



SWiFT SVP & SWiFTplus Operating Manual



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As part of our policy of continuous development, we reserve the right to alter, without prior notice, all specifications, designs, prices and conditions of supply for all our equipment.



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1. EU Declaration of Conformity - CE Marking

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EU Declaration of Conformity

CE Marking

Manufacturer:	Valeport Ltd
Address:	St Peter's Quay, Totnes, Devon, TQ9 5EW
Certification marking:	CE
Product Description:	SWIFT SVP SWIFTplus

We the manufacturer declare that the product **SWIFT SVP/SWIFTplus**, are in conformity with the following EU Directives and harmonised standard(s):

Radio Equipment Directive 2014/53/EU	Standards
Safety (Article 3.1a)	EN 61010-1:2010 EN 62479:2010 EN 60950-1:2006+A2:2013
EMC (Article 3.1b)	EN 301 489-1 V2.1.1 (Basic Level) EN 301 489-17 V3.1.1 EN 61326-1:2013 (Basic Level) EN 301 489-19 V2.1.0
Radio Spectrum (Article 3.2)	EN 300 328 V2.1.1 EN 300 330 V2.1.1 EN 303 413 V1.1.1

RoHS Directive 2011/65/EU	Standards
Prevention (Article 4.1)	BS EN 50581:2012

Additional harmonised standard(s) for SWIFTplus profilers with optical sensors fitted:

Harmonised Safety Standards	Standards
Photobiological safety of lamps and lamp systems	BS EN 62471:2008

Name:	Jason Horsell
Position:	Development Engineer
Place of issue:	Valeport Ltd, Totnes, UK
Date of issue:	26 th March 2018
Signature:	

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VAT No: GB 165 8753 67 Registered in England No: 1950444





Approved antenna

Antenna name	Manufacturer	Comment	Gain
Internal Bluetooth antenna	ProAnt	SMD PIFA antenna	+2
Internal A15-4840920-UBL9	AMOTECH	1571 MHz ~ 1606 MHz	

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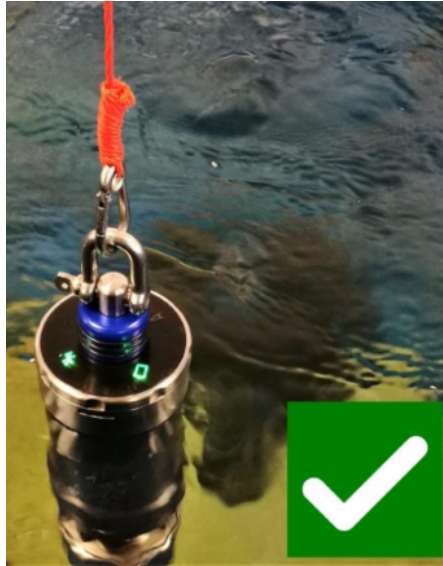
VAT No: GB 165 8753 67 Registered in England No: 1950444



Please note: Any changes or modifications to the product or accessories supplied, that are not authorised by Valeport Ltd, could void the CE compliance of the product and negate your authority to operate it. This product has demonstrated CE compliance under conditions that include the use of shielded cables. It is important that you use shielded cables compliant with the product's conformance, to protect from potential damage and reduce the possibility of interference to other electronic devices.

2. Important Information

The SWiFT must only be deployed with the suspension spar securely fitted as shown below



Never deploy the instrument with the USB cable connected



In the event that your SWiFT should be required to be disposed of Valeport is WEEE Compliant

For disposal instructions see:

<https://www.valeport.co.uk/Portals/0/Docs/Valeport-B2B-Compliance.PDF>

If the equipment is used in a manner not specified by the manufacturer the protection provided by the equipment may be impaired.

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

3. SWiFT SVP - Sound Velocity Profiler



Designed from the outset with the intention of a seamless workflow, the SWiFT profiler provides survey-grade sensor technology coupled with the convenience of Bluetooth connectivity and rechargeable batteries. An integral GPS module, to geo-locate each profile, completes the package. Data can be easily and quickly downloaded and reviewed wirelessly, via Bluetooth, using the either Valeport's Connect PC software or the SWiFT App for iOS portable devices and instantly shared, in industry standard SVP formats through email and cloud services. Using the provided USB adapter or cable, Valeport's Connect software package provides further tools.

In addition to the directly measured sound speed, temperature and pressure observations, Conductivity, Salinity and Density are calculated using Valeport's proprietary algorithm developed from extensive laboratory and field work.

With an operational battery life of up to 5 days and the convenience of charging via USB, SWiFT is intended for coastal, harbour and inland hydrographic survey use and offers the highest quality sound velocity profiles in a compact, robust and portable package.

<p>Key Features</p> <ol style="list-style-type: none"> 1. Self contained, sound velocity, temperature and pressure profiling system <ol style="list-style-type: none"> 1.1. From measured observations conductivity, salinity and density can be calculated 2. Lithium Ion rechargeable battery 3. Depth rated to 200m 4. LED symbols to identify: <ol style="list-style-type: none"> 4.1. Instrument status 4.2. Battery Status 4.3. GPS Status 4.4. Bluetooth Status 5. Bluetooth connectivity to PC & iOS App. 6. Automatic reacquisition of Bluetooth connection and file down load on recovery 7. GPS Geo-Location and time 8. Deployment weight that will not interfere with sensor performance 	<p>Applications</p> <p>A shallow water, self contained Sound Speed profiler possible applications include:</p> <ol style="list-style-type: none"> 1. Coastal, harbour and inland hydrographic survey 2. Sound velocity profiling <ol style="list-style-type: none"> 2.1. Single Beam echo-sounder 2.2. Multi-Beam echo-sounder 2.3. USBL 2.4. Imaging sonar 3. Lakes, reservoir and river studies
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4. SWiFTplus - SVP profiler with Optical Sensor



Extending the SWiFT's functionality still further the SWiFTplus offers all the performance of SWiFT SVP with the addition of an optical sensor.

<p>Key Features</p> <ol style="list-style-type: none"> 1. Everything a SWiFT SVP can do plus 2. An optical sensor: <ol style="list-style-type: none"> 2.1. Turbidity 2.2. Chlorophyll a 2.3. Fluorescein 2.4. Rhodamine 	<p>Applications</p> <p>A shallow water, self contained Sound Speed profiler possible applications include:</p> <ol style="list-style-type: none"> 1. Coastal, harbour and inland hydrographic survey 2. Turbidity surveys - dredging, pollution, sediment loading 3. Environmental survey - Chlorophyll a, Phycoerythrin 4. Dye tracing surveys - Fluorescein, Rhodamine 5. Sound velocity profiling <ol style="list-style-type: none"> 5.1. Single Beam echo-sounder 5.2. Multi-Beam echo-sounder 5.3. USBL 5.4. Imaging sonar 6. Lakes, reservoir and river studies
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5. Sensors

5.1. Sound Velocity Measurement

Utilising Valeport's latest design for the world's most accurate sound velocity sensor, each measurement is made using a single pulse of sound travelling over a precisely known distance, so is independent of the inherent calculation errors present in CTD calculated data. Valeport's unique digital signal processing technique virtually eliminates signal noise, and gives almost instantaneous response; the digital measurement is also entirely linear, giving predictable performance under all conditions.

Range:	1375 - 1900m/s
Resolution:	0.001m/s
Accuracy:	±0.020m/s
Acoustic Frequency:	2.5MHz

5.2. Temperature

The SWiFT is fitted with an accurate Platinum Resistance Thermometer (PRT) temperature sensor.

Type:	PRT
Range:	-5°C to +35°C
Accuracy:	±0.01°C
Resolution:	0.001°C

5.3. Pressure Sensor

The SWiFT is supplied with either a 100m or 200m rated piezo-resistive pressure transducer

Type:	Strain Gauge
Accuracy:	±0.05% range
Resolution:	0.001% range

5.4. Optical Sensors

An optical sensor must be kept clean to operate correctly. Ensure that the SWIFT is powered down before cleaning the sensor.

Use warm soapy water with a soft bristled brush to remove any light fouling.
For heavy fouling use a solvent (e.g Isopropyl alcohol) and a soft bristled brush.

Always rinse thoroughly after every use in clean, fresh water.

5.4.1. Fluorometers

5.4.1.1. Safety Statement

A Valeport Fluorometer is classified as Risk Group 1 under standard 62471. As the type is classified as Risk Group 1 solely due to radiation in the visible band a hazard label is not required. However,

- the LED used is in excess of the Exempt Group and that the viewer- related risk is dependent upon how the user installs and operates the equipment.
- the exposure hazard value (EHV) for a Valeport Fluorometer in terms of distance is 320mm.

Never look directly into the optical aperture

5.4.1.2. Chlorophyll a

	Performance
Excitation:	470 nm
Detection:	696 nm
Dynamic Range:	0-800 µg/l 2 gain settings: 0-40 and 0-800 (software controlled)
Instrument Detection limit:	0.025 µg/l*
Actual Detection limit:	0.025 µg /l**
Linearity:	0.99 R ²
Response Time:	0.03 to 2 sec

* 3x SD in RO water

** calibrated against Chlorophyll a in acetone solution

5.4.1.3. Fluorescein

Performance	
Excitation:	470 nm
Detection:	545 nm
Dynamic Range:	0-500 ppb 2 gain settings: 0-25 and 0-500 (software controlled)
Instrument Detection limit:	<0.01 ppb*
Actual Detection limit:	0.03 ppb**
Linearity:	0.99 R ²
Response Time:	0.03 to 2 sec

* 3x SD in RO water

** Calibrated against Fluorescein solution

5.4.1.4. Rhodamine

Performance	
Excitation:	520 nm
Detection:	650 nm
Dynamic Range:	0-1000 ppb 2 gain settings, 0-50, 0-1000 (software controlled)
Instrument Detection limit:	<0.01 ppb*
Actual Detection limit:	0.06 ppb**
Linearity:	0.99 R ²
Response Time:	0.03 to 2 s

* 3x SD in RO water

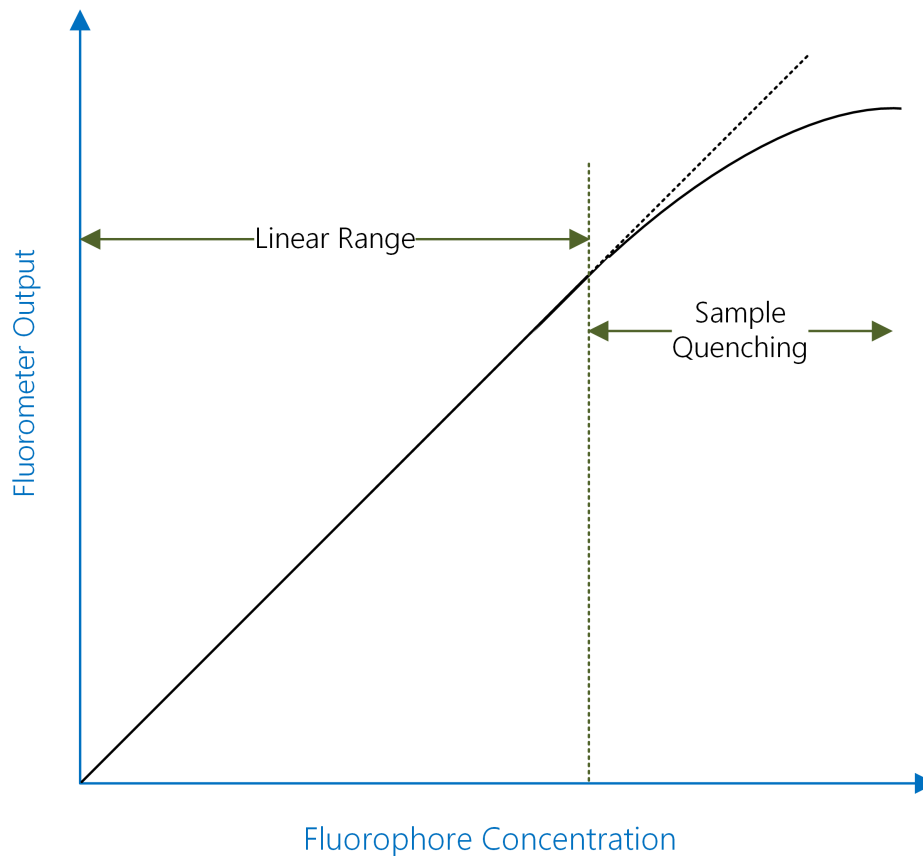
** Calibrated against Rhodamine solution

5.4.1.5. Linear Observation Range

The linear range is the concentration range for which the fluorometer signal is directly proportional to the concentration of the fluorophore. The linear range starts at the minimum detection limit (MDL) and extends to the upper limit of the instrument (dependent on fluorophore properties, optical filters, LED power, sample volume and optical path length).

Valeport Fluorometers have a calibrated linear response for 2 gain settings (e.g. the ranges 0-40 µg/l (G5) and 0-800 µg/l (G1) for chlorophyll a). At higher concentrations, unlike analogue devices which generally flat-line at full-scale deflection (e.g. FSD 5V) the fluorometer will continue to output a signal which increases with concentration (i.e. meaningful data), though which is no longer guaranteed to be linear.

At very high fluorophore concentrations, signal quenching can occur, whereby the instrument output does not increase linearly with fluorophore concentration (roll-off) and may decrease at even higher levels.



To perform a quick linearity check, dilute the sample 1:1 with RO water. If the reading decreases by 50%, the sample is in the linear range. If the reading decreases by less than 50% or even increases, the sample is above the linear range.

5.4.1.5.1 Quenching

Quenching refers to the reduction in fluorescence of a fluorophore. Several processes can result in quenching:

1. Chloride is known to quench quinine sulphate and Fluorescein. It is, therefore, advisable to prepare any fluorophore solutions with RO* or DI** water.
2. Temperature quenching - as the temperature of the sample increases, the fluorescence decreases, that is, fluorescence is sensitive to temperature. In order to improve accuracy, measure the sample at different temperatures and derive corrections for changes in temperature.
3. Photo-bleaching (or fading) is the (permanent) degradation of a fluorophore molecule by light resulting in lower signal levels. Photo-bleaching is dependent on exposure (intensity of light and duration) and wavelength (UV is more damaging than longer wavelengths). Use of more robust fluorophores is recommended to avoid photo-bleaching.

* Reverse Osmosis

** De-Ionised

5.4.2. Turbidity

Valeport's Turbidity technology is essentially two sensors in one. The first is a "classic" nephelometer, using a 90° beam angle for turbidity levels between 0 and 2000 NTU. The second sensor uses optical backscatter - OBS (~120° beam angle) for turbidity levels beyond 10 000 NTU. Both sensors output data simultaneously, at a programmable rate, so there is no need to switch ranges as conditions vary. Intelligent sampling and the use of a 24 bit ADC eliminates the need to switch gain. The optical head is very compact, measuring just 20mm diameter and is rated to full ocean depth.

Excitation\Detection:	850nm	
Linear Range:	Nephelometer	0 to >1 000 NTU - linear response
	Optical Backscatter:	0 to 4 000 NTU - linear response (>4,000 NTU has a non-linear monotonic response that allows derivation of higher values using look-up tables)
Minimum Detection Level	0.03 NTU	

5.4.2.1. Safety Statement

The Turbidity sensor is classified EXEMPT under the standard 62471.

As a Valeport Turbidity sensor is classified as EXEMPT a hazard label is not required.

Never look directly into the optical aperture

5.5. Calculated Parameters

5.5.1. Calculated Conductivity

From directly measured sound velocity, temperature and pressure, SWiFT calculates Conductivity using a proprietary Valeport algorithm developed from extensive laboratory and fieldwork.

Type:	Calculated
Accuracy:	± 0.05 mS/cm
Resolution:	0.001 mS/cm

5.5.2. Calculated Salinity

From directly measured sound velocity, temperature and pressure, SWiFT calculates Salinity using a proprietary Valeport algorithm developed from extensive laboratory and fieldwork.

Type:	Calculated
Accuracy:	± 0.05 PSU
Resolution:	0.001 PSU

5.5.3. Calculated Density

From directly measured sound velocity, temperature and pressure, Density is calculated using a proprietary Valeport algorithm developed from extensive laboratory and field work.

Type:	Calculated
Accuracy:	± 0.05 kg/m ³
Resolution:	0.001 kg/m ³

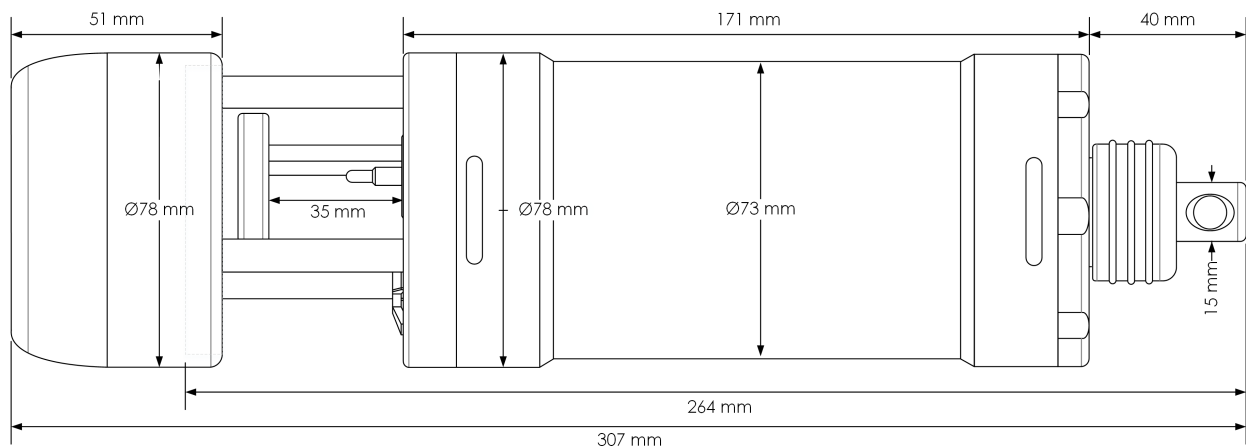
6. Physical Characteristics

SWiFTSVP:

Housing & Bulkhead:	Titanium
Deployment Weight:	Stainless Steel
Depth Rating:	200m (Titanium)
Weight:	2.0kg (in air) / 0.9kg (in water)
(Titanium Housing)	3.0kg (in air) / 1.8kg (in water) with optional Deployment Weight

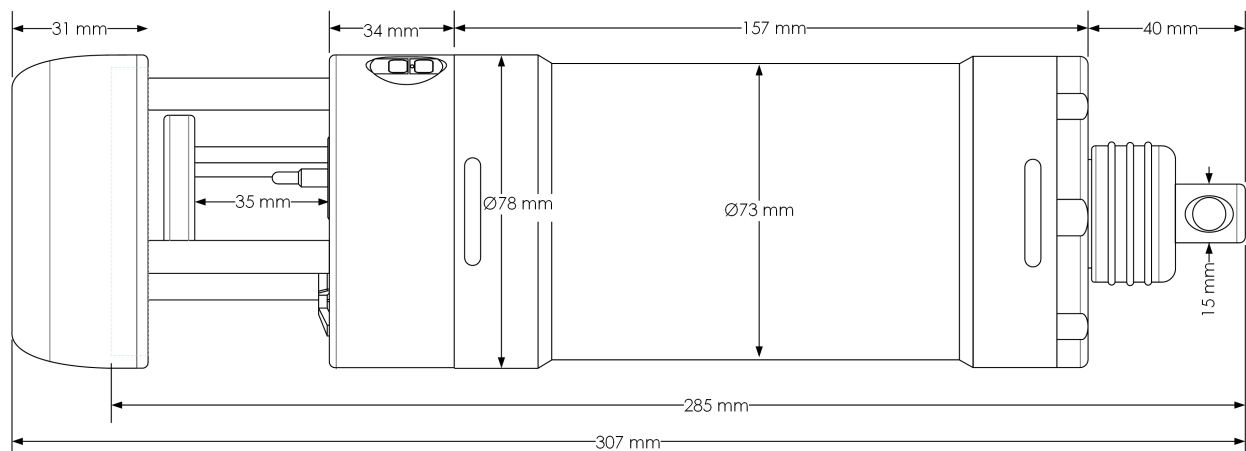
6.1. Dimensions - SWiFT SVP

Please refer to Valeport for more detailed dimensions if required.



6.2. Dimensions - SWiFTplus

Please refer to Valeport for more detailed dimensions if required.



7. Communications

The SWiFT is designed to communicate primarily through a Bluetooth interface but has cabled RS232 comms capability as a fall back.

The Bluetooth module communicates with an iOS App and can be used with Valeport's Connect software in the same way. If Bluetooth is not available the RS232 comms cable can be used directly with Connect.

Baud Rate:	230400
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Protocol:	8 data bits, 1 stop bit, No parity, No flow control
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7.1. Interfacing to a PC

There are two methods of connecting a SWiFT to a PC:

1. A wired connection using the supplied USB cable
2. Bluetooth with the supplied USB key.

7.1.1. USB Communications

The SWiFT contains a USB-Serial FTDI chip. When the SWiFT is first plugged into the USB port of a PC it will install the relevant FTDI drivers.

Please note that when the USB cable is plugged into the SWiFT the GPS module is switch off.

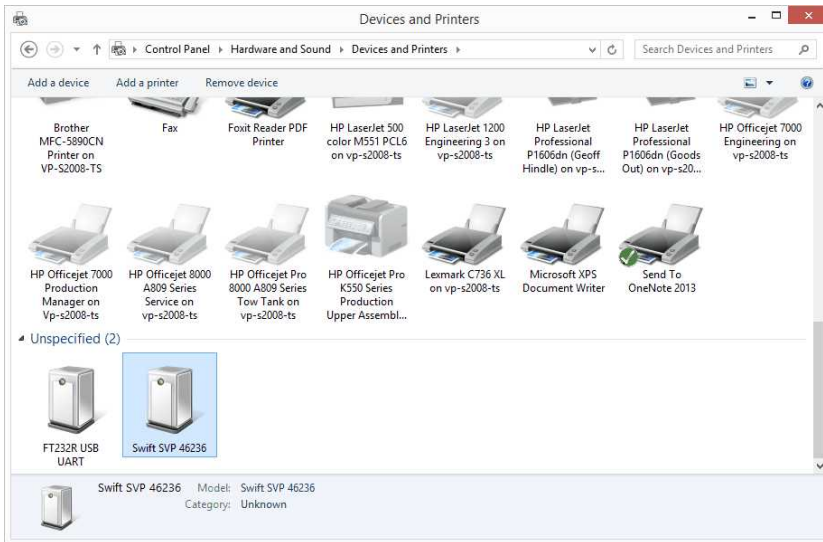
This installation may require administration rights for the installation of the serial port drivers, if the drivers do not automatically install they can be manually installed by running the CDM v2.12.00 WHQL Certified utility.

The SWiFT will be assigned a COM port (e.g. COM 10) and on every subsequent connection it will retain this port.

To find out the COM port of a connected SWiFT, access the devices and printers selection from Windows Control Panel.

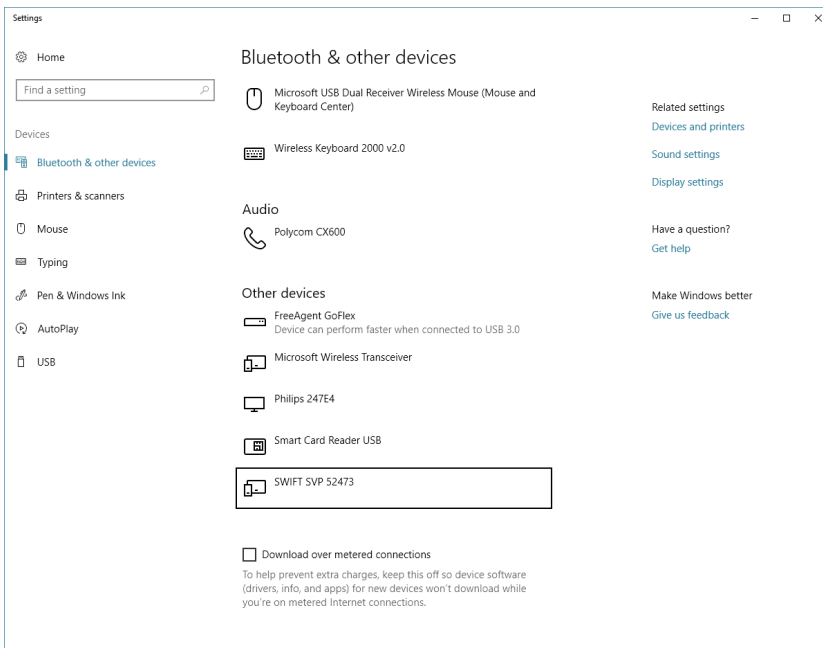
In the Unspecified section you will find "SWiFT SVP xxxxx" where xxxxx is the serial number.

Right click and select Properties, next select the Hardware tab and you will see the assigned COM port.



The Connect Utility will then be able to communicate with and configure the SWiFT SVP using the configured COM port.

in Windows 10:



7.1.2. Bluetooth Communications

SWIFT is fitted with a Bluetooth 4.0 LE chip. This allows short range wireless comms with a Windows 10 PC or hand held device running the Valeport Connect App. Using the App will allow the instrument to be configured and recorded data downloaded.

The reliable range of the Bluetooth comms is 5 to 10m.

The SWIFT is supplied with a Valeport Bluetooth Key. Prior to delivery each key is pre-paired and bound to the SWIFT that it is supplied with. The pairing can be updated using the vp_Bluetooth application provided and available to download from the Valeport Downloads site (<http://valeport.download/>).



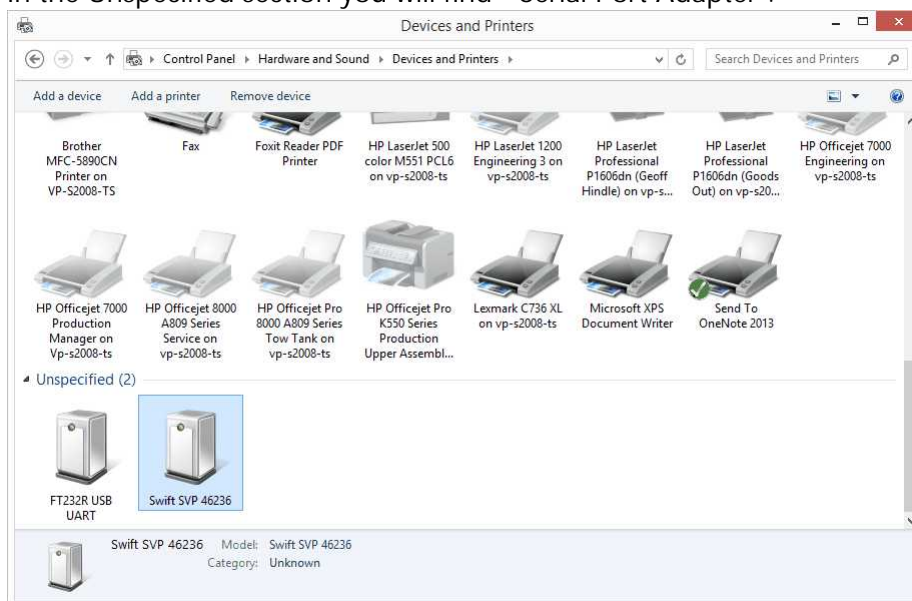
The SWIFT will not communicate with native Windows 10 Bluetooth or any other type of Bluetooth key

If the supplied Key is lost or damaged, it can only be replaced with another Valeport key.

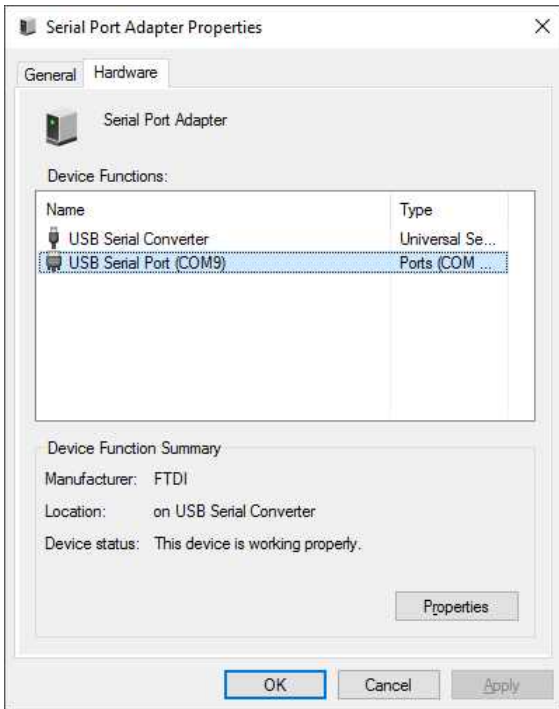
The Valeport Bluetooth Key will install as a USB serial port and will be assigned a COM port (e.g. comm 9) and on every subsequent connection it will retain this COM port designation. This installation may require administration rights for the installation of the serial port drivers, if the drivers do not automatically install they can be manually installed by running the CDM v2.12.00 WHQL Certified utility contained in the Connect installation folder on the supplied USB flash drive.

To find out the COM port of the Valeport Bluetooth Key, access the devices and printers selection from Windows Control Panel.

In the Unspecified section you will find "Serial Port Adapter".



Right click and select Properties, next select the Hardware tab and you will see the assigned COM port.



The Valeport Bluetooth Key is configured to automatically establish a connection to its paired SWIFT whenever it comes into range. The Key scans every 10 seconds so may take up to 10 seconds to connect after the SWIFT is switched on or comes into range. The LED on the Valeport Bluetooth Key gives an indication of operational status.

LED Status	Operation
Green	Not Connected
Purple	Scanning for paired instrument
Blue	Connected (Flashing - data transfer)
Orange	Configuration Mode
Red	Error
None	Not connected or Drivers not installed correctly

When the connection is established, the Bluetooth symbol on the SWIFT end cap will turn from green to blue. The Connect Utility will then be able to communicate and configure the SWIFT SVP over Bluetooth using the configured COM port. The SWIFT can only maintain one Bluetooth connection at a time so can either talk to the mobile app OR the Valeport USB key.

7.1.2.1. Regulatory and Safety Information

EU Declaration of Conformity

SWIFT SVP and SWIFTplus Profilers have u-blox type AG OBS421 stand-alone dual-mode Bluetooth® module fitted as standard. There is the same type of Bluetooth module fitted in the USB communications device supplied with the SWiFT.

It complies with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EU and Restriction of Hazardous Substances (RoHS) Directive 2011/65/E

Essential Requirements	Standards
Radio Equipment Directive 2014/53/EU	
Safety & Health (Article 3.1a)	IEC 60950-1:2005 + A1:2009 EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 + A2:2013 EN 62479:2010
EMC (Article 3.1b)	EN 301 489-1 V2.1.1 EN 301 489-17 V3.1.1 IEC 60601-1-2:2007 (Medical Electrical Equipment
Radio Spectrum Efficiency (Article 3.2)	EN 300 328 V2.1.1
Essential Requirements RoHS Directive 2011/65/EU	Standards
Prevention (Article 4.1)	EN 50581:2012

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Radio Frequency Exposure

The OEM Serial Port Adapter contains a small radio transmitter and receiver. During communication with other Bluetooth products the OEM Serial Port Adapter receives and transmits radio frequency (RF) electromagnetic fields (microwaves) in the frequency range 2400 to 2500 MHz. The output power of the radio transmitter is very low.

When using the OEM Serial Port Adapter, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations.

Potentially Explosive Atmospheres

Turn off your electronic device before entering an area with potentially explosive atmosphere. It is rare, but your electronic device could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fueling areas, such as petrol station, below deck on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

7.2. Configuration

A SWiFT should be configured and operated through the Connect PC Utility, or your iOS hand held device Connect App.

See separate Connect Software manual.

8. Rechargeable Battery

The SWIFT is fitted with a rechargeable battery with the following characteristics:

Battery:	Internal, Rechargeable Lithium Ion Battery Pack
Capacity	12Ah
Charging:	USB 1.5A Charger that is supplied 0.5A Laptop USB port
Battery Life:	Up to 5 operational days from a fully charged pack

As the battery becomes discharged the SWIFT status LEDs will change during operation:

Solid Green	More than 24 hours
Solid Amber	less than 24 hours but more than 12 hours
Solid Red	Less than 12 operational hours

The actual number of operational hours can vary from one project scenario to another and if a SWIFTplus is being used. Environmental factors have to be taken into account as well as the age of the battery, the time the SWIFT is switched on as well as the time in the water all have to be taken into consideration.

Below is a table of the current drawn by the SWIFT in various modes:

Mode	Bluetooth	GPS	Current mA
Running on the surface	ON	ON	110
Running on the surface	Connected	ON	116
Interrupted	Connected	ON	112
Running sub surface	OFF	OFF	55
Sleep	OFF	OFF	0.5

Note that there is still current drawn when the SWIFT is switched off or in Sleep Mode and that the current drawn is considerably less when sub surface recording sound velocity, pressure and temperature data but the GPS and Bluetooth are off. The GPS and Bluetooth are disabled as the pressure reading passes a trigger value, by default this is 0.5m but can be set by the operator.

8.1. Charging

The battery pack is supplied with a dedicated USB charging and data download interface cable, this must be used.

In order to gain access to the charging socket the lock nut and suspension spar must be removed - see illustration on the inside of the transit case lid. Pay special attention to the O ring seals during dis-assembly and most importantly reassembly to insure a fully water tight seal. When replacing the suspension spar and lock nut do not over tighten either thread. Finger tight is tight enough.

The suspension spar contains a vent hole in case of pressure build up in the housing. This venting hole must be kept clean and clear. If the SWiFT is used in a manner not specified by Valeport the protection provided by the equipment might be impaired.



The supplied USB charger is capable of charging the battery with a 1.5 A current.

The battery pack has intelligent charging and discharge circuitry. There is no 'memory' to the pack so partial charging sessions will not reduce the capacity or life of the pack. The capacity of the pack will, however, reduce with age.

It is advised that the SWiFT battery is never allowed to become fully discharged. In a fully discharged state the battery is open circuit. In order to reduce the chances of battery becoming fully discharged the SWiFT will disable all sensors with 1 hour's operational charge left. From disabling the sensors you have approximately 100 hours to start a charging session to prevent

the battery becoming open circuit.

If the battery is completely discharged and, therefore, open circuit it will take 50 minutes, using the supplied 1.5A charger, to start taking on a charge. Please note, during this 50 minute period of charging no LEDs will be lit.

If charged for 1 hour from a near flat but not an open circuit state, using the supplied 1.5A charger, the battery will take on a charge that will allow the SWiFT to operate for approximately 12 hours.

It will take approximately 12 hours, using the supplied 1.5A charger, to fully charge the battery from a near flat but not open circuit state.

When the charging session is complete, disconnect the charging cable from the SWiFT before disconnecting power from the charger.

8.1.1. Charging Status

During charging the status of the process can be monitored:

Flashing Red	Charging < 12 hours capacity
Flashing Amber	Charging at > 12 hours capacity < 24 hours capacity
Flashing Green	Charging > 24 hours capacity
Solid Green	Fully charged or running with charger off

8.1.2. Charging from a Laptop USB Port

A typical Laptop USB port is rated to supply up to 0.5A for charging, although many newer laptops have dedicated USB sockets (usually marked yellow) that often are capable of higher output currents. The SWiFT's electronics is able to detect the higher current available resulting in faster charging cycles. The SWiFT also maintains the maximum charge voltage at a reduced level, resulting in longer battery life.

Any charging operation from a standard USB port will take approximately three (3) times longer than if the supplied 1.5A rated charger is used as described above.

8.2. Battery Life Expectancy

The batteries installed in the SWiFT will lose capacity over time. Lithium-ion batteries use the movement of ion particles to create and store an electrical charge. Eventually these ion particles are trapped and can no longer move around. The batteries then lose their capacity to store energy.

Under normal operational conditions the SWiFT battery pack should offer a practical, usable capacity for a period in excess of 4 years.

8.3. Shipping Your SWiFT with Lithium Ion Batteries


The Lithium Ion battery within this product, when packed and shipped in its transit box, conforms to UN3481, PI967 section II and its additional requirements.

No battery handling labels are required.

For further information, please contact Valeport and ask for one of the Dangerous Goods in shipment advisers or visit the IATA website page:

<http://www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx>

8.3.1. Lithium Ion Battery Certification



Supplier's Declaration of Conformity


SAP No.: 241740 Model name: Li18650-31 1s4p+BQ27541-G1 fuel gauge 3.7V 12.4Ah 45.88Wh	
<input type="checkbox"/> Lithium metal	<input checked="" type="checkbox"/> Lithium-ion
<input type="checkbox"/> cell	<input checked="" type="checkbox"/> battery (pack)
Lithium content or Watt-hour rating:	
<input type="checkbox"/> batteries > 0.3g(Lithium metal or Lithium alloy), 2.7Wh(Li-ion) <input type="checkbox"/> batteries ≤ 0.3g(Lithium metal or Lithium alloy), 2.7Wh(Li-ion) <input type="checkbox"/> cells > 1g (Lithium metal or Lithium alloy), 20Wh (Li-ion) <input type="checkbox"/> cells ≤ 1g (Lithium metal or Lithium alloy), 20Wh (Li-ion) <input type="checkbox"/> batteries > 2g(Lithium metal or Lithium alloy), 100Wh(Li-ion) <input checked="" type="checkbox"/> batteries ≤ 2g(Lithium metal or Lithium alloy), 100Wh(Li-ion)	

Test results in accordance with the UN Manual of Test and Criteria ST/SG/AC.10/11 Rev.5/ amend. 2, 38.3

Test number	Test item	Results	Remarks
T-1	Altitude simulation	Accepted	
T-2	Thermal test	Accepted	
T-3	Vibration	Accepted	
T-4	Shock	Accepted	
T-5	External short circuit	Accepted	
T-6	Impact /Crush	Accepted	
T-7	Overcharge	Accepted	for rechargeable battery only
T-8	Forced Discharge	Accepted	for cell only

We, Jauch Quartz GmbH, hereby certify that above results are confirmed in accordance with the Manual of Tests and Criteria of the UN Recommendations on the Transport of Dangerous Goods, 5th revised edition, Amendment 2, section 38.3.

Name / Title of Signatory Sönke Zacher / Sales Manager

Signature 

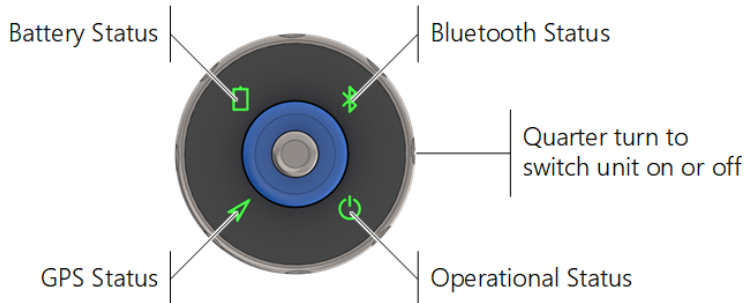
Sept 11, 2015

Headquarters: Jauch Quartz GmbH · In der Lache 24 · 78056 Villingen-Schwenningen · Germany
Registry court: Freiburg HRB 602574, Managing Director: Thomas Jauch

As certified above the SWiFT SVP rechargeable, Lithium Ion battery is not subject to any shipping restriction.

9. Operation

SWiFT is switched on and off by a quarter turn of the ring surrounding the deployment spar end cap. The turn can be in either direction



The SWiFT is supplied with an optional sinker weight fitted. If not required or to reduce shipping weight this weight can be removed - a Hex key is provided.

The SWiFT has two user operational modes. Smart Profile and Continuous. The default mode for profiling operations is Smart Profile.

A Smart Profile has three controlling parameters and can operate as the Up Cast or Down Cast:

Trigger Depth:	Trigger point at the surface (default = 0.5m)
Depth Increment:	The depth increment at which profile data points are recorded (default = 0.1m)
Trigger Step:	Trigger point at depth (default = 1.0m)

For example: SWiFT with the default settings, Down Cast profile mode and lowered to 100m and then retrieved.

Get a GPS fix and Tare pressure setting to apply to the data. The SWiFT will continually update its GPS fix until deployed into the water. GPS and all LEDs are disabled at 2m depth to conserve power. If no fix is found before the SWiFT is deployed the profile data will still be recorded but with a position of 999,999

- Last GPS fix and Tare observation recorded.
- Will start recording values at 0.5m depth,
- Record values every 10cm on the downcast to a depth of 100m
- Stop recording on the Up Cast at 99m (trigger step set to 1 m).
- Close file
- To obtain a GPS fix, the SWiFT needs to be above the water surface. A hot fix is usually obtained in less than 30 seconds.

The SWiFT can also operate in a continuous mode where data is recorded at a user defined rate (1,2,4,16, or 32 Hz). All data is recorded from when the SWiFT is placed into run mode (either by turning the SWiFT on, or sending a run command). A SWiFTplus will record data at 1Hz intervals.

Operational Status:

The operational status LED will be solid green when the unit is switched on and not interrupted, that is, is not in a command mode.

When the unit is on but interrupted the Operational status LED will flash green.

If in an 'interrupted' state and no commands are received after 5 minutes the instrument will automatically leave the configuration status and start operating again.

Power Saving Mode:

A mode has been implemented to save power if the SWiFT is inadvertently left switched on. When operating in Smart Profile mode, if no activity is detected after a defined period, the SWiFT will move into a low power sleep mode. As a default this is set to 120 mins. This value can be changed with a configuration code or disabled.

If the SWiFT has gone into power save mode, the switch ring will need to be rotated two quarter turns to wake the SWiFT up.

When operating in Continuous Mode, if the SWiFT is left on, it will continue to operate until the battery is empty and then switch off.

GPS Status

When the unit is switched on the GPS will immediately search for time and position data - the LED will flash green until a fix is acquired. Once a valid fix has been obtained the LED will switch to solid green.

If a fix is not acquired, the unit can be deployed but no position information will be recorded in the data file.

Note: The GPS will not be powered when the comms cable is plugged in.

Battery Status

As the battery becomes discharged the status LED will change from:

Green	More than 24 and up to 60 operational hours
Amber	less than 24 but more than 12 operational hours
Red	Less than 12 operational hours

If there is a fault with the battery then the LED will flash once a second in different colours.

Bluetooth Status

Green	Not Connected
Flashing Blue	Connected and Transmitting (status message will cause blue light to flash every 10s)
Solid Blue	Connected
Flashing	Low Power Mode enabled

9.1. Operational Modes

Use Valeport Connect Software to configure the SWIFT and control the data download process. See the separate Connect Software Operating Manual (Document No. 8500800).

Smart Profile Mode

Smart Profiling allows the operator to specify a change in depth to trigger an observation set to be recorded.

The profile can be recorded either as a Down Cast or an Up Cast with start and stop triggers specified as required using the Settings dialogue.

The Down Cast

The Trigger Depth is the depth, close to the surface, at which the Profile will start and open a new logging file.

The Trigger Step is the change in depth upwards, that will cause the Profile to stop and close the logging file. This should be set to a magnitude greater than the local swell.

The Up Cast

The Trigger Step is the change in depth upwards, that will cause the Profile to start and open a new logging file. This should be set to a magnitude greater than the local sea and swell.

The Trigger Depth is the depth, close to the surface, at which the Profile will stop and close the logging file.

An observation for each sensor - Sound Speed, Temperature, Pressure and Optical in the case of a SWIFTplus, will be recorded at each Depth Increment as defined in the settings dialogue.

Once the unit is switched on and ready for deployment the following criteria must be met before logging will start:

- the Start Trigger event has been met depending on the direction of the cast - up or down.

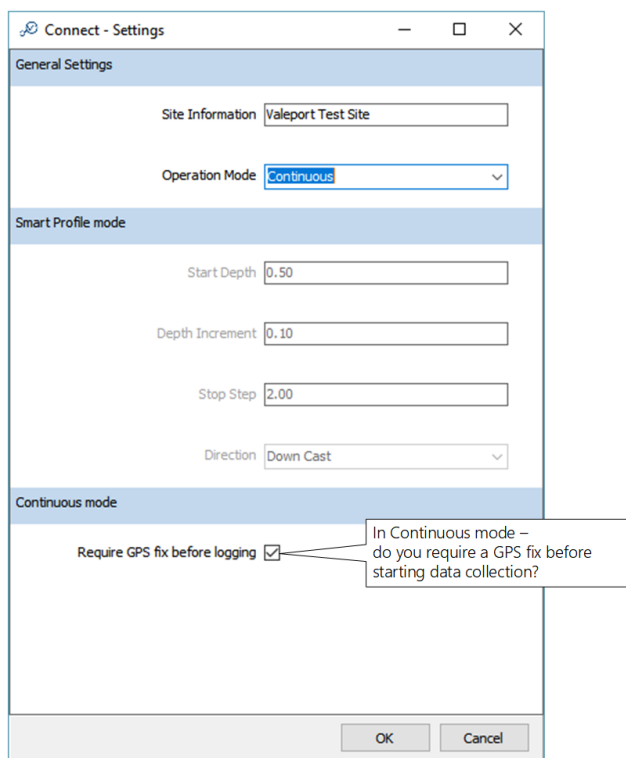
Logging will be stopped when the End Trigger event has been met.

Continuous Mode

In Continuous mode a set of observations will be recorded at a rate of 1Hz. Data will be recorded from the moment the Instrument is set to work and will continue until the Instrument is interrupted.

SWiFT SVP will record an observation for each sensor every second. That observation will be an average of 32 readings (32Hz observation period).

The SWiFTplus will record an observation for the Optical sensor, Temperature, Pressure and Sound Speed every second.



Once the unit is switched on and ready for deployment the following criteria must be met before logging will start:

- A Valid position has been obtained if the 'Require GPS fix before logging' option is ticked
- or
- If the 'Require GPS fix before logging' option is not ticked as soon as the SWiFT is turned on and set to work.

Observations will be recorded at 1 Hz in continuous mode.

In a SWiFT SVP this 1Hz recorded value is the average of a 32Hz observation period for each sensor. The SWiFTplus is a single reading taken at 1 Hz and could, therefore, appear to be more noisy than a SWiFT SVP.

Logging is stopped by turning the instrument off or Interrupting it with a # character.

9.2. Tare

The pressure Tare of the instrument is automatically updated and applied when a GPS fix is obtained.

The Tare value is stored in the file header with a time and date stamp of when it was observed. It is applied to the recorded pressure data.

9.3. Do Not Deploy Flag

In Smart Profile Mode a message is broadcast every 10 seconds. Within the message is a flag to indicate if the SWiFT is ready to be deployed, i.e. is a file created and is valid data going to be recorded.

There are 4 instances when the flag will be set to 0 (zero) and, therefore, the SWiFT will not be in a correct state to be deployed, it will not record data. Connect will attempt to recover the the situation using a specific reset command.

1. The GPS is off e.g. USB Plugged in.
2. The GPS Clock is set to Year 80.
 - 2.1. Reset the GPS, make sure you have a recent and valid GPS fix.
3. Date from GPS is NOT greater than 1/1/2018.
 - 3.1. Reset the GPS, make sure you have a recent and valid GPS fix.
4. Pressure reading is greater then the Trigger Point. If there is a small Tare value taken from a normal atmospheric value or Tare mode is turned off.
 - 4.1. Turn the SWiFT off and back on again, ensure you have a valid GPS fix. This will cause a new file to be created and a Tare value recorded.

When the the Flag is set to 0 a warning message is shown in Connect.

The most usual reason for this error status is an incorrect GPS update. Try moving the SWiFT unit to an area of open sky and ensure a valid GPS fix has been received.

9.4. Low Power Mode

Primarily designed for use on long duration autonomous vehicles, a low power sleep mode has been developed for SWiFT to provide for maximum endurance.

Low Power mode is only available in a SWiFT delivered after May 2018. A modification was included in the switch end cap from this build standard onwards.

If your SWiFT is enabled to operate in this mode the Bluetooth LED will flash at 1 Hz

If you would like to investigate the use of this mode for your operation please contact Valeport directly

9.4.1. Low Power Mode Detail

There are two stages of the low power sleep mode.

Issuing a serial command to the SWiFT, powers down the main processes leaving only the Bluetooth connection running.

The status, GPS and battery light on the SWiFT will turn off, the Bluetooth symbol will briefly turn light blue and then dark blue. In this mode the SWiFT will draw ~7mA.

The second stage of low power sleep mode requires the Bluetooth connection at the PC end to be terminated. Disconnecting the Bluetooth Adapter from the PC breaks the Bluetooth link and the SWiFT moves into a lower power sleep mode. The Bluetooth status light on the SWiFT will change from solid blue to flashing green once per second. In this mode the SWiFT will draw ~1.5mA.

To reestablish a Bluetooth connection, reconnect the Bluetooth Adapter to your PC. Within 30s the status light on both the SWiFT and the USB Adapter should go blue.

To wake the SWiFT, send any character via the COM port. We recommend not to use the # symbol as this will interrupt the instrument.

If the SWiFT has been successfully woken up, within 10 seconds a status message will be transmitted from the SWiFT and then every 10 seconds it will be updated.

See section on the Status Message for details of this message.

To Control Low Power Sleep Mode

#160;1	Enable Low Power sleep mode
#160;0	Disable Low power sleep mode
#161	Read Low power sleep mode

To place SWiFT into low power sleep mode:

#162 Place unit into low power sleep. Will return an error if Low Power Sleep mode is disabled.

To wake SWiFT from low power sleep mode:

Send any character. Do not use # as this will interrupt the instrument.

Battery life Calculations (SWIFT SVP):

Operational Deployment time: 24 Hours		
Winch Speed	1	m/s
Profile Depth	200	m
Profile time	400	Seconds
Surface time no connection but all on	30	Seconds
Connection time during extraction etc	30	Seconds
Surface sleep time after BT disconnect	52	minutes
No of profiles / day	24	
No of days from fully charged pack	46	days

Operational Deployment time: 24 Hours		
Winch Speed	1	m/s
Profile Depth	100	m
Profile time	200	Seconds
Surface time no connection but all on	30	Seconds
Connection time during extraction etc	30	Seconds
Surface sleep time after BT disconnect	56	minutes
No of profiles / day	24	
No of days from fully charged pack	69	days

9.5. Status Message

The SWIFT continuously broadcasts a status message over Bluetooth. It is only broadcast over Bluetooth.

It allows for the status of the SWIFT to be determined without interrupting its operation.

The message is broadcast every 10 seconds and is in the form of a proprietary NMEA type message. It contains the following information:

\$PVBB,00102532,56150,50.4264,-3.6814,66.00,160817154647,0,*42

\$PVBB,00102532,56150,50.4264,-3.6814,65.99,160817154647,0,*41

\$PVBB,00102532,56150,50.4264,-3.6814,65.99,160817154647,0,*41

\$PVBB,00102532,56150,50.4264,-3.6814,65.98,160817154647,0,*40

Where:

\$PVBB	Type	Identifier
00102532	Identifier	Hardware ID
56150	Long	Instrument Serial Number
50.4264	Float	Last Latitude (Decimal Degrees), 999 for no fix
-3.6814	Float	Last Longitude (Decimal Degrees), 999 for no fix
66.86	Float	Battery Status (hours remaining until empty)
180817154647	Time	Date/Time Stamp of last recorded file [YYMMDDhhmmss]
0 or 1	Char	Ready for deployment (New file flag and in run mode)
*40		Check Sum

9.6. Data File

If a file has already been extracted and converted from the binary format using the iOS app or Connect, it will be stored in a VPD format. This is a common format that is used across all Valeport products.

From Connect version 1.0.4.0 a slightly altered format: .VP2 was introduced to replace VPD and allow for future expansion. The structure is largely the same.

This format is generated from Connect and the iOS App after download and during recording. The raw downloaded and recorded files are also maintained as a backup.

Basic Structure:

The basic structure is that of an INI file:

The file is split into sections (denoted by a the name of the section in square [] brackets).

Within each section, the values are presented as Key Value pairs, delimited by an 'equals' sign. INI files are fairly old technology, but have been chosen for a number of reasons:

- a) They are readily readable as text files.
- b) They can be randomly accessed for both read and write - many programming languages have readily available INI File Access Classes.
- c) They are not case sensitive.
- d) Their structure can be split into sections, and the sections can be hierarchical by using a back-slash '\'
- e) Comments can be added (prefixing the line with a semicolon ';')
- f) They can be readily dropped into Excel etc for onward processing.

More information on Windows INI Files can be found here:

http://en.wikipedia.org/wiki/ini_file

9.7. Data File Translation

Once downloaded from the SWIFT SVP profiles can be converted in the Connect App to the following Industry Standard formats.

The following profile formats are available in the iOS App:

Kongsberg	.asvp format
ELAC	.sva format
AML	.csv format
Hypack	.vel format
Reson Velocity Profile	.log format
Reson Simplified Profile	.svp format
Sonardyne SPI	.ssp format
Sonardyne PRO	.pro format
CARIS	.svp format

If the format you require is not available then contact support@valeport.co.uk

9.8. Real Time Data Format

When operating in continuous mode and connected by Bluetooth the SWIFT will output the following data format:

Example:

```
$PVSVP,20150521,150715,0.00,m/s,10.31,dBar,23.87,DegC,3863,3863,*6A
```

Where:

\$PVSVP	Identifier
20190521	Date: YYYYMMDD
150715	Time: hhmmss
0.00	Sound Velocity Value
m/s	Sound Velocity Units
10.31	Pressure Value
dBar	Pressure Units
23.87	Temperature Value
DegC	Temperature Units
3863	Status
*6A	Checksum

9.9. Care and Maintenance

SWIFT is a robust profiling sensor and will provide many years of reliable service.

The unit should be thoroughly cleaned and rinsed with fresh water before being returned to its transit case, where it should be kept at all times when not in use.

Care should be taken when removing and replacing the deployment spar to gain access to the charging and data port. The O rings included in the locking mechanism are an integral part of the system to keep the SWIFT watertight and should be kept in good condition and checked for correct seating before reassembly.

When the deployment spar is removed every care should be taken to avoid any water getting into the connector bay. If water does inadvertently make its way into this space it should be very carefully dried out. The deployment spar should not be put back in place until the connector bay is completely dry as water could be forced further into the instrument and cause damage to the connector or even the electronics inside the housing.

Charging should not be carried out where any water is present.

9.10. Software

SWIFT is supplied with two forms of software package - PC based Valeport Connect and an iOS hand held device App.

Valeport Connect is a PC program to set up, down load and display data. It is licence free.

Please see manual 8500800b for further details

10. Upgrading Your SWiFT

10.1. Valeport SWiFT - Firmware Upgrade

This procedure describes the upgrade process for the firmware of a SWiFT.

This upgrade is required to operate with the new Valeport Connect PC and Connect iOS applications.

It is compatible with all SWiFT SVP and SWiFTplus profilers.

Requirements

- § Windows PC
- § Valeport's Bootloader Utility (ver.1.0.10.3 or higher)
- § SWiFT SVP firmware .zip file
- § SWiFT SVP
- § USB interface cable

Do Not Attempt to Carry Out this Upgrade over Bluetooth

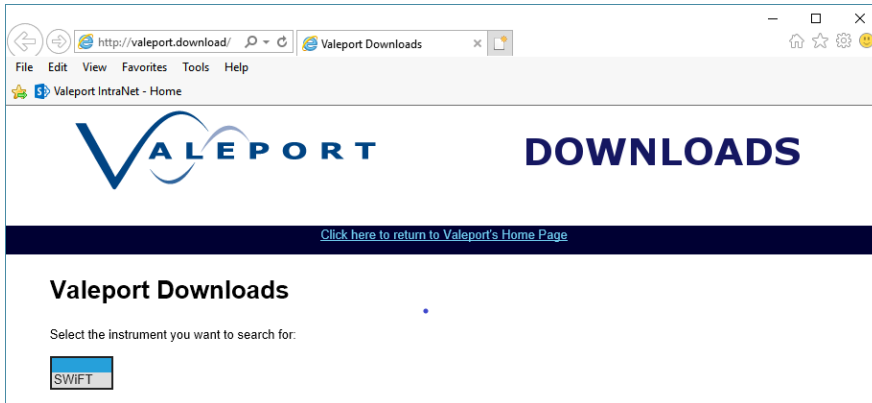
Once upgraded to 0650735, the SWiFT SVP and SWiFTplus will NOT be compatible with:

- Valeport DataLog x2 - replaced with Valeport Connect for PC
- Valeport SWiFT iOS App - replaced with Valeport Connect App for iOS
 - and potentially other third party software integrations.

Please contact Valeport for further details

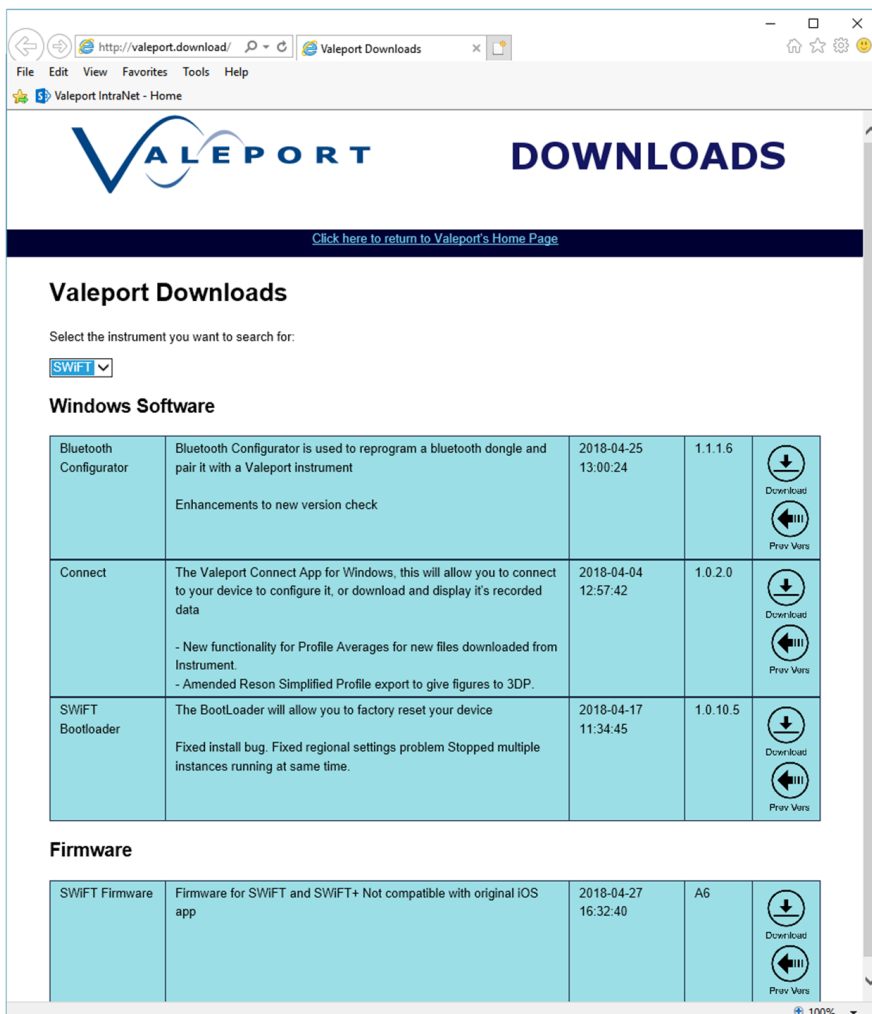
10.2. Step 1 - Download the Required Files

Visit Valeport's dedicated Downloads site: [http://valeport.download/] Select SWIFT from the drop down menu



Download the following files:

- Bluetooth Configurator
- Connect
- Bootloader Utility
- SWIFT Firmware - **do not unzip this file**



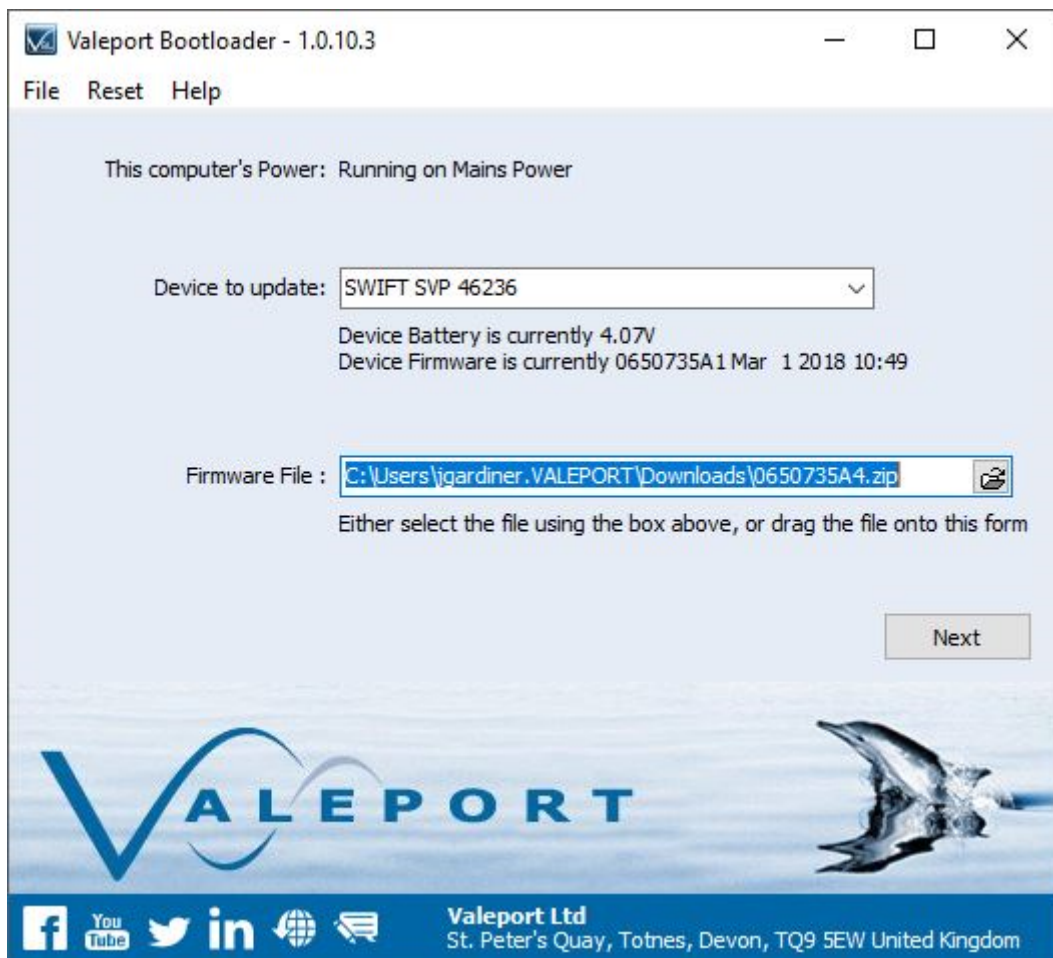
10.3. Step 2 - Update the Firmware

1. Unplug any devices interfaced to any serial ports on the PC
2. Install SWIFT Bootloader (vpSWIFTBootLoaderSetup.exe)
3. Interface the SWIFT to the PC with the provided USB lead
4. Ensure the SWIFT is powered on

If you are operating a laptop on battery power, ensure you have sufficient power to complete the operation

Run the Bootloader utility:

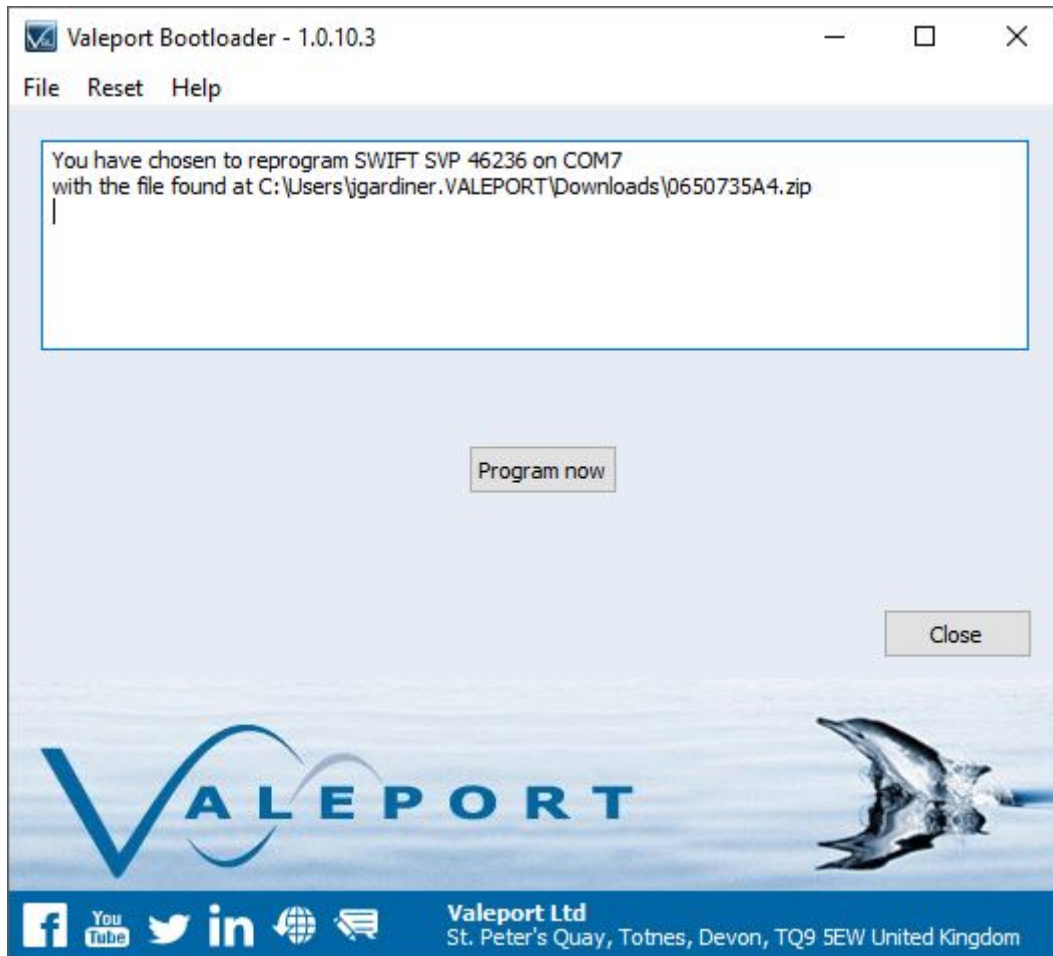
- The correct device should be shown in the top input box
- When the device is selected, the battery status of the device and current firmware should be displayed
- Drag and drop the firmware.zip file onto the application
 - Or use the browse button in the lower input box and navigate to the location of the firmware.zip file and select it:

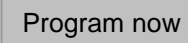


Click

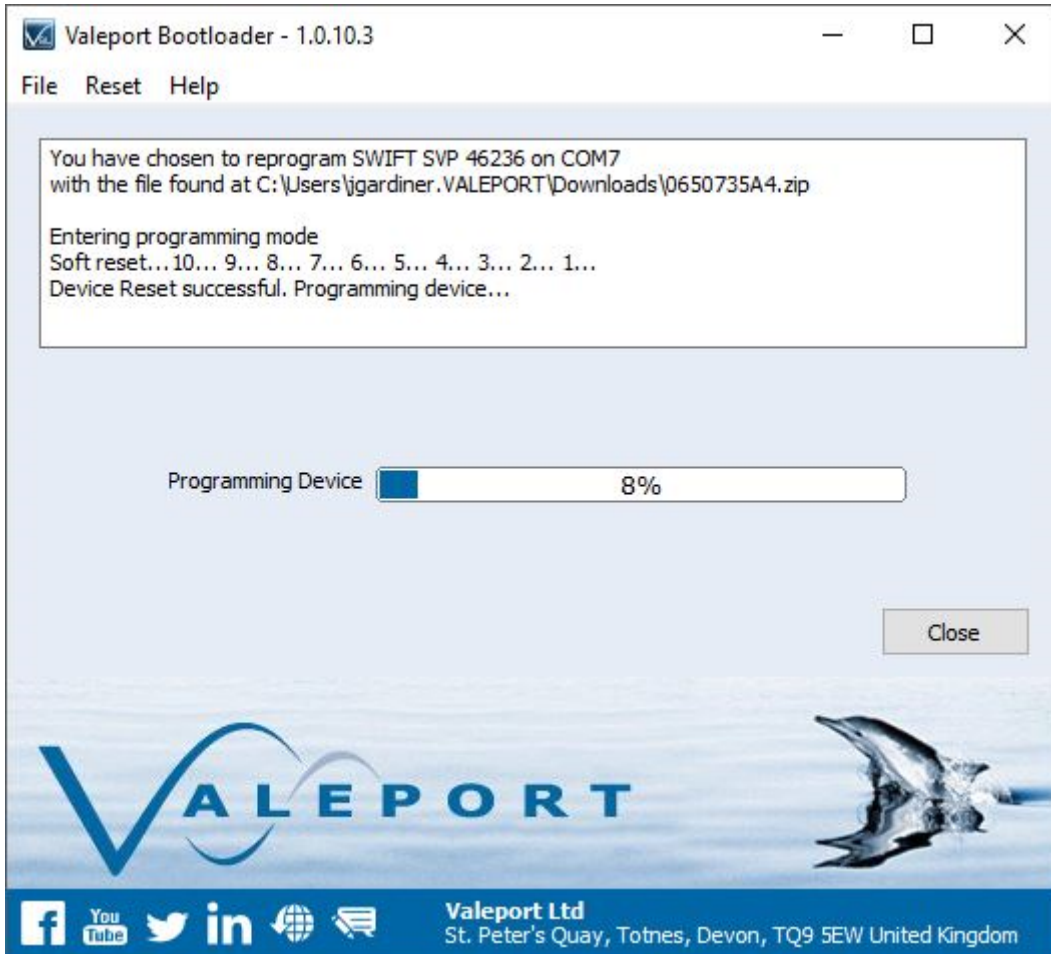


A summary of which device will be programmed with which firmware will be displayed. Check carefully you are programming the correct device with the correct firmware:



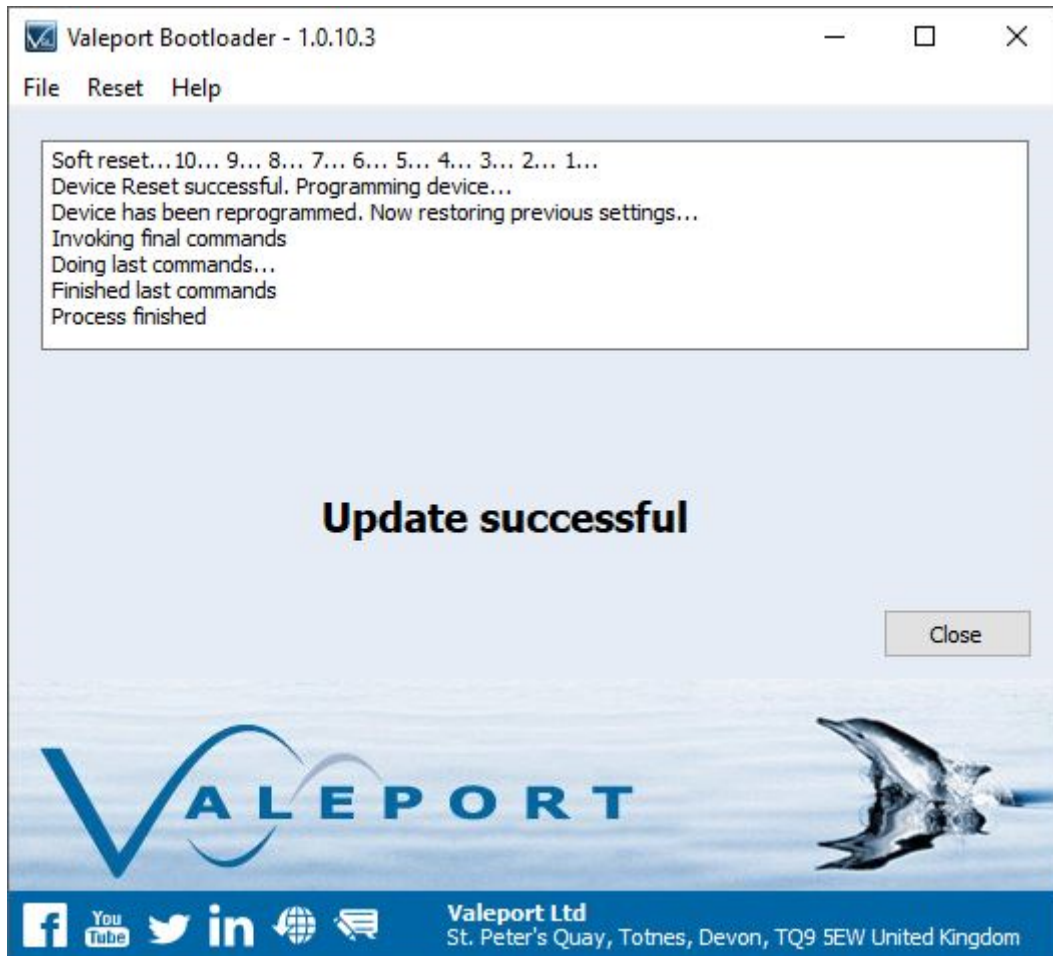
Once you are satisfied everything is correct, click 

The status of the firmware update will be displayed. The LED's on the SWIFT will flash and may go off completely at times.



Do not interrupt this process

You should see an 'update successful' message when the process is complete:



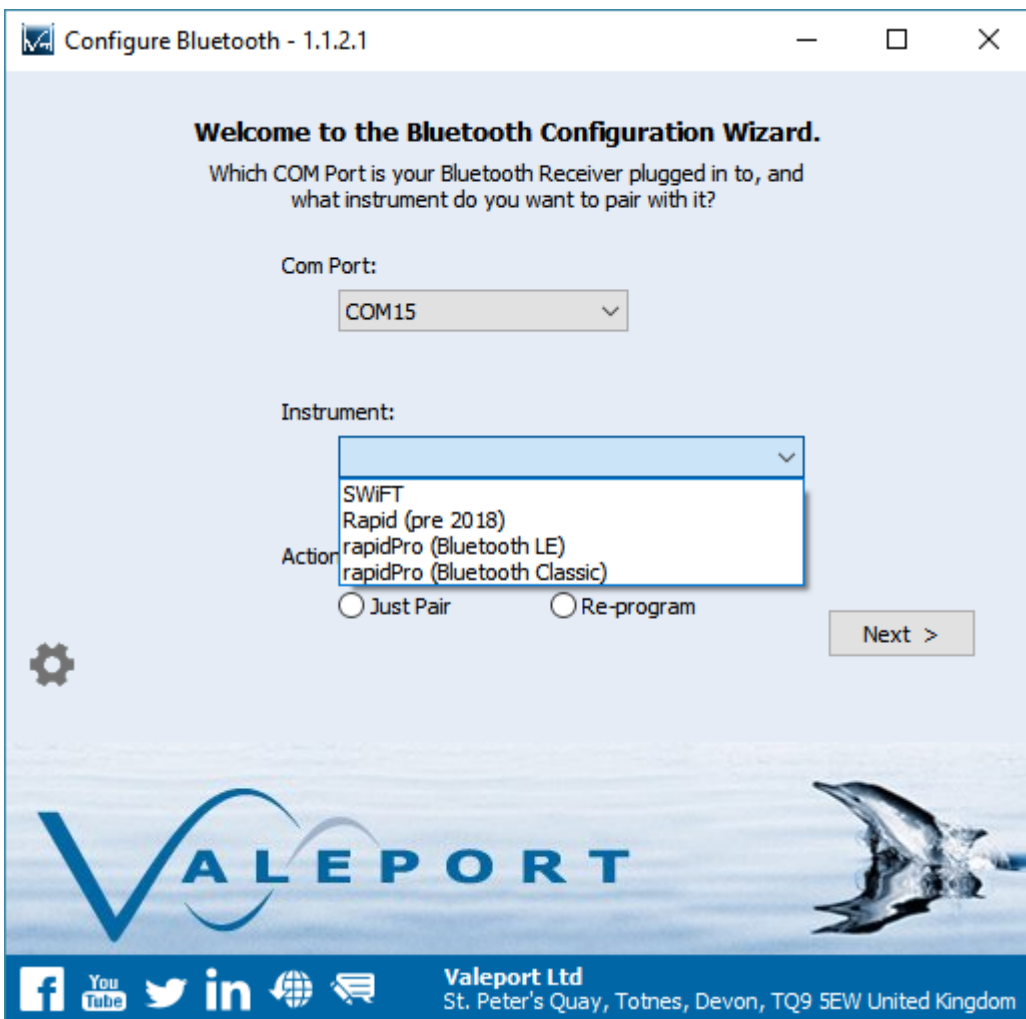
After updating your firmware and your instrument has an integral GPS receiver - SWIFT SVP, SWIFTplus, rapidPro SVT or rapidPro CTD (F) it is very important that you insure a valid GPS fix is received by the unit before it is deployed. The system must have valid clock and date settings in order to open logging files correctly

If the firmware update fails, contact Valeport for support:
e mail: support@valeport.co.uk
Tel: +44(0)1803 869292 (UK office hours only)

10.4. Bluetooth Adapter - Re-Program and Pair

Complete the following steps:

- Install the Bluetooth Configurator utility (vpBluetoothSetup.exe)
- Ensure that the SWiFT USB cable is disconnected
- Ensure the SWiFT is turned on
- Plug USB Bluetooth adapter into the PC and note the Com port number
- Select the Com port the USB Bluetooth adapter is configured as
 - § In order to do this go to the Windows Control Panel > Device Manager > Ports (COM & LPT) if the Com port is not obvious, unplug the cable or Bluetooth adapter, the Com will disappear and reappear when the adapter is plugged back in.



- Select the instrument type:
 - SWiFT: SWiFT SVP and SWiFTplus
 - Rapid: original Rapid, pre 2018
 - Rapid Logger (Bluetooth LE Mode): ProLogger Module (rapidPro SVT, CTD and CTDplus) - Factory Default.
 - Rapid Logger (Classic Mode): ProLogger Module (rapidPro SVT, CTD and CTDplus).
- Select Re-program if your Bluetooth module is not in the mode required - Classic or LE.
- Select Just Pair if your Bluetooth module is in the correct mode and you simply need to pair with your instrument.

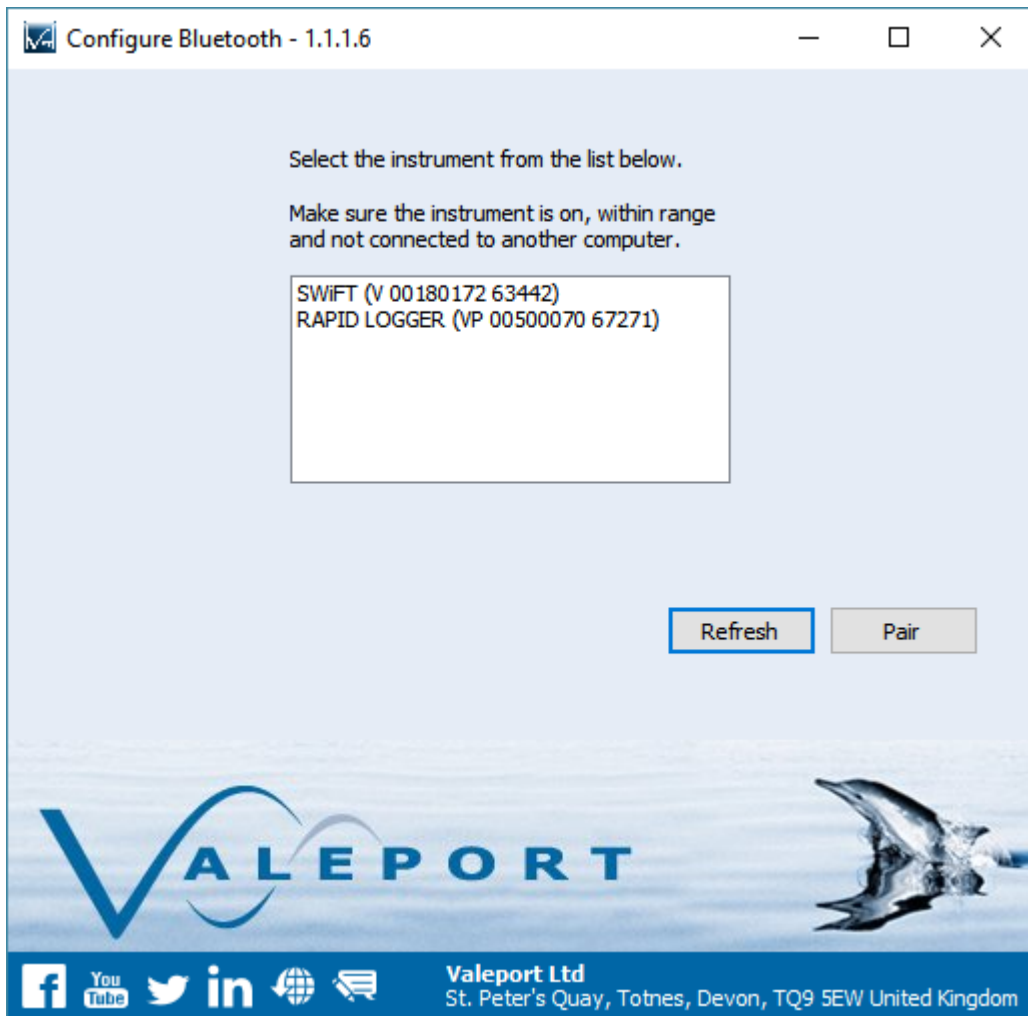
Click

The status LED on the USB Bluetooth module will change colour a number of times while it is being configured

Once configured, the USB Bluetooth key will scan for devices in range.

Your Instrument should appear in the list, if it doesn't, ensure it is powered up, in range and not connected to another adapter or Bluetooth device and try again:

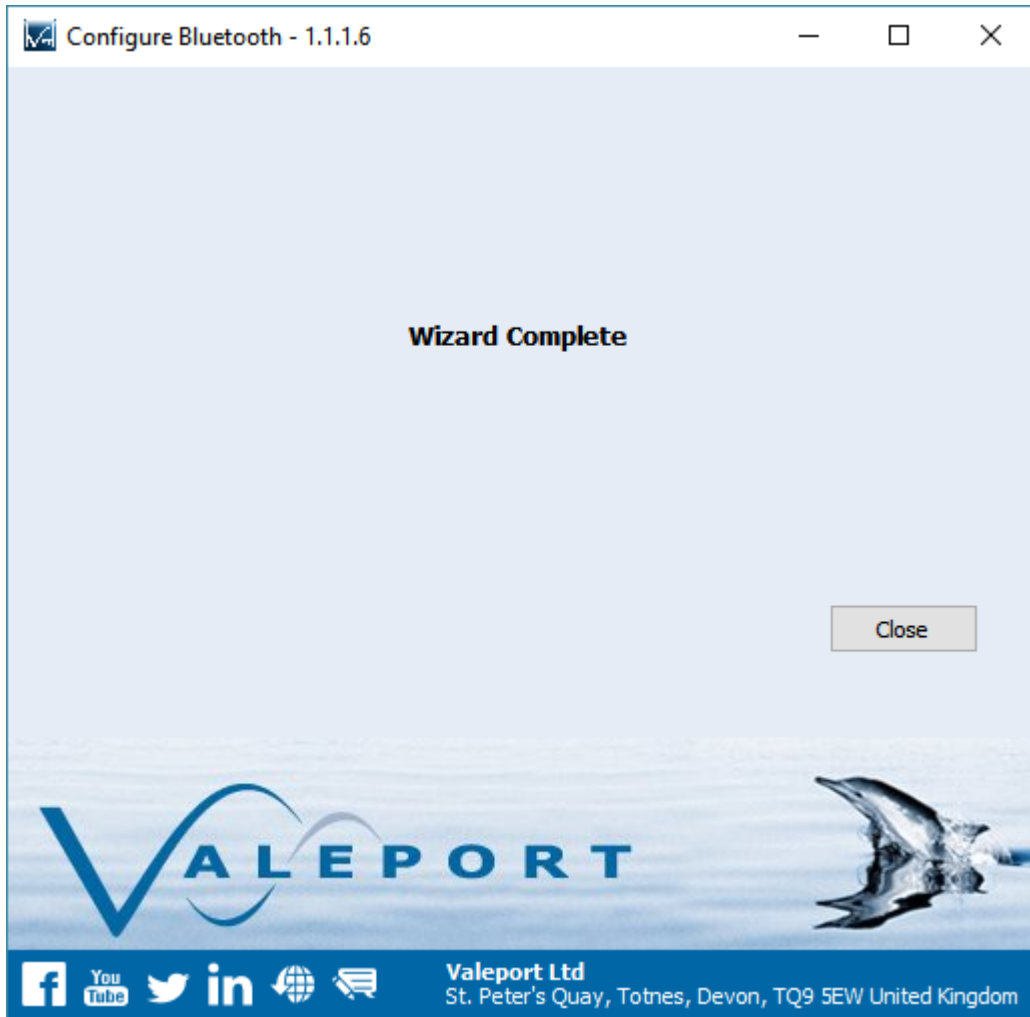
Click on



Select your Instrument from the list and

Click

The LED on the adapter should go blue to indicate a successful pairing operation. If your Instrument has a visible Bluetooth LED it should also have turned blue.



11. Ordering and Part Numbers

Part No.	DESCRIPTION								
	Basic Instruments								
0660047 - XX	<p>SWIFT SVP Profiler - Titanium housing rated to 200m Fitted with</p> <ul style="list-style-type: none"> • 35mm Carbon composite time of flight SV sensor • Pressure sensor - 0.05% FS • PRT Temperature Sensor • Bluetooth connectivity • GPS module • Rechargeable battery pack • LED status indication <p>Supplied with:</p> <ul style="list-style-type: none"> – Deployment weight – USB Interface and Charging cable – PC USB Bluetooth adapter – Multi-zone Charger – DataLog x2 software / iOS App available from the Apple Store – Operating manual and system transit case <p>Note: XX denotes pressure transducer range select from: 10 or 20 bar</p>								
0660047-XX-F: YY	<p>SWIFTplus Profiler - Titanium housing rated to 200m Fitted with</p> <ul style="list-style-type: none"> • Optical Sensor • 35mm Carbon composite time of flight SV sensor • Pressure sensor - 0.05% FS • PRT Temperature Sensor • Bluetooth connectivity • GPS module • Rechargeable battery pack • LED status indication <p>Supplied with:</p> <ul style="list-style-type: none"> – Deployment weight – USB Interface and Charging cable – PC USB Bluetooth adapter – Multi-zone Charger – DataLog x2 software / iOS App available from the Apple Store – Operating manual and system transit case <p>Note: XX denotes pressure transducer range select from: 10 or 20 bar F denotes a Fluorometer YY denotes the optical sensor:</p> <table style="margin-left: 40px;"> <tr> <td>Ch:</td> <td>Chlorophyll</td> </tr> <tr> <td>Fl:</td> <td>Fluorescein</td> </tr> <tr> <td>Rh:</td> <td>Rhodamine</td> </tr> <tr> <td>Tu:</td> <td>Turbidity</td> </tr> </table>	Ch:	Chlorophyll	Fl:	Fluorescein	Rh:	Rhodamine	Tu:	Turbidity
Ch:	Chlorophyll								
Fl:	Fluorescein								
Rh:	Rhodamine								
Tu:	Turbidity								