plastics, quarrying, power generation, cement and other bulk solids material storage industries. It is suitable for most dry bulk solids from powder up to 20mm particle size.

Products include: flour, sugar, cellulose, coffee, sawdust, styrofoam, powdered milk, tea, ground glass, sand, grain, pellets and animal feed.

A normal process temperature of -20°C to +80°C may be monitored with the standard unit, whilst a higher temperature version the 212-20, allows a process temperature of 150°C to be handled.

Pulsarpoint 210-02 - standard

The 210-02 is suitable for most granular products with a bulk density of 20g/litre or more. A relay output is standard. The electronics are mounted in a diecast aluminium housing. The process connection and probe are in stainless steel. An adjustable sensitivity setting allows easy adjustment to suit the material being monitored.

POINT 210-02

144mm

190mm

POINT 210-02 SIDE VIEW

THIN PROFILE BLADE PREVENTS BUILD UP

Pulsarpoint 212-20 - high temperature unit

This 212-20 unit uses a separate electrical enclosure, with a 2m long high temperature cable, between the fork assembly and the separated electronics. Applications up to 150°C process are able to be handled.

POINT 212-20

Pulsarpoint 210-03 - rigid tube extension

Where a longer insertion length is needed, then 210-03 can be provided this with its rigid welded tube construction. This is suitable for top mounting on a vessel or silo. Maximum insertion length is 2m.

POINT 210-03

Pulsarpoint 210-06 - cable extension

The polyurethane sheathed steel reinforced cable allows insertion lengths up to 20m. These versions are typically used in bulk powder as high level switches leaving sufficient space not to overfill the silo. Cable length needs to be specified at the time of ordering.

Pulsarpoint 210-02 – Ex ia
Pulsarpoint 210-03 – Ex ia
Pulsarpoint 210-06 – Ex ia

These versions are all available with flammable atmosphere approval to the following:

Gas: ATEX II 1G Ex ia IIB T4.
(Zone 0, 1 and 2)
Dust: ATEX 1D Ex ia D20 TX
(Zone 20, 21 and 22)
See specification table for electrical supply and output signal of these Ex ia versions.

Technical Specification: Pulsarpoint 200 Series

210 (SOLID):	
Power supply:	20 to 250 V AC/DC, 3VA (Ex ia version18 to 23,7V DC provided by barrier unit)
Output:	1 volt free contact (DPDT) 8A @250Vac (Ex ia version 8 / 16mA depending on switching mode)
Sensor:	Stainless steel 1.4301 / AISI 304
Housing:	IP 66/67 Diecast aluminium
Thread:	1½ " conical DIN 2999 (1½ " BSP) or NPT
Resonance frequency:	290 HZ
Temperature limits:	Process -20°C to +80°C (-4°F to +176°F) (212 sensor unit -20°C to +150°C (-4°F to +302°F), ambient 20°C to 60°C (68°F to 140°F)
Application:	Minimum material density: 20g/litre (1.25lbs/ft3)
Maximum pressure in silo:	10 bar (145psi)
Options:	24V or 48Vac, 24Vdc; Extensions
PULSARPOINT 200 SERIES OPTIONS:	
210-02:	Standard length probe system
212-20:	High temperature 150°C (302°F) standard length probe system with 2m (6.5ft) separation
210-03:	Rigid tube extension up to 2m (6.5ft) between probe and electronics
210-06:	Flexible cable extension up to 20m (65ft) between probe and electronics

Rotating Paddles:
300 Series

The Pulsarpoint 300 series is a range of rotating paddle level switches, for level measurement and switching on bulk solids. The paddle's rotation is interrupted when material reaches the paddle, causing a clutch to disengage the motor. This in turn actuates a relay allowing an alarm signal to be switched. This may be used to signify a material level as being high, intermediate or low depending on configuration chosen.

Application

Effective management of material storage and flow prevents overflows, empty vessels, clogged or blocked chutes or conveyors. Costly or dangerous spillage, material waste or unnecessary maintenance may be avoided.

Typical applications may be found in the food, animal feed, pharmaceutical, chemical, plastics, quarrying, power generation, cement and other industries employing bulk solids material storage or conveying.

Suitable products for monitoring include plaster, cement, chalk, lime, granules, wood chips, cereals, cocoa, sugar, animal feeds, washing powders or plastic powders and pellets.

POINT 300

Pulsarpoint 300

The 300 utilises a polycarbonate housing, sealed to IP 66. The process connection is of the same material, with a polypropylene double blade paddle as standard. This can easily be converted to a single blade (as shown).

Rope and solid extensions are available, along with an aluminium process connector (shown).

POINT 310

Pulsarpoint 310
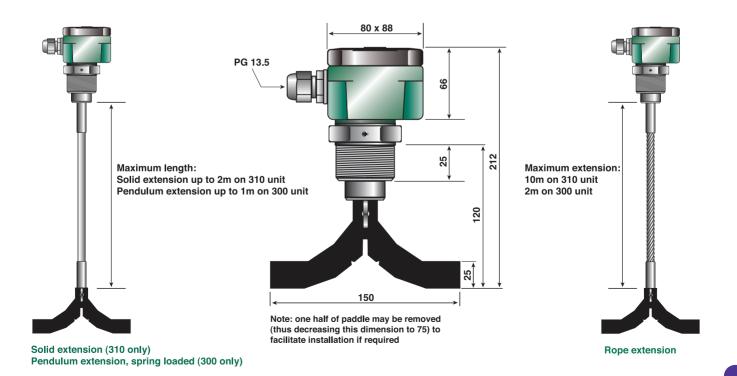
The 310 has a diecast aluminium housing sealed to IP 66, with process connection in aluminium, or stainless steel. Various paddle materials, along with options on seals for aggressive media applications are available. The 310 switch is available for high application temps of up to 600°C. It is also available with ATEX dust approval for zone 20, 21 and 22.

Options

Switches are available with solid or cable extension, allowing a wide range of alarm points to be catered for with materials to suit the application, as well as high temperature versions for applications up to 600°C, such as is required in electrostatic precipitator hopper level measurement.

Technical Specification: Pulsarpoint 300 series

TECHNICAL SPECIFICATION PULSARPOINT 300 and 310:	
Voltage: (5 versions):	240, 110, 48, 24VAC 50/60HZ, 24V DC (Universal Voltage option)
Installed load:	3VA
Switched output:	Max. load 250V, 2A, AC: 300V, 2A, DC

TECHNICAL SPECIFICATION PULSARPOINT 300:	
Housing:	Polycarbonate IP66
Cable entry:	1 entry with M20 x 1.5. 2nd entry optional
Process connection:	1½ " DIN 228 (1½" BSP)
Process connection material:	Polycarbonate
Shaft material:	Stainless steel
Paddle material:	Polypropylene
Bearing and seal:	Slide bearing, shaft seal to DIN 3760
Shaft speed:	1 rpm or 5 rpm with 1.3 second switching delay
Minimum bulk density:	Adjustable in 3 steps from 100g/litre
Process temp and pressure:	-20C (-4F) (-40C/-40F with optional heater) to +80°C (+176°F) and +0.8bar (5 & 10 bar options)

TECHNICAL SPECIFICATION PULSARPOINT 310 and ATEX IEC-Ex OPTION:	
Housing:	Aluminium die cast IP65
Cable entry:	1 entry with PG13.5 gland. 2nd entry optional
Process connection:	1½ " DIN 228 (1½" BSP) or optional flange
Process connection material:	Stainless steel, aluminium, galvanised
Shaft material:	Stainless steel
Paddle material:	Stainless steel
Bearing and seal:	Ball bearing, shaft seal to DIN 3760
Shaft speed:	1 rpm or 5 rpm with 1.3 second switching delay
Minimum bulk density:	15g/litre (0.94lbs/ft3)
Process temp and pressure:	-20C (-4F) (-40C/-40F optional heater) to +80°C (+176°F) and +0.8 bar (5 & 10 bar options)
Flammable atmosphere version:	Dust: ATEX 1/2D Ex ia D20 (Zone 20, 21 and 22)
High temperature option:	600°C (1112°F) (not Ex version)

Maximum length:
Solid extension up to 2m on 310 unit
Pendulum extension up to 1m on 300 unit

PG 13.5

80 x 88

66

25

212

120

25

150

Note: one half of paddle may be removed (thus decreasing this dimension to 75) to facilitate installation if required

Maximum extension:
10m on 310 unit
2m on 300 unit

Solid extension (310 only)
Pendulum extension, spring loaded (300 only)

Rope extension

Pressure Tranducer:

Pulsarbar 700 Pressure / Level Transducers

Pulsarbar is a range of pressure and level transmitters that are perfect for demanding applications throughout industry and the utilities. They are exceptionally stable and combine advanced sensing technology with modern manufacturing methods to provide a superb pressure transducer with very long life. All Pulsarbar pressure transducers are submersible. The robust measurement cell provides good overrange protection and, with accuracy of at least 0.25% fs, you can specify Pulsarbar with confidence. Typical applications include borehole level measurement, sumps, tanks and basin depth.

Pulsarbar 720
General Purpose Transducers

Pulsarbar 720 series feature a stable and accurate proven CVD (Chemical Vapour Deposition) sensing technology that provides accuracy of 0.25% together with a welded stainless steel back end for all demanding or submersible applications. Models are available for pressure ranges of vacuum to 400bar and offer long-term stability. Gauge, absolute and relative pressure versions are available, with a choice of millivolt, voltage and current outputs.

Pulsarbar 750
Low Range Transducers

Pulsarbar 750 features a strong ceramic diaphragm with high over-pressure capability and very accurate capacitance technology that will detect minute pressure variations while withstanding large pressure spikes. Sensing ranges are available from 25mbar to 1bar, with voltage or current output options. Accuracy is 0.2%, long term stability 0.25% and there is a field adjustment range of 3:1. Open faced option for viscous liquids.

Pulsarbar 760
Transducers with turn-down

For applications where a wide range ability is required the Pulsarbar 760 provides an internal 5:1 turndown capability using a potentiometer. Gauge and absolute sensing ranges are available from 0.5bar to 400bar. The Pulsarbar 760 features a sputtered sensing element for high stability (0.15% long term) with an accurate strain gauge sensor (0.15%). The Pulsarbar 760 has a rugged stainless steel enclosure. Design life is 100 million full scale cycles.

Technical Specification: PULSARbar 700 series

PULSARbar VERSION	PULSARbar 720	PULSARbar 750	PULSARbar 760
INPUT			
Pressure range:	Vacuum to 400bar (5800psi)	0-25mbar to 0-1bar (-0.36psi to 14.5psi)	0.18 to 400bar (2.6psi to 5800psi)
Proof pressure:	2 x full scale (FS) (1.5 x FS for 400bar)	2bar for range to 200mbar 4bar for range 201 to 350mbar 7bar for range 351mbar to 1bar	2 x full scale (FS)
Burst pressure:	>35 x FS (<=6bar) >20 x FS (>=60bar) >5 x FS (<=400bar)	3bar for 70mbar and below 4bar for 71 to 200mbar 6bar for 201 to 350mbar 10bar for 351mbar to 1bar	>35 x FS (<=6bar) >20 x FS (>=60bar) >5 x FS (<=400bar)
Fatigue life:	> 100 million FS cycles	10 million FS cycles	> 100 million FS cycles
Supply voltage:	24Vdc (7-35Vdc) 4-20mA output version	9-35Vdc 4-20mA version	8.5-40 Vdc 4-20mA only
PERFORMANCE			
Long term drift:	0.2% FS per year (non-cumulative)	0.25% FS per year	0.15% FS per year
Accuracy:	0.25% FS typical	0.2% span maximum	0.15% FS typical
Thermal error:	1.5% FS typical	2% span maximum	0.5%-1% FS typical
Compensated temperatures:	-20 to 80ºC (-4°F to +176°F)	-20 to 60ºC (-4°F to +140°F)	-20 - 80ºC (-4°F to +176°F)
Operating temperatures:	-20 - 50ºC (-4°F to +122°F) submersible version	-20 - 50ºC (-4°F to +122°F) submersible version	-20 - 50ºC (-4°F to +122°F) submersible version
Zero/Span tolerances:	1% of span	0.1% of span	0.1% of span
Zero adjustment:	approx 10% factory set	+/-10%	+/-10% (100% at factory)
Span adjustment:	approx 50% factory set	+/-10%	17 - 100% of span (potentiometer)
MECHANICAL CONFIGURATION:			
Pressure port:	Various	Various	Various
Wetted parts:	17-4 PH stainless steel	s/s to UNS 31803 Inconel 625, ceramic and nitrile	17-4 PH stainless steel
Electrical connection:	moulded cable submersible	moulded cable submersible	moulded cable submersible
Enclosure:	Submersible version IP68	Submersible version IP68	Submersible version IP68
Approvals:	CE	CE; ExII 1G; EExia IIB*	CE; ExII 1G;EExia II CT4*
Weight:	Approx 100g (0.22lbs) (cable 75g/m / 4.68lbs/ft3)	330g (0.73lbs) plus cable	250g (0.55lbs) plus cable

ExII is optional extra

	PULSARbar 720	PULSARbar 750	PULSARbar 760
OUTPUT:			
Output:	4-20mA (2 wire)	4-20mA (2 wire)	4-20mA (2 wire)
Max loop resistance:	(Vs-7) x 50 ohms	(Vs-9) x 50 ohms	(Vs-8.5) x 50 ohms
Versions:	Millivolt and voltage output versions also available	Voltage output version also available	Current output only

Float Switches:
800 Series

The Pulsarpoint 800 range of liquid level float switches and accessories offer the user a wide selection of high integrity devices, designed for very reliable operation when controlling the level of non-potable water and sewage. Versions are available to provide alarm control and pump control. The units have all been designed for maximum durability and dependability, and are manufactured to the highest standards.
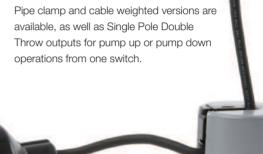
Description

Mechanically activated designs are available. With units capable of switching operating currents from 5 to 13 Amps, pump up or pump down.

The 800 series pump control switches have a wide angle operation to enable user adjustable pumping ranges from one pump switch.

The 800 series alarm control switches have narrow angle operation to provide precise switch on and off points to activate pump control panels and alarms.

The floats are manufactured from high impact and corrosion resistant PVC or polypropylene and are suitable for liquid temperatures up to 60ºC.

A specially designed seal bonds the cable into the float, preventing water ingress, whilst allowing flexibility and ensuring reliable operation. Pulsarpoint 800 series float switches have typical working life of over ½ million operations.

Pipe clamp and cable weighted versions are available, as well as Single Pole Double Throw outputs for pump up or pump down operations from one switch.

800-20 Pump Master – Pump Switch

A versatile, mechanically activated wide angle pump switch, not sensitive to turbulence. Controls pump control panels or control pumps directly up to 1.35kW at 115V AC and 2.59kW at 230V AC. Maximum continuous current 13 Amps, maximum starting current 85 Amps. Pump up and pump down or SPDT versions. Available with cable weight option.

The float is 7.73cm dia x 9cm and is manufactured from PVC. Adjustable pumping range from 18cm to 91cm.

800-50 Micro Master – Pump Switch

A low cost mechanically activated pump switch designed for use in turbulent conditions. Controls pumps up to 10 Amps at 115V AC, 8 Amps at 230V AC. Pump up, pump down or SPDT versions.

The float is 7cm dia x 12.3cm and is manufactured from high impact resistant polypropylene.

800-70 Signal Master – Control Switch

A high performance, mechanically activated narrow angle control switch designed to accurately activate pump control panels and alarms. Switches currents of up to 5 Amps AC.

Switch operating range typically ±4cm from horizontal. Pump up, pump down or SPDT versions are all available with pipe clamp or cable weight options. The float is 7.2cm dia x 8.7cm and is manufactured from high impact resistant polypropylene housing.

This narrow-angle sensing device is used to accurately monitor liquid levels in:

- Potable water
- Water
- Sewage applications

The Pulsar Signal Master SPDT can be wired to work in either normally open or normally closed applications. It is not sensitive to rotation.
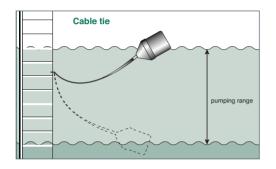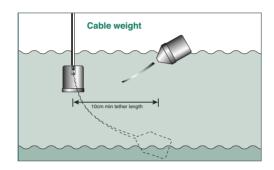
Normally Open Model (high level)

The control switch turns on (closes) when the float tips slightly above horizontal signalling a high level, and turns off (opens) when the float drops slightly below horizontal.

Normally Closed Model (low level)

The control switch turns on (closes) when the float tips slightly below horizontal signalling a low level, and turns off (opens) when the float tips slightly above horizontal.

Cable tie

pumping range

Cable weight

10cm min tether length

Technical Specification: Pulsarpoint 800 Series - Float Switches

800 -20 PUMP MASTER – PUMP SWITCH:

A most versatile, mechanically activated wide angle pump switch, not sensitive to turbulence. Controls pump control panels or control pumps directly up to 1.35kW at 115V AC and 2.59kW at 230V AC. Maximum continuous current 13 Amps, maximum starting current 85 Amps. Pump up and pump down or SPDT versions. Available with cable weight option. The float is 7.75cm dia x 9cm (3.05in dia x 3.54in) and is manufactured from PVC. Adjustable pumping range from 18cm to 91cm (7.09in to 2.99ft).

800-50 MICRO MASTER – PUMP SWITCH:

A low cost mechanically activated pump switch designed for use in turbulent conditions. Controls pumps up to 10 Amps at 115V AC, 8 Amps at 230V AC. Pump up, pump down or SPDT versions. The float is 7cm dia x 12.3cm (2.76in dia x 4.84in) and is manufactured from high impact resistant polypropylene. Adjustable pumping range from 20cm to 91cm (7.87in to 2.99ft).

800-60 SENSOR FLOAT – CONTROL SWITCH:

A mercury activated, narrow angle control switch designed to accurately activate pump control panels and alarms. There is a smaller version for operation in confined spaces. Switches currents of up to 5 Amps AC. Switch operating range typically ±1cm (±0.39in) from horizontal. Pump up, pump down or SPDT versions are available with the pipe clamp, integral weight (not SPDT) or cable options. The float is 8.6cm dia x 11.6cm (3.39in dia x 4.57in) and is manufactured from PVC.

800-70 SIGNAL MASTER – CONTROL SWITCH:

A low cost, mechanically activated narrow angle control switch designed to accurately activate pump control panels and alarms. Switches currents of up to 5 Amps AC. Switch operating range typically ±4cm (±1.57in) from horizontal. Pump up, pump down or SPDT versions are all available with pipe clamp or cable weight options. The float is 7.2cm dia x 8.7cm (2.83in dia x 3.43in) and is manufactured from high impact resistant polypropylene housing.

Pulsar Guard 2010:

Non- invasive solids flow monitor

The Pulsar Guard 2010 sensor detects structure borne acoustic signals caused by the movement of material. This movement causes impacts and frictional contact with a containing face, for example the inside of a pipe. The sensor is fastened to the outside of the structure, and its high frequency detection picks up these signals, which are often undetectable to the human ear. The high frequency detection allows use in environments where there is a high degree of machinery or process noise, without interference. Pulsar Guard's non-invasive nature allows easy fit to most pipes, chutes or feed mechanisms without stopping the process.

Features

- Non invasive and maintenance free
- Simple bolt on installation
- Low cost
- No moving parts and vibration resistant
- IP 68 Stainless Steel housing
- Highly reliable in low or high temperatures
- ATEX Flammable atmosphere approved '2011' option

The Technology

The 2010 series of process protection units use patented state of art soundwave technology to detect changes in structure borne acoustic emissions from equipment and materials in motion. The sensor listens to noise caused by impacts, and friction within structures, on a wide frequency band width of 100 to 600kHz, making it sensitive to the slightest changes in process conditions but also immune to audible noise or vibration caused by plant machinery.

Instant reaction to flow changes provides protection to plant operation from abnormal flow conditions in pipes, supply lines, chutes and feed machines. Fine powder in flight, in minute quantities, can generate a large acoustic signal enabling flow or no flow alarms.

Easy To Use

The 2010 sensor series is designed with the operator in mind. Powered with 23 to 30 V DC the sensor provides a 0 to 10 volt output, this signal may be fed directly to a PLC, or the optional control unit 2020.

Simple Installation

As the sensor is completely non-invasive there is no need to shut down the process for installation. Installation takes minutes, and the compact design means that it can be fitted in the tightest of positions or environments.

Typical Applications

- Burst filter bag detection
- Detects impending blockages
- Detects flow and no flow of solids
- Detects pump cavitation
- Valve leakage detection
- Detects 'Bridging' or 'Rat-holing' in silos
- Material flow/route verification
- Bearing failure

Pulsar*guard* Sensor

Control Unit
Output 24Vdc
Input 0−10V

Isolated 4−20mA

2 x relay

3 4 2 0

Supply 90−253V AC

Technical Specification:
2010, 2015, 2011Z and 2011G Sensor

Detection frequency:	100 to 600 kHz
Power supply required:	23 to 30 V DC (except 2011Z = 24V to 26 V DC)
Analogue output:	0 to 10 V DC
Cable:	4m of 4 core shielded 24 AWG
Operating temperatures:	Standard version (2010 unit): -40° to +85°C (-40°F to +185°F) High temperature version (2015 unit): -40° to +125°C (-40°F to +257°F)
Ingress protection:	IP 68 (NEMA 4)
Sensor mounting:	Tab with 14mm (0.55in) hole
Construction:	Cap and base housing in 316 stainless steel
Weight:	640 grams (1.41lbs) (includes cable)
Size:	120mm (4.72in) long
Electrical connection:	4 core screened cable

(I.S.) 2011Z

Suitable for use with Zener barriers only. This system requires connection to an intrinsically safe earth. Identified by "Z" stamped on mounting tab.
Approval to EEx ia IIC T6 (+40°C) (+104°F), or EEx ia IIC T4 (+92°C) (+197.6°F).

(I.S.) 2011G

Suitable for use with Galvanically isolating barriers only. This system does not require connection to an intrinsically safe earth. Identified by "G" stamped on mounting tab.
Approvals as above.

Application Data Sheet:

Page [ ] of [ ]

Company: [ ]

Address: [ ]

Date: [ ]

Contact: [ ]

Phone: [ ]

Fax: [ ]

Email: [ ]

If Solids

Particle size: [ ]

Bulk density: [ ]

Temperature: Min [ ] Max [ ] °c

Dust in air: None [ ] Low [ ] High [ ]

Angle of repose: Flat [ ] Low [ ] High [ ]

Bridging: Yes [ ] No [ ]

Rat holing: Yes [ ] No [ ]

If Liquids or Slurries

Build-up on walls: Yes [ ] No [ ]

Temperature: Min [ ] Max [ ] °c

Liquid surface: Still [ ] Waves [ ] Turbulent [ ]

Foam: Yes [ ] No [ ] If yes, what is av height (m) [ ]

Vapour: Yes [ ] No [ ]

Condensation: Yes [ ] No [ ]

Carbon Dioxide, Methane or Hydrocarbons: Yes [ ] No [ ]

Application Information

Material: [ ] [ ] **Quantity of Instruments:**

Application: Continuous Level [ ] Point Level [ ] OCM Flow [ ]

Type of Primary Device: [ ]

Pump Control, how many pumps: [ ] **Relays required:** Yes [ ] No [ ] If yes, how many: [ ]

Range to be measured: [ ] **Diameter:** [ ] m (see sketch below)

Is the area General Purpose: [ ] **Hazardous:** [ ] **Classification Requirements:** [ ]

Transducer mounting: 1.5" BSP [ ] 2" BSP [ ] **Flange:** 2" [ ] 3" [ ] 4" [ ] 6" [ ] 8" [ ]

50 DIN [ ] 80 DIN [ ] 100 DIN [ ] 150 DIN [ ] **Power Supply:** AC 115-230 [ ] DC [ ] DC Loop Powered [ ]

Output required: 1 x 4-20mA [ ] 2 x 4-20mA [ ] Modbus RTU [ ] HART [ ] Profibus PA [ ]

Profibus DP: Vs0 [ ] or Vs1 [ ] Ethernet [ ]

Sketch application and provide any comments:

[ ]

Notes:

Notes:

ISO 14001
Registered Company

sira
CERTIFICATION

UKAS
MANAGEMENT
SYSTEMS
011

CERTIFICATE NUMBER: 072578-1

ISO 9001
Registered Company

sira
CERTIFICATION

UKAS
MANAGEMENT
SYSTEMS
011

CERTIFICATE NUMBER: 650136-1

Pulsar® Process Measurement Ltd.

Cardinal Building
Enigma Commercial Centre
Sandy's Road
Malvern
Worcestershire
WR14 1JJ
England

Tel: +44 (0) 1684 891 371
Fax: +44 (0) 1684 575 985
Email: info@pulsar-pm.com

Pulsar® Process Measurement Inc.

P.O. Box 5177
4565 Commercial Drive
Suite 105
Niceville
FL 32578
USA

Tel: +1 850 279 4882
Fax: + 1 850 279 4886
Email: info.usa@pulsar-pm.com

www.pulsar-pm.com