Keynes Controls Ltd

Water Quality Sensors

ARGES Dissolved Oxygen Sensor

CE

Keynes Controls Ltd
Instrumentation Design & Manufacture

UK CA

Declaration of Conformity

(In accordance with UK Government Legislation)

Product: ARGES Dissolved Oxygen

Keynes Controls Ltd, Unit B1, Lambs Farm Business Estate, Basingstoke Road, Berks, RG7 1PQ, UK

This declaration of conformity is issued under the sole responsibility of the manufacturer for the following product

Model	Description
ARGES Dissolved Oxygen	Intelligent Submersible Dissolved Oxygen Sensor

The object of the declaration described above conforms with the relevant UK Statutory Instruments and their amendments:

2016 No. 1091 The Electromagnetic Compatibility Regulations 2016
2012 No. 3032 The Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Standards referenced during compliance assessment:

BS EN 61326-1:2013 Electrical equipment for measurement, control, and laboratory use – EMC requirements - for use in industrial locations.
BS EN 63000:2018 Technical documentation for the assessment of electrical and electronic products concerning the restriction of hazardous substances.

Signed for and on behalf of Keynes Controls

Ian Thomas
Director
Keynes Controls Ltd

Directors: P Bayton, Ian Thomas Registered Address: Unit B1 Lambs Farm Business Estate, Bassingstoke Rd, Swallowfield RG7 1PQ
Company Registration No: 3199347. Vat No: 677738865

Keynes Document: QM-14-CON-v1

ARGES Dissolved Oxygen Sensor Manual

Product Overview

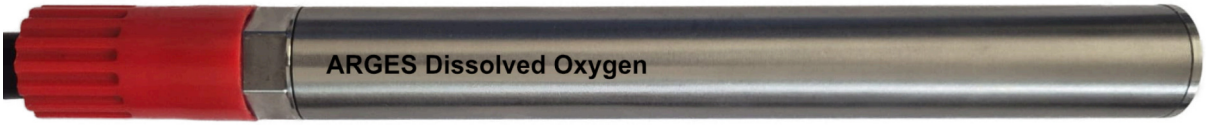
The ARGES Dissolved Oxygen sensor is an intelligent submersible fluorometer type sensor manufactured by Keynes Control Ltd. The sensor is manufactured using high grade stainless-steel tube and is fitted with a high performance wet mate network connector. The sensor is purely digital in operation and offers high performance measurements.

The advanced power saving design ensures the sensor is ideal for remote operations. The sensor can be used as a standalone sensor or as part of a multiparameter system. All ARGES fluorometers have built-in temperature sensors that can be used to record the sample temperature.

The sensor is fully user configurable and supports the advanced SDI12 V1.4 protocol.

Product Images

This is a photograph of the Dissolved Oxygen Sensor, featuring a sleek silver finish with its name prominently displayed for easy identification.



These photographs showcase the Dissolved Oxygen Sensor in action, being used to test river quality in Abingdon, Oxfordshire.

Figure 1

Figure 2

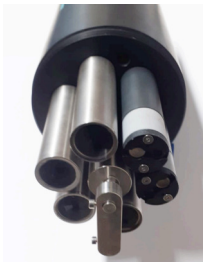


Figure 3

Figure 4

QLOG Applications Software

The ARGES Dissolved Oxygen sensor is supplied with a copy of the QLOG applications software. QLOG gives the user the ability to make configuration changes, take measurements, display real-time measurements and store results in spreadsheet format CSV text files for easy analysis.

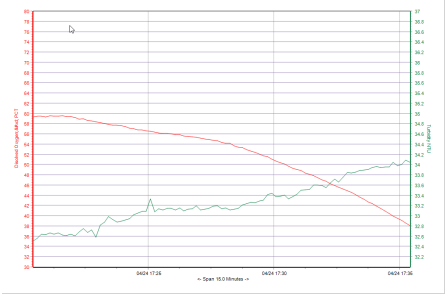


Figure 5

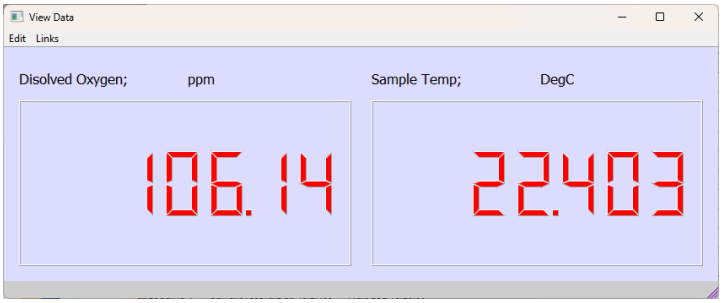


Figure 6

The images above show real-time measurements of Ammonia in a series of panel meters and charts.

Dissolved Oxygen Sensor Technical Features

TYPE	RANGE (Typical levels)
Solid state Fluorometer	Optical Fluorescent
Concentration range:	0. to 16.5 mg/L 0-200% - at 25 Deg C
Resolution:	0.001 mg/L
Accuracy:	+/- 2 % of reading - Typical
Multi-parameter Housings	7 / 3 Port Options - others on request
Calibration Period:	Approximately 2 year between Calibration -
Sensor Material	Stainless-steel body - Gold plated Connector pins
pH Range	0 - 14
SDI12 V1.4	Automatically assigned SI Units - %DO, Temperature Deg C
Digital Communications	SDI12 / RS485 / MODBUS Digital Communications - 0-2 V DC Optional
Temperature Sensor	NTC 0 - 50 Deg C / 0.2 % accuracy
Simple Calibration	Two points
SI Units	mg/L - % Dissolved H20 - Degrees Celsius - User adjustable
Analogue Output	Optional - 0-2 V DC - proportional to concentration and temperature
Standby Current	2 mA @ 12V DC

Table 1

The calibration procedure used with the dissolved oxygen sensor follows the same procedures as described on page 9 for all of the ARGES range of fluorometers. The easiest way to calibrate a fluorometer is to use the free QLOG software and set the sensor to calibration mode. Full calibration details are shown on page 14.

Measurement Integrity

The dissolved oxygen sensor is a fluorometer that makes measurements using light, and is suitable for long term submerged operations. For best results it should be deployed into slow moving or stationary water. The optical measurement of a fluorometer experiences very little calibration drift when compared to similar electrochemical sensors and this advantage results in less frequent calibrations. In fact, optical sensors are so stable they are capable of holding their calibration for many months

The ARGES Dissolved Oxygen sensor is factory calibrated at 2 points, a zero point, and a high point which is typically at 100% saturation. The sensor can report levels above the maximum calibration point. At the surface of a water body values of saturation close to 100% can be observed, with the value dropping with depth and under biological action.

The ARGES Dissolved Oxygen sensor is factory set to provide readings in % saturation at the raw sensor temperature, and compensated readings based on the calibration temperature.

where

1 ppm Dissolved Oxygen = 3.125×10^{-5} mols/dm³
1% DO = 0.07 - 0.14 ppm or mg/mL

User calibration feature is included in the QLOG software supplied with this sensor.

Best Measurement Practice

All fluorometers type sensors such as the ARGEs Dissolved Oxygen supply the most accurate measurement when deployed in still, or slow flowing water sources. The sensors should be deployed into the shade to reduce any reflected light entering the instrument.

Avoid fast flowing water sources as this will cause an error in the measurements.

Measurement Variables

The following variables are available for use with the Dissolved Oxygen sensor.

The user can adjust the order and measurement variables being sent out from the sensor. Additional concentration parameters can be added to the sensor on user request.

Letter	Description	Name	Units
Group 1: Main Signal Related			
A	Raw photodetector output	sraw	uA
B	Raw DO concentration before correction	btp	pct
C	Temperature corrected DO concentration	tctrp	pct
Group 2: Temperatures			
H	Board temperature	tempL	°C
I	Leaded thermistor - sample temperature.	tempC	°C
Group 3: Diagnostics Monitoring			
L	Ambient light as % of range	lightp	%
M	Ambient light in uA	lightu	uA
O	Peak photodetector % of range	pkp	%
P	Peak photodetector in uA	pku	uA

Table 2

Variable Selection

Default Output Parameters : BCIL
Where:

A = Uncompensated concentration in ppm
G = Temperature compensated concentration in ppm
M = Sample Temperature in Deg C
E = Raw sensor reading in millivolts.

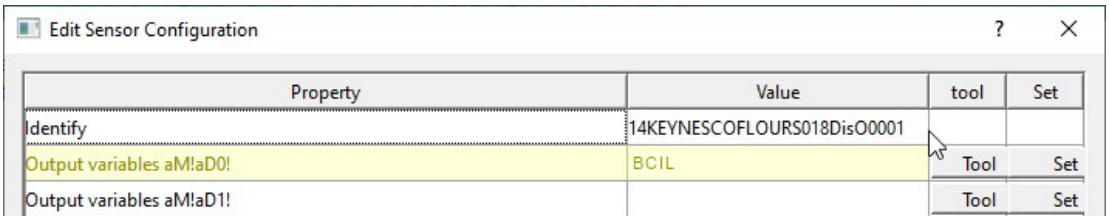


Figure 8 - Output Parameter Selection - Sensor Configuration Window QLOG - Output AGME

Communications with Windows PCs Using SDI12

The simplest way to configure and take measurements with the sensor is with a USB-SDI12-AG1 media converter connecting the sensor to a windows device, and using the free QLOG software downloadable from the Keynes Controls website.

Equipment Required:

1. USB-SDI12-AG1 — Figures 9-12, USB to SDI12 media converter for use with the ARGES chemical sensors
2. USB Cable — Figure 13, Type 2.0 Male A to Type Male B cable
3. ARGES Network cable — Figure 16
4. ARGES Extension cable — Figure 15

Software

Use the Keynes Controls QLOG software

Download a copy from the www.keynes-controls.co.uk website and install onto a Windows Operating system computer.
The software should run on Windows XP, 10 and 11 operating systems.

The software can be used without restriction. Any similar software that supports SDI12 network operations can be used instead.

Figure 9

Figure 10

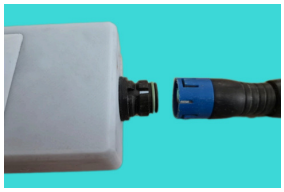


Figure 11

Figure 12

Figures 14 and 16 show the network cables used with all ARGES chemical sensors.

Figure 13 USB 2.0 Type A Male to Type B Male

Figure 14

Figure 15 - ARGES Sensor network extension cable

Figure 16 - ARGES Network Cable

Figure 17 ARGES Dissolved Oxygen Sensor

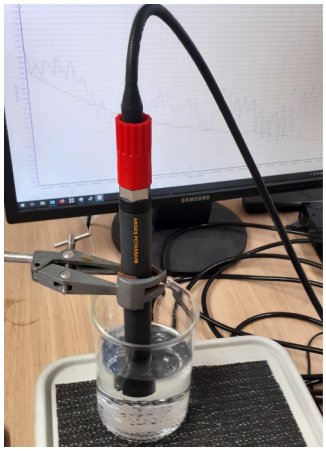


Figure 18 - ARGES network cable attached to the Dissolved Oxygen sensor.

Hardware Installation

The cables used with the ARGES Dissolved Oxygen sensor, media converter and network cables can only be fitted together in a single combination. It is not possible to connect the instrumentation together incorrectly.

1. Connect the USB cable into the base of the USB-SDI12-AG1 media converter. See Figures 10 and 13 on page 3 above.

2. Connect the orange extension cable or ARGES network cable to the blue binder connector on the USB-SDI12-AG1 media converter. See Figures 11 and 12 on page 3, or 18 and 19 below.

Figure 19

Figure 20

Network cable connection to the USB-SDI12-AGI media converter.

Figure 18 shows the network cable alignment to the USB-SDI12-AG1 media cable.

A white marker on the Blue Binder connectors has to line-up for the cable to push onto the media converter.

Figure 19 shows the network cable terminated onto the media converter.

3. The black ARGES network cable shown in figure 16 above, is waterproof and safe for submergence with the Dissolved Oxygen sensor. It is terminated with a moulded 5-pin connector that fastens to the sensor and a blue IP68 rated Binder connector.

   The 5-pin sensor terminating socket on the network cable is moulded into the cable end and ensures high integrity and reliable connection. The moulded socket is wet mate capable.

   The orange extension cable is terminated with Binder IP68 plugs.

4. Terminate the ARGES network cable to Dissolved Oxygen sensor. It only fits one way onto the gold connector at the rear of the sensor. See Figure 20 below.. Lock into place on the sensor using the red securing ring.

5. Using the USB interface cable, Plug the USB type A socket into a standard USB port on the Windows PC. See Figures 9 and 13 on page 3 for more details.

   As long as the Windows PC is powered on, and the USB port is operating to the correct technical specification then the blue status LED on the USBSDI12-AG1 media converter will illuminate. See Figure 12 on page 3.

Figure 21 - ARGES Network Cable

Figure 22 - ARGES Network Extension cable

Powering the ARGES Dissolved Oxygen Sensor

The ARGES Dissolved Oxygen sensor is powered directly from the PC USB port via the USB-SDI12-AG1 media converter. This makes measurements and calibration operations very easy. A Windows laptop can supply enough power through a USB port to power any of the ARGES Sensors.

The USB-SDI12-AG1 media converter can power single sensors and multiparameter systems directly from the PC USB Port.

Figure 23

USB-SDI12-AG1 Device Drivers

The device driver software for the usb media converter automatically loads into the PC so long as an Internet connection is made. The media converter uses the FTDI chipset and the driver software that is usually already part of Microsoft Windows.

Plug the USB cable supplied with the USB-SDI12-AG1 media converter into a windows PC. The blue status indicator visible in figure 20 will switch on to indicate that the chosen port is operating correctly.

Further Information

All items shown in this document are available from the Keynes Controls online shop.

See keynes-controls.co.uk for details, or E-mail sales@keynes-controls.com

Pin-outs

The pin-out is standard on all of the ARGES range of chemical sensors.

View looking into the sensor connector.

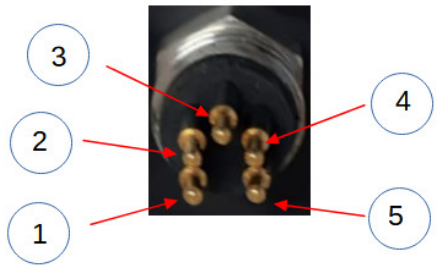


Figure 24

1 = - RS485 2 = + RS485 3 = SDI12 Data 4 = Gnd 5 = + 12V DC

Downloading QLOG

A free copy of QLOG can be downloaded from https://keynes-controls.co.uk/q-log-software/.

QLOG Software Quick User Guide

The ARGES Dissolved Oxygen sensor supports multiple digital communication networks. This manual only considers using the SDI12 network for communications using the USB media converter and QLOG software.

Required Information:

1. COM Port used by the USB-SDI12-AG1 media converter.

Use the Device Manager feature of the operating system to locate the USB-SDI12-AG1 COM port number.

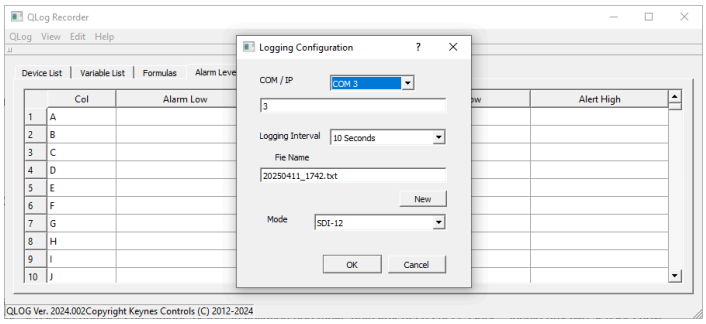


Figure 25 - QLOG Configuration Window

Enter the USB media converter COM port number into the QLOG Software Configuration Window.

The QLOG software has to identify the media converter so the sensor measurements can be read.

Select **QLOG - Configuration menu option**

The Window opposite will appear. Select the COM port number from the pull down list. In the example COM port 3 has been selected.

Network Selection

The ARGEs Dissolved Oxygen sensor automatically detects the network on which has been connected by reading the network traffic.

The **USB-SDI12-AG1** media converter used with the ARGERS Dissolved Oxygen sensor only supports the SDI12 network. Upon connecting the media converter to the instrument then the SDI12 network will be activated.

Select **SDI-12** menu option from the pull down list. See Figure 25 above.

Recommended Sample Rate

1. A single sensor connected directly to a PC or similar data acquisition system

   Maximum sample rate **1 Second**

   Recommended sample rate **10 Seconds**

   Once all the configuration settings have been assigned press the ‘OK’ button to store.

   The slower the sample rate, the longer the sensor will last before recalibration is required.

Multiparameter Housing Sample rate

2. The fastest sample rate for a fully populated 7 Port SONDE is **10 Seconds**

   Recommended sample rate is **30 Seconds**.

   It is now possible to scan the network and identify the sensor

Scanning the SDI12 Network

Select **F9** on the PC keyboard, or select ‘Scan for Devices’ from the QLOG menu system

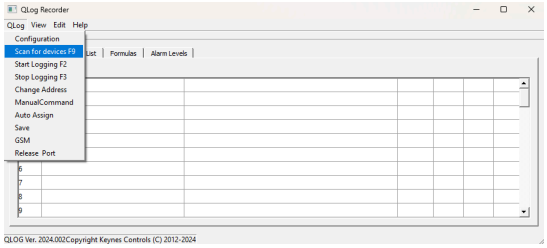


Figure 26

Figure 27

The USB-SDI12-AG1 media converter status indicators will flash on and off, see Figure 27 above.

Identify the Dissolved Oxygen Sensor in the SDI12 Network

The SDI12 network supports 10 sensors each with an individual ID number for identification. The SDI12 ID number is an integer ranging from 0 to 9. Each sensor has a unique ID address, and supports an enhanced address mode to allow additional devices on the same network.

Each sensor also has an Product Description string, in the case of the Dissolved Oxygen sensor will be similar to:

a14KEYNESCOFLOURS018DisO0001

This has been assigned by Keynes Controls Ltd and is a standard feature of the SDI12 protocol.

Where:

a = ID number of the sensor

Factory Default settings:

ID = 0 for all sensor types

Once the Dissolved Oxygen sensor has been identified on the network then it will appear under the Device list tab in the QLOG Software, see figure 28 below. The ID number of the sensor may vary depending on configuration.

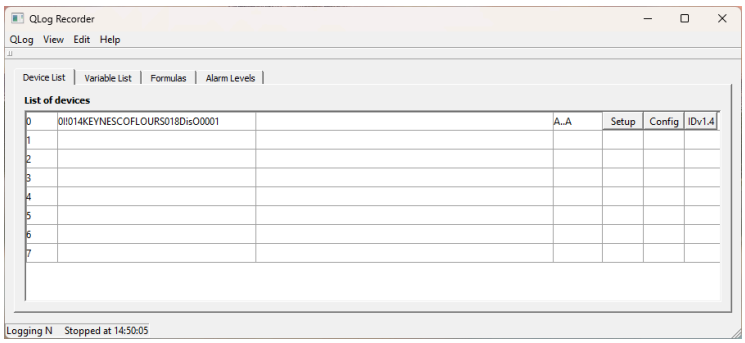


Figure 28 - Device List after a network scan

Figure 28 opposite shows a Dissolved Oxygen sensor with **ID 0** on the SDI12 network.

The sensor will appear the same as opposite should the RS485 network be used.

Figure 33 shows a typical network scan when multiple sensors are being used and has identified a Dissolved Oxygen sensor. The QLOG software does not yet understand what has to be done with the measurements that will be returned from the sensor or sensors.

Note. The 4th column shown in Figure 28 shows the cell locations where the measurements will be stored in the results file. The QLOG software uses the same cell references as common spreadsheets.

The Dissolved Oxygen sensor above is shown storing measurements into cells A..A.

Use the **Auto-assign** option in the main QLOG menu option to enable software to automatically adjust the results to be stored into the first available cells in the results file..

The first three cells referenced A..C are reserved and cannot be used by the User. The cell references are the same as those used by most spreadsheet programs.

Understanding Sensor Parameters

Any SDI12 sensor will send measurements in engineering units. In order to understand the measurements then the QLOG software has to correctly interpret the measurements being sent out by the sensor. In order for QLOG to interpret the values the User has to first select the sensor type from the menu that appears after pressing the Setup button.

Each sensor has the following options

Sensor Type
User Calibration

Dissolved Oxygen Measurements

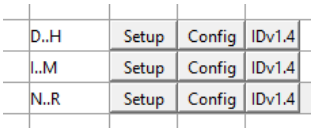


Figure 29

Select the '**Setup**' Button. See column 4 in Figure 29.

The Device Setup Window shown in Figure 30 will appear.

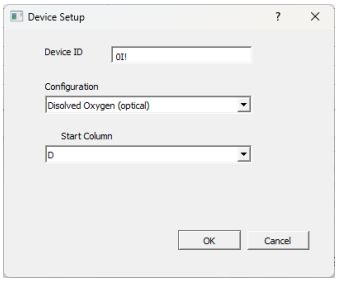


Figure 30 - Dissolved Oxygen Device Setup Window

Figure 30 opposite shows the QLOG device setup window for the current Dissolved Oxygen sensor.

Select the '**OK'** button.

Ensure the '**Dissolved Oxygen Sensor**' option is shown in the Window. Adjust with the pull down menu options as necessary.

The Start column into which the measurements are to be stored is defined under the 'Start Column' tab. In the example the cell location is shown as 'A'. This can be adjusted. Any cell after D required.

The **Auto Assign** function will assign the correct cell location for measurement storage automatically.

The dissolved oxygen sensor can return up to four parameters after each measurement operation

The parameters are User selectable.

Repeat for all sensors on the network.

Once the Dissolved Oxygen sensor has been identified then the measurements can be stored into the results file

Using the menu system shown below

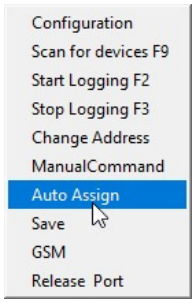


Figure 31

Select '**Auto Assign**' menu option.

The menu is also used to start and stop the data acquisition operations, change the sensor ID, etc.

The QLOG sensor can now be used to make measurements. Everything is configured.

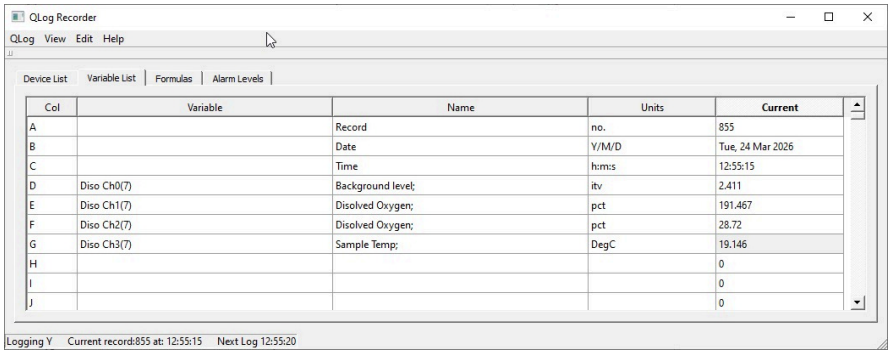


Figure 32

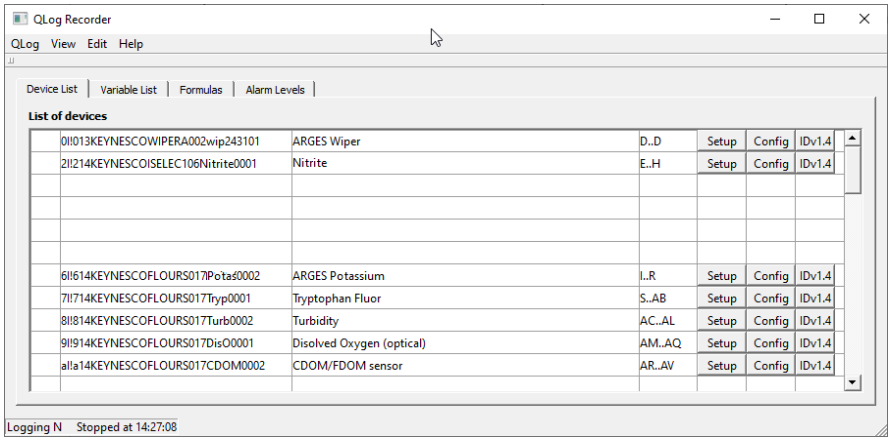


Figure 33

Once the **Auto Assign** function has been activated then the cell references used by the dissolved oxygen sensor will be automatically assigned.

Figure 33 opposite shows a Device List for a 7 Port multiparameter SONDE with a Dissolved Oxygen sensor set as ID 9 .

Cells AM .. AQ

Understanding the Sensor Parameters

An SDI12 sensor can return multiple measurements back to the PC or any other data acquisition system controlling the network.

The QLOG software has to be told which measurements the ARGES Dissolved Oxygen sensor will be sending to the PC in order to make sense of the results.

The ARGES Dissolved Oxygen sensor is preset to return the following values::

Raw Dissolved Oxygen Concentration	**%Saturation**
Sample Temperature	**°C**
Temperature Corrected Dissolved Oxygen concentration	**%Saturation**
Raw sensor reading	**BLUX**

Real-time Measurements

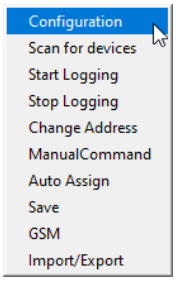


Figure 34

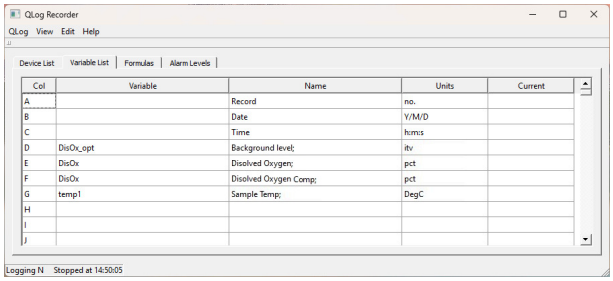


Figure 35 - Measurements

In order to observe measurements from the Dissolved Oxygen sensor, select the '**Start Logging'** option.

The status indicators on the USB-SDI12-AG1 indicator will flash as measurements are sent from the sensor.

The light level shown is the background level at the time of measurements.

Changing the sensor ID number

It is possible to change the sensor ID number using the QLOG software.

The simplest way is to use the Change Address option from the QLOG software.

Select the 'Change Address' option as shown below.

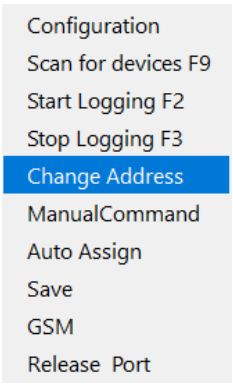


Figure 36

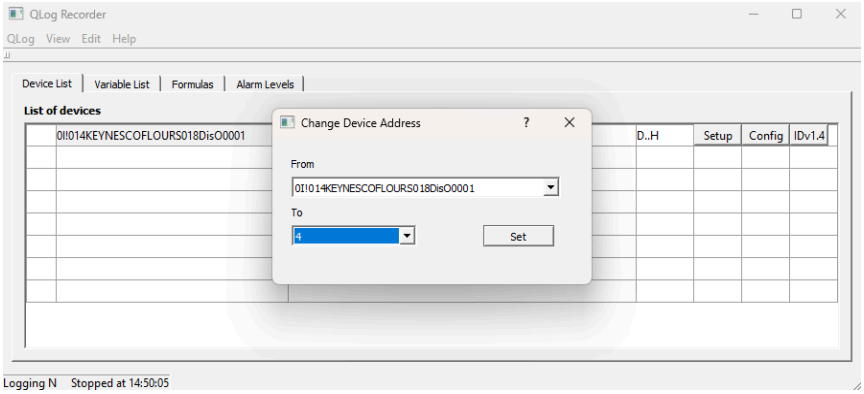


Figure 37 - Change Address Window

The example shows the Change Window configure to adjust a sensor with original ID of 0 to a new ID of 6

Press the 'Set' button to store the new ID.

The QLOG software will scan the network to identify the sensor.

Make sure each sensor has a unique ID number.

Calibration Solutions

Calibrating the ARGES Dissolved Oxygen sensor requires two calibration solutions, a 0% solution and a 100% solution. A 100% solution can be made by aerating deionised water. A 0% solution can be made with an oxygen scavenging agent, such as sodium sulfite.

A 0% dissolved oxygen solution can be produced from sodium sulfite. The industry standard is 10 ppm of sodium sulfide for every 1 ppm of dissolved oxygen you want to remove.

Solution	Solute	ppm / %	Ratio	Mass for 200 ml
Dissolved Oxygen	Sodium Sulfite	0 ppm / 0%	1 : 6667	0.030

Table 3

Calibration Solutions | Keynes Controls Ltd **https://keynes-controls.co.uk/calibration-solutions/**

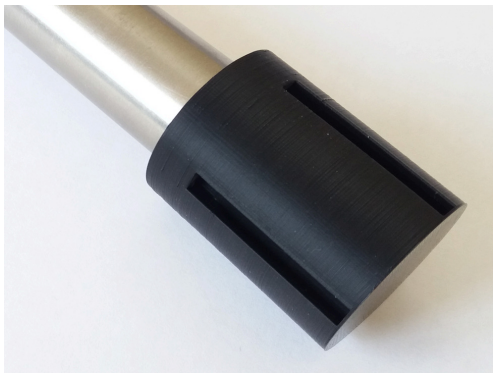
Materials Required for Sensor Calibration

The Dissolved Oxygen sensor requires the same items for calibration as all other sensors in the ARGES fluorometer range:

- 1 Litre plastic bottle
- Deionised water - 0.75 Ltr
- Low concentration calibration solution
- Beaker of distilled/deionised water
- 2 plastic beakers
- Temperature probe
- Sensor stand (ideal but nonessential)
- Shade Cap
- Windows PC running QLOG Software.

Calibration Equipment setup

Dissolved Oxygen Calibration Setup



ARGES Fluorometer Shade Cap

All of the ARGES range of fluorometers require a shape cap fitted before any calibration operations. Calibration can be undertaken directly without any requirement for special equipment. The shape cap is supplied with the sensor.

Use a retort stand to secure the sensor in the calibration solutions. The image opposite shows the dissolved oxygen sensor on test,

Background Light

For the best results make sure there is no direct light source shining at the fluorometer.

Beaker Type

Use a plastic beak for calibration operations. These will offer less reflection to indirect light than a similar glass beaker.

Hardware Setup

1. Make sure the sensor is clean before calibration.
2. Identify the sensor in the QLOG Software
3. Switch to User Config Mode of operation.

Calibration Standards

The calibration solutions should be made up close to the time of calibration.

The 0% saturation solution requires several hours to settle.
The 100 % saturation calibration solution should be made up just before the calibration is undertaken

Sensor Calibration

1. Set up the sensor on a stand as shown in figure 18 (page 6)
2. Ensure the sensor is connected to a Windows PC and communications are configured.

The calibration procedure used with the Dissolved Oxygen sensor is the same as for the entire range of ARGES fluorometers. The easiest way to calibrate a selective ion sensor is to use the free QLOG software and to set the sensor into configuration mode.

Use the 0 ppm / % Saturation calibration solution for the low calibration point.

Clean the sensor in deionised water before sampling with the second calibration solution. Make sure the sensor is clean.

Use the temperature sensor built into the ARGES Dissolved Oxygen sensor to give the sample temperature. When possible, calibrate the sensor at the temperature into which it will be deployed. Once the sensor is deployed into the calibration solution, wait for the reading to settle before recording the result.

100 % Saturation - High Calibration

Use deionised water or still tap water to create the second calibration solution. Allow tap water to settle for several hours before use.

Fill a 1 Ltr bottle with 750 mL of water. Seal the top and shake vigorously for a minimum of 30 seconds. The water will become saturated to 100% dissolved oxygen.

Make the 100% saturated calibration reading and record the results.

To enter configuration mode, press the **Setup Button'** button adjacent to the sensor requiring configuration changes as shown in Figure 38.

Figure 38

Calibration Certification

Calibration of the sensor and of the buffer solutions are available as optional extras.

Saving Calibration Information into the sensor.

To store new parameters into the ARGES Dissolved Oxygen sensor simply enter the new parameter into the table and press the adjacent ‘Set’ button.

If using a Keynes Controls USB-SDI12-AG1 interface then the status indicators will flash briefly indicating that the new parameter has been sent to the instrument.

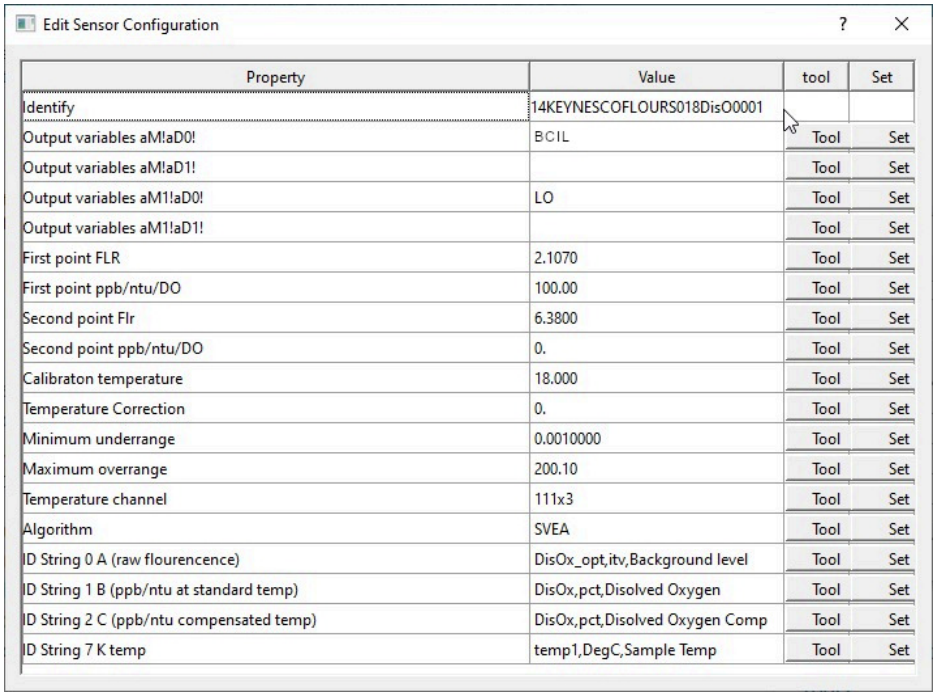


Figure 39 Dissolved Oxygen Sensor User Configuration Window

Sensor Configuration Parameters Terms

TERM	DESCRIPTION
Minimum Underange	The minimum value of dissolved oxygen that the sensor will return - Any measurement below this value will also return at the minimum set level. Example 0.01 %
Maximum Overanage	This is the maximum value that the sensor will return - Any measurement above this value will also be returned at the maximum set level. Example 200%.
Output Variables	User selectable outputs variables - Table 1 page 3 - Default = **BCIL**
Molecular mass	Mass of the molecule in atomic units. 32 amu,
Scaling factor ppm to mg/L	Typical value = 1.00 can be adjusted to allow for variations in density for dissolved ions.
Scaling factor ppm to mol/dm³	Typical value = 3.13E-05
First point FLR	Raw sensor reading in units BLUX Example 100 % saturation ppm - sensor returns 2.089 BLUX.
First point DO	First point ppm = 100.00 %
Second point FLR	Raw sensor reading in BLUX at 0% saturation 12.03
Second point DO	100 % saturation
Secondary scale factor	Scalar number - used to calculate mg/l from ppm - 1.0
Tertiary Scale factor	User defined scalar factor for SI Units conversion.
Calibration Temperature	Temperature for which the calibration was taken. eg 21.02 Deg C
Temperature Correction BLUX/°C	Variation in raw light level with temperature change - can be a positive or negative value.

Table 4

BLUX is the arbitrary unit used by Keynes Controls to represent the measured light level in a fluorometer.

ARGES Dissolved Oxygen Sensor Configuration Settings

The ARGEs Dissolved Oxygen sensor is fully user configurable. Figure33 above shows the Configuration Window for the sensor.

Setting the Dissolved Oxygen Calibration Parameters

the Dissolved Oxygen sensor in an optical device and uses light to make measurements. The unit referred to for the sensor is BLUX. This is an arbitrary unit for the instrument to describe the raw light measurement. The sensitivity of the sensor will vary between devices.

The sensor uses a 2 point calibration system to report measured concentration levels. Test calibration before use can be undertaken using a single point calibration.

First Calibration Point	: 100 % Dissolved Oxygen	2.089 BLUX
Second Point FLR (raw)	: 0% Dissolved Oxygen	12.03 BLUX

The value of 2.089 BLUX is the measurement reported from the ARGES Dissolved Oxygen sensor in Manufacturer Setup Mode using a 100 % DO test solution. To store new parameters into the instrument configuration select the '**Set'** button.

The 0% test solution is chemically created to a known solution and as such is considered a fixed value.

RANGE: User Defined.

The ARGES Dissolved Oxygen sensor range can be user defined. The default value is 0 - 100 % Dissolved oxygen as this defines the most common range over which the sensor is deployed for water quality measurements.

Maximum Concentration Level

Unit: **pct** (% DO)

Maximum Overange: Sets the maximum level of measurement that the sensor can return
Maximum Overange: 200 % DO measurement.

In this example a ARGES Dissolved Oxygen sensor has a maximum range of 200% Dissolved Oxygen before an out of range error message is returned.

The sensor will not return a value greater than 200 % DO..

Minimum Concentration Level

Minimum underrange: Sets the minimum level of measurement that the sensor can return
Minimum underrange: 0 % Saturation - O point calibration solution to determine this calibration point..

Note - Dissolved Oxygen sensor will be set to operate from 0.001 to 200 % saturation.

In practice the sensor operates over a typical range - 0 to 100 % saturation. !00% saturated water can be seen at the air/ water boundary and will depend upon the prevailing temperature.

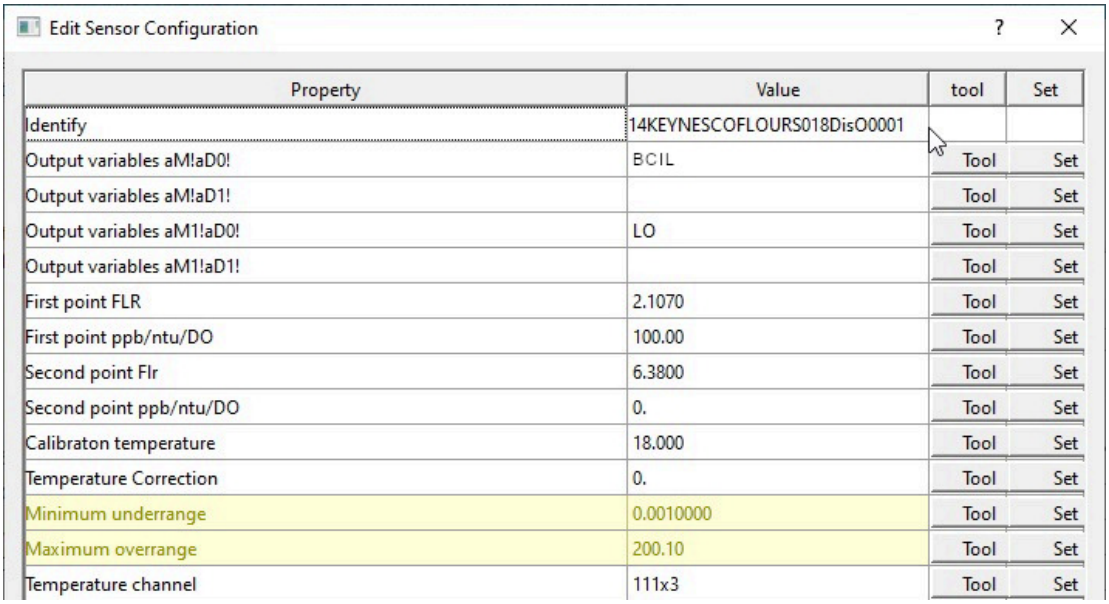


Figure 40

Output Variables

The ARGES Dissolved Oxygen sensor can be configured to return any of the variables listed in Table 2 above. The user has the ability to adjust the measurement parameters being sent out by the sensor..

Figure 42 below shows a sample of the Dissolved Oxygen sensor Configuration Window where the output variables are assigned.

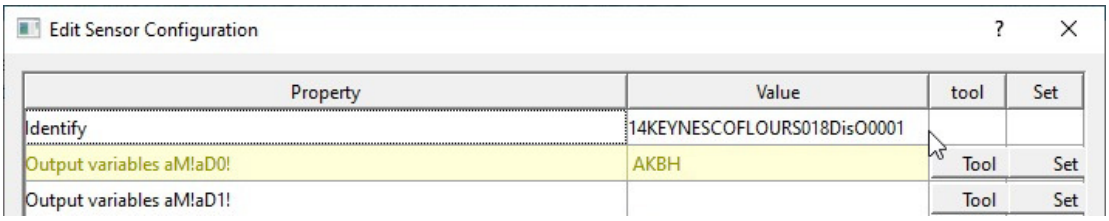


Figure 42 - ARGES Dissolved Oxygen Configuration Window - Return Parameters

aM!aD0! **AMGE** - returns 4 values for the D0 command.

A = Raw Concentration in ppm **M** = Temperature in °C
G = Temperature compensated concentration in ppm **E** = Raw sensor reading in millivolts.

aM!aD1! Command - returns 4 values for the D1 measurement command

Set the output variables to be returned from the sensor using the D1 command Sensor Serial Number.

The sensors have a factory set serial number.

Maximum data type: 16 x alpha-numeric characters.

Additional User Defined Output Variables

The aM!aD1! Command can be used to set additional parameters to be sent out by the sensor

4 user assigned variables are used with this command.

Assign the variables from the Table 2 shown in page 2.

Calibration Temperature

This is the temperature for which the calibration operations for the sensor were carried out. Under ideal conditions the calibration temperature should be close to the deployment temperature for the chosen water source.

Units : **°C**
Calibration temperature : 18.850 °C

Figure 43 - Calibration Temperature Setting - Dissolved Oxygen Sensor Configuration

Enter the calibration temperature and press ‘Set’ to store the new value into the sensor.

Manufactures Probe Type ID

This is a sensor type as shown on the device list Window and cannot be user assigned.

Caring for the ARGES Fluorometer

The ARGES fluorometers are precision instruments and should be treated with care. It is important that no trace of a previous sample is left on the instrument as it can affect future readings.

1. Clean the sensor optics using distilled / de-ionised water and dry with a soft cloth.
   Make sure there is no residue visible on the optics.
   Do not touch the sensor optical window with any sharp object.

2. Check that the 5 way connection fitted onto the top of the sensor is clean and free of debris/
   Remove any debris found between the pins and wash with distilled water. Tap water can be used if required.

Should the sensor have been deployed into a heavily contaminated water source then soak the sensor in Isopropanol Alcohol. This will kill any bacteria left on the sensor housing.

Figure 36

Figure 37

Figure 36 shows the 5-Pin connector fitted onto the fluorometers.

Figure 37 shows the Window fitted onto the front of the fluorometers.

Figure 38 - 3 x Fluorometers inside a multiparameter housing.

Remove the shade cap and clean the sensors fitted into a multiparameter housing.

Use deionised water when possible. Dry with a soft cloth

Remove any contamination and detritus before redeployment.

Dimensions

Figure 39 shows the dimensions of the sensor, which are the same for all ARGES fluorometers.

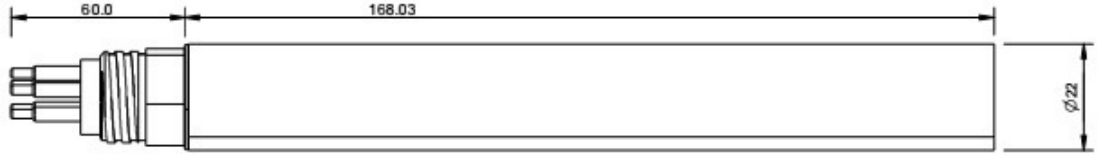


Figure 48

Length: 228mm
Width: 22mm

Sensor Deployment

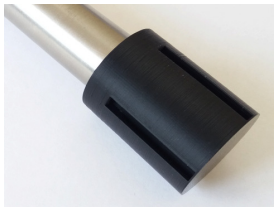


Figure 49 - Shade Cap

Figure 50

Fit the shade cap supplied with the sensor when deploying as a single sensor into a water source in order to protect the window from damage and excess background light.

Keynes recommends a minimum operating depth of 1 meter. Under ideal conditions keep the sensor in shade. The shade can be from a tree or simply in the shadow of a bridge.

Clean with deionised water after use and dry with a soft cloth.

When fitted into a multiparameter housing ensure that the shade cap for the complete unit is installed.

The images below show the different multiparameter housing configurations with the shade cap attached.

Figure 51

Figure 52

Figure 53

Charts and Panel Meters

Example Configuration

The images below are taken from the configuration of a 3 port SONDE using

CDOM/fDOM sensor ID = 3
Dissolved Oxygen Sensor ID = 4
Turbidity ID = 5

The QLOG software can be configured to show real-time measurements on panel meters and charts as shown below

Select the '**View**' tab from the main QLOG window to select the panel meter and chart options.
The charts support up to 2 Y axis parameters, so Dissolved Oxygen and temperature values can be shown on the same plot.

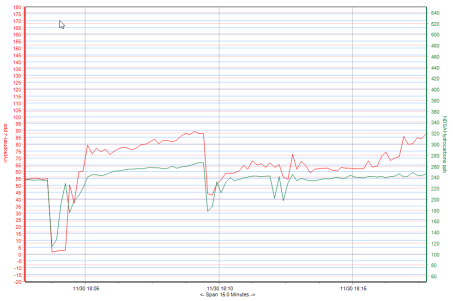


Figure 54

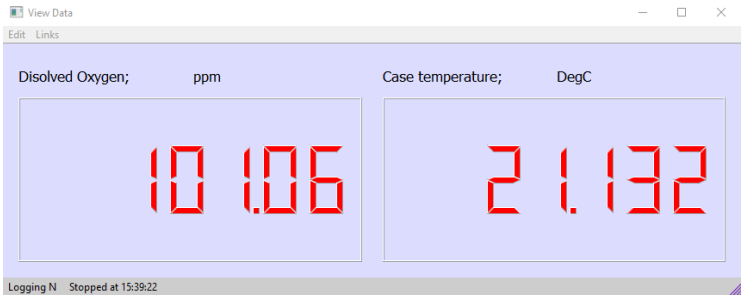


Figure 55

Setting Up The Panel Meter Display

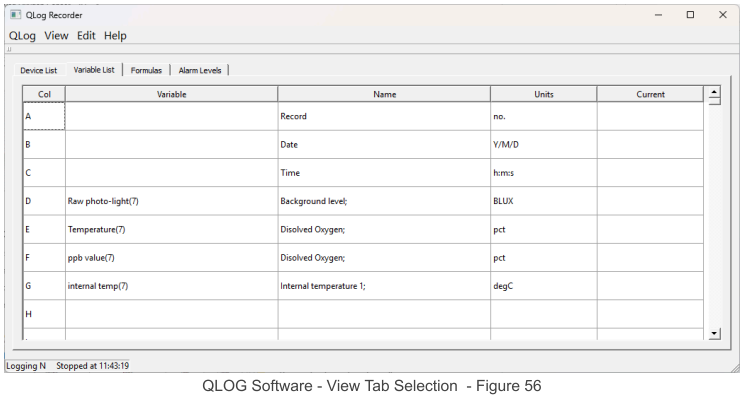
The QLOG software can present results in a series of User defined panel meters or charts.

The panel meter configuration is the same for all the different panel user assigned panel meter displays.

A typical panel meter display for the ARGES Dissolved Oxygen sensor is shown above.

To configure the QLOG software panel meter then:

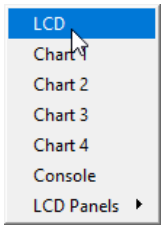
1. Start at the QLOG main menu - Select the '**View**' Tab



QLOG Software - View Tab Selection - Figure 56

It does not matter where or how the QLOG software is configured, or what type and number of sensors are in operation.

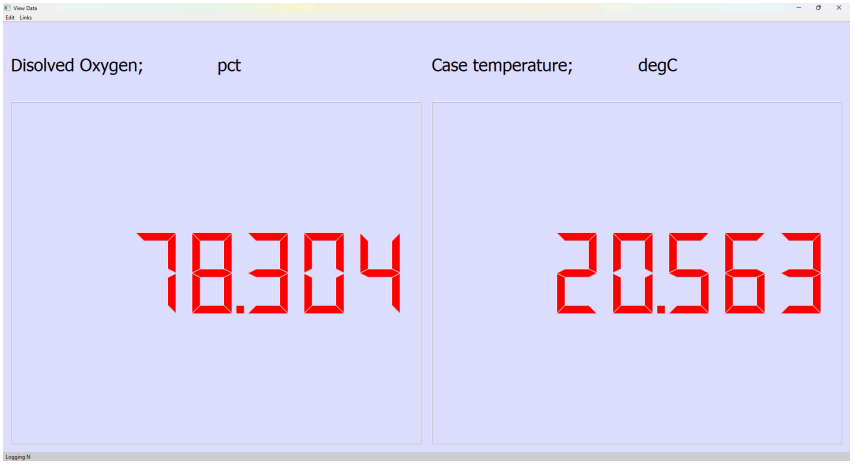
The panel meter configuration is the same.



Select ‘LCD’ Option from the View Tab List.

Figure 57

A panel meter display will appear but it will require configuration to make it usefull. The display will be the last panel meter configuration that was previously saved, or used on the Windows device.



1 x 2 Panel Meter Display - default

Figure 58

Number of Parameters to Display

Currently the panel meter can display up to a maximum of 32 individual parameters on a single display

However for most applications only several parameters from the sensors are required.

1. From the panel meter display select the ‘Edit’ Tab

Note. The panel specification is Column x Row. 2 x 3 = 2 Columns x 3 Rows.

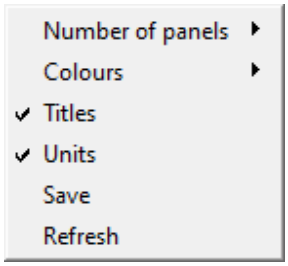


Figure 60

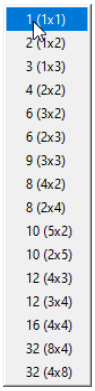


Figure 61 - Panel List

2. Select the number of parameters that are to be displayed.

The greater the number of parameters then the smaller they will appear on the display.

Once the number of parameters has been defined then the panel meter display will update to show the changes.

Selecting the parameters to be displayed.

1. Select the ‘Links’ tab on the panel meter a menu similar to that shown below will appear.

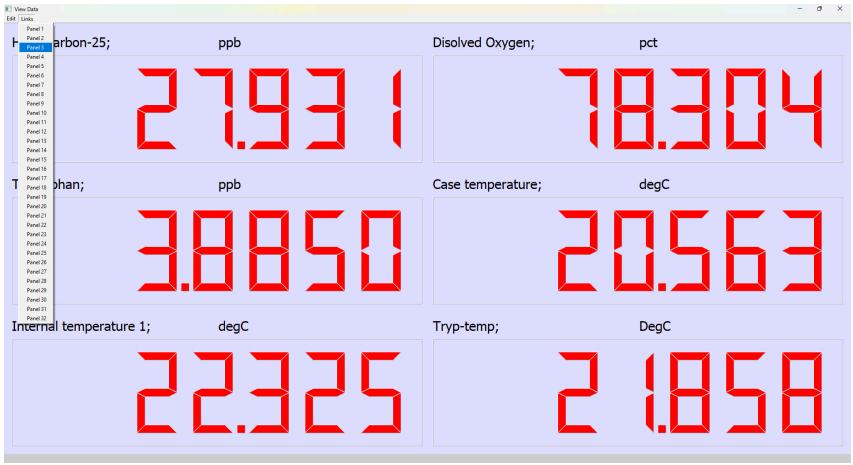


Figure 62

Parameter 1 is always the top left hand corner of the display.

In the panel opposite

Parameters selection is

Panel 1 **Panel 2**
Panel 3 **Panel 4**
Panel 5 **Panel 6**

Choose Parameter

Repeat this operation for each parameter to be shown.

Select ‘Panel 1’ and this will display a value in the top left hand 7 segment display - The Select variable Window similar to that shown will appear.

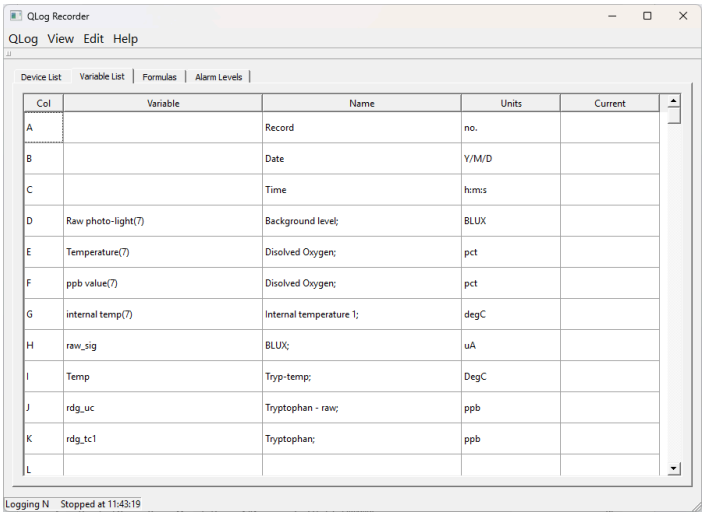


Figure 63

All the sensor measurements that are in use will be displayed in a table similar to that shown opposite in Fig 63

Choose the parameter to be displayed
Press the ‘**Select** ‘ button to confirm.

Example: select ‘Dissolved Oxygen Compensated’ in cell J.

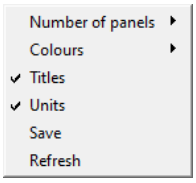
Press the **‘Select**’ button and the current temperature compensated value will appear in the panel meter.

Repeat the operation for all parameters to be displayed.

Once all the parameters are set then close the Select Variable Window

Saving the Panel Meter Configuration

In order to save the Panel Meter setup once it has been configured select the ' **Save**' menu option as shown in the figure below.



SDI12 V 1.4 Features

In order to use the SDI12 V1.4 feature for any fluorometer type sensor ensure it has already been identified on the network and set up. See page 9 Figure 28 above.

Figure 64

The Window in Figure 41 will appear

Wait to allow all the parameters in the table to be downloaded from the sensor then press the '**Update**' button.

The status LED indicators on a USB-SDI12-AG1 media converter will stop flashing once all of the parameters have been sent.

The ARGES Dissolved Oxygen sensor will report the measu-rements into QLOG with the SI units for area measurement automatically defined.

If a number of sensors are being used then activating the '**Auto Assign**' option in the QLOG menu is recommended.

SDI12 V1.4 assigned SI Units

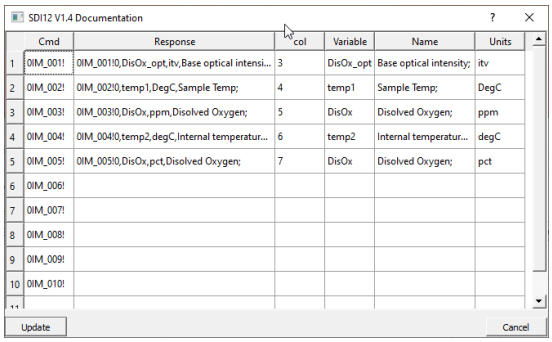


Figure 65 - SDI12 V1.4 SI Units

The SI units are preset into the sensor and will automatically assign themselves in measurement operation.

The sensor can output concentration in the following units:

- %Stauration / pct
- mg / L
- mol / dm³
- ppm

Temperature will always be given in °C.

The ARGEs Dissolved Oxygen sensor supports the SDI12 V1.4 protocol and as such supplies measurements directly in SI units.

The SI units for the Dissolved Oxygen sensor are shown in Figure 43 above.

To store any changes into the sensor select and press the 'Update' button.

Supported Commands

Table 3 below lists the commands supported by the Dissolved Oxygen Sensor

Start measurement	aM!	a05\r\n where 05 = time delay before measurement sent
Send ID	aI!	14KEYNESCOISELEC Part description assigned by Keynes
Address Query	?!	Where a = ID number - 0 - 9 (standard) / (a..z) Enhanced SDI-12 0 - 9 / a - z for RS485
Change Address	aAb!	where a = Initial address and b = Final address
Start Measurement	aM!	Make a measurement - a = address of sensor Example 1M! starts a measurement for sensor with ID=1
Set Output Variables	XCSTR0	Sets the parameter order for measurements sent from the sensor - factory set BCDM
Read Serial Number	aXSN!	Instrument Response a+Serial-number
Calibration Date	aXCD!	Instrument Response a+date
First Point FLR	XCA0	Typical value = 2.0107
First point ppb/NTU/DO	XCA1	Typical Value = 100.00
Second Point FLR	XCA2	Typical Value = 6.380
Second point ppb/NTU/DO	XCA3	Typical Value = 0.00
Temperature Compensation % per Deg-C	XCA20	Typical 0.25 % per/Degree C

Table 3

Device List

Figure 44 shows the 'Device List' Tab in QLog for a seven port multiparameter housing. Depending on the ID numbers assigned for the various sensors then this table can vary.

Each individual sensor must have a unique ID/ Address assigned. The Ammonium sensor in Fig 44 has ID = 4.

All sensors identified on a network are listed here.

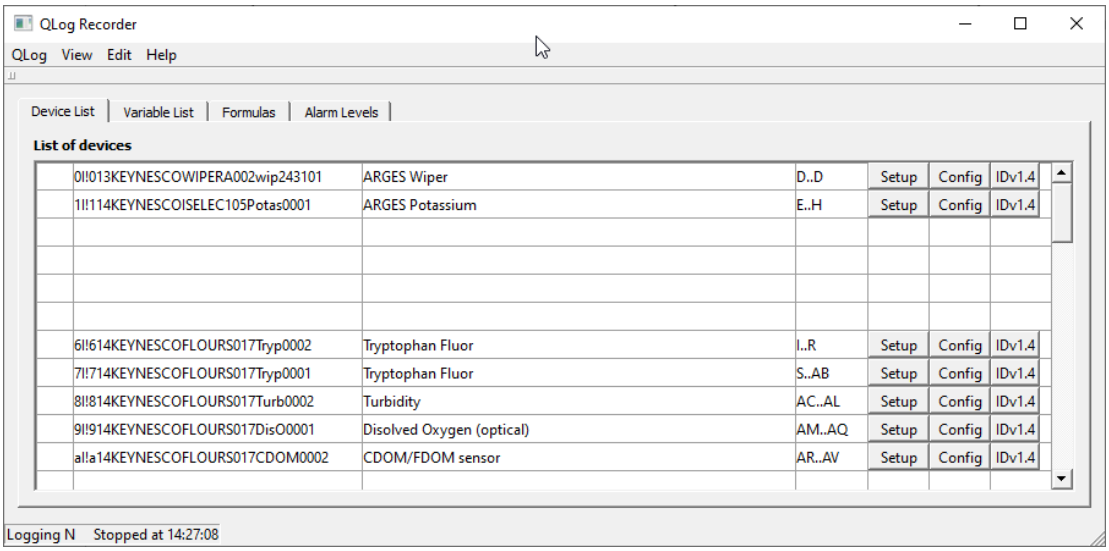


Figure 66

To assign the parameters in the results table correctly simply select the '**Auto-Assign**' option from the QLOG menu list.

User Calibration

To select the User Calibration mode sensor operation

The simplest way to calibrate the sensor is to use the QLOG software and switch the sensor into calibration mode

Measurement mode is when the sensor is returning the real-time measurements such as

Raw concentration (ppm),
Temperature Deg-C,
Temperature compensated concentration (ppm),
raw sensor reading in millivolts

as defined in the output variables, see table 2, parameters AMEG

Press the 'Setup button' as shown adjacent to the sensor shown in Figure 67 below,

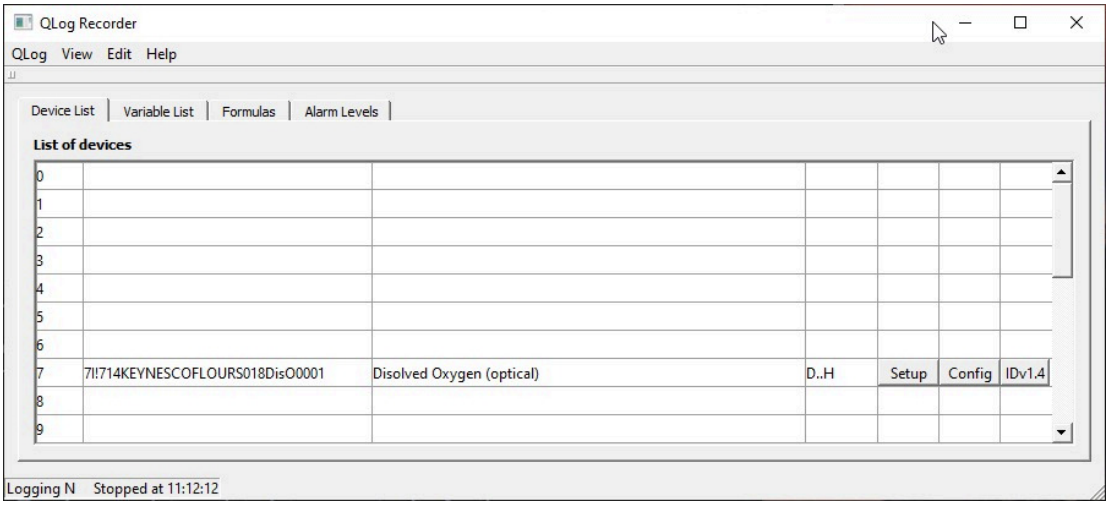


Figure 67

Two menu options are available for selection

1. **Ammonium Sensor**
2. **User Configuration**

Select the '**User Configuration**' option

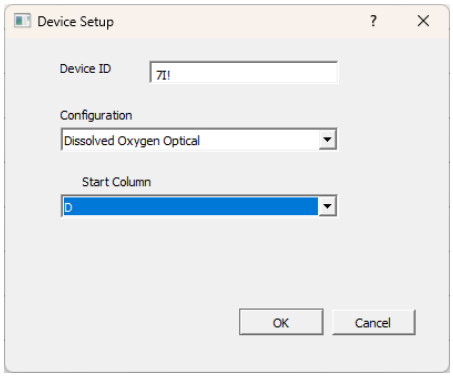


Figure 68 - Measurement Mode

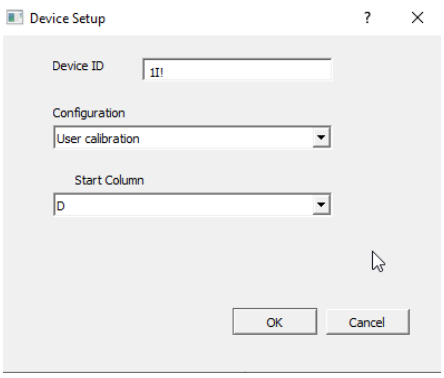


Figure 69 - User Calibration Mode

The output variables AGME shown in table 2 are only returned in measurement mode. If measurements are taken in user calibration mode then the results returned may be incorrect or wrongly identified.

The Sensor Configuration Window shown in figure 70 will appear

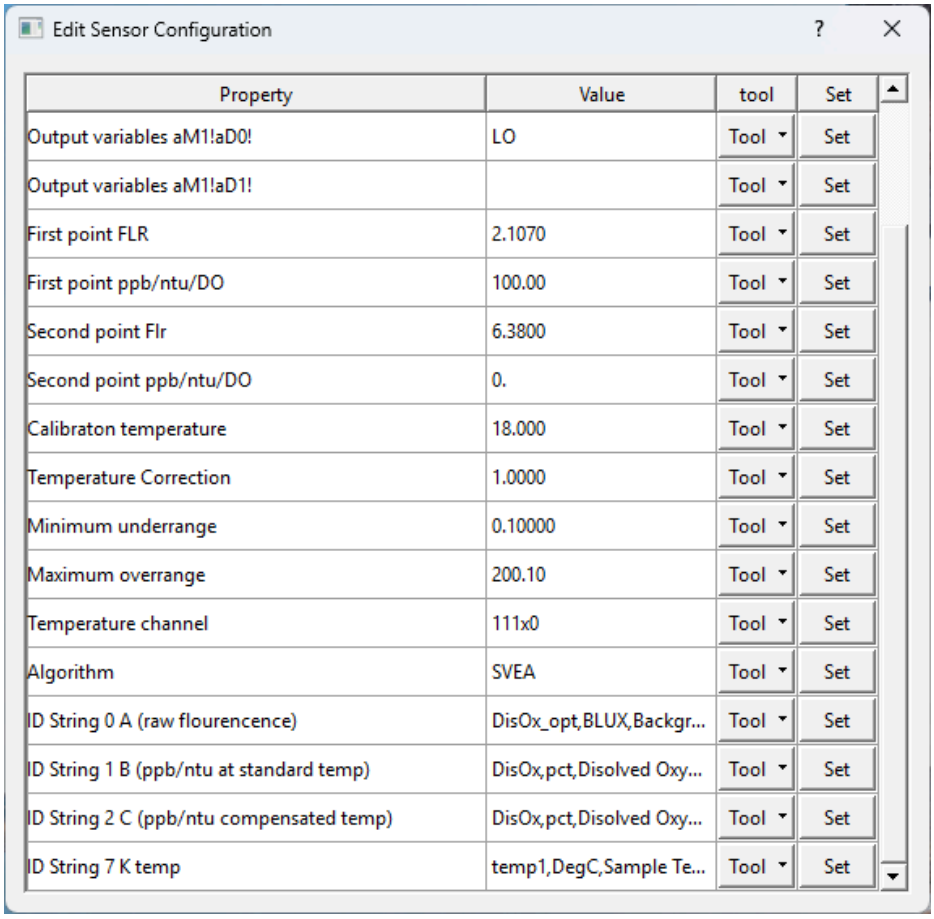


Figure 70 - Dissolved Oxygen Sensor Configuration Window

The user can adjust some but not all of the parameters in this window; **Identifier String**, **Product Type**, and **Serial Number** cannot be adjusted. All of the other parameters can be changed by the user.

Enter each new calibration factor into the table, store the values with the **'Set'** Button. When using a Keynes Controls media converter the status lights will flash briefly, showing the parameters have been sent to the sensor.

After completing sensor calibration the user should switch the sensor back to the normal mode of operation.

Measurement Mode Operation

Once the configuration is complete then the user has to set the sensor to return the standard measurements.

Should the user forget to switch the sensor mode of operation the sensor will return measurements but these may not match defined units shown in the variable list, or panel meter displays.

1. Close the **User Configuration** Window

2. Select the '**Setup**' Button adjacent to the Chloride sensor as shown in figure 67 above.

This is on the Device List tab of the QLOG Software.

3. Select the '**Chloride Sensor**' option as shown in Figure 68 on page 25

QLOG Charts & Panel Meters

Use the 'View' Tab to select and configure the real-time charts and panel meters.
The QLOG software supports up to 4 x dual Y axis real-time charts.

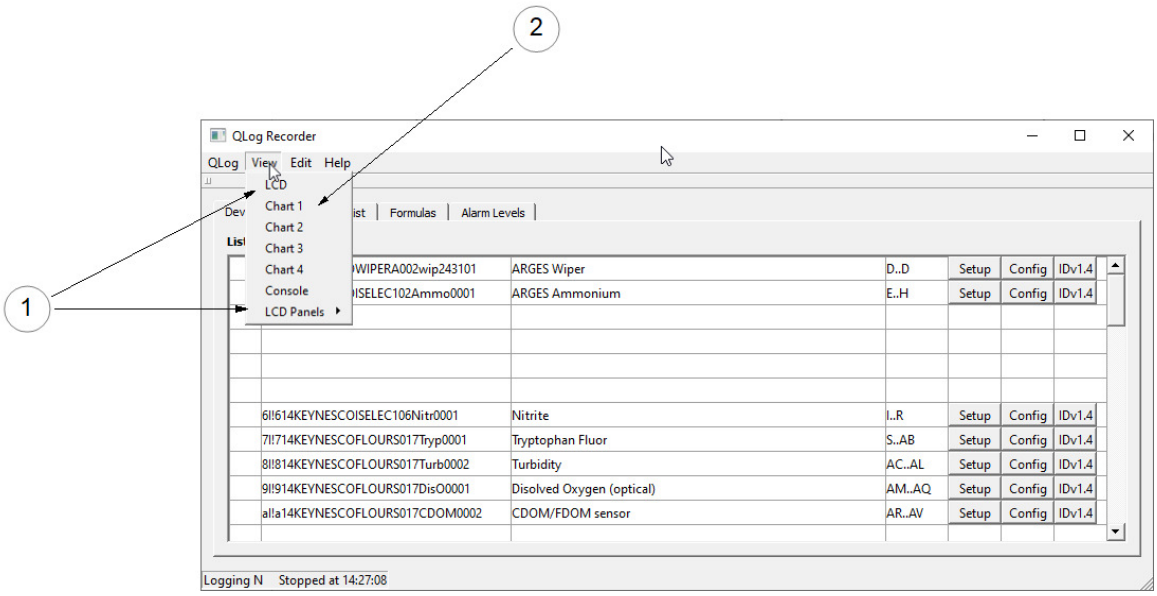


Figure 71

1 = Panel Meter Selection
2 = Charts Selection

Identifying the USB-SDI12-AG1 media converter COM Port Number

Use the Windows Device manager

Select ‘Ports (COM LPT)’

a list similar to that shown below will appear

Windows 10 Device Manager Window

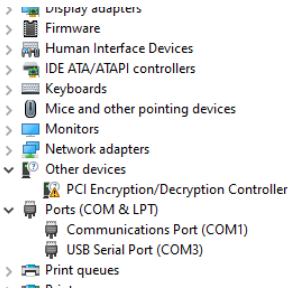


Figure 72

The USB-SDI12-AG1 media converter used in the examples above is identified as **USB Serial Port (COM 3)** as shown in the image opposite.

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