

Ultimate Controller

An integrated approach to pump control



Pulsar's Ultimate Controller - Control, Comply, Monitor and Maintain Your Assets

Pulsar Process Measurement's Ultimate Controller is a pumping station control system that combines ultrasonic level and flow measurement, RTU and advanced pump control in one economic, easily programmed, modular unit with dedicated web server remote control, DNP (WITS) and touch-screen HMI.

Bringing together the world's leading non-contacting ultrasonic advanced pump controller with patented functions that reduce energy costs, aid Asset Management, reduce installation and maintenance costs and improve Compliance.

Ultimate Controller is modular and expandable, with peripherals offering substantial I/O, pump power monitoring, battery back-up and even a remote infra-red camera, allowing remote viewing of the well and the process.

One supplier. One number to ring for the complete control package.



ULTIMATE CONTROLLER INTEGRATED INTO A CONTROL PANEL - COMPACT AND EASILY INSTALLED



ULTIMATE CONTROLLER:
INTEGRATED, MODULAR, FLEXIBLE
AND COMPACT CONTROL

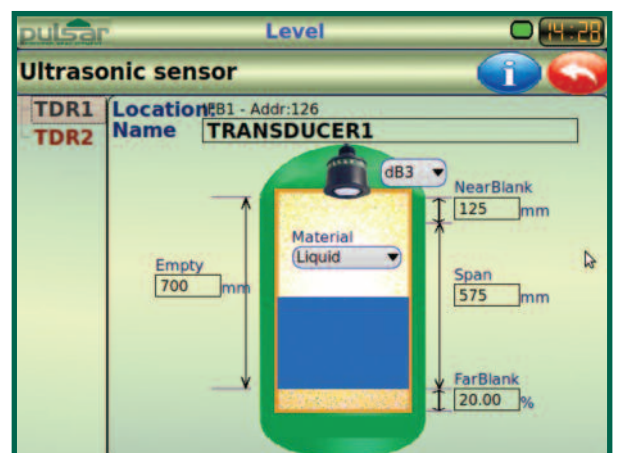
- CLOCKWISE FROM LEFT
 INFRA-RED CAMERA
 I/O INTERFACE UNIT (DIN RAIL)
 ULTIMATE CONTROLLER - FASCIA MOUNT
 ULTIMATE CONTROLLER - WALL MOUNT
 dB10 TRANSDUCER
 POWER MONITOR WITH PUMP REVERSING (DIN RAIL)
 FLOW PULSE NON-INVASIVE FLOW MONITOR

Simple, Straightforward Set-up

A key strength of Pulsar equipment has always been the logical layout and straightforward, menu-based programming approach. Ultimate Controller is no different, and takes the concept even further with a simple, visual setup made through the HMI touchscreen. You can, of course, program the unit and adjust parameters remotely.

Set up the application, add a transducer and add peripherals with a few touches of the screen. Ultimate Controller will fill in parameters automatically so you get immediate feedback on important elements such as maximum range, blanking distance etc.

Ultimate Controller - intuitive simplicity



THE TRANSDUCER SCREEN - A CLEAR, LOGICAL APPROACH TO TRANSDUCER AND APPLICATION BASIC SETUP

End to End **Cost Savings**

- **Operational Cost Saving** by high energy cost avoidance (patented), pre-blockage detection, automatic reset, spill prediction and most efficient pump selection
- **Capital Cost Saving** by combining HMI, PLC, RTU and level and flow control with no costly logic programming
- **Remote monitoring** of flow and level with photographic verification for Compliance, reducing carbon footprint
- **Modular and expandable** to suit simple and complex applications
- With **convenience and safety** in mind the power monitor can be mounted away from the ICA section
- **Asset Management** data calculated by the Ultimate which can be displayed locally and remotely
- Signals from **existing peripherals** or other instruments can usually be utilised if required

Ultimate Controller brings together the world's leading non-contacting ultrasonic advanced pump controller with unique patented functions.

For more information on each area, please see the inserts at the back of this folder.

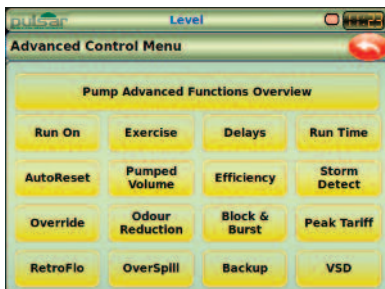
THE MOST
ADVANCED SET OF
CONTROL TOOLS IN
THE WORLD READY
TO BE APPLIED TO
EVERY PUMPING
STATION



Pump Control, Level and Flow

Based on Pulsar's unique DATEM echo processing software, Ultimate Controller offers rock-solid, reliable level measurement, and builds on that with the most advanced pumping station control functions on the market. See the Pump Control insert at the back of this brochure for more information.

A WIDE RANGE OF
ADVANCED
FUNCTIONS GIVES
YOU COMPLETE
CONTROL



Advanced Control

Ultimate Controller includes a host of sophisticated functions built on tens of thousands of installations worldwide. Functions that save you time and money, including automatic tripped pump reset, pump prioritisation by efficiency and automatic avoidance of high energy costs.

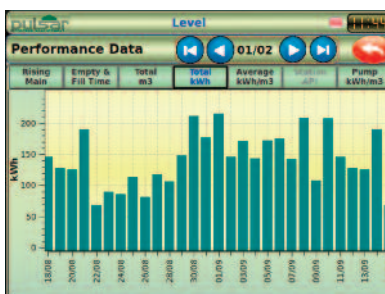
ULTIMATE CAN
PRIORITISE THE
MOST EFFICIENT
PUMP, MINIMISING
ENERGY
CONSUMPTION



Asset Management, Compliance and Predictive Maintenance (patent pending)

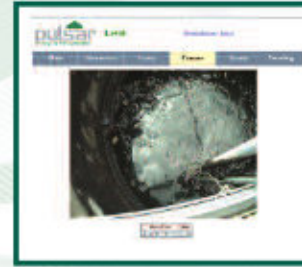
With features such as extensive data logging and remote monitoring, optional Flow Pulse flow monitor integration, Pump Performance Indicator and pre-blockage detection, Ultimate Controller provides you with all the data you need to manage and proactively maintain every aspect of the pumping station, reducing man hours and call-outs and maximising efficiency.

VITAL INFORMATION
SUCH AS TOTAL
ENERGY USED AND
KW/CUBIC METRE
CAN BE
DYNAMICALLY
COMMUNICATED



Communications

Ultimate Controller saves you money by combining all functions in a single, easily programmed unit, including a Radio Telemetry Unit (RTU), with Wi-Fi and GPRS/3G options. Communications is via industry standard DNP3 (WITS 1.1). Also available is a battery back-up module with float charging power loss and level status notification.



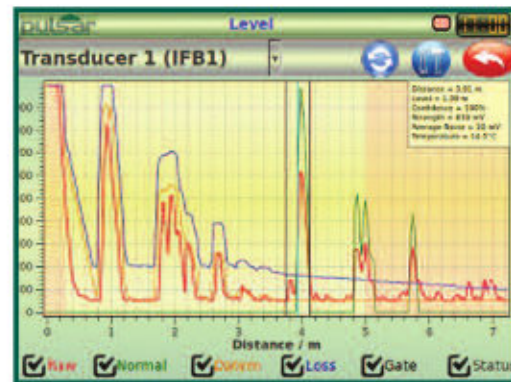
MONITOR THE PROCESS DIRECTLY THROUGH THE REMOTE SERVER WITH OPTIONAL INFRA RED CAMERA



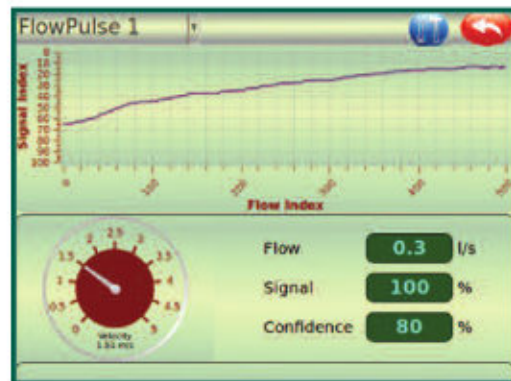
DETAILED PUMP INFORMATION AVAILABLE THROUGH THE HMI AND REMOTELY



DESKTOP, LAPTOP, TABLET OR SMARTPHONE
ACCESS CRUCIAL STATION DATA FROM ANYWHERE



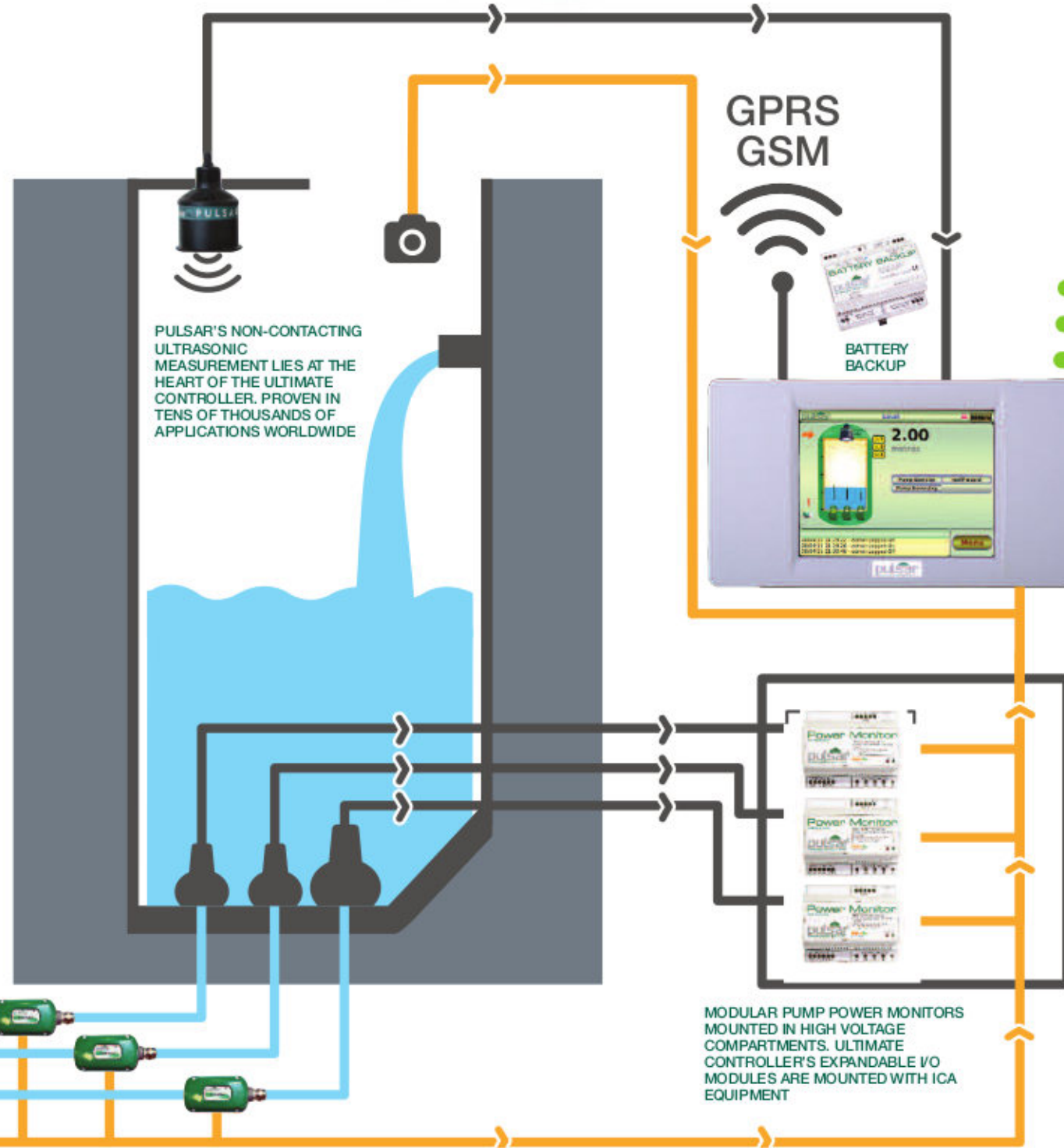
VIEW ECHO TRACES ON THE ULTIMATE CONTROLLER SCREEN



INSTANTANEOUS FLOW RATE AND FLOW TRENDS ARE VIEWABLE WITHIN THE HMI WHEN FLOW PULSE MONITORS ARE IN USE



OPTIONAL FLOW PULSE NON-INVASIVE FLOW MONITORS RECORD FLOW RATE FOR PUMP EFFICIENCY DIAGNOSTICS AND ANALYSING STATION EFFICIENCY DURING STORM CONDITIONS FOR COMPLIANCE REPORTING



PULSAR'S NON-CONTACTING ULTRASONIC MEASUREMENT LIES AT THE HEART OF THE ULTIMATE CONTROLLER. PROVEN IN TENS OF THOUSANDS OF APPLICATIONS WORLDWIDE

GPRS
GSM

BATTERY BACKUP

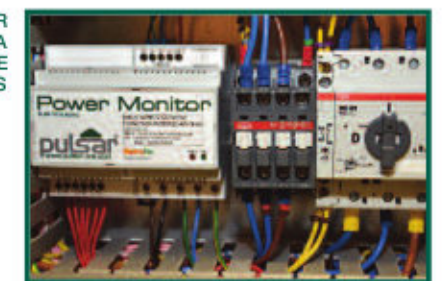
REMOTE ACCESS



DNP3 (WITS 1.1 pending)
TCP/IP/ PSTN
MODBUS
PROFIBUS

VERSATILE COMMS, INCLUDING INDUSTRY STANDARD DNP3. MONITOR THE ULTIMATE CONTROLLER ON THE MOVE VIA DEDICATED WEB SERVER

PULSAR'S POWER MONITOR PROVIDES IMPORTANT DATA ABOUT PUMP PERFORMANCE AND POWER PROFILES



MODULAR PUMP POWER MONITORS MOUNTED IN HIGH VOLTAGE COMPARTMENTS. ULTIMATE CONTROLLER'S EXPANDABLE I/O MODULES ARE MOUNTED WITH ICA EQUIPMENT



OPTIONS INCLUDE PATENTED RETROFLO TECHNOLOGY THAT CAN AUTOMATICALLY CLEAR RAGGED OR BLOCKED PUMPS, OFTEN BEFORE ANY PROBLEM HAS APPEARED

Advanced Functions

Pulsar's Ultimate Controller gives you a depth of control and maintenance functionality that reaches far beyond the limits of a standard ultrasonic pump controller. Ultimate's Asset Management for Predictive Maintenance, support for compliance and in-built remote access and communications build on its world-leading non-contacting ultrasonic level measurement and pump station control; aid Compliance, reduce total expenditure (TOTEX) and improve usability and ease of implementation.

Please use the inserts opposite to learn more about specific aspects of the Ultimate Controller.

For more information about the depth of functions available check out our website www.pulsar-pm.com or call us, and we'll be happy to discuss your requirements with you.

Ultimate Advanced Pump Control Functions

Ultimate Asset Management & Predictive Maintenance

Ultimate Remote Communications



Pump Control, Level and Flow

Ultimate Controller is a fully-functioned advanced pump controller with all the sophisticated multi-pump control that you expect from Pulsar. Not only that, but Ultimate also offers level and volume measurement and control, with a measurement range from 125mm right through to 50m, Open Channel Flow monitoring and differential level control using an additional transducer.



Advanced Control

From Tariff Management to minimise your energy costs to Burst/Block alarms to Pump Prioritisation on the basis of efficiency, Pulsar's Ultimate Controller is packed with the advanced control features that bring effortless sophistication to pumping stations, meaning every installation can benefit from Pulsar's wealth of experience.



Asset Management & Compliance

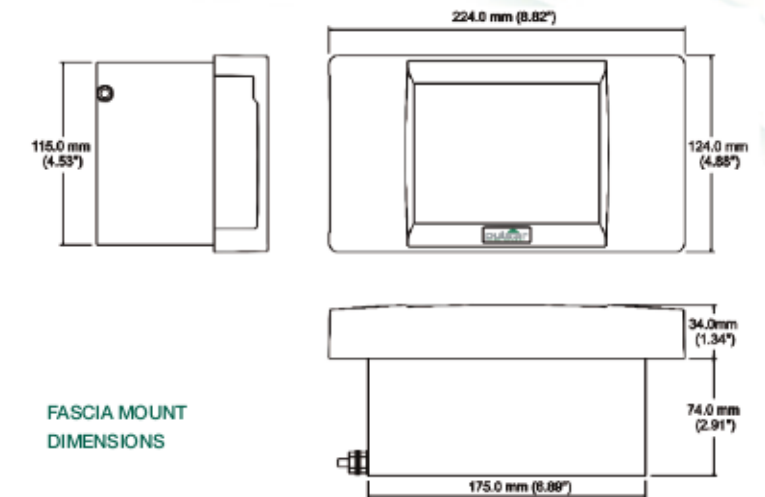
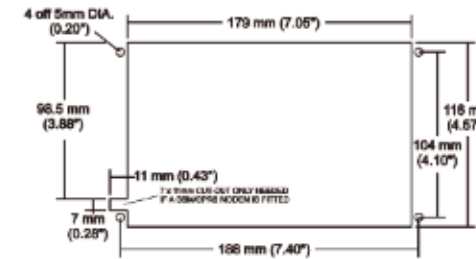
With data logging up to 100,000 events, plus the option of adding the unique Pulsar Flow Pulse to measure actual flow, Ultimate Controller will monitor your assets, report on pump performance and provide crucial data to help your predictive maintenance. Optional Pump Monitors help to bring comparative data on these important assets. Ultimate Controller helps you to confirm due diligence and to comply with consents.



Communications (RTU, Ethernet, DNP3 WITS)

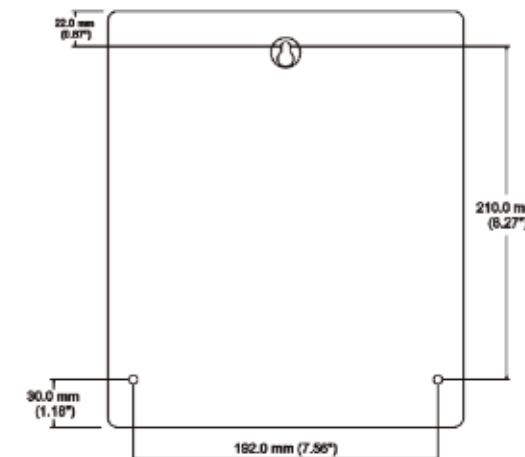
With a variety of communications available including industry standard DNP3 as well as dedicated web server, you can monitor the Ultimate Controller from anywhere. An optional infra red camera gives a perfect view into the wet well or the station so you know exactly what is going on, wherever you are. Battery backup means that Ultimate will continue to monitor even if all power is lost.

FASCIA MOUNT MOUNTING DIAGRAM

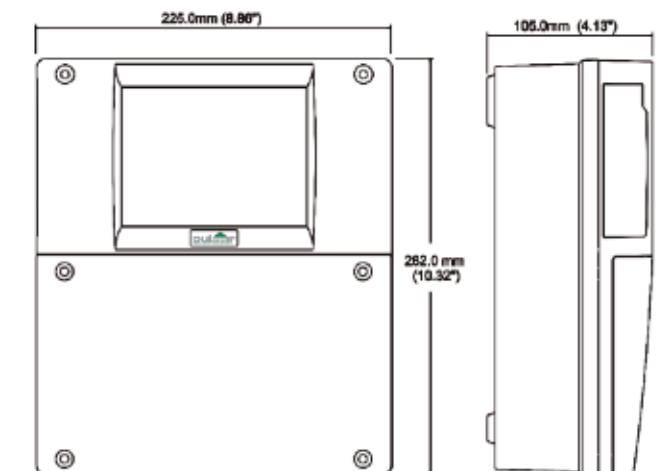


FASCIA MOUNT DIMENSIONS

WALL MOUNT MOUNTING DIAGRAM



WALL MOUNT DIMENSIONS



No matter how **sophisticated** the control, the fundamental reliability of the **measurement** is key

Pulsar's DATEM echo processing is the benchmark by which ultrasonic measurement is judged. Proven in tens of thousands of applications worldwide, DATEM has provided the rock-solid reliability that underpins the rest of Pulsar's technology and has allowed the depth and sophistication of Ultimate Controller to be developed.

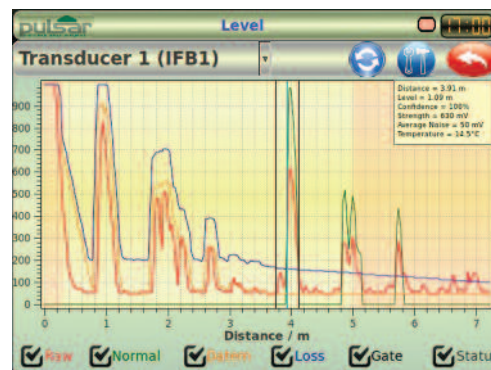
Ultimate Controller allows you to view echo profiles both on the screen and remotely, allowing a dynamic application set-up and giving you access, both on the screen and remotely, to see exactly what is happening in the application.

Uniquely, Ultimate will 'tune' the DATEM algorithm to the surface you are measuring, making it perfect for both liquid and solids applications.

Please see over for technical specification.

Pump Control

Ultimate is a fully-functioned pump controller, offering a full range of sophisticated single and multi pump control routines. Pulsar equipment is in use in thousands of pump control applications all over the world. For full details of our pump control capabilities, check out the relevant sections of our website, and see the Advanced Control insert in this brochure for more information about Ultimate's specialised functions.



DATEM SCREEN SHOWS HOW THE ECHO IS BEING PROCESSED AND CAN BE VIEWED ON THE ULTIMATE CONTROLLER OR REMOTELY



WET WELL 6m WITH LADDER AND FLOAT



RETENTION TANK WITH SMALL CLUTTERED WET WELL AT 15m



WET WELL 4.5m WITH LADDER AND FAT RING



Flow Measurement

Pulsar's Flow Pulse clamp-on flow monitoring sensor offers easy installation and no interruption to service. Winner of the UK Institute of Water's National Innovation Award 2015, Flow Pulse has enabled Dwr Cymru Welsh Water to make installation cost savings of over £1.5 million. For more information see the case study on our website.

PHYSICAL

Outside dimensions:	Wall Mount: Nominal 225mm H x 262mm W x 105mm D Fascia Mount: Nominal total 124mm H x 224mm W x 114mm D Nominal 116mm x 179mm cutout, 34mm in front of panel, 80mm behind
Weight:	Wall mount nominal 2kg, fascia mount 1.5kg
Enclosure material/description :	Fascia: Polycarbonate/stainless steel, Wall: Polycarbonate
Cable entry detail (wall only):	11 off; 9 x M20 and 2 x M16 knockout underside
Transducer cable extensions:	2-core screened, 1000m max

ENVIRONMENTAL

Mounting:	Wall mount: indoor/outdoor, Fascia mount: indoor. 2000m altitude max.
IP rating:	Fascia: IP64 (front of panel), Wall: IP65, Pollution degree 2, IK06 @ -20°C
Max & min temperature (electronics) :	-30°C to +55°C (-22°F to 131°F) ambient
Flammable atmosphere approval:	Safe area: compatible with approved Pulsar dB transducers
CE Approval:	See EC Declaration of Conformity

PERFORMANCE

Accuracy:	0.25% of the measured range or 6mm (whichever is greater)
Resolution:	0.1% of the measured range or 2mm (whichever is greater)
Measurement range:	Dependent on transducer; max 40m (dB40), min zero (dB Mach3)
Rate response:	Fully adjustable
Echo Processing:	DATM (Digital Adaptive Tracking of Echo Movement)

PROGRAMMING

On-board programming	By capacitive touchscreen
Data security and integrity:	Security: via passcode (user selectable/adjustable) integrity: non-volatile memory
Memory:	2 (1 x internal) 4GB supplied as standard (up to 32GB optional)

CONNECTIVITY

Mini USB (External)	Connecting of laptop/PC, located under flap on side of unit
USB 'A' socket (Internal)	Connecting of peripherals such as modems
'D' type 9 pin (Internal)	Connecting of optional comms (Modbus and Profibus)
Camera Port (Internal)	Power and comms for Pulsar Camera

RTU/COMMUNICATIONS

Protocol supported:	DNP3 Level 4 (WITS 1.1 pending) via Ethernet or modem (optional) Modbus RTU, ASCII, TCP/IP (optional) Profibus V1 (optional) GSM/GPRS/PSTN RS485 Pulsar expansion bus
Firmware/application upgrade:	Locally via SD card, USB, Wi-Fi, TCP/IP, Ethernet, remotely via Ethernet, modem
Digital inputs:	8 digital inputs, min input voltage 5VDC, max input voltage 30VDC (Max current 3mA). 24VDC input supply maximum total current 24mA
Analogue inputs:	2 off 4-20mA or 0-20mA sink or source (user programmable and adjustable) 0.1% resolution, open circuit voltage (source mode) 24V, output voltage (source mode) @4mA, 22V @ 20mA, 18V

OUTPUTS

Digital outputs (volt-free contacts):	8 Form C (SPDT), rated at 5A at 240V AC
Analogue outputs:	2 off, isolated (floating) outputs (to 150V) 4-20mA or 0-20mA into 1KΩ. 0.1% resolution
Display:	5.7 inch TFT colour display with capacitive touchscreen

SUPPLY:

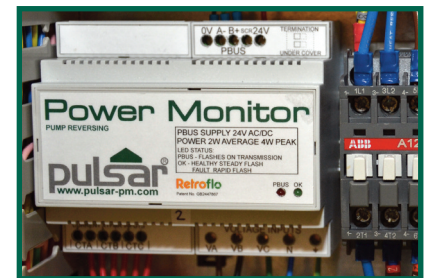
AC Supply:	Universal 85-265VAC 47.400Hz 50W max input power 2A 'T' 20mm fuse
DC Supply:	22-28Vdc (internally fused 2A 'T')

A depth of **control functionality** never seen before in a **measurement and control** instrument

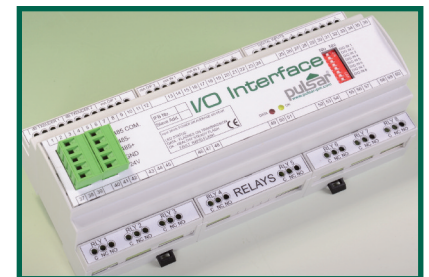
Advanced Control

Pulsar's range of Advanced Pump Controllers have, over many years, set a high standard for pump management. The capability of the devices has grown to include a number of valuable time and money-saving routines, developed in direct response to customer needs. As a pumping station management system, Ultimate Controller delivers:

- **Advanced Management Functions** – Well known Pulsar control functions such as fixed and alternate duty/assist, service ratio and FOFO are all built right into Ultimate Controller
- **Tariff Management** – TRIAD periods add costs, and the annual extra charges can run into millions of pounds. Pulsar's patented tariff avoidance routines, based on rate of change rather than a simple set point shift, make sure that pump running is kept to an absolute minimum during TRIAD periods
- **Time To Spill** – There are many factors that affect the time before a station spills, and Pulsar's patented feature includes not only rate of change of level, but also takes into consideration pumping rate compared to maximum inflow rate to provide a clear, relevant and accurate warning of imminent spillage in order to prioritise site visits
- **Pump Prioritisation by Efficiency** - Ultimate Controller identifies the most efficient pump and prioritises the running of that pump over others to maximise the efficiency of pump control routines
- **Pump Trip/Reset** – Many man-hours are wasted in site visits to reset a tripped pump. Ultimate Controller will automatically reset a pump, with failure thresholds built in, so you know that, when you visit site, there is a genuine issue to address (patented)
- **Burst/Block Alarm** - A sophisticated Pulsar system that uses predicted change of level rates and identifies system problems, such as a burst rising main or pump blockage
- **Pump Reversing** – Ultimate Controller uses patented 'Retroflo®' technology built into a Pump Power Monitor to automatically reverse pump motors if a restricted flow is detected so, most of the time, you don't need to worry about pump performance. Pulsar's implementation of Retroflo integrates level with current so pump pre-blockage can be detected and cleared using backwash or pump reversal (patented)
- **Pumping Economy** - records kWh/m³ pumped
- **Expandable** – Utilising a range of control functions requires extra I/O. Pulsar's Interface Board gives you the option to duplicate the existing I/O. A maximum of 3 Interface Boards can be used.
- **Inflow Monitoring** - Based on rate of change, Ultimate can detect storm conditions, deriving infiltration figures
- **Insulation Resistance Measurement** - On-demand reporting of wiring resistance, used to determine performance of the pump motor



POWER MONITOR FEATURING RETROFLO®



I/O INTERFACE MONITOR



OPTIONAL RETROFLO® TECHNOLOGY, BUILT INTO PULSAR'S PUMP POWER MONITORS, INTEGRATE LEVEL MEASUREMENT WITH PUMP CURRENT FOR EARLY IDENTIFICATION OF BLOCKAGE, OFTEN RESOLVING THE ISSUE BEFORE THE PROBLEM APPEARS

pulsar[®]
PROCESS MEASUREMENT

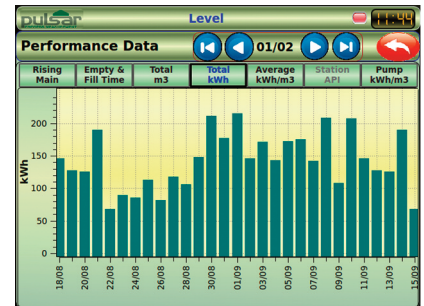
www.pulsar-pm.com

Understanding **asset performance** reduces energy, reduces manpower, **reduces TOTEX** and **improves Compliance**

Pulsar's Ultimate Controller makes calculations based on the measured data to give you the critical Asset Management information that you need to be able to allocate maintenance budget to where it is most needed, programme maintenance effectively and make informed, proactive decisions. Ultimate allows you to focus on the areas that give you the best return for your manpower and maintenance investment, reducing total expenditure (TOTEX) and helping you to ensure full asset availability, supporting your efforts for full compliance.

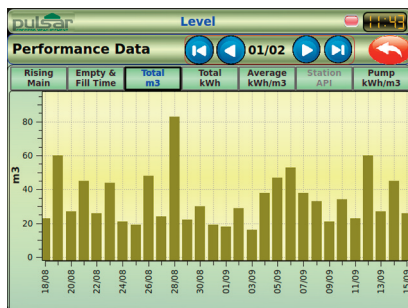
- Calculate asset performance data from each pump station
- Compare dissimilar pump stations and determine relative efficiency
- You can make real-time decisions based on live data
- Prioritise assets in order of maintenance needs
- Ultimate Controller can provide early warning of deterioration in relative performance when compared to other pump stations
- Aids predictive maintenance through:
 - Failing non-return valve
 - Pump blockage (with automatic unblock when Pump Monitor with Retroflo is specified)
 - Burst rising main
 - Pump efficiency

It is now possible to compare pumping stations across a catchment using Ultimate's unique Asset Performance Indicator (API) algorithm (patent pending). API uses a range of measured data to calculate station efficiency - see over for more details.

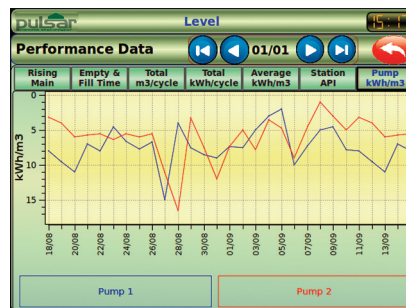


Parameter	Value
Time to Service (days)	46
Num fill cycles this week	54
Average fill time this week (min)	2.26
Num fill cycles last week	25
Average fill time last week (min)	2.21
Num empty cycles this week	53
Average empty time this week (min)	2.76
Num empty cycles last week	24
Average empty time last week (min)	2.66
Num pump starts	135
Num pump starts this week	56

Ultimate Controller gathers and displays critical station performance data, including energy used per cubic metre pumped (kWh/m³)



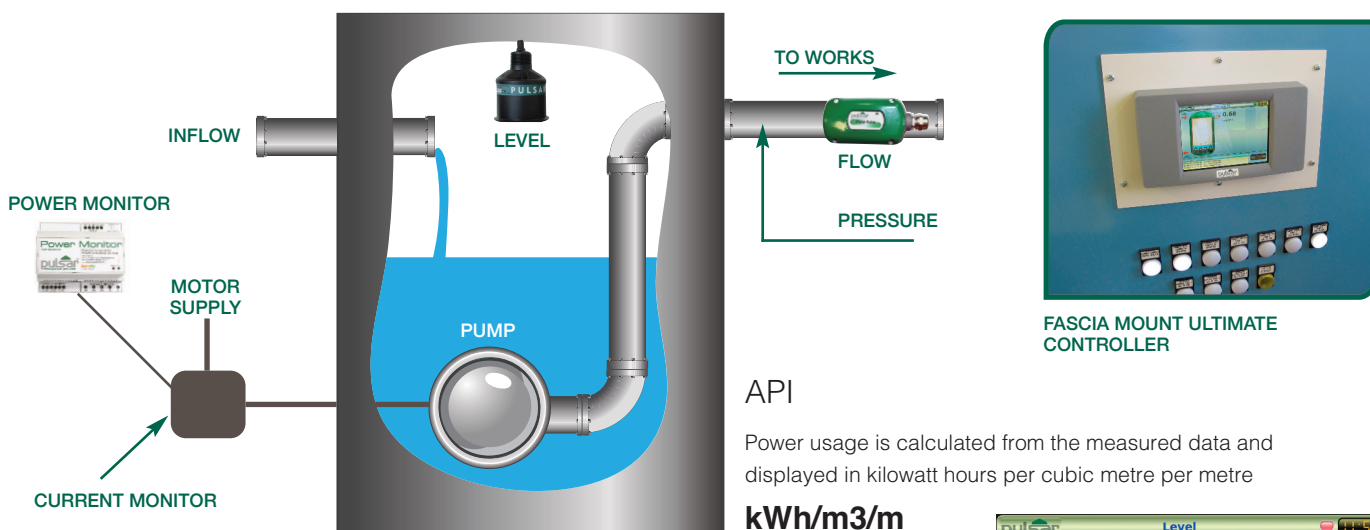
Pumped Volume Chart
Derived either from level or with direct input from a flow device



Pump kWh/m³ chart

Asset Performance Index (API) - a vital tool to operate more efficiently (patent pending)

The efficiency of a pump is commonly expressed in terms of the energy it uses to move a given volume of fluid - a simple calculation expressed in kilowatt hours per cubic metre (kWh/m³). However, that doesn't take into consideration factors such as the pump station configuration and pipework condition, which will have an effect on this calculation. Ultimate Controller uses measured level, measured flow rate and rising main pressure to calculate the 'dynamic head', which provides a way to compare the efficiencies of pumps across a range of stations, so you can prioritise maintenance effectively. The API is then expressed in industry standard units of kilowatt hours per cubic metre per metre (kWh/m³/m).



API

Power usage is calculated from the measured data and displayed in kilowatt hours per cubic metre per metre

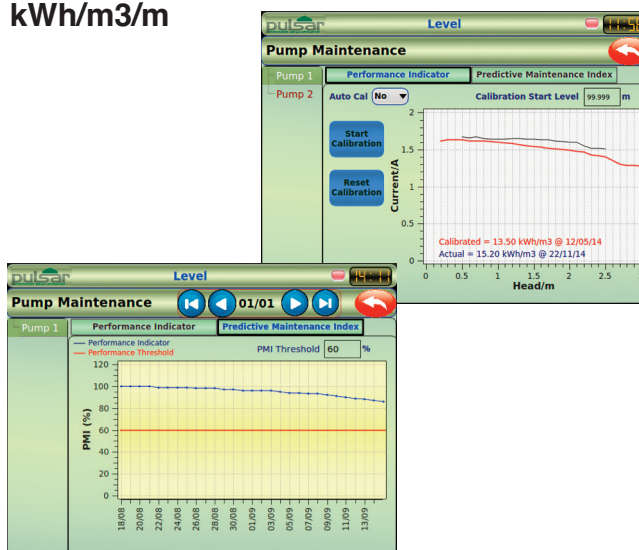
kWh/m³/m

Pump Performance Monitor

The performance of an individual pump varies over time, and Ultimate Controller gives you an easy way to visualise that change, so you can plan pump maintenance most effectively. Reduce increases in power consumption due to wear and avoid critical failures. Using both level and current measurement (measured from the Pulsar Pump Power Monitor), current is measured for every pump run and compared to an initial calibration curve. Pump efficiency is then expressed as a relative performance index, and an alarm can be set to warn when pump performance drops below a pre-determined level (customer configurable). PMI is calculated for every pump run and can be seen on either the Ultimate Controller screen or remotely so pump performance trends can be determined. The most efficient pump can then be manually or automatically selected within the Ultimate Controller

(patent pending)

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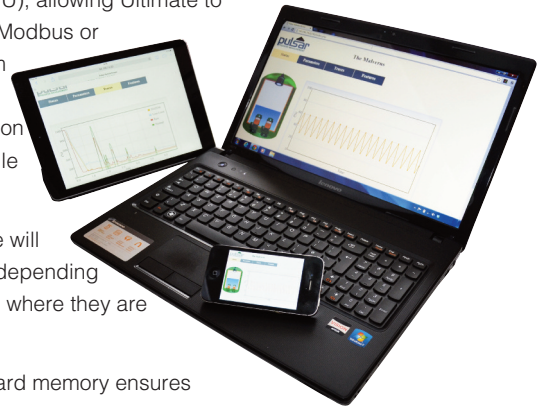
Dedicated TCP/IP, DNP3 and GPRS with battery backup. Log, monitor and prioritise with ease

Pulsar's Ultimate Controller can operate as a fully functioned Remote Terminal Unit (RTU), allowing Ultimate to communicate via standard communications systems. Remotely over ethernet, RS232, Modbus or through a dedicated web server (TCP/IP), allowing you to view, download and program Ultimate units wherever you are. For ultimate flexibility, Ultimate can also integrate a GPRS/GSM 2G modem which can communicate industry standard DNP3 communication protocol (WITS 1.1 pending) or external 3G modem so you can view data using a mobile phone or tablet.

Unlike other RTUs, Ultimate Controller includes an optional battery backup, so Ultimate will continue to measure level even if all power is lost, so you can prioritise your response depending on need, minimising vehicle movements and making sure that critical responses get to where they are needed most.

Data may also be downloaded locally via a removable SD card, while an internal SD card memory ensures that data is secure.

Ultimate also offers optional Wi-Fi connectivity, allowing you to access, program and interrogate the system wirelessly.



Camera



Ultimate Controller's optional camera allows users to see the process from anywhere in the world. Ultimate also records up to 32 images, so a visual record of the recent history of the process may be viewed.



Pulsar Battery Backup module manages an external battery so that the station continues to measure and report on level even when all external power is lost.

pulsar[®]
PROCESS MEASUREMENT

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UK AWARDS/CERTIFICATIONS



Patents apply to this product

Pulsar® is a registered trademark of Pulsar Process Measurement Ltd. in the UK, USA and China.

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

Literature number: Ultimate V4/SY/10-16