



levelpro 6100

advanced liquid level sensor

User Manual

VERSION 1.21



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Quality Assurance Statement

ISO accreditation

ES&S is a company practicing manufacturing techniques specified in AS/NZS ISO9002:1994 standards. The standard covers a quality management system for the supply and manufacture of remote data acquisition instruments for seismic, water and geological event monitoring and the provision of related services. In July 2008 ES&S begun a process to achieve accreditation under the new ISO9001:2008 standard.

It is hereby stated that internationally accepted practices are used to supply high quality instrumentation to your organization within a reasonable time interval. Standard practices are used for all areas of manufacture, beginning with the efficient procurement of incoming orders, right through to shipment.

Stringent quality assurance procedures are applied to all aspects of manufacturing, including the calibration of scientific instruments against NATA traceable references. Every sensor is accompanied by a test and calibration certificate that can be used as reference information as well as evidence of sensor accuracy.

Terms of Warranty

The warranty period for a new 6100 levelpro shipped from ES&S is 36 months from the shipment date. This warranty ensures the instrumentation will operate and continue to operate for a period of one year from the purchase date, according to specifications and expectations.

The warranty covers part or complete replacement, repair or substitution of new instrumentation that has failed in part or completely within the warranty period. While every effort has been made to supply robust and user friendly instrumentation, the warranty does not cover instruments incorrectly installed, misused or operated in conditions outside those specified. The warranty does not cover shipment costs for instrumentation, installation or removal and, under no circumstances whatsoever, indirect or consequential losses caused by the failed instrumentation.

ES&S believes the warranty conditions to be fair and just and in accordance with standard business practices worldwide. ES&S reserves the right to arbitrate any warranty issues and will ensure that these are treated with the highest standards of professional conduct.

At ES&S we believe your investment in our products and services is a good decision and we will therefore ensure all your requirements are met at all times, both now and in the future.

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Background Information

Level measurement using a gas purge system

Gas purge systems have been used for many years in the hydrographic industry, well before electronic pressure sensors were introduced. They provide a convenient method to measure water levels accurately without having to install sensitive instruments in water.

The principle of operation is simple. A gas purge system provides a close to static pressure condition inside a capillary tube. One end of the tube is installed under water, while the other is connected to the gas purge system and pressure sensing instrument, out of the water. To ensure water does not enter the submerged tube end (when the level increases), an inert gas (typically nitrogen) is pumped into the tube by the gas purge system. The flow rate is maintained extremely low, just enough to prevent water from entering the tube, while providing a static pressure condition. The pressure required to overcome the hydrostatic (head of water) pressure is therefore same at both ends of the tube. By measuring the pressure at the dry end, the pressure at the submerged end is determined. A simple calculation using pressure to head of water conversion is then made to determine water level.

A practical gas purge system consists of several components. Firstly a compressed gas is required for which low cost dry nitrogen is typically used. Nitrogen bottles are filled at high pressure, around 15-20MPa (2000psi) hence a bottle regulator is used to reduce the pressure to around 400kPa (60psi). Gas is fed into a gas purge regulator also called a constant differential flow regulator as it regulates the flow with varying backpressure. Next, a capillary tube is required to carry the gas to below the water surface. One end is connected to the flow regulator output, while the other is installed under the water surface to be measured. The gas purge regulator is adjusted to produce a very low flow rate of approximately 50 cc/hour. The flow of gas is so low that it is always laminar producing only negligible friction effects. This is important as it results in almost zero pressure difference between tube ends, even if small internal diameter tube is used. Lastly, a pressure sensor is connected to the dry tube end for measuring the pressure in the system. Pressure is converted to level using liquid density and a standard for kPa to level conversion.

The levelpro 6100 is designed to operate with all types of gas purge systems. A typical layout configuration is shown below.

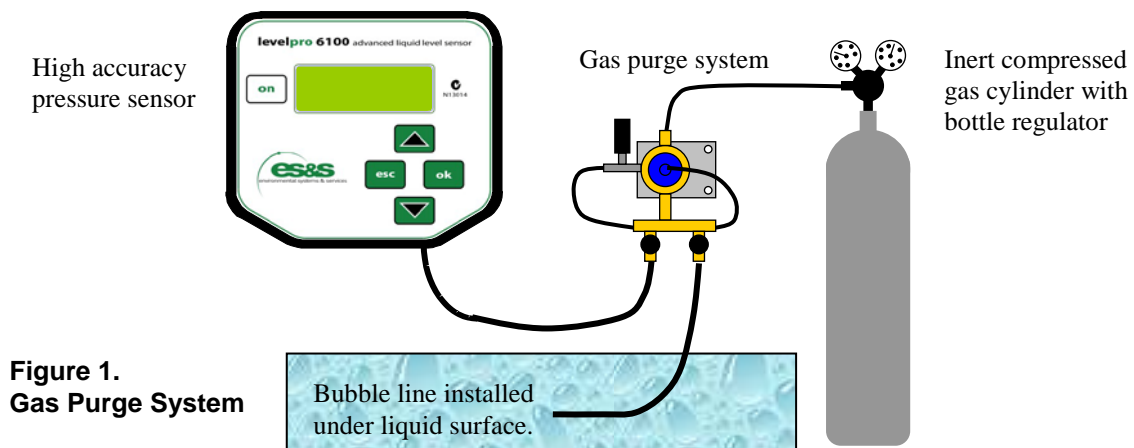


Figure 1.
Gas Purge System

Sensor Description

The levelpro 6100 sensor is a microprocessor based pressure sensor, calibrated in kilopascals (kPa). Measurement is converted to a number of units including linear distance (metres and feet) of liquid head, volume and flow. A four line LCD display (dot matrix type) shows measurements, short messages and instructions for in-built functions. Configuration is via a keypad on the front display panel. Two multi-pole connector sockets are available for electrical connection and a ¼" tube fitting for pneumatic connection to the gas purge system.

The sensor enclosure houses all electronic and electromechanical components and provides IP67 protection. A 0.2µm hydrophobic filter is fitted on the bottom of the sensor to allow atmospheric pressure regulation inside the enclosure, thereby eliminating barometric pressure variations.

Every 6100 sensor is supplied with a signal cable, power cable and stainless steel wall mounting bracket, conveniently packaged in a sturdy, recycled cardboard carton. The figure shown below shows the basic sensor layout and major components.

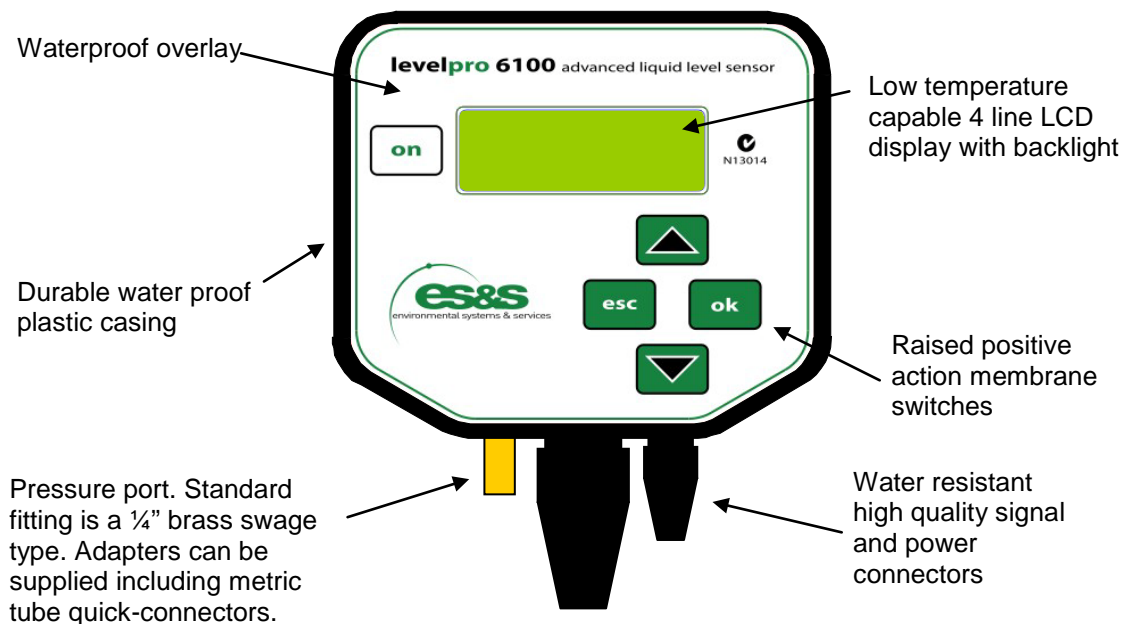


Figure 3. 6100 levelpro front view

Installation

Sensor installation

The levelpro 6100 must be wall mounted using the supplied stainless steel wall mounting bracket. Screws are supplied for fitting the bracket to the sensor. You must provide 2 wall mounting screws suitable for the wall material being used.

Items required

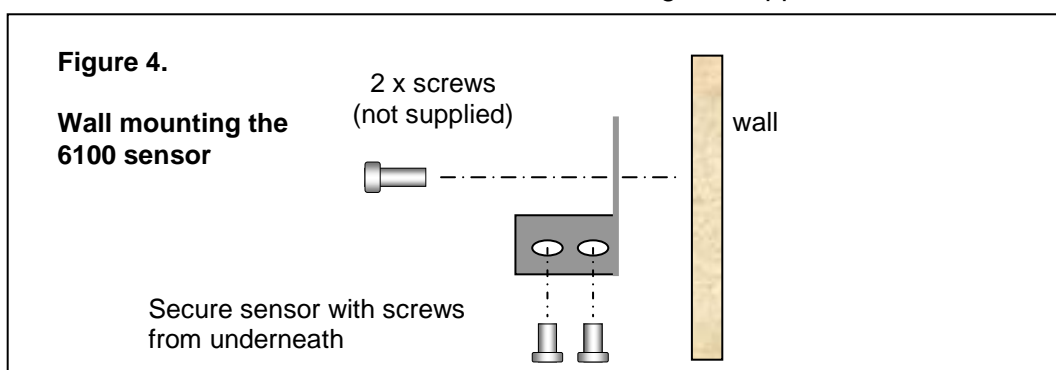
- levelpro 6100
 - Signal and power cables
 - Connecting tube, ¼" nylon
 - Wall mounting bracket and screws
 - 2 screws for mounting bracket to wall – to suit wall material
 - Phillips head screwdriver, medium size
 - 2 x adjustable spanners, 150mm minimum
- } Supplied with new sensor

Some points to consider

- The sensor must be installed out of rain, snow and direct sunlight. Air borne moisture and dust will not affect the sensor operation.
- A gas purge system must be installed according to the manufacturer's installation instructions. The system should ideally be installed close to where the sensor will be installed (within 1.5 meters (60")).
- Single or dual line gas purge systems can be used, provided they operate according to specifications and there is one available ¼" tube port.
- The gas purge system sensor port must be fitted with an isolation valve to ensure the sensor can be isolated during gas purge system maintenance (capillary line purging).

Typically, a site shelter that offers protection from at least the above should be provided. Choose a suitable vertical wall section within, no more than 1.5 m (60") from the gas purge system. Also ensure that the display can be read easily without staff having to strain to achieve a suitable viewing position.

- Fit the sensor bracket to the wall section using appropriate screws as shown below. If mounting the bracket onto a metal wall section, pilot holes should be pre drilled before fitting the bracket. Use plastic wall plugs and appropriate screws when fitting brackets to masonry walls.
- Place the sensor onto the bracket and secure using the supplied screws.



Tube connection

The ¼" black nylon tube included with the levelpro 6100 is used to connect to the gas purge system. It must be fitted to the sensor pressure port and appropriate connection point on the gas purge system.

You MUST use two spanners to connect the ¼" tube to pressure port to prevent the mating tube fitting from rotating. The tube nut size is 9/16" and bulkhead fitting nut size, located at the bottom of the 6100, is 5/8".

To prevent damage to the 6100 always install an isolation valve in the connecting tube or at the purge system. Use the valve to isolation the sensor during capillary tube purge cycles.

The ¼" tube may be shortened or extended. Doing so has no significant effect on sensor performance as the pressure inside is static only (no flow).

- Connect the ¼" brass nut to the 6100 pressure port by hand until tight.
- Using two adjustable spanners, tighten the nut half a turn further.
- Connect the other end of the tube to the gas purge system. A fitting must be provided that accepts ¼" OD tubing. It is recommended to use a compression ferrule type fitting where the ferrule is crimped onto the tube end when the nut is tightened. Either brass or plastic fittings can be used. Using a spanner matching the nut size, tighten the nut onto the fully inserted tube. Typically only one and a half turns are required to crimp the ferrule.

Tightening the nut more than the recommended amount will result in eventual leaking of pressure. Do not tighten the nut more than necessary.

Crimp ferrule type fittings do not require the use of a sealing compound, unless specified in instructions. The fitting used must be suitable for the ¼" nylon tube as any variation in size will result in possible leaks. Please refer to your fitting supplier's instructions before proceeding.

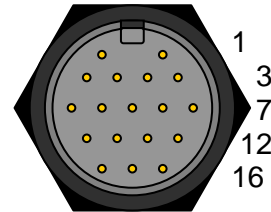
The ¼" tube can be extended using a ¼" tube union (or adapter for another size tube) and a length of suitable tube. Ensure any fittings are installed to the manufacturer's recommendations to ensure gas tight seals are formed. The quality of gas seals on fittings can be checked with a detergent and water solution. When applied to the outside of fittings, any leaks will result in the formation of many small bubbles around the area of the leak. Off the shelf leak test solutions are available from your gas fitting shop.

Sensor electrical connection

The levelpro 6100 sensor is supplied with 2 cables with connectors fitted that match the sensor sockets on the bottom of the sensor. The larger connector is used for connection of all signal lines while the smaller connector and cable is used purely for providing dc power. The following tables provide details of all signal and power connections.

Cable Conductor Designation – multi-pole connector

1	RED	Battery power +
2	BLACK	Battery power -
3	BLUE	Ground
4	BROWN	RS232 Rx (receive data)
5	WHITE	RS232 Tx (transmit data)
6	DARK GREEN	RS232 handshaking
7	YELLOW	SDI-12 data
8	VIOLET	High Level alarm output
9	GREY	Low Level alarm output
10	PINK	Switched power enable
11	ORANGE	Not used
12	RED-WHITE	Not used
13	BLACK-WHITE	Not used
14	ORANGE-WHITE	Not used
15	BROWN -WHITE	Not used
16	GREEN-WHITE	Firmware loading enable
17	LIGHT GREEN	Analogue output (voltage)
18	BLUE -WHITE	Analogue output (current)



Sensor signal connector
– Multi-pole socket for RS232, SDI-12, analogue output, other I/O and logger switched power.

Cable Conductor Designation – 2 pin power connector

1	RED	Battery power +
2	BLACK	Battery power -



Sensor power connector
2 pin socket for dc power connection

Battery Power +

Use this connection to supply power to the sensor. Power must be between +10 and +15V DC. Supply is reverse bias protected using a diode. When power is applied, the sensor switches on briefly to indicate power connection. Thereafter the ON button must be pressed to obtain readings or configure the sensor for operation. To automatically output measurements on analogue output, you must connect Switched Power Enable (PINK pin 10) to power supply +ve.

Battery Power -

Use this connection to supply power return (-ve) to the sensor. This input is directly connected to sensor analogue and digital ground.

Ground

Connected directly to sensor analogue and digital ground.

RS232 Rx

This connection is an input that allows the sensor to accept RS232 commands from a controlling device (DTE). All RS232 parameters are fixed except the baud rate. Input must be via a true RS232 driver that can provide the correct signal levels.

RS232 Tx

The 6100 sensor outputs RS232 data at 5.0V EIA/TIA-232 levels. All RS232 parameters are fixed except the baud rate. Select the desired baud rate through the Settings menu. Only one digital output can be selected at any one time.

SDI-12 data

The SDI-12 data line is used exclusively for SDI-12 bi-directional communication. This line remains at high impedance until the sensor responds to a correctly addressed command at which time a 0-5V logic data signal is transmitted to the SDI-12 controller in accordance with SDI-12 protocol version 1.3.

High Level Alarm Output

This connection is will be driven from 0V to 5V when the preset threshold for the "high" level alarm is exceeded. See page for alarm setup instructions.

Low Level Alarm Output

This connection is will be driven from 0V to 5V when the preset threshold for the "low" level alarm is exceeded. See page for alarm setup instructions.

Analogue Enable

Connect this line to supply +ve (RED). It effectively forces analogue output whenever power is applied to the sensor. This feature is required for data loggers and recorders that provide a switched power output whenever measurements are taken. When power is removed the sensor turns off completely.

Analogue Output - Voltage

This connection will output voltage (0-1V or 0-2.5V) in proportion to measurements with reference to ground. A high impedance voltage input equipped recorder can be used to measure the output on this connection. Select voltage output by configuring the sensor through the Settings menu. Only one analogue output can be selected.

Analogue Output - Current

Use this connection if 4-20mA output signal is desired. It is a ground referenced current *source* that can be connected to current measuring devices. For 12 volt operation, the load resistance must not exceed 450ohms (900 ohms for 24 volt). Select current output by configuring the sensor through the Settings menu.

Power Connector – 2 pin

Battery +12Vdc - RED

The red wire is used for +12Vdc battery supply and is protected by a reverse protection diode to prevent sensor damage if the polarity is accidentally reversed.

Ground 0Vdc – BLACK

Power supply ground connection.

6100 Sensor Output Configuration

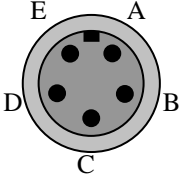
The following details show sensor electrical connections for interface to specific recorder/ controllers (using appropriate sensor configuration settings).

Digital (SDI-12) Mode Electrical Connection

To operate the 6100 sensor in SDI-12 mode, only 3 terminations are required. The DC power cable is not required as the SDI-12 recorder/ controller will provide continuous power to the sensor. While power is supplied, the sensor is in a sleep state that causes very little power draw.

The table includes pin-out for an ES&S SDI-12 connector used for connection sensors to SDI-12 enabled recorder/ controllers.

6100	colour	designation	5 pin male plug
1	RED	Supply +ve	A
3	BLUE	Ground	C
7	YELLOW	SDI-12 data	B

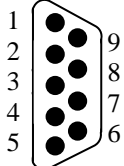


Digital (RS232) Mode Electrical Connection

To operate the 6100 sensor in RS232 mode, 3 terminations are required. The DC power cable is required as the RS232 DTE does not provide continuous power to the sensor. While power is supplied, the sensor is in sleep mode where very little power is drawn. An incoming, correctly addressed RS232 command will cause the sensor to wake and process the command. No handshaking is required as the 6100 sensor wakes upon an incoming RS232 command. During command processing the sensor display remains off.

The table below shows connection to a 9 pin female "D" connector that connects directly to a computer serial port.

6100	colour	designation	RS232	9 pin "D" female
5	WHITE	RS232 Tx	RxD	2
4	BROWN	RS232 Rx	TxD	3
3	BLUE	Ground	Ground	5



2 pin power cable

1	RED	Supply +ve
2	BLACK	Ground

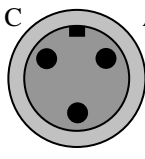
Analogue Power Mode Electrical Connection - Voltage

The 6100 sensor can be configured to output analogue signals in two modes, continuous and switched. For continuous mode the sensor is powered (and ON) continuously and remains in this state indefinitely. Use this mode to connect to recorders/ controllers that require a continuous signal such as PLCs. You must connect the PINK (pin 10) wire to supply + (RED, pin1) to force continuous output.

For switched power mode, connect the sensor the same way (as shown below). The recorder must be able to switch sensor power on and off as required. While switched on, the sensor operates as a continuously powered sensor. While switched off, the sensor draws zero power. Configure the sensor to output either 0-1V or 0-2.5V.

The table includes pin-out for an ES&S analogue connector used for connecting sensors to analogue input equipped devices.

6100	colour	designation	3 pin male plug
1	RED	Supply +ve	A
3	BLUE	Ground	C
17	LIGHT GREEN	Voltage signal output	B
10	PINK	Analogue Enable Connect to Supply +ve	A



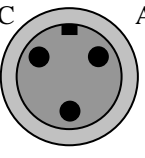
Analogue Mode Electrical Connection – 4-20mA Current Loop

The 6100 sensor can be configured to output analogue signals in two modes, continuous and switched. For continuous mode the sensor is powered (and ON) continuously and remains in this state indefinitely. Use this mode to connect to recorders/ controllers that require a continuous signal such as PLCs. You must connect the PINK (pin 10) wire to supply + (RED, pin1) to force continuous output.

For switched power mode, connect the sensor the same way (as shown below). The recorder must be able to switch sensor power on and off which provides the power switching control. While switched on, the sensor operates as a continuously powered sensor. While switched off, the sensor draws zero power.

The table includes pin-out for an ES&S analogue connector used for connecting sensors to analogue input equipped devices.

6100	colour	designation	3 pin male plug
1	RED	Supply +ve	A
3	BLUE	Ground	C
18	BLUE-WHITE	Current signal output	B
10	PINK	Analogue Enable Connect to Supply +ve	A

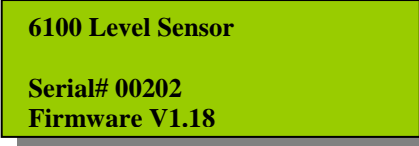


Operation

Manual Power Mode

In manual power mode the sensor will take a level measurement and display it on the LCD display. Connect the 2 pin DC power cable to a 12V battery and sensor DC power socket

Once power is connected to the sensor
Display shows



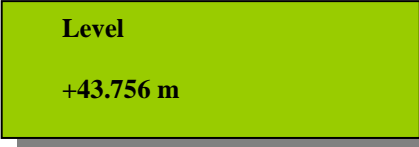
6100 Level Sensor
Serial# 00202
Firmware V1.18

To obtain a measurement from the sensor:

Press



Display shows



Level
+43.756 m

(example only)

To switch off, do not press any keys for 25 seconds. The sensor will automatically switch off thereafter or revert to another power mode.

You may also press

A rectangular button with rounded corners, a black border, and the text "esc" in white lowercase letters.

twice to switch the sensor off.

Display shows



Or the sensor will revert to another power mode

If the sensor is configured to continuous
analogue power mode, display shows:

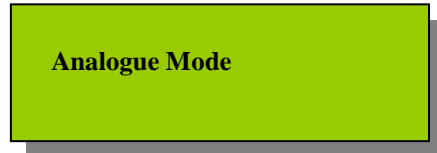


Analogue Mode

Analogue Power Mode

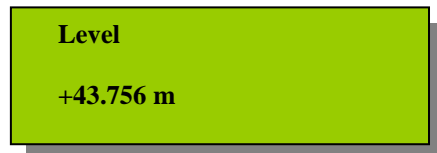
In analogue power mode the sensor will take a level measurement and output a corresponding analogue voltage or current signal (depending on configuration). Connect the sensor as described in section *Installation- Analogue Power Mode*. While switched or continuous power is applied with the Analogue Enable terminal connected to supply +ve, analogue output will be active continuously and updated as level changes occur.

While switched dc supply is applied, the display will show:



To display the current measurement:

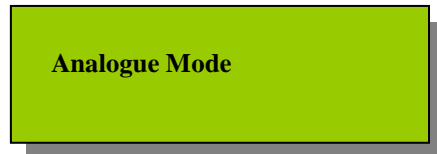
Press  Display shows



(example only)

To switch off displayed value and revert back to Analogue Power Mode:

Press  twice. Display shows



Or simply wait for around 25 seconds. The unit will automatically switch back to Analogue Power Mode, as this is the prevailing mode.

Please note:

Analogue Power Mode always takes preference over Manual Power Mode. If the display is activated to show a reading while in Analogue Power Mode, the analogue output will not be interrupted.

Analogue output is available and stable after one second from the time switched power is applied. Switched power is typically removed after a reading has been attained. However it may be permanently applied to allow continuous analogue output used for devices requiring continuous signal such as PLCs. In doing so, continuous power consumption will result (see Specifications).

Any incoming SDI-12 or RS232 commands with an address matching the sensor address will be processed as highest priority. This ensures digital sensor data is unaffected while users are configuring the sensor or viewing measurement on the display.

SDI-12 Communication Mode

To obtain a reading from the levelpro 6100 sensor in SDI-12 mode, it must be connected to a fully compliant SDI-12 controller device (SDI-12 protocol version 1.3). Please refer to section *Installation – SDI-12 Communication Mode* for correct electrical connection.

In SDI-12 mode the sensor is permanently powered by the 12Vdc supply from the recorder/ controller or through the dc battery power cable. Incoming SDI-12 commands will only be processed if the preceding address matches the set sensor address. A correct SDI-12 command received will invoke a sensor response according to the protocol as summarized below.

The SDI-12 command/ response sequence causes the sensor to switch on, respond to the command and switch off. As the sequence takes less than 1 second, there is no visible activity on the display.


If the sensor was started in manual or analogue power mode, a correctly addressed SDI-12 command will be processed as priority and override all other modes.

Command Set

Command	Response	Description
?!	a	reveals sensor address
Eg: ?!	1 <CR><LF>	sensor address is "1"
aI!	a13ccccccccmmmmmmmvvvs	sensor identification
Eg. 1I!	113ESandS 6100 11020202	
aM!	attn	buffers new measurement
Eg. 1M!	10011	
aD0!	apd.ddd	returns buffer contents or measurement
Eg. 1D0!	1+1.234	
aR!	apd.ddd	not implemented
Eg. 1R!	1+1.234	in version 1.10
aAb!	ar	change sensor address
Eg. 1A2!	21	from 1 to 2
a	= sensor address	1 character
b	= new sensor address	1 character
ttt	= measurement time (secs)	3 characters %
n	= number of data fields	1 character
p	= polarity (+ or -)	1 character #
r	= return code (1 = all ok)	1 character
dd.ddd	= measured data	variable *
ccccccc	= Vendor ID	8 characters
mmmmmm	= sensor model	6 characters
vvv	= sensor firmware version	3 characters
sssss	= sensor serial number	5 characters

- * Leading and trailing zeros can be user configured through the Settings menu
- # Polarity sign, whether + or – will always be included in response.
- % The 6100 sensor has a fixed measurement time of 1 second unless averaging is used (averaging not implemented in version 1.10).

A menu for adjusting SDI-12 parameters is included in the 6100 sensor. Users can set all configurable parameters as shown below. To enter the SDI-12 mode:

Press  to switch on the sensor. Press any other key to enter the main

configuration menu. Display shows:



Enter the Settings- Communications –SDI-12 menu to adjust SDI-12 parameters.

RS232 communication mode

Every 6100 sensor has an RS232 interface fitted as standard and is accessible using the designated wires in the signal cable. A 9 pin “D” connector, suitable for direct connection to most RS232 equipped communication equipment, can be factory fitted to allow easy connection. The 6100 sensor is a Data Communication Equipment (DCE) device and can be directly connected to Data Terminal Equipment (DTE) which includes modems, computers and telemetry systems.

Please refer to the section *Installation – RS232 Communication Mode* for installation instructions.

Commands and responses to and from the sensor through RS232 are the same as for SDI-12 communication. A command summary can be found on the previous page.

Communication parameters:

To communicate to the 6100 sensor via RS232, the DTE must be configured with the parameters shown below. No handshaking is required as the 6100 wakes upon incoming commands. The sensor baud rate is adjustable through the Settings menu.


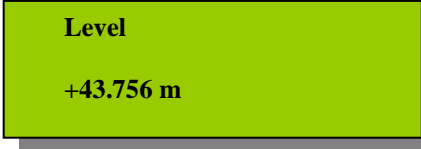
Baud rate	= 1200 to 115000 bps
Parity	= none
Data bits	= 8
Stop bits	= 1


When sending RS232 commands, you must send the “!” character at end of command strings, similar to SDI-12 commands.

Menu Functions

When the sensor is switched on and a reading is being displayed, pressing any button (except ON) will enter the menu mode. In this mode the configuration of the sensor can be adjusted.


To obtain a measurement from the sensor:


Press  Display shows 
(example only)


Press any other key to enter the menu mode Display shows 

To navigate through the menus, use the following:

Use  and  keys to scroll through menu items.

Use  to enter into a sub-menu item or confirm and save a change.

Use  to revert back to the previous menu level or cancel an operation.

Pressing  while in the highest menu level will cause the sensor to switch off completely or revert to the previous power mode.

Display Menu

Access the display menu by pressing any button except ON while the sensor is showing measurements.

Display will show



>Display
Datum
Settings
Password

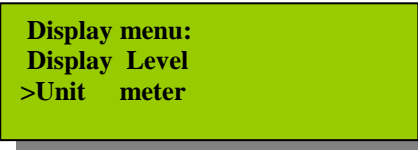
Press  to enter submenu



Display menu:
>Display Level
Units meters

or

Press  to move cursor



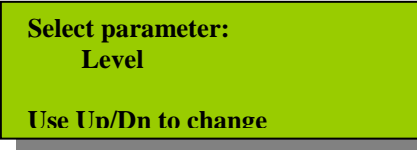
Display menu:
Display Level
>Unit meter

Display: shows the currently displayed parameters when readings are taken.

Units: shows the currently displayed unit when readings are taken.

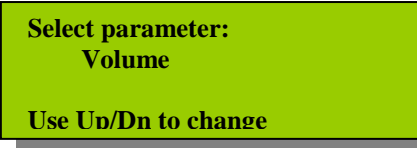
Display menu - Display

Press  to enter



Select parameter:
Level
Use Up/Dn to change

Press  or 

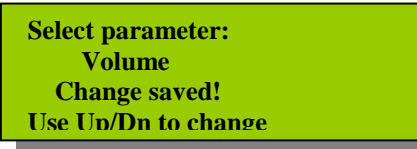


Select parameter:
Volume
Use Up/Dn to change

Level: Selecting this parameter outputs a linear distance of liquid level

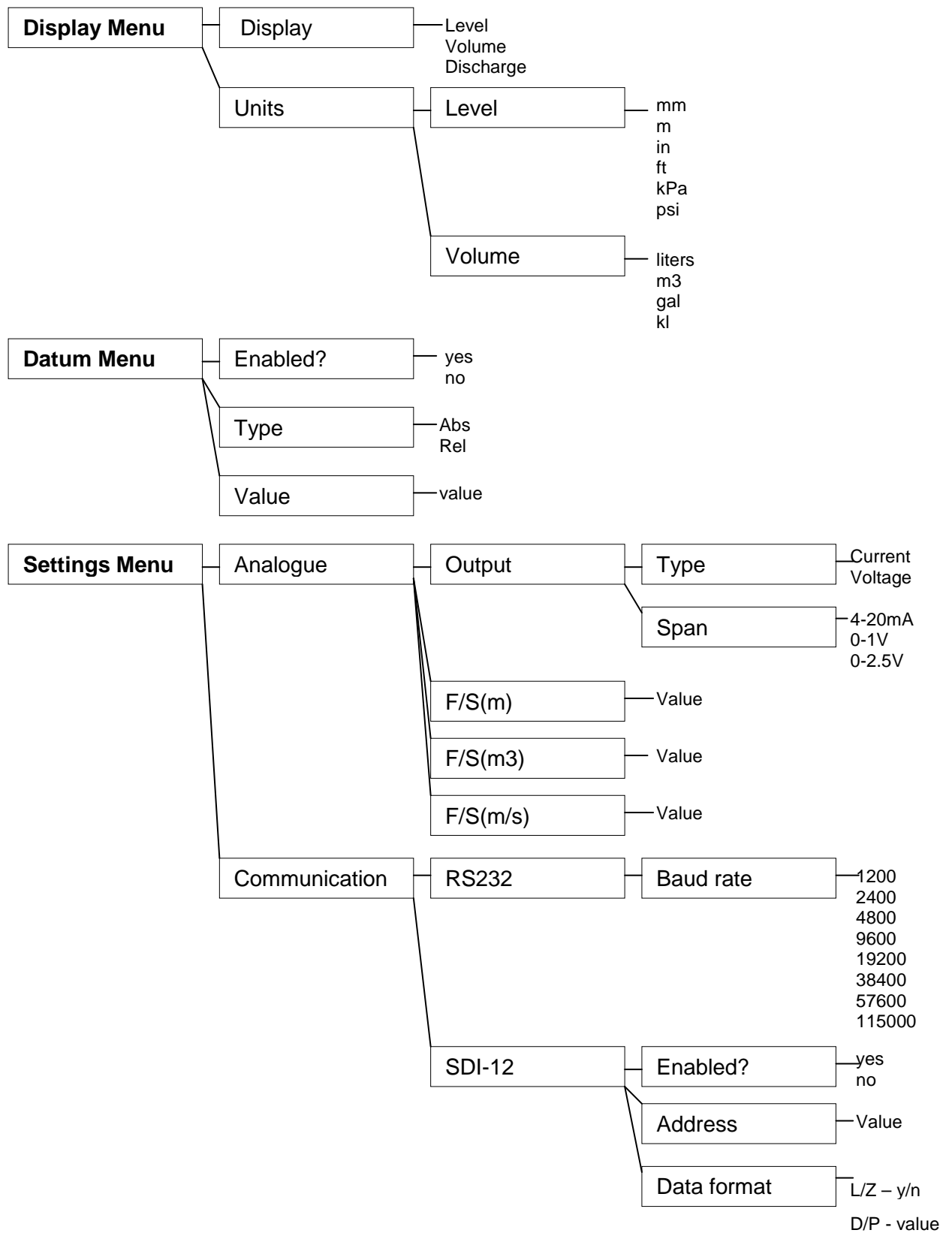
Volume: Selecting this parameter outputs a volume of liquid in accordance with a particular vessel shape.

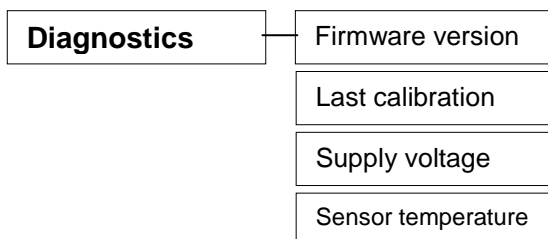
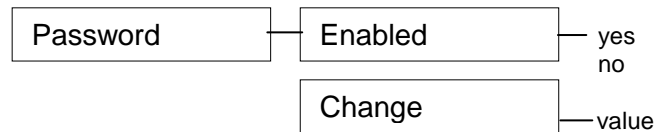
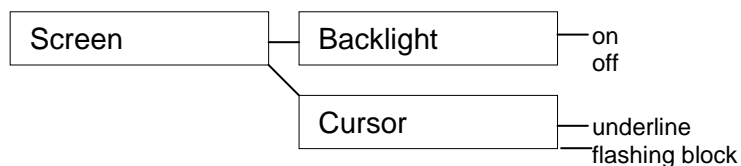
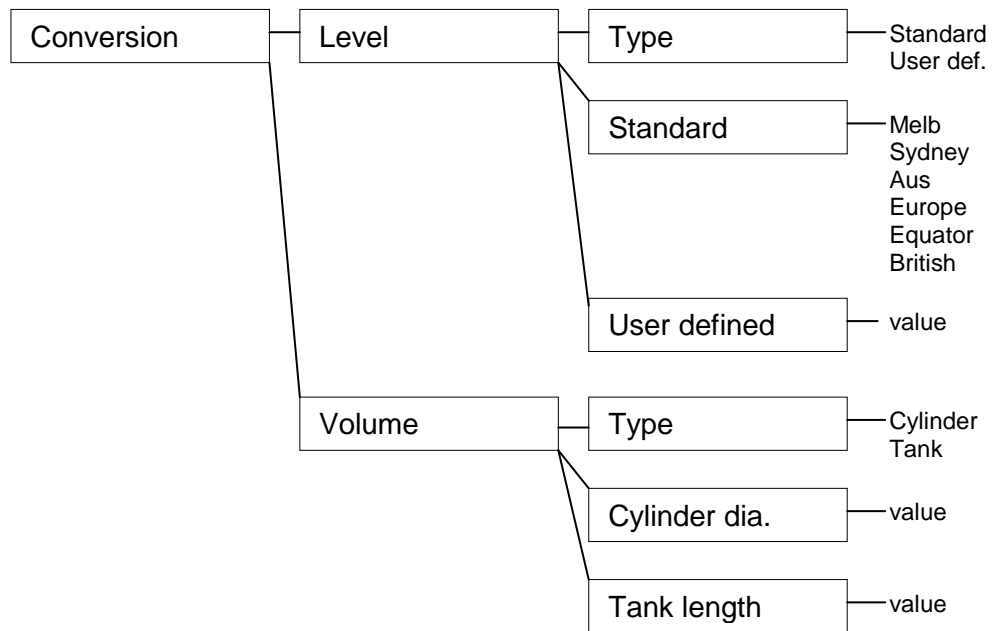
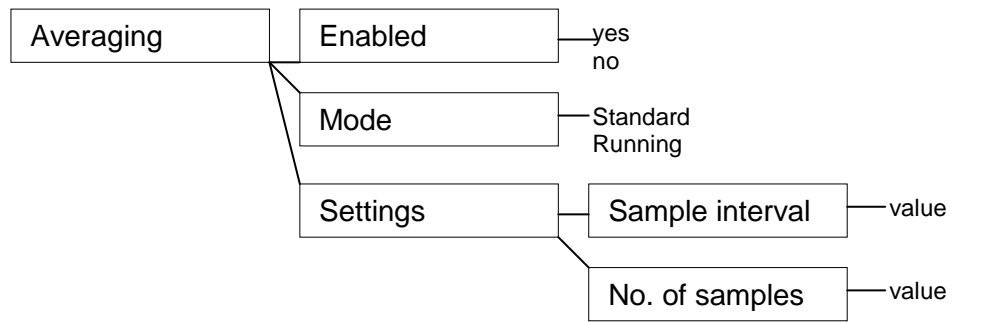
Press  on the selected parameter to save the setting



Select parameter:
Volume
Change saved!
Use Up/Dn to change

Main Menu Structure





Display menu – Units

Press  to set parameter

Select units for:
>Level
Volume

Press  or 

Select units for:
Level
>Volume

Each parameter has different units. Use this menu to select which parameter you want to change the units of measurement for.

Display menu – Units – Level

Press  to set units

Level Units:
m
Use Up/Dn to change

Press  or 

Level Units:
psi
Use Un/Dn to change

- mm: all measurements are in millimeters using kPa to meters conversion
- m: all measurements are in meters using kPa to meters conversion
- psi: raw pressure output in pounds per square inch
- kPa: raw pressure output in kilo Pascals
- in: all measurements are in inches using kPa to feet conversion
- ft: all measurements are in feet using kPa to feet conversion

Display menu – Units – Volume

Press  to set units

Volume Units:
m3
Use Up/Dn to change

Press  or 

Volume Units:
gal
Use Un/Dn to change

- litres: all measurements are converted to liters using selected tank shape
- m3: all measurements are converted to cubic meters using selected tank shape
- gal: all measurements are converted to imperial gallons using selected tank shape
- kl: all measurements are converted to kiloliters using selected tank shape

To save press



Level Units:
psi
Change saved!
Use Up/Dn to change

Datum Menu

Sensor measurements can be referenced to a known level called a datum. Two types of datum calculations are available as shown below. Access the datum menu by pressing any button except ON while the sensor is showing measurements.

Display will show

```
Display
>Datum
Settings
```

Press  to enter submenu

```
Datum menu:
>Enabled  No
Type     ABS
Value    +0.000
```

or

Press  to move cursor

```
Datum menu:
Enabled  No
>Type   ABS
Value   +0.000
```

Enabled: set to YES to add datum value to reading.

Type: shows the type of datum used.

ABS – Datum value is added to all readings.

REL – Reading is taken. Datum is subtracted from reading and result is added to reading. This has the effect of forcing the current reading to be the same as the datum. Use this when entering exact staff gauge reading for water level measurement

Value: This is the datum value to be used in the calculation.


Datum menu - Enabled

Press  to enter

```
Datum enabled ?
No
Use Up/Dn to change
```

Press  or 

```
Datum enabled ?
Yes
Use Up/Dn to change
```

Press  to save
parameter to save the setting

```
Datum enabled ?
Yes
Change saved!
Use Up/Dn to change
```


Datum menu - Type

Press  to enter

Datum type:
Absolute
Use Un/Dn to change

Press  or 

Datum type:
Relative
Use Un/Dn to change

Press  to save
parameter to save the setting

Datum type:
Relative
Change saved!
Use Un/Dn to change

Datum menu - Value

Press  to enter

Datum value(m)
±0000.000
Dn-move. Un-change

Press  to change sign

Datum value(m)
-0000.000
Dn-move. Un-change

or

Press  to move one
character to the right

Datum value(m)
+0000.000
Dn-move. Un-change

Press  to increase digit

Datum value(m)
+1000.000
Dn-move. Un-change

Example only.

Continue this process to adjust all digits. Once finished,

press  to save the new value.

Datum value(m)
+1000.000
Change saved!
Dn-move. Un-change

Note: Datum values only apply to digital output (SDI-12 or RS232). Analogue output (voltage or current) is not affected by the datum value. Datum for analogue output is typically applied within the recorder/ controller to which the sensor is connected.

Settings Menu

The Setting menu is used to configure the sensor for the desired operation and includes functions to set up analogue and digital output as well as housekeeping functions. Each Setting menu item is described in detail in the following sections.



To access the Settings menu it must be unlocked first by entering a password (see Main Password, page 28). By default, the Settings menu is unlocked.

Press  to enter submenu

Settings menu:
>Analogue
Communication
Averaging

Settings – Analogue

Use the analogue menu to set the type and range of analogue output. Two types are available, current and voltage. The full scale analogue output can be adjusted, effectively re-ranging the sensor. Full scale adjustment must be set for level, volume and discharge separately.

Press  to enter submenu

Analogue menu:
>Output
F/S(m): +10.000
F/S(m3): +0.0E+00

Settings – Analogue – Output



Use this menu to select either current (4-20mA only) or voltage output. Select the span for the type of analogue output by entering the respective submenus.

Press  to enter submenu

Analogue output:
>Type: Current
Span (mA): 4-20mA
Span (V): 0-2.5V


Press  to enter submenu




Output type:
Current
Use Up/Dn to change

Use  to change to Voltage output and press  to save

Settings – Analogue – F/S(m)

Use this parameter to assign the full scale level, pressure, volume or flow for analogue output. The value selected here will be that represented by 20mA (current) or 1V/ 2.5V (voltage). Enter the value desired in the next submenu.

Press  to enter submenu


Use  to change to sign/ value and  to move one digit to the right. Press  to save.

F/Scale (m):
+0010.000
Dn-move. Up-change

Change the volume full scale (F/S(m³)) and discharge full scale (F/S(m³/s)) in the same way. Please note that discharge is not implemented in version 1.22.

Settings – Alarm

A digital output provides alarm control for external devices. Output is at 0V when off and at 5V when active. This is a low current driver capable of driving high impedance external circuitry only.

Press  to enter submenu

Enable or disable the alarm as required

Set the high alarm trigger level and reset level in the next menu

Set the low alarm trigger level and reset level in the next menu

Alarm menu:
>Alarm use: Disabled
High config
Low config

Alarm usage:
Disable
Use Up/Dn to change


High settings:
Trigger +0.000
Reset +0.000

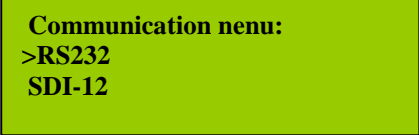
Low settings:
Trigger +0.000
Reset +0.000

Use both high and low alarms to set an alarm window. You must however ensure the high trigger and reset values are always higher than the low alarm values or the alarm may never trigger and/or reset.

Settings – Communication

The Communication menu is used to configure digital output. Both RS232 and SDI-12 settings can be adjusted as shown in the following menus.

Press  to enter submenu




Communication menu:
>RS232
SDI-12


Settings – Communication – RS232

Only the baud rate can be adjusted for RS232 communications. All other parameters remain fixed as shown below:


No. of data bits: 8
No of stop bits: 1
Parity: none

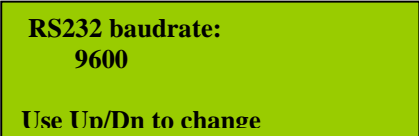
To set RS232 baud rate:

Press  to enter submenu



RS232 settings
>Baud rate: 9600



Press  to enter submenu

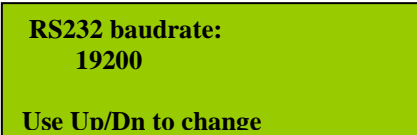


RS232 baudrate:
9600
Use Un/Dn to change


Set the baud rate compatible with the DTE device to which the sensor is connected. The possible baud rates are shown below:

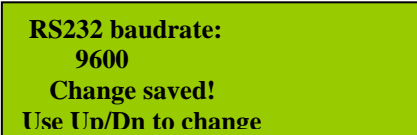
1200
2400
4800
9600
19200
38400
57600
115000

Use  or  to change



RS232 baudrate:
19200
Use Up/Dn to change

baud rate, press  to save

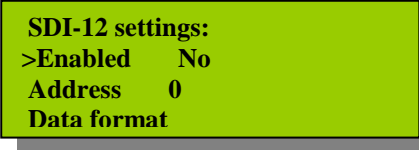


RS232 baudrate:
9600
Change saved!
Use Un/Dn to change

Settings – Communications – SDI-12

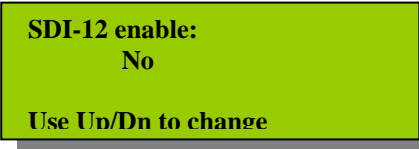
The SDI-12 settings menu can be used to enable SDI-12, set sensor address and configure the output data format.

Press  to enter submenu



```
SDI-12 settings:  
>Enabled No  
Address 0  
Data format
```

Press  to enter submenu

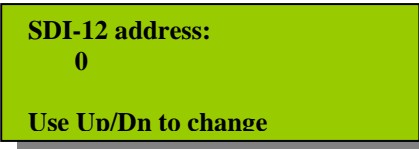


```
SDI-12 enable:  
No  
Use Up/Dn to change
```

Change the status to “Yes” to activate SDI-12 communications. You cannot use RS232 output in this mode, however, this does not affect analogue output which can be used simultaneously, as previously configured.

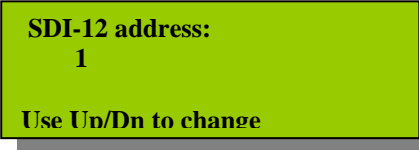
Address

Press  to enter submenu



```
SDI-12 address:  
0  
Use Up/Dn to change
```

Use  or  to change

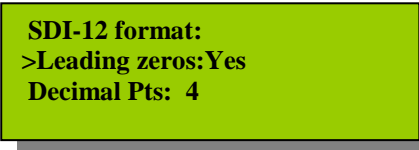


```
SDI-12 address:  
1  
Use Up/Dn to change
```

Data Format

Use this menu to change the SDI-12 output data format. This feature is particularly useful when recorders require a particular format to ensure data is received correctly at all times. Leading zeros ensures the data string is always of a fixed length while the number of decimal points can be changed to allow output of very large or very small numbers.

Press  to enter submenu



```
SDI-12 format:  
>Leading zeros:Yes  
Decimal Pts: 4
```

Use the respective menus to set leading zeros off or on and set the number of decimal points between 0 and 4.

Note: The 6100 is able to output numbers up to 8 digits. When outputting large numbers (level in mm or inches, volume in litres etc), set the number of decimal places to 0 or 1. Similarly, set the number of decimal places to 2,3 or 4 when outputting small numbers.

Settings – Averaging

The Averaging menu allows users to configure the sensor to take several readings that are averaged. Use this menu for tide gauge applications where wave action must be filtered out. Averaging operates by outputting the average level of a pre-programmed number of readings.

Press  to enter submenu

```
Averaging menu:  
>Enabled   No  
Mode      STD  
Settings
```

Averaging – Enabled

Select YES to enable averaging output.

Press  to enter submenu

```
Averaging Enabled:  
No  
  
Use Un/Dn to change
```

Averaging – Mode

Select standard averaging (STD) for typical averaging whereby a number of readings are added then divided by number of readings. Select Running (RUN) for producing running average that takes the last number of readings to produce an averaged reading every consecutive reading. This function is only available for 6100.

Press  to enter submenu

```
Averaging Mode:  
Standard  
  
Use Un/Dn to change
```

Press  to change

```
Averaging Mode:  
Running  
  
Use Un/Dn to change
```

Averaging – Settings

This menu allows users to change the averaging parameters as required. There are two parameters, namely *sample interval* and *number of samples*. The total averaging time is the product of sample interval (in seconds) and no. of samples. For running averaging the averaging time is the same as the sample interval (6100 only).

Press  to enter submenu

```
Averaging Settings:  
>Sample Interval 1  
No. of Samples 60
```

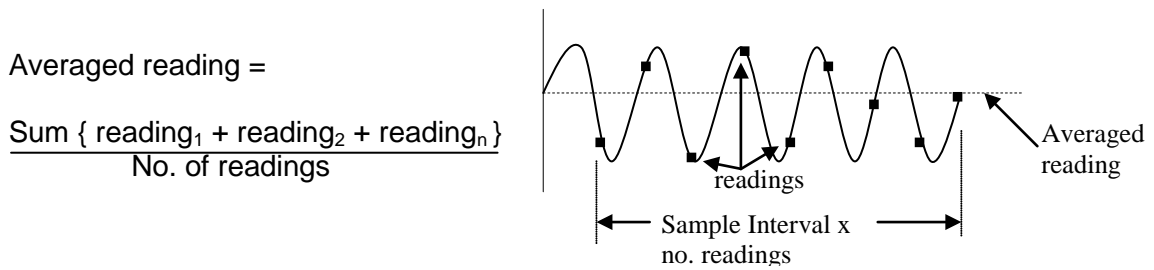
Sample Interval

Change the sample interval between 1 and 60 seconds. The sample interval is the time between readings in seconds. When selected, the averaging process forces the sensor to take level readings at this interval. The number of readings taken depends on the programmed number of readings (see *No. of Samples*).

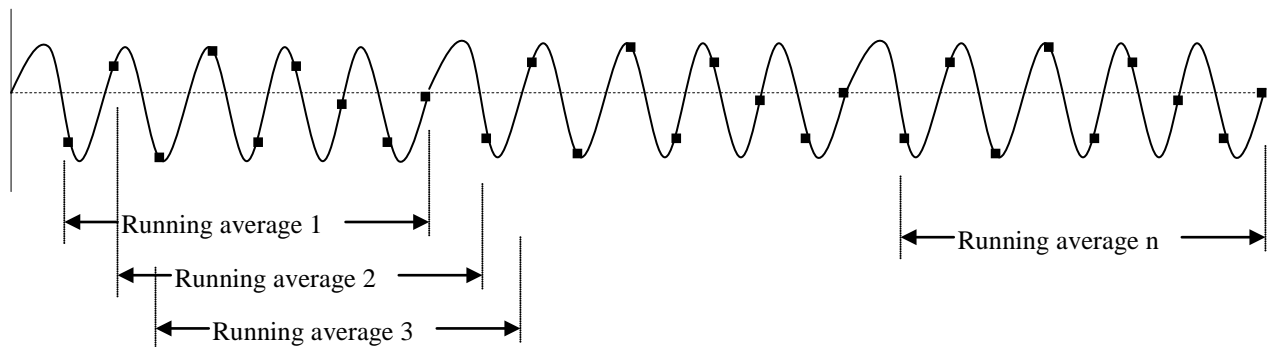
No. of Samples

Select the number of samples for averaging between 2 and 60. Number of samples is the number of individual level readings the sensor will take before outputting an averaged reading. Total averaging time is the number of samples x sample interval (minimum 2 seconds, maximum 3600 seconds).

Standard Averaging – sensor takes a number of readings, adds all readings together and divides total by number of readings. This produces an averaged reading even if some or all readings vary substantially. Use this setting to measure tidal levels with waves superimposed onto desired sea level reading. Once reading is output, a new averaging interval begins.



Running Averaging – sensor takes a number of readings, adds all readings together and divides total by number of readings as per *Standard Averaging*. In standard averaging the process begins anew once the averaged reading is output for the first time. For running averaging and output is generated after each sample interval using the latest no. of samples. This way an averaged reading is output much faster after every sample interval (1 to 30 seconds). The sensor remains on continuously in this mode as this is a continuous output.



When averaging is enabled the main display will show that the reading is averaged. Running average is only available for 6100. For example:

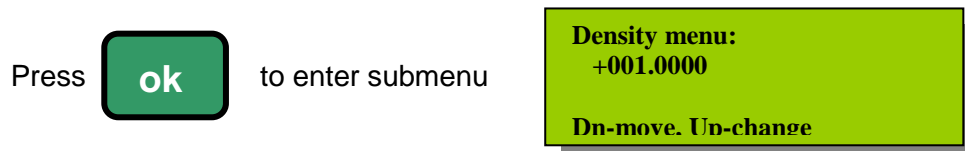
Level
(Ave:STD)
+43.756 m

or

Level
(Ave:RUN)
+43.756 m

Settings – Density

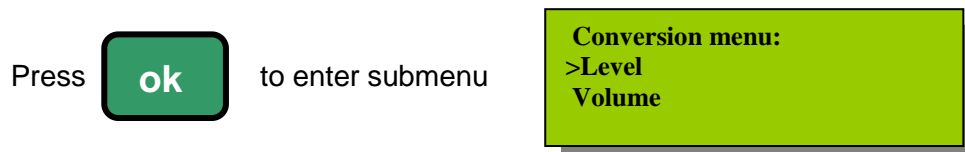
When measuring level in liquids of density other than fresh water, a density factor can be programmed into the sensor to ensure pressure to level conversion remains accurate. For this sensor a relative density is assumed whereby freshwater has a density of 1.0000.



Liquid density is the ratio of weight to volume. Fresh water is lighter than seawater, therefore seawater has a higher density. Some liquids other than water have a density less than 1. Simply enter the density of the liquid in the above menu. The readings taken thereafter will be automatically converted to the correct level.

Settings – Conversion

The conversions menu is used to set the type of conversion used by the sensor to provide a calculated output.



Setting – Conversion – Level

Use the level conversion menu to select kPa to distance conversion factor. All conversions are based on mm/kPa units.



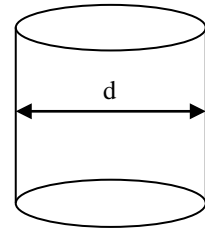
Type: Select between a Standard and user defined conversion
Standard: If a STD conversion type is used, this submenu allows selection the Standard used to convert kPa to millimeters water.

Standards:	Australian	102.15 mm/kPa	British:	101.97 mm/kPa
	Sydney:	102.07 mm/kPa	Europe:	101.85 mm/kPa
	Melbourne:	102.04 mm/kPa	Equator:	102.25 mm/kPa

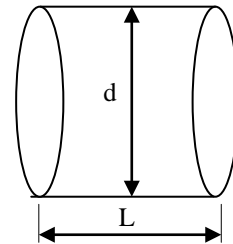
User defined: If a user defined type is used, this submenu allows entry of a non standard conversion in mm/kPa.

Settings – Conversion – Volume - Cylinder

Vertical cylinder (tank) is oriented as shown. Enter diameter (d) of the tank only. Level sensor will calculate tank volume based on measured height of liquid. For bubble tubes installed with end fitting above tank floor, use *Datum* menu to adjust volume.

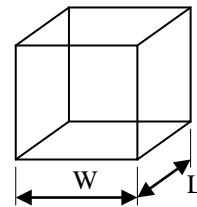


For horizontally oriented cylindrical tank, enter diameter (d) and length (L) as shown. Ensure internal dimensions are used only. For bubble tubes installed with end fitting above tank floor, use *Datum* menu to adjust volume.



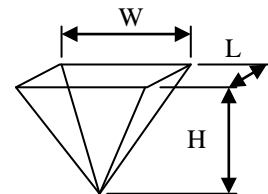
Settings – Conversion – Volume - Box

Box shaped tanks have vertical sides as shown. Enter length (L) and width (W) of the tank only. Level sensor will calculate tank volume based on measured height of liquid. For bubble tubes installed with end fitting above tank floor, use *Datum* menu to adjust volume.




Settings – Conversion – Volume - Hopper

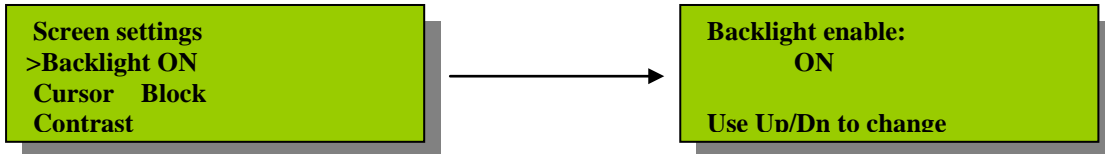
This is an inverted pyramid shape commonly used in the process industry. Enter length and width dimensions in reference to height (H) . Level sensor will calculate tank volume based on measured height of liquid. For bubble tubes installed with end fitting above tank floor, use *Datum* menu to adjust volume.



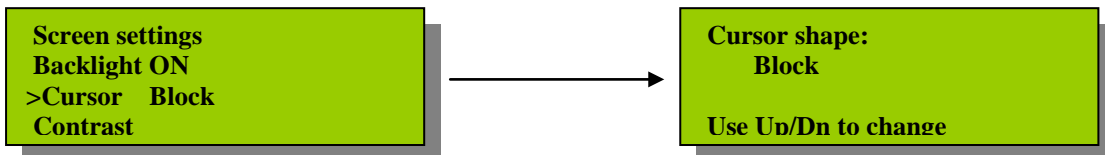
Settings - Screen

Use this menu to adjust screen settings.

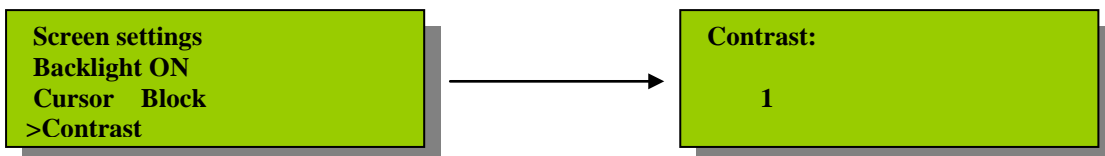
Press  to enter screen settings menu.



The display backlight can be switch on an off using this menu.



By default the cursor is a flashing block. Use this menu to change it to underline if desired.

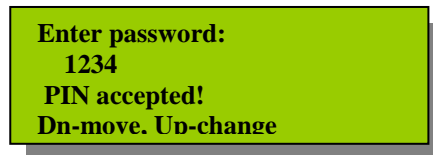


Display contrast can be adjusted in this menu between 1 and 7.

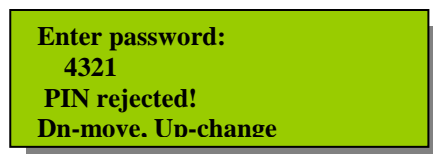
Settings – Password

By default the settings menu can be accessed at all times. However users have the facility to password protect the settings menu to prevent unauthorized access. Once a password has been enabled in the settings menu, this menu is only available after the password is entered to unlock it. To unlock the Settings menu you must enter the correct password consisting of 4 numbers between 0 and 9. This must be done in the main menu.

Once password is entered press OK. If correct:

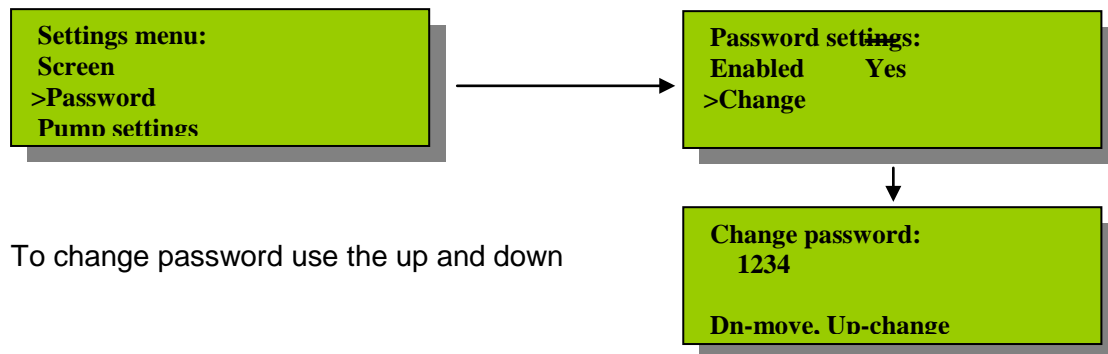


or if incorrect:




To lock the Settings menu again, enter the password again until it is accepted.

To change the password and enable/ disable you must get access to the Settings menu.

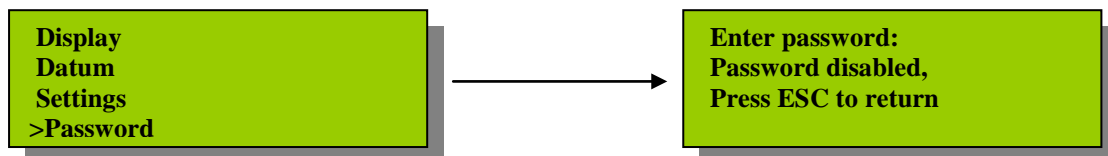


To change password use the up and down

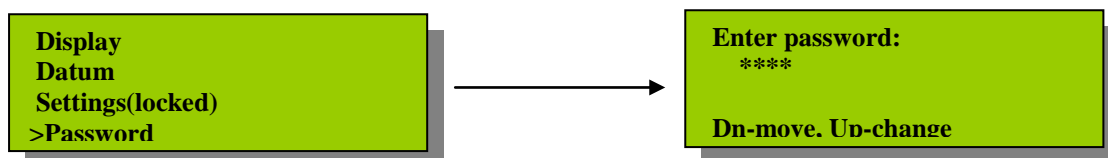
buttons and press  when finished to accept the new password.

The password menu allows you to enable or disable a password used to protect the sensor settings from unauthorized access. When in the Main Menu, the password must be entered to allow access to the Settings menu only. All other menus are freely accessible.

If password is disabled:

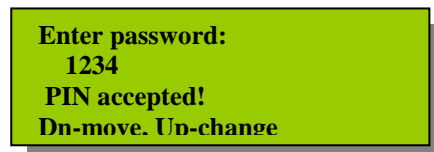


If password is enabled:

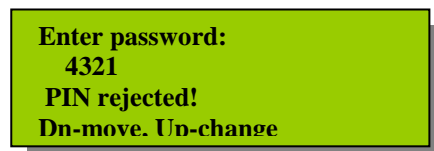


To unlock the Settings menu you must enter the correct password consisting of 4 numbers between 0 and 9.

Once password is entered press OK. If correct:




or if incorrect:

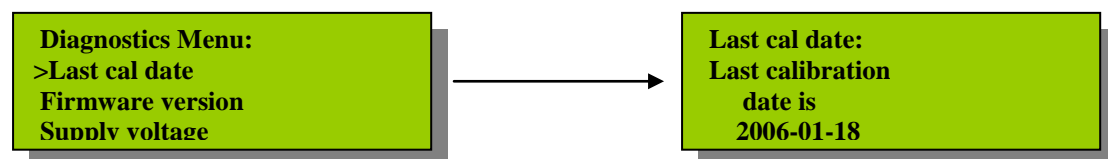
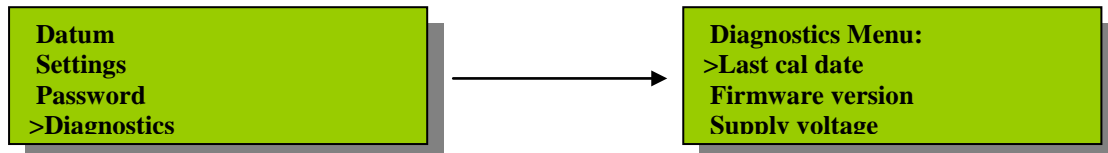


To lock the Settings menu again, enter the password again until it is accepted.

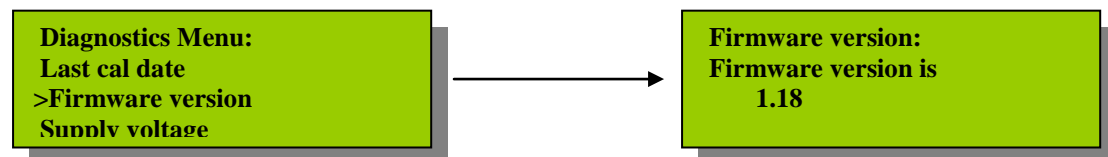
Settings - Diagnostics

The diagnostics menu provides details of basic internal sensor parameters. While these provide information only, they are very useful while diagnosing technical difficulties when setting up the sensor. The calibration date parameter provides the date of last factory calibration.

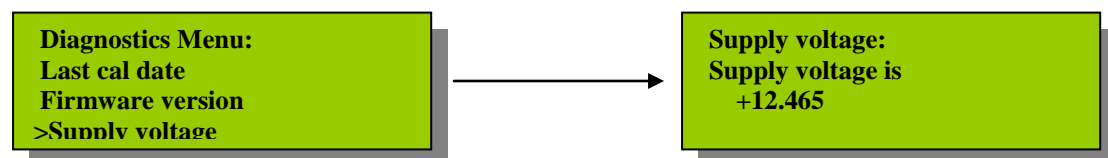
Press  to enter diagnostics menu



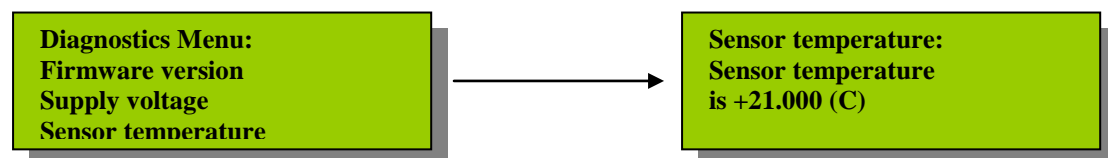
Shows date of last calibration (yyyy-mm-dd)



Shows currently loaded sensor firmware version



Shows current supply voltage available to sensor.



Shows current internal sensor temperature

Settings - Pump Settings

6100 does not have pump system connected. This menu is only available for 6150 version.

pumppro 6150 not connected. Press <esc> to return

Settings - AutoZero

Autozero is used to counteract long term sensor drift due to sensor ageing. The expected drift is typically very small and is due to thermal stress relief of silicon strain gauge components

Settings menu:
Diagnostics
Pump Settings
AutoZero

Press  to enter submenu

Autozero menu:
Offset 0.000%
>Apply offset? No
Set offset

Offset shows the amount of offset that was added to bring the atmospheric pressure reading back to zero. This value is automatically adjusted by the sensor after the Autozero is carried out.

You are able to select whether or not to use the offset. If you select "No", any offset value will not be added to the sensor reading. Selecting "Yes" will added the offset shown above.

Press  to enter submenu

Apply offset:
No
Use Un/Dn to change

When back in previous menu,

Press  to enter submenu

Autozero menu:
Offset 0.000%
Apply offset? No
>Set offset

Press  to AutoZero

AutoZero:
Set pressure to zero then press OK
<esc> to cancel

AutoZero:
Please wait ...

AutoZero:
AutoZero Set!
Press ESC

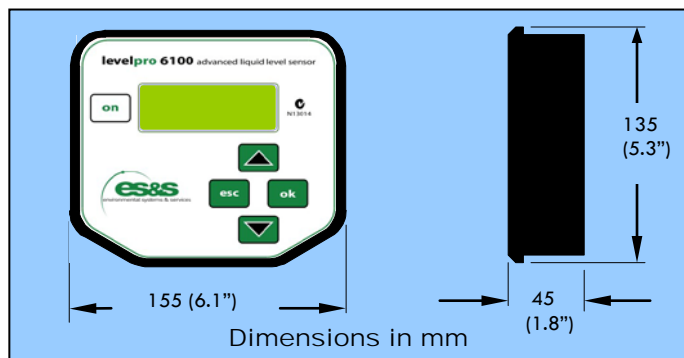


Ensure pressure is set to zero before performing AutoZero function.

Specifications

Range:	10, 20, 35, 70 meters freshwater (15, 30, 50 and 100psi) -non standard ranges are available.
Units:	kPa, psi, feet, inches, meters, centimeters, flow and volume units based on above.
Accuracy:	Combined linearity/ hysteresis/ temperature compensation error over 0-50°C range: < ±0.15% of full scale for standard ranges - over pressure less than 150% FS
Resolution:	Analogue: 12 bit Digital: 16 bit Display: 0.1mm water
Temperature range:	operating: -5°C to + 55°C storage: -20°C to + 70°C
Response Time:	from standby: 0.25s to full accuracy From power-up 1 second to full accuracy
Type:	Piezo resistive pressure sensor vented to atmosphere (gauge type)
Output Options:	Analogue: 4-20mA current, 3 wire loop (up to 600 ohm load @12Vdc) 0-1 Volt or 0-2.5 Volt, 100 ohm impedance Digital: SDI-12 data protocol version 1.3 RS232C data, Simultaneous digital and analogue output
Tube Connection:	¼" BSP female fitting as standard with a selection of tube fittings available.
Power Supply:	10-15 Volts DC unregulated Standby @ 12V: <10 mA Active @12V: <120mA backlight on, plus current loop if used <25mA backlight off, plus current loop if used
Surge Protection:	Inputs/ outputs protected against transients by a secondary protection circuit that can absorb up to 1.5kW for 1ms.
Enclosure:	IP67 rated.
Display:	4 line x 20 character LCD (7 x 5 dot matrix) with Backlight, extended temperature range.
Weight:	0.85 kg

Dimensions



Ordering Information

Item description	code
Levelpro 6100 advanced liquid level sensor, battery cable with 2 pin connector, signal cable with connector, mounting bracket, 2m x ¼" tube, manual, calibration certificate.	6100
Signal cable fitted with 3 pin male plug to suit 3500 logger analogue input	6111
Signal cable fitted with 5 pin male plug to suit 5000 data radio SDI-12 port	6112
Signal cable fitted with 9 pin female "D" connector to suit computer RS232 serial port connection	6113
Signal cable fitted with 4 pin MIL Spec plug to suit ALERT RTU analogue input	6114
Signal cable, spare, 2m , with 18 pin plug	6115
Battery cable, spare, 2m, with 2 pin plug	6116
Mounting bracket, spare, stainless steel with hardware	6120

Contact Details

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