Keynes Controls Ltd

Water Quality Sensors

ARGES Potassium Sensor

ARGES Potassium Sensor Manual

Product Overview

The ARGES Potassium sensor is a submersible selective ion sensor built for taking sustained measurements of dissolved potassium levels in water sources such as rivers and lakes. The sensor is manufactured from high grade PVC tube, fitted with a wet mate network connector, and is designed to conserve power, making it ideal for remote operations. It can be used standalone or as part of a multiparameter system (such as the ARGES SONDE). Like all of the ARGES selective ion sensor range, it has a built-in temperature sensor for measurement correction that can also be used to record the sample temperature.

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

Product Images

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

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

Figure 1

Figure 2

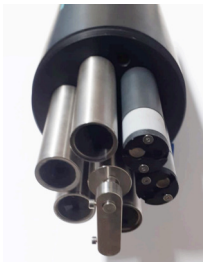


Figure 3

Figure 4

QLOG Applications Software

The ARGES Potassium 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.

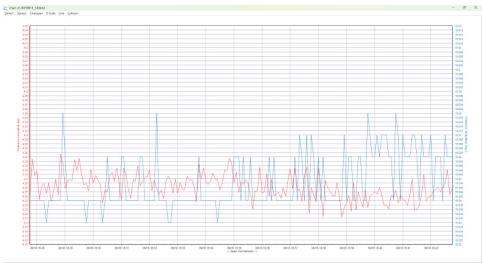


Figure 5

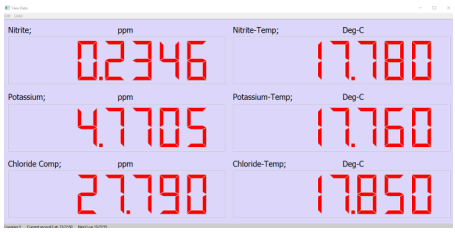


Figure 6

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

Potassium Technical Features

TYPE	RANGE (Typical levels)
Solid state ISE sensor	
Temperature range	0 - 50 °C
Measurement range:	0.1 to 39,000 ppm
Potassium Resolution:	0.01 ppm, on user set range between 0.4 to 39000 ppm.
Potassium Accuracy:	+/- 10 % of reading - depending on the calibration and use.
Operation	Stand-alone / multiparameter solutions.
Sensor life:	Approximately 2 Years, depending on usage.
Long storage shelf life	Dry storage
Integrity	Built in serial number / Latest Calibration Date
User Range	User defined sensor range - Maximum / Minimum
pH	1 - 9
Interference IONS	Rb^{+} (2), Cs^{+} (0.4), NH_4^{+} (0.01), Na^{+} (0.0004), Ca^{2+} (0.0003), Mg^{2+} (0.0003), Li^{+} (0.0001)
Standby Current	

Table 1

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

Measurement Integrity

A solid state sensor makes measurements using reference and selective ion half cells and is suitable for long term submerged operations. For best results it should be deployed into slow moving or stationary water.

The ARGES Potassium sensor is factory calibrated at 2 points, which should bracket the expected value for Potassium concentration in the water. Selective ion sensors cannot be calibrated at a zero point, even with deionised water.

The ARGES Potassium sensor is factory set to provide readings in ppm at the raw sensor temperature, and compensated readings based on the calibration temperature.

where

1 ppm	= 1	mg/mL
1 ppm of Potassium	= 2.56E-05	mols/dm^3

User calibration features are included in the QLOG software supplied with this sensor.

Best Measurement Practice

All selective ion sensors such as the ARGEs Potassium sensor supply the most accurate measurement when deployed in still, or slow flowing water sources.

Avoid fast flowing water sources as this will cause an error in the measurements. Selective ion sensors will report a lower level measurement when used in fast flowing water sources.

Measurement Variables

The following variables are available for use with the Potassium 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
	Main Sensor Readings		
A	Raw Concentration Output		ppm
B	Raw Concentration in mg/mL		mg/mL
C	Raw Concentration in mol/dm³		mol/dm³
E	Raw Chemical Sensor Reading		millivolts
G	Temperature Compensated Concentration		ppm
H	Temperature Compensated mg/mL		mg.mL
	Temperature Compensated mol/dm³		mol/dm³
M	Temperature		°C

Table 2

Variable Selection

The flow chart below shows the parameters from Table 2 and how they are calculated and referenced

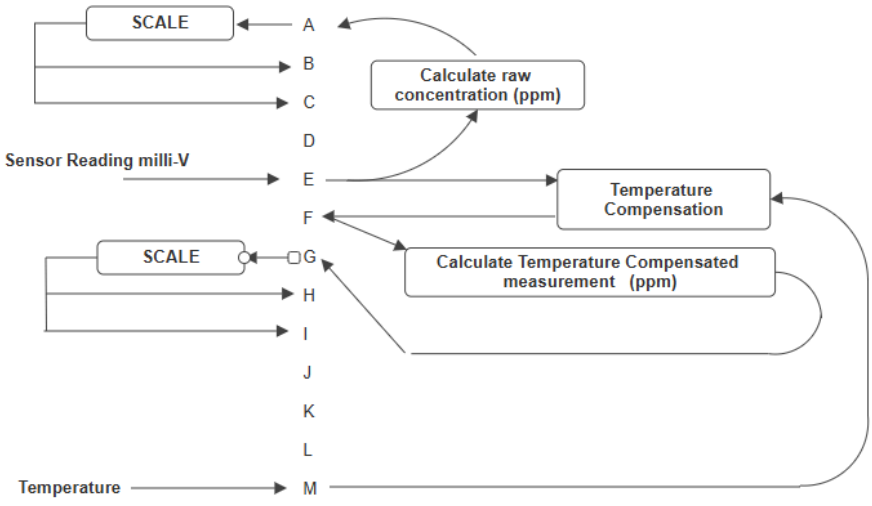


Figure 7

Default Output Parameters : AMGE
Where:

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

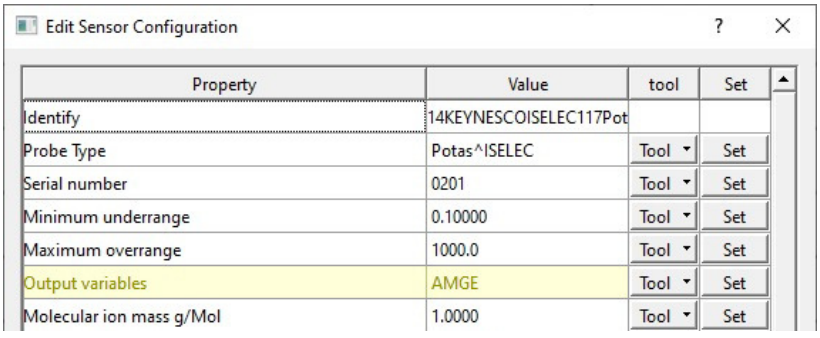


Figure 8 - Output Parameter Selection - Sensor Configuration Window QLOG - Output AGME

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

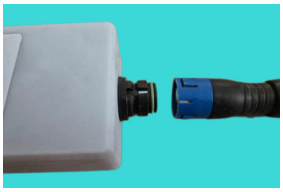


Figure 11

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 Potassium Sensor

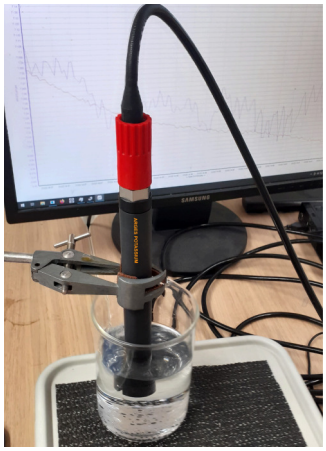


Figure 18 - ARGES network cable attached to the Potassium sensor.

Hardware Installation

The cables used with the ARGES Potassium 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 Potassium 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 Potassium 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 Potassium Sensor

The ARGES Potassium 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.

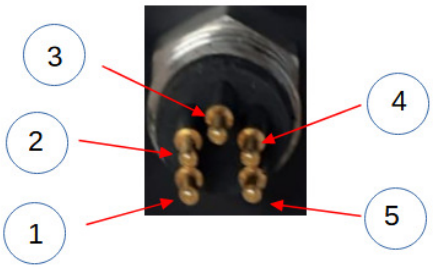


Figure 24

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 Potassium 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.

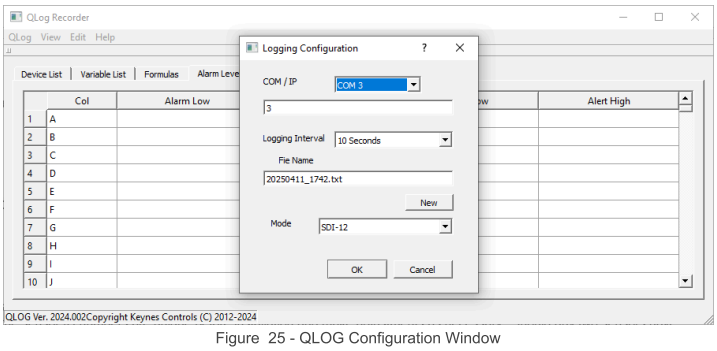


Figure 25 - QLOG Configuration Window

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 Potassium automatically detects the network on which has been connected by reading the network traffic.

The **USB-SDI12-AG1** media converter used with the ARGERS Potassium 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

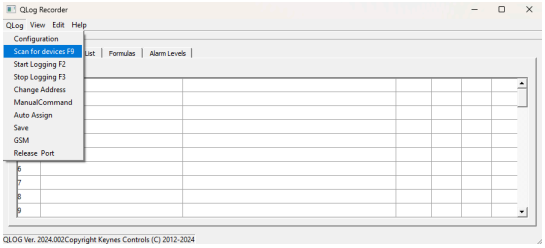


Figure 26

Figure 27

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

Identify Potassium Sensors 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 Potassium sensor this is

a14KEYNESCOISELEC107Potas

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 Potassium 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.

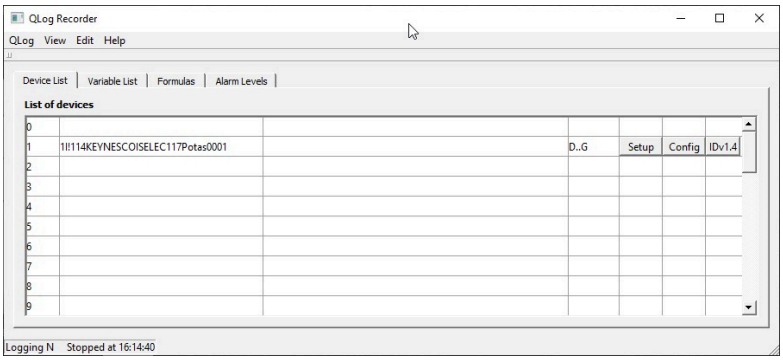


Figure 28 - Device List after a network scan

Figure 28 opposite shows a Potassium sensor with **ID 1** on the SDI12 network.

Figure 33 shows a typical network scan when multiple sensors are being used and has identified a Potassium 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 Potassium sensor above is shown storing measurements into cells D .. G.

Use the Auto-assign option in the main QLOG menu option to enable software to automatically adjust the cells.

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 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 Potassium sensor will be sending to the PC in order to make sense of the results.

The ARGES Potassium sensor is preset to return the following values:

Raw Potassium Concentration	**ppm**
Sample Temperature	**°C**
Temperature Corrected Potassium concentration	**ppm**
Raw sensor reading	**millivolts**

Potassium Measurements

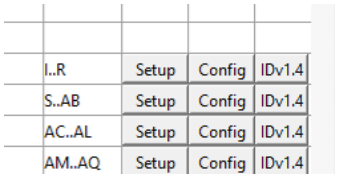


Figure 29

Select the '**Setup**' Button. See column 4 in Figure 28.

The Device Setup Window shown in Figure 30 will appear.

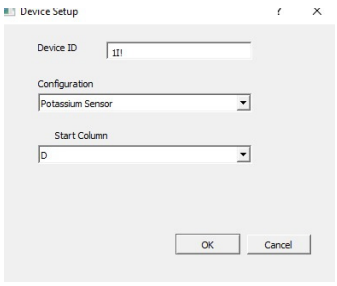


Figure 30 - Potassium Device Setup Window

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

Select the '**OK'** button.

Ensure the '**Potassium 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.

Once all the sensors on a network have been identified and set the cell locations for the measurements can be automatically assigned.

Repeat for all sensors on the network.

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

Using the menu system shown below

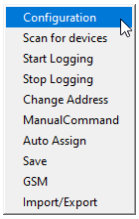


Figure 31

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.

The sensor will return four parameters after each measurement: raw potassium reading (ppm), sample temperature (°C), temperature-corrected potassium concentration (ppm), raw sensor reading (mV).

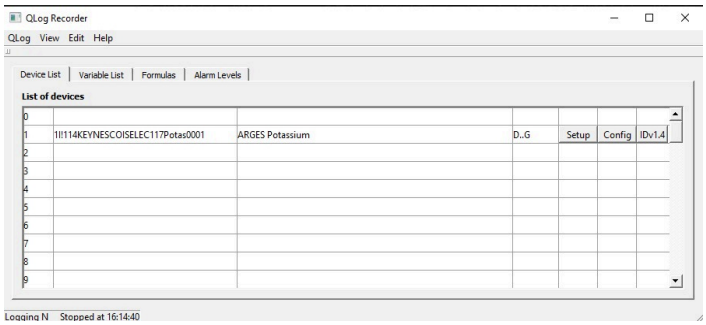


Figure 32

Once the **Auto Assign** function has been activated then the cell references used by the different sensors are automatically assigned.

Figure 33 opposite shows a Device List for a 7 Port multiparameter SONDE with a Potassium sensor set as ID 1 .

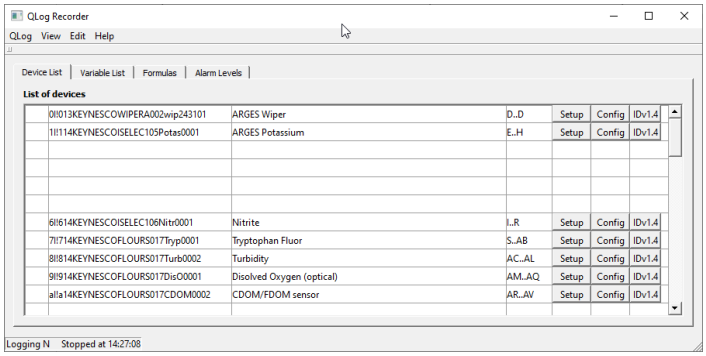


Figure 33

Real-time Measurements

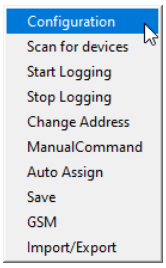


Figure 34

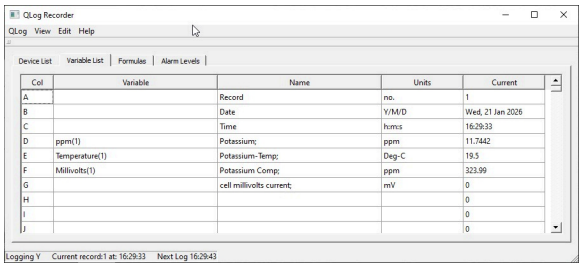


Figure 35 - Real-time measurements

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

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

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.

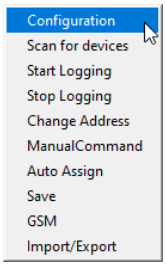


Figure 36

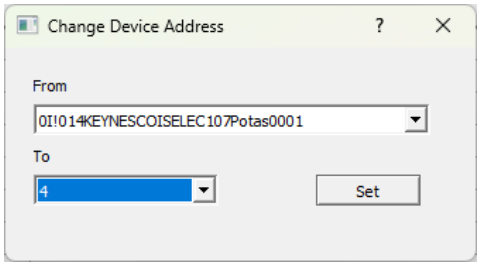


Figure 37 - Change Address Window

The example shows the Change Window configure to adjust a sensor with original ID of 0 to a new ID of 4

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 Potassium sensor requires two calibration solutions, which should bracket the expected value of the solution to be measured. These solutions are most easily made from a base solution of 1000 ppm, which is then diluted down to the desired concentration.

The following table presents the ratios to make a variety of concentrations of solution, as well as the masses necessary to make 200 mL of solution at that concentration. Add the specified masses to 200 g of water.

Ion	Solute	ppm	Ratio	Mass for 200 mL
Potassium	Potassium Chloride (99% pure)	1000 ppm	1 : 518	0.386 g
Potassium	Potassium Chloride (99% pure)	500 ppm	1 : 1037	0.193 g
Potassium	Potassium Chloride (99% pure)	200 ppm	1 : 2595	0.077 g
Potassium	Potassium Chloride (99% pure)	100 ppm	1 : 5191	0.039 g

Table 3

Base Concentration Calibration Solution

The base calibration solution is the one from which the lower calibration solutions are derived.

The values for high and low levels shown are based on the concentration standards used by Keynes for monitoring rivers in the UK and are a good guide to what should be used.

Using 0.2 g Potassium Chloride in 100g of water gives 1036.4 ppm base solution, from which the diluted calibration standards are derived. 100g of water = 100 mL.

Using these values will provide a solution with a concentration of 1036±1 ppm so long as the Potassium Chloride weight is measured correctly using a chemistry scale.

To produce a solution of 1000 ppm, mix 0.386 gram of Potassium Chloride into 200 ml of deionised water (you may find it easier to mix 10 grams of Potassium into 990 grams of water for a 10,000 ppm solution, then mix 100 grams of this solution into 900 of deionised water) to dilute to the base standard concentration.

Common range of potassium in UK rivers is within the range 0.1 to 100 ppm so the example demonstrates sample calibration levels. Do not attempt a zero point calibration.

Store cool when completed. The calibration standard should last approximately 2 months from manufacture.

High Level Calibration Solution

To produce a 103.6 ppm calibration solution, dilute the above 1036.4 ppm solution with deionised water in a 1 : 9 ratio (for example 10 ml of solution in 90 ml of deionised water).

Low Level Calibration Solution

1:4 dilution of the 103.6 ppm standard calibration solution gives 20.7 ppm (for example, 20 ml of solution in 80 ml of deionised water).

Materials Required for Sensor Calibration

The potassium sensor requires the same items for calibration as all other sensors in the ARGES selective ion range:

- High concentration calibration solution
- Low concentration calibration solution
- Beaker of distilled/deionised water
- 2 glass beakers
- Temperature probe
- Sensor stand (ideal but nonessential)
- Magnetic stirrer (ideal but nonessential)

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 Potassium sensor is the same as for the entire range of ARGES selective ion sensors. The easiest way to calibrate a selective ion sensor is to use the free QLOG software and to set the sensor into configuration mode.

Make test measurements at the 2 calibration points. Record the raw values and sample temperature.
For normal river monitoring the calibration points mentioned above will be satisfactory for many applications. Once some idea as to the levels of Potassium in the water source is known then the sensor calibration factors can be adjusted to be closer in range for higher accuracy results.
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 Potassium 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.

Enter the raw Potassium level as measured by the instrument at the known calibration level (ppm). In the example above this will be for 103.6 and 20.7 ppm calibration points. These levels give a good quality sensor reading at the levels expected for sample detection in the UK.

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 Potassium 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.

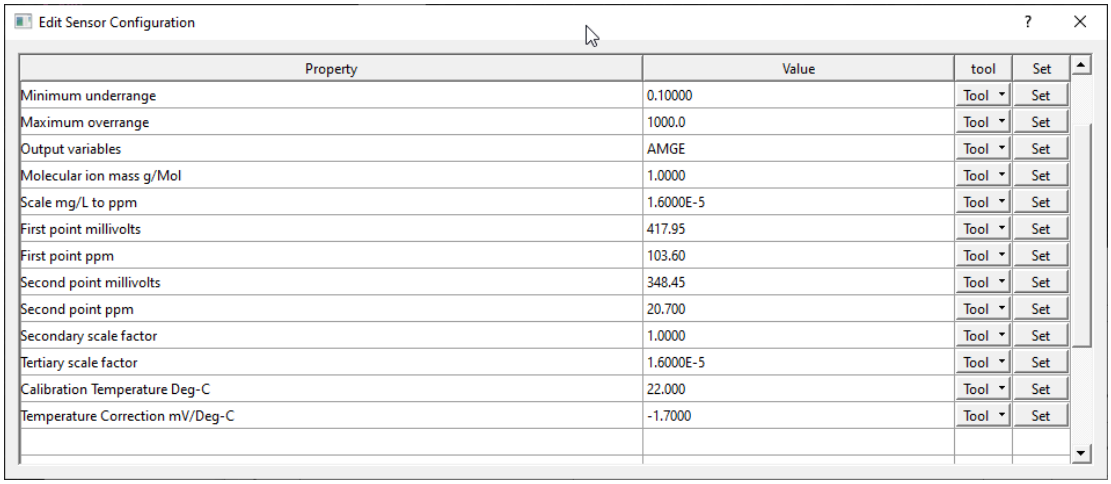


Figure 39 Potassium Sensor Configuration Window

Sensor Configuration Parameters Terms

TERM	DESCRIPTION
Minimum Underange	The minimum value that the sensor will return - Any measurement below this value will also return at the minimum set level. eg \Minimum underrange = 10 ppm then any reading less than this level will show as 10 ppm.
Maximum Overanage	This is the maximum value that the sensor will return - Any measurement above this value will als be returned at the maximum set level.
Output Variables	User selectable outputs variables, see table 2 - Default = **AMGE**
Molecular mass	Mass of the molecule in atomic units.
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 = 2.56E-05
First point millivolt	Raw sensor reading in millivolts with the sensor deployed into first calibration standard solution. Example 103.6 ppm solution - 417.95 millivolts
First point ppm	First point calibration standard solution ppm - as above First point ppm = 103.6 ppm
Second point millivolt	Raw sensor reading in millivolts with the sensor deployed into first calibration standard solution.
Second point ppm	First point calibration standard solution ppm - as labelled
Secondary scale factor	Scalar number - used to calculate mg/l from ppm -
Tertiary Scale factor	Scalar number - used to convert ppm to mol/dm³ - useful for high concentration readings
Calibration Temperature	Temperature for which the calibration was taken.
Temperature Correction mv/°C	Variation in raw sensor millivolts with temperature change - can be a positive or negative value.

Table 4

ARGES Potassium Sensor Configuration Settings

The ARGEs Potassium sensor is fully user configurable. Figure33 above shows the Configuration Window for the potassium sensor.

Setting the Potassium Calibration Parameters

The sensor uses a 2 point calibration system to report measured concentration levels.

First Point Calibration	103.6	ppm calibration solution	431.04 mV
Second Point Calibration	20.7	ppm calibration solution	396.49 mV

The value of 431.04 is the measurement reported from the ARGES Potassium sensor in Manufacturer Setup Mode using a 100 ppm test solution. To store new parameters into the instrument configuration select the '**Set**' button. The sensor reading in millivolts will vary between sensors and over time.

The ISE sensor requires two calibration points - a high concentration value and a low concentration value. It does not matter if the values are entered high then low or low then high. It is not possible to use a 0 ppm solution for calibration, a nonzero low value must be used.

Maximum Concentration Level

The operating range of the ARGES Potassium sensor is user defined.

Maximum Overange: Sets the maximum level of measurement that the sensor can return
Maximum Overange: 1,000 ppm See Figure 40 below.

In this example a ARGES Potassium sensor has a maximum range of 1,000 ppm. Any measurement above the 1000 ppm level will return as 1000 only.

The sensor will not return a value greater than 1,000 ppm.

Minimum Concentration Level

Minimum underrange: Sets the minimum level of measurement that the sensor can return
Minimum underrange: 0.1 ppm

Note - Potassium sensor configuration below will be set to operate from 0.1 to 1000 ppm only.
Should the sensor be calibrated over the range 0 to 100 ppb then the out of range message can be set to operate over the 0 to 100 ppm range.

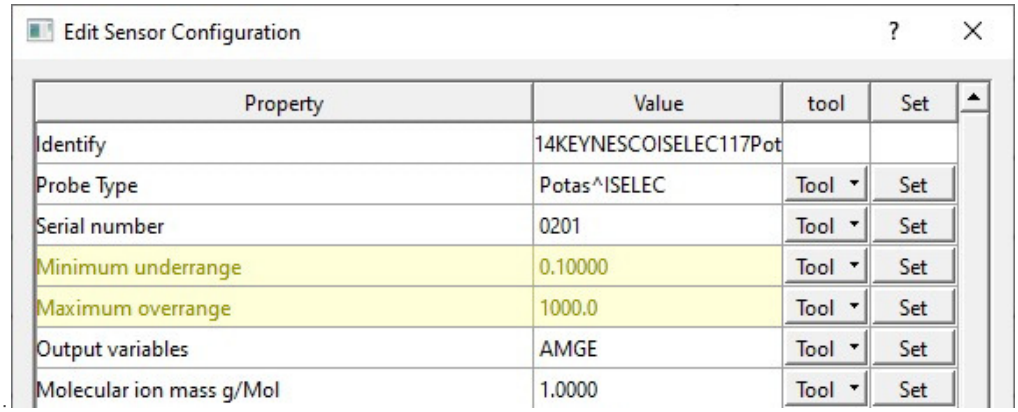


Figure 40

Typical Calibration Curve for Ion Selective Electrode

Figure 41 illustrates the response (in voltage) produced by a selective ion sensor when measuring a solution of a given concentration.

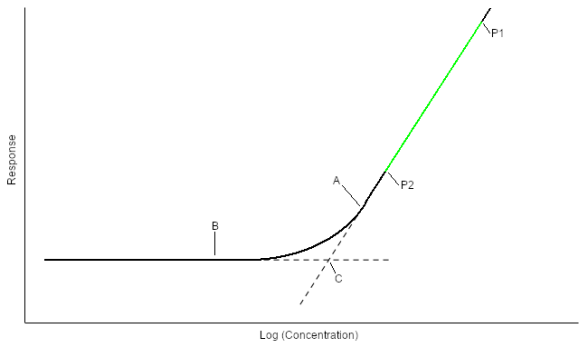


Figure 41 - ISE sensor response graph

A selective ion sensor is usually calibrated between two points (example points here labeled P1 and P2) on the linear section of the graph. Below a given concentration (the point labelled A on the graph) the calculation becomes nonlinear, and a sensor expecting to measure in this region will be calibrated differently. The ARGES sensor cannot measure this out of the box, but can be set up to do so on request.

Selective ion sensors have a lower limit on the concentration they can meaningfully detect as the response asymptotically tends towards a fixed value as concentration lowers.

The calibration points P1 and P2 are chosen to give good reliable readings in milli-V at the calibration contraction levels.

For river water operations Keynes Controls typically calibrate the sensor at 97 ppm and 25 ppm.

Where:
P1 = 97 ppm
P2 = 25 ppm for the above plot.

Output Variables

The ARGES Potassium 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 Potassium sensor Configuration Window where the output variables are assigned.

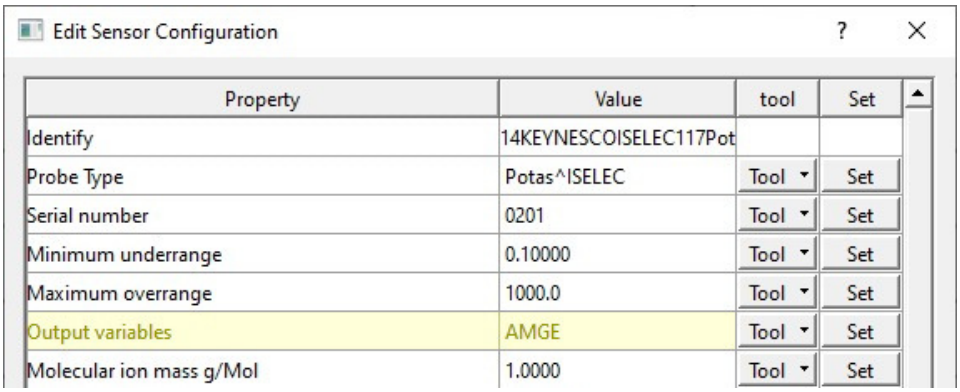


Figure 42 - ARGES Potassium Configuration Window - Return Parameters

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 - Potassium 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 selective ion sensor

The ARGES selective ion sensors 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 using distilled / de-ionised water and dry with a soft cloth.
   Make sure the channel between the potassium half cell and the reference is clean before deployment.

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 44

Figure 37 shows the head of the potassium sensor head. The trench between the two sensors i where the conductive bridge will form and must be cleaned and clear of contaminants.

Figure 45

Figure 46

Figure 38 shows the 5-Pin connector fitted onto the selective ion sensors.

Figure 39 shows the sensor fitted inside a multiparameter housing. A brush unit can be used to clean the sensor heads between measure operations.

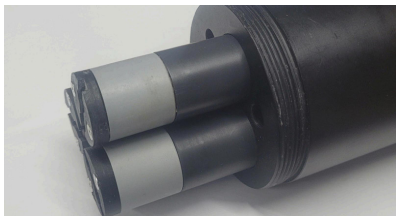


Figure 47 - 3 x selective ion sensors inside a multiparameter housing.

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 selective ion sensors.

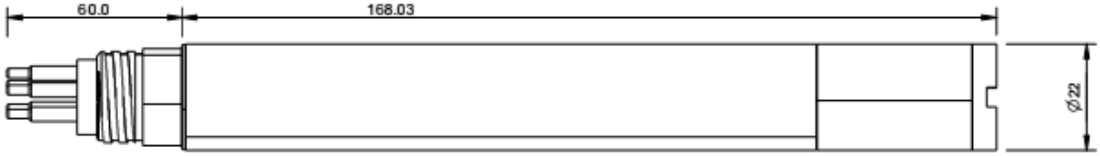


Figure 48

Length: 228mm
Width: 22mm

Sensor Deployment

Figures JJ to LL show the ARGES Potassium sensor prepared for direct deployment into the water source. Make sure the network cable is attached and secured onto the instrument. The sensor can be directly connected to the USB media converter for use with a Windows computer system. The sensor can be directly into a data logger using the SDI12, or RS485 communication networks.

Figure 49

Figure 50

Figure 51

Multiparameter Sensor Deployment

The ARGES Potassium sensor can be fitted into a multiparameter housing. Use silicone grease on the 5 pin connector to ease the installation onto the housing socket.

The sensor can be fitted into any spare port in the housing. Secure the protective housing shade cap to the base unit Once the network cable is attached the multiparameter sensor system can be deployed.

Fit the shade cap supplied with the housing when deploying as a multiparameter system into a water source in order to protect the sensor heads from damage and debris.

Figure 52

Figure 53

Charts and Panel Meters

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 Potassium and temperature values can be shown on the same plot.

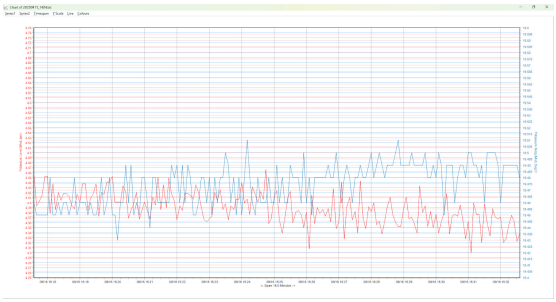


Figure 54

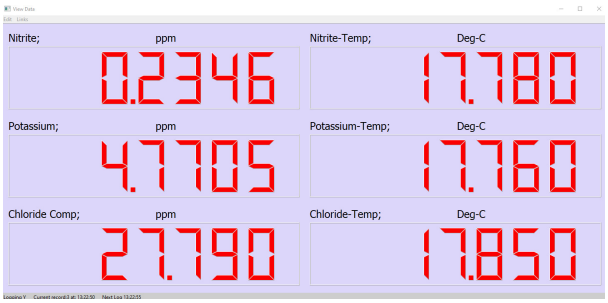


Figure 55

Setting Up The Panel Meter Display

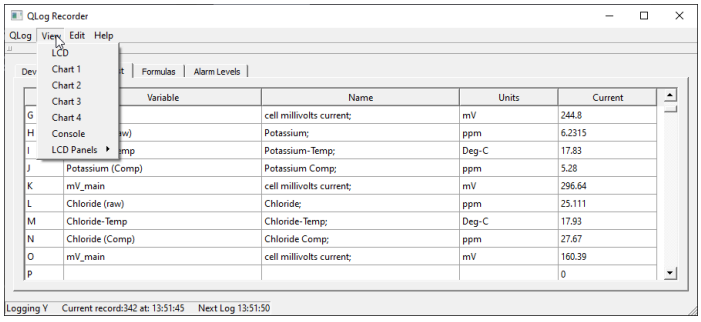
The QLOG software can present results in a series of User defined panel meters or charts.

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 Potassium 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.

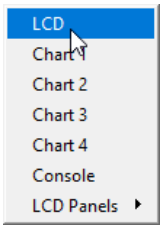


Figure 57

Select 'LCD' Option from the View Tab List.

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.

+- 2 x 3 Panel Meter Display

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.

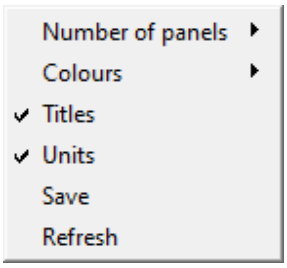


Figure 60

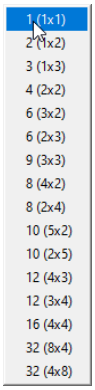


Figure 61 - Panel List

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.

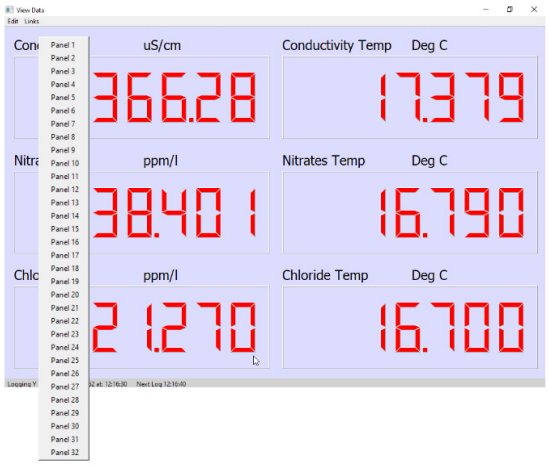


Figure 62

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.

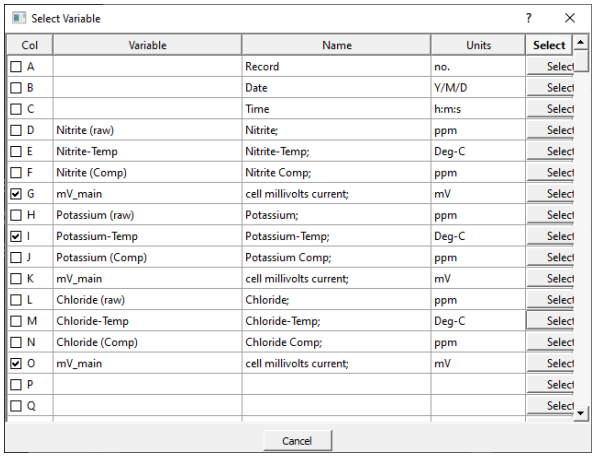


Figure 63

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 ‘Potassium Compensated’ in cell J.

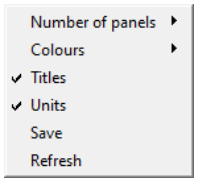
Press the **‘Select**’ button and the current temperature compensated value will appear in the panel meter.

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 ISE 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 Potassium 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

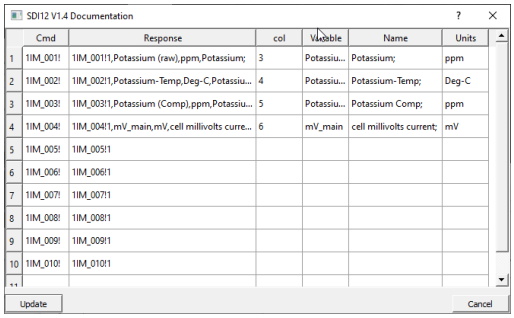


Figure 65 - SDI12 V1.4 SI Units

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:

- ppm
- mg / L
- mol / dm³

Temperature will always be given in °C.

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

The SI units for the Potassium 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 Potassium 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 Calibration point (ppm)	XCA0	Typical value = 103.6 ppm
First point uncompensated (mV)	XCA1	Typical Value = 417.95 mV
Second point electrical (ppm)	XCA2	Typical Value = 20.7 ppm
Second point uncompensated mV)	XCA3	Typical Value = 348.45 mV
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 potassium sensor in Fig 44 has ID = 1.

All sensors identified on a network are listed here.

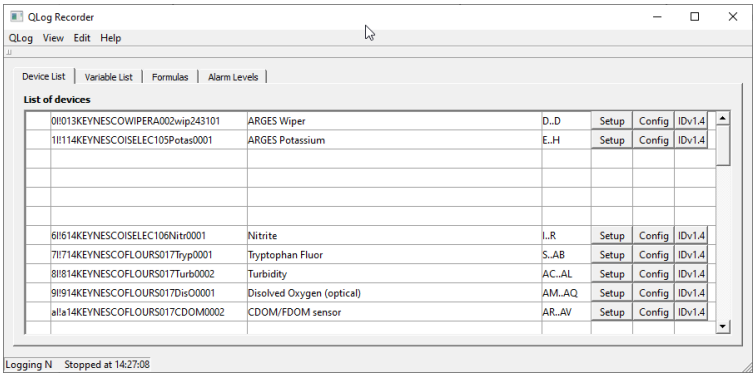


Figure 66

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 from measurement mode 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,

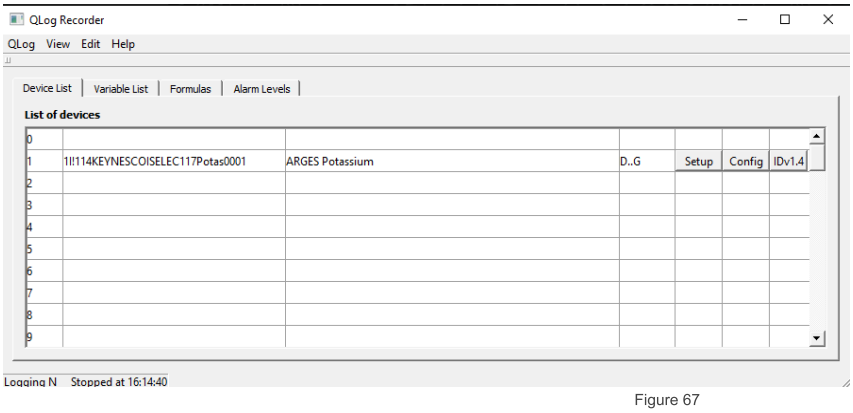


Figure 67

Two menu options are available for selection

1. **Potassium Sensor**
2. **User Configuration**

Select the ‘**User Configuration**’ option

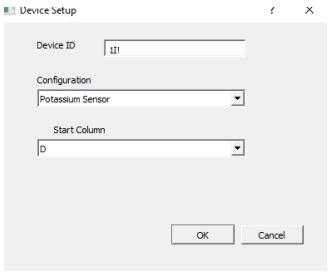


Figure 68 - Measurement Mode

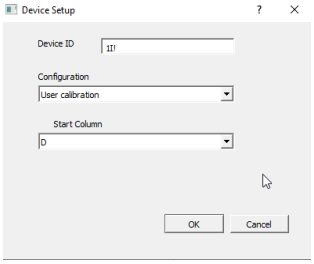


Figure 69 - User Calibration Mode

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

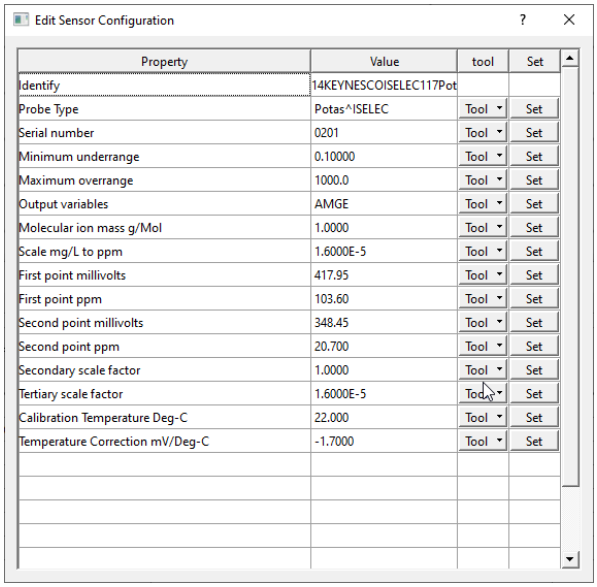


Figure 70 - Potassium Sensor Configuration Window

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.

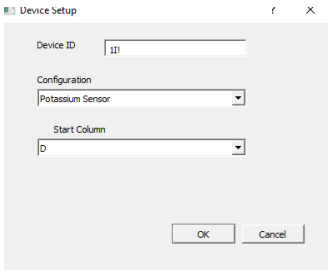
Should the user forget to switch the sensor mode of operation the sensor will return measurements but these may not match defined units shown in the variable list, or panel meter displays.

1. Close the **User Configuration** Window

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

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

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



Standard measurement mode

The sensor will now return the new calibrated measurement values.

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.

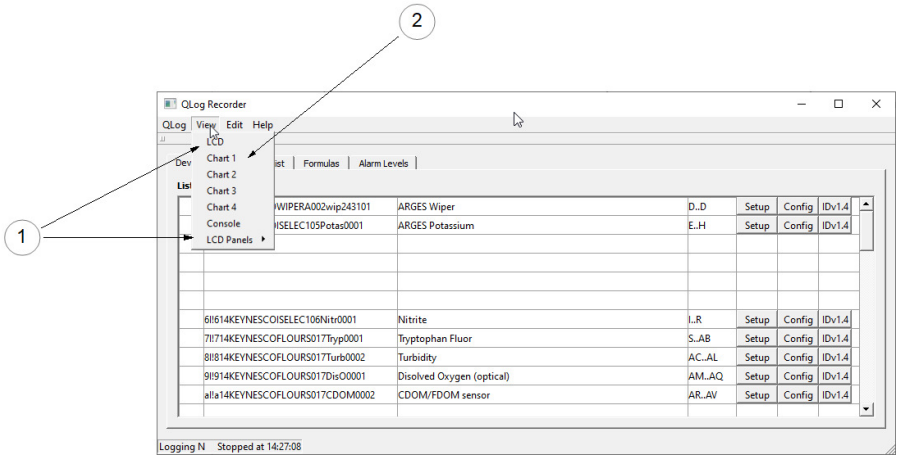


Figure 71

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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