

Product Guide



Level and Flow Measurement

Advanced Pump Controllers

Zenith, Quantum 2, 2+ and 3

Intelligent Pump Controllers:

Zenith, Quantum 2, 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.

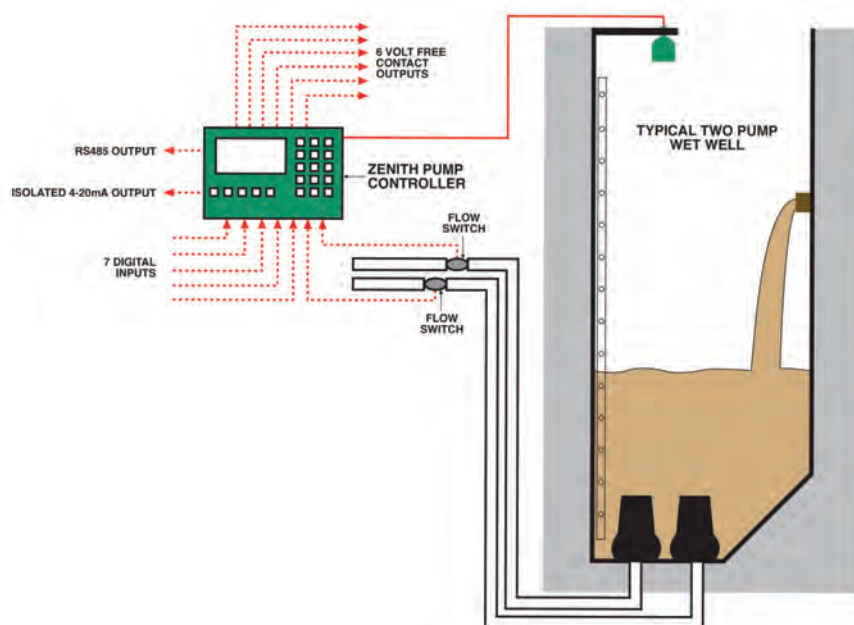
The liquid level and the inflow rate is continually measured and assessed in the well. Both these variables are then related to the time the next tariff change occurs. If the next tariff change is for a higher cost rate, the well will be first filled to enable pump down immediately prior to the tariff 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 2+ and 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)
- 1 x mA input and 1 x mA output (Quantum 2+ controller option)
- 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, 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.

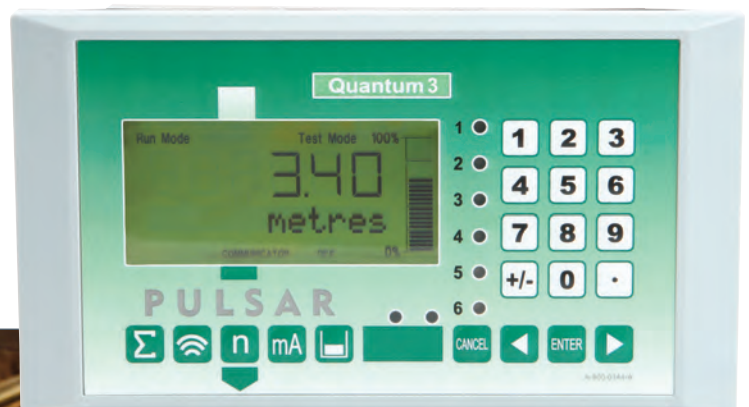
The Quantum controllers have optional RS485 digital communications (Modbus and optional Profibus DP V0 and DP V1) allowing the status to be monitored and the unit to be programmed remotely. Additionally it has the option of a large on board data-logging facility (256kb).

The Quantum 2+ controller includes all the features within Quantum 2 with the exception of the second mA output for pumped flow rate.

The Quantum 2+ controller instead features 1 x mA output and the addition of 1 x mA input.

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, Quantum 2+ and Quantum 3

COMMON FEATURES UNLESS STATED - PHYSICAL:

| | |
|---------------------------------------|--|
| Weight: | Nominal 1kg (2.2lbs), Zenith; 1.3kg (2.9lbs), Quantum 2, 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. |
| 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: | dB MACH3 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:

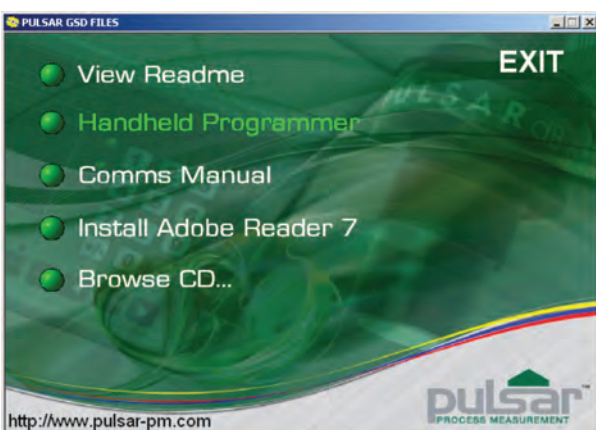
| | |
|--|---|
| Volt-free contacts: Zenith | 6 form "C" (SPDT) 5A, 220V ac |
| Volt free contacts: Quantum 2 and Quantum 3 | 10 in total; Relays 1-5 form C (SPDT) 5A, 220V ac, Relays 6-10 form C (SPDT) 3A, 220V ac |
| Digital inputs: | 7 NO or NC with 24V dc internal supply, available max 20mA |
| Analogue 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 (Zenith and Quantum 2+) |
| 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 (Zenith and Quantum 2+):

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® Process
Measurement Ltd.**

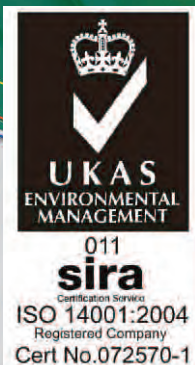
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Pulsar operates a policy of constant development and improvement and reserves the right to amend technical details as necessary.

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