ARA Single Gas Detector

Instrument User Manual V1.1



Pioneering Gas Sensing Technology.

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Thank you for purchasing your ION Science product.

Standard warranty for the ARA is two years.

Hibernation models have a three-year warranty (if hibernation mode is activated)

Hibernation models (ARA100H and ARA200H) require the ARA IR Link p/n 908201 to activate and deactivate the Hibernation function.

EU Declaration of Conformity

The EU Authorised Representative of the manufacturer Ion Science limited has sole responsibility, on the date this product accompanied by this declaration is placed on the market, the product conforms to all technical and regulatory requirements of the listed directives

Authorised Representative:	ISM Deutschland GmbH · Laubach 30 · D-40822 Mettmann, Germany
PRODUCT:	ARA Single Gas Detector Series
MODEL:	ARA100, ARA200, ARA300, ARA400, ARA100H, ARA200H
Description:	Intrinsically safe, wearable single gas detectors.
Directive:	ATEX Directive (2014/34/EU) EMC Directive (2014/30/EU)
Certificate:	CML 20ATEX2016 IECEx CML 20.0007
Notified body:	SGS Fimko 0598
North American: certifying authority	QPS
North American File #:	ML 1621-1
Type of protection	CE Ex II 1G Ex ia IIC T4 Ga

ATEX TEMPERATURE RANGES	H_2S (ARA100, ARA100H)	-40°C ≤ Ta ≤ 60°C
	CO (ARA200, ARA200H)	-40°C ≤ Ta ≤ 60°C
	O_2 (ARA300)	-30°C ≤ Ta ≤ 60°C
	SO_2 (ARA400)	-40°C ≤ Ta ≤ 60°C

APPLIED TECHNICAL STANDARDS	EN ISO 60079-0-2018 EN ISO 60079-11-2012 EN ISO 61010-1-2010 EN 55032-2015 EN 55035-2017 EN ISO 61000-3-2-2014 EN ISO 61000-3-3-2013
ATEX Notified Body	SGS Fimko 0598

Name: Clemens A. Verley **Position:** Chief Executive Officer

Signature:  **Date:** 31st December 2020

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Safety

Legal Notices Regarding the Safe Operation of Equipment

- Whilst every attempt is made to ensure the accuracy of the information contained in this manual, ION Science accepts no liability for errors or omissions in the manual, or any consequences deriving from the use of information contained herein. It is provided “as is” and without any representation, term, condition or warranty of any kind, either expressed or implied.
- To the extent permitted by law, ION Science shall not be liable to any person or entity for any loss or damage which may arise from the use of this manual.
- We reserve the right at any time and without any notice to remove, amend or vary any of the content which appears in this manual.

Symbols

	**WARNING!** **USED TO INDICATE DANGER WARNINGS WHERE THERE IS A RISK OF INJURY OR DEATH.**
	**Caution** **Used to indicate a caution where there is a risk of damage to equipment.**
	**Information** Important information or useful hints about usage.
	**Recycling** Recycle all packaging.
	**WEEE Regulations** Ensure that waste electrical equipment is disposed of correctly.

Warnings, Cautions and Information notifications

The following Cautions apply to the product described in this manual.

	If the ‘Activate Before Date’ marked on the package is expired, do not activate.
	Do not attempt to replace the internal components. This could impair the intrinsic safety rating and will void the warranty of the product.

	Before daily use: Make sure the sensor and audible port are clear of any obstruction such as debris or blockages. Perform the self-test to ensure the display, visual, audible and vibration alarms are operating. The sensor symbol stops blinking if the self-test is successful.
	Ensure that the O_2 detector is zeroed at least every 30 days in a clear air environment. See O_2 detector section for information on zeroing. The toxic gas sensors (CO, H_2S & SO_2) may require calibration during the life of the product. ION Science recommend bump testing frequently to ensure the sensor is functioning. Perform a bump test at least every 30 days. Please perform a bump test if the detector has been subject to physical impact, liquid immersion, over limit alarm event, change of ownership or anytime the detectors performance is in doubt. Perform a bump test by exposing the detector to a concentration of gas that exceeds the low alarm set points. When selecting suitable bump test concentrations, please consider your local health & safety exposure limits and ensure to take any necessary precautions when handling these gases. If the unit fails the bump test, attempt a calibration.
	The accurate measurement of gas concentration depends upon the target gases and the period.
	The product is a gas detector, not a measuring device.
	Do not attempt to replace the battery or sensor, the product is designed to be maintenance free, changing these components will void the warranty.
	If you suspect any malfunction or have any technical problems, please contact ION Science.

The portable ARA has been designed and certified Intrinsically Safe.

Disposal

- The equipment does not include any toxic materials, but if it has been contaminated by toxic materials, then exercise due care and follow the appropriate regulations when disposing.
- Always adhere to local regulations and procedures when disposing of the equipment.
- ION Science Ltd offers a take back service. Please contact us for more information.



RECYCLING

The detector contains a lithium battery that must be disposed in a recycling bin.



WEEE REGULATIONS

Ensure that electrical equipment is disposed of correctly.

The portable ARA has been designed and certified Intrinsically Safe.

Device Overview

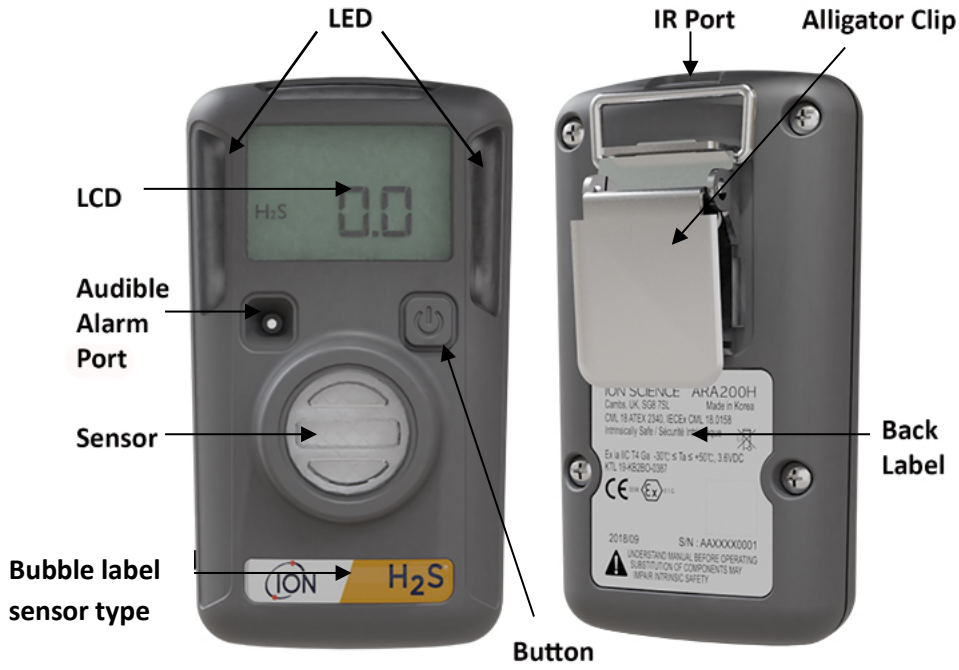
The ARA is a portable, single gas detector. These devices are disposable and will operate for 2 years without any replacement of components, to detect the presence of specific toxic gases or depleted/enriched Oxygen. There are 4 single gas detector options:

1. Hydrogen Sulphide (H_2S)
2. Carbon Monoxide (CO)
3. Sulphur Dioxide (SO_2)
4. Oxygen (O_2)

For ease of use, the ARA is single button operation. Ensure the manual is fully understood before using the ARA.

Device overview

Diagram 1 below shows the key components of the product.



Activating ARA

To activate ARA within the validity period indicated on the packaging, press and hold down the button for approximately 5 seconds.

On activation, ARA will sound an audible alarm, flash and vibrate in sequence.

A successful activation will display the life remaining (24 months) or the reading value.

Display (LCD and Symbols)

Ara uses an LCD display to show its status. In the absence of gas, it will display the life remaining. When gas is present, the display will automatically shift to show what the gas concentration is.

NOTE: The display mode can be changed in the IR Link software with the "Life Remaining" and "Sensor Reading" user options.

WARNING: If the display is missing icons or displayed figures can’t be read, please contact ION Science promptly.

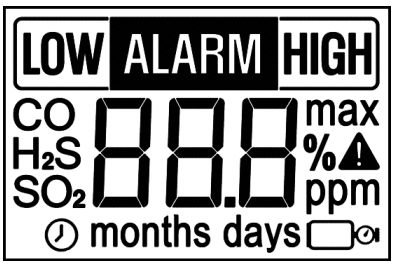


Image above shows all the icons on ARA.

The table below shows the symbols and their meanings.

Self-Test

Prior to daily use, it is recommended that users perform a self-test to ensure ARA awareness alarms (audio, visual and vibration) and all segments of the display screen are functioning correctly.

Mode	Symbol	Description
Alarm	ALARM	HIGH/LOW Alarms
	LOW	LOW Alarms
	HIGH	HIGH Alarms
Sensor	H_2S	H_2S sensor (blinking: Self-Test required)
	CO	CO sensor (blinking: Self-Test required)
	O_2	O_2 sensor (blinking: Self-Test required)
	SO_2	SO_2 sensor (blinking: Self-Test required)
Warning	⚠	Self-Test, Bump-Test, Calibration failed
	max	Exposed to gas above Low alarm set points
		blinking: Bump-Test required
Unit	%	to display unit of O_2 sensor
	ppm	to display unit of H_2S/CO/SO_2
Time		to display Life Remaining
	months	to display time over 1 month
	days	to display time over 24 hours

Below is a step-by-step process for performing the test:

STEP 4

When the self-test is successful, one short audible beep will sound, the unit will then turn to the original screen.

NOTES:

Self-test can be performed with the IR Link when the sensor icon isn't blinking after 1 hour from self-test.

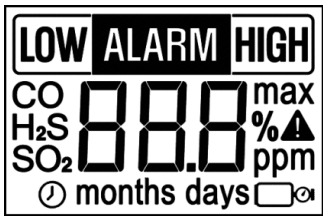
The self-test interval reminder can be defined by the user from 8 to 168 hours (7 days) via the IR Link software.

The factory default setting is 20 hours.

After pressing the button, the unit will perform the following sequence:

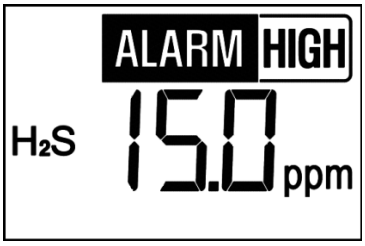
The right and left side LEDs light up after emitting audible beep and vibration.

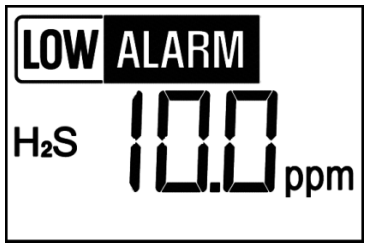
All LCD display icons appear.



STEP 3

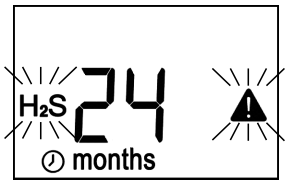
LOW and HIGH alarm set points will be displayed.
When LOW and HIGH alarm set points are displayed, the unit will perform STEP 2 if you press the button.





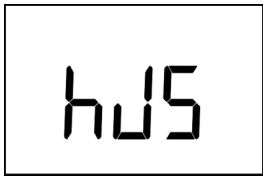
If the unit fails the self-test, a warning icon ⚠ will appear and the sensor type icon will start to blink. The unit will then wait for the self-test to be repeated.

If unsuccessful following a few attempts, do not use the instrument and contact ION Science.



User ID Display

If programmed with a "User ID" via the IR Link, the image below will appear on the screen. The "User ID" consists of up to 6 digits and alphabetic characters. If this has 6 characters, it will show 3 characters across 2 screens.



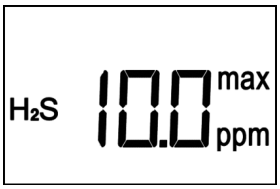
Peak Reading Display

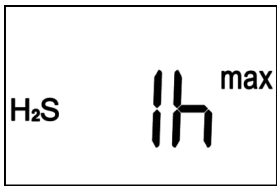
If an ARA has been exposed to a gas concentration that exceeds the LOW or HIGH alarm set points, the detector will display the "max" icon.
If the "max" icon is displayed, the peak (maximum) value will be displayed as shown below.

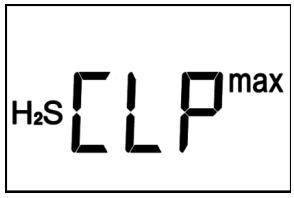
To determine the max peak value detected by the ARA, press the button.

The screen will then automatically scroll to display the LOW Alarm setting, HIGH Alarm setting, maximum peak value, elapsed time since peak reading was detected (in hours, days and months) and finally, the option to clear peak reading and reset to zero (0 ppm for toxic sensors and 20.9% for Oxygen sensor).

Max Peak Value Elapsed Time Clear Peak





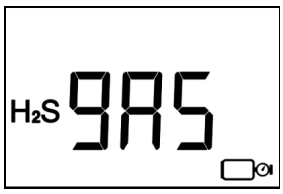


If the user presses the button down while the CLP (clear peak) is displayed, the peak value on the detector will be reset and the "**max** " icon will not be displayed.

Bump Test Display

If the ARA has been programmed to remind the user to perform a bump test, the bump test icon ( ), will appear on the screen and blink.

After pressing the button, the units screen will indicate that its ready for a bump test. For the detailed process of the bump test, please follow the instructions found in "Bump test Procedure".



User guidelines

Please ensure self-test has been completed before use. This is to confirm the functions of the display, audio, visual and vibration alarm are all working.

In normal running mode, the unit will automatically detect gas and alert the user when the concentration of gas goes above the set threshold.

For safety, wear the detector close to the user's breathing zone.

WARNING: Ignorance or failure to notice the alarm can lead to serious injury or death.

Alarms

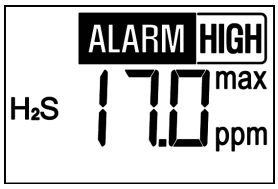
LOW Alarms

1) Audible Alarm (2 times/second)
2) Visual LED blinking (2 times/second)
3) Vibrator Alarm (1 time/second)



HIGH Alarms

1) Audible Alarm (3 times/second)
2) Visual LED blinking (3 times/second)
3) Vibrator Alarm (1.5 time/second)



Alarm Set Point

The below table shows the factory default settings

Alarm	H_2S	CO	SO_2	O_2
HIGH	15 ppm	200 ppm	10 ppm	23.5 %
LOW	10 ppm	35 ppm	5 ppm	19.5 %

These set points can be changed using the IR-Link. Please refer to your local jurisdiction or Company policy for guidance on the set points. To display the detector alarm set points, press the button.

SHUT-DOWN Alarm

SHUT-DOWN alarm occurs in the following three cases.



If the unit is displaying "EO4", the battery voltage will be too low or below a certain level when 3 hours passed.



The unit will be displaying "EO5" if the self-test fails three consecutive times.
NOTE: If the self-test fails two consecutive times, the unit will emerge a warning such as a HIGH alarm.



If the unit is displaying **"EOL"**, the life remaining of the unit will be less than 8 hours.

If SHUT-DOWN alarms occur, the detector will generate an alarm, the LED will start to blink and the vibration alarm will activate in 5-second intervals.
The alarms will be continuous until a user presses the button. If the user presses the button, the detectors alarms will stop but a warning sign will remain on the screen.

Event Log

ARA stores the last 30 alarm events. The log system stores events on a first in first out basis. The events stored in the unit can be downloaded using IR Link. The information stored includes:

- The detector serial number
- Life remaining on the detector
- Number of self-tests performed
- Number of warnings occurred and its cumulative time
- Date of event log
- Time elapsed since the alarm occurred
- Duration of the alarm
- Alarm level(s) in ppm or %
- Type of alarms
- Bump test (Yes or no)

Bump Test procedure

NOTE: Ion Science recommend the below calibration gas concentrations when conducting bump tests and/or calibrations.

Gas	H_2S	CO	SO_2	O_2
Calibration Gas Span settings	25ppm	100 ppm	10 ppm	18.0 %

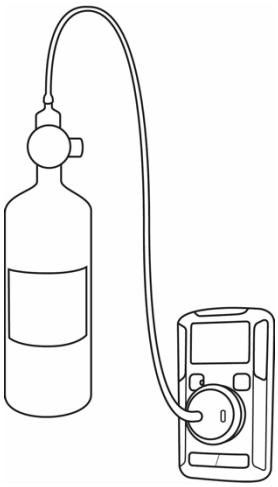
The bump test interval can be changed by the user (via the IR-Link). The interval can be set from 1 to 365 days. To deactivate this reminder, set the interval to zero.
NOTE: The factory default is set to zero therefore the bump test is deactivated.
NOTE: We recommend bump testing prior to each use to verify the sensor responds to gas.

If the detector needs bump-testing, the icon ( ) on the bottom right-hand side of the screen will be blinking. The top/right and top/left LEDs will also start to flash alternately at intervals of 32 seconds.

To conduct a manual bump test the following equipment will be required.
1) Ara calibration cap (included with each Ara)
2) Appropriate calibration gas

3) Manual Fixed flow regulator Ion Science recommend 0.3L/min (Alternative 0.5L/min)

4) A suitable length of tubing to connect the calibration cap to the fixed flow regulator (eg Tygon)



To conduct a bump test, press the button once and wait until the screen displays .

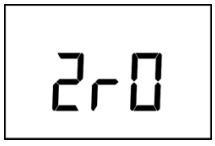
Connect the calibration cap to the sensor inlet (a click can be heard to indicate its seated correctly) then apply the relevant gas for several seconds until the display changes from  to displaying the actual gas concentration or life remaining. This indicates a successful bump test. The bump test icon () will no longer be displayed. Switch off the fixed flow regulator and disconnect the calibration cap. The ARA is now ready for use.

NOTE: If the button is pressed and the instrument is not exposed to gas it will time out after 45 seconds and revert back to displaying the default screen along with bump test flashing icon () reminder. This alarm will be logged as an event and stored in the ARA.

Zeroing the O_2 ARA

The ARA O_2 detector factory default settings will remind the user to perform a fresh air zero every 30 days.

The user will be prompted by the screen blinking , please see zeroing instructions below.



If the detector is due a fresh air zero, the screen display will alternate between  and 20.9% (if display set to sensor reading) or  and Life Remaining (if display set to life remaining)

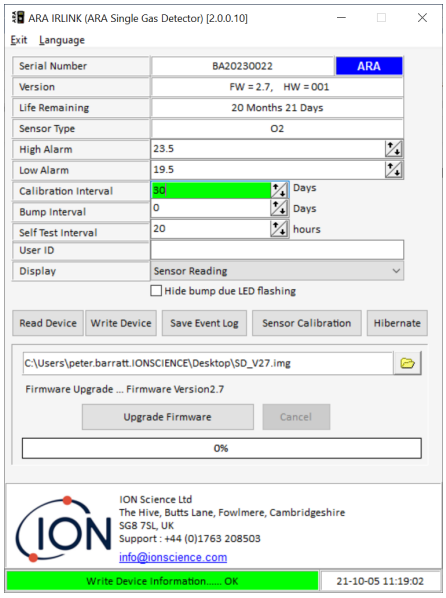
How to zero the Oxygen sensor

IMPORTANT: Ensure you are in a clean fresh air environment.

When prompted with the  screen, press and hold the button for approximately 5 seconds. A successful zero is indicated when the  message disappears, and the default screen is displayed.

If this procedure fails, the detector will continuously sound the audio alarm and the LEDs will turn on and off, If this happens, please contact ION Science.

NOTE: The Calibration Interval for the Oxygen ARA refers to the frequency of **Zeroing**. For the remaining ARA versions, this means **SPAN** calibration frequency.



Calibration procedure

When an ARA is due for a calibration, the message  will appear on the screen.

IMPORTANT: Ensure you are in a clean fresh air environment.

To conduct a manual calibration the following equipment will be required.

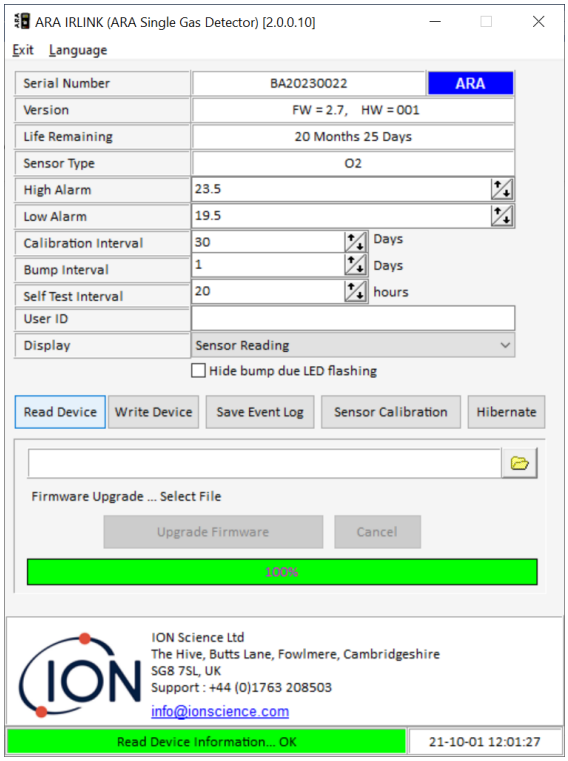
1) ARA calibration cap (included with each ARA)
2) Appropriate calibration gas
3) Manual Fixed flow regulator ION Science recommend 0.3L/min (Alternative 0.5L/min)
4) A suitable length of tubing to connect the calibration cap to the fixed flow regulator (eg Tygon)
5) ARA IR Link (p/n 908201)
6) The ARA software V2.0.0.10 is required, go to www.ionscience.com to download a free copy.

Load the ARA IR LINK software by double clicking on the ICON.



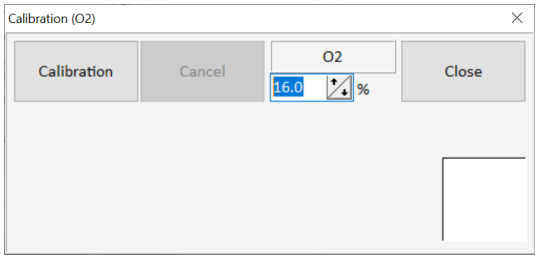
Position the ARA in front of the IR Link. When the ARA is in position, click ‘Read Device’.

The settings will be retrieved from the device and displayed within the software.



Attach the regulator, tubing and calibration cap to the cylinder so it’s ready for use.

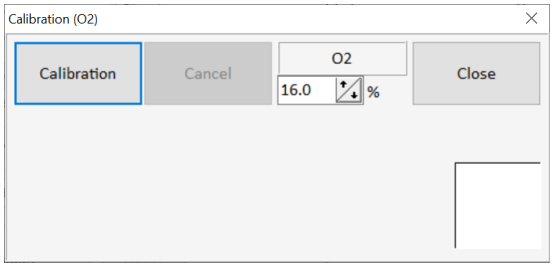
Click ‘Sensor Calibration’ (a new window will pop-up)



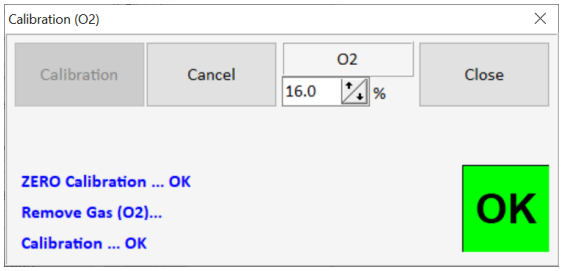
NOTE: Ensure that the Span value is the same as the calibration gas concentration. If not use the Up/Down arrows to adjust (refer to the label on calibration gas cylinder)

IMPORTANT: Ensure you are in a clean fresh air environment.

Click Calibration, a zero is then established (very quickly).

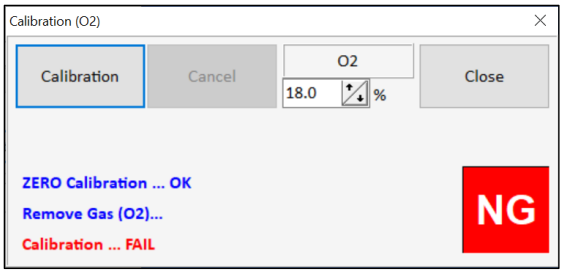


At this point click the calibration cap onto the sensor inlet port then open the valve on the manual fixed flow regulator. The screen on the ARA will then display C90 and begin counting down C89, C88 etc for approximately 20 seconds for the Oxygen ARA and 90 seconds for the other versions.



NOTE: If its position is moved away from the IR Link after C90 countdown starts, the ARA will still continue to calibrate but the IR software will not acknowledge a pass or fail calibration. Ideally, the ARA needs to be aligned with the IR Link during the complete calibration procedure.

NOTE: If no gas is connected within approximately 45 seconds, the calibration procedure will fail and display the below message.



Hibernation Mode*

This option is only for hibernation models (CO & H2S). These models can be powered down (hibernated) to suspend the operation and extend operational life. Hibernation models display 24 months upon activation from new. This period remains in place until the ARA has exceeded 12 months of accumulated hibernation. ION Science cannot guarantee the product after the warranty of 3 years.

To switch over to the hibernation mode, please follow the instructions below:

1) Position the ARA in front of the IR Link
2) Click on the hibernation button, the detector will then go into hibernation.



To differentiate the different models, the hibernation option models have two coloured lines on the label whereas normal models have one thicker line. (See front cover for normal model image)

NOTES:

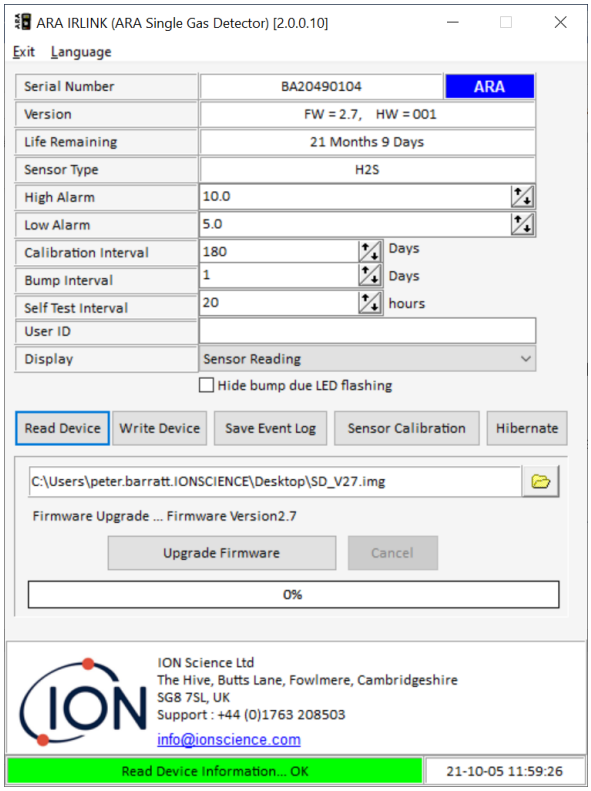
- The event log will be cleared when the detector is hibernated. It is highly recommended to save event logs before hibernation.
- To re-activate the detector from hibernation status, press and hold the button for approximately 5 seconds.
- When the detector is in hibernation, it is powered down, the screen will be blank and will not detect any gases.

Using ARA Software

The below shows the user options which can be

Adjusted from a PC or Laptop

- High Alarm
- Low Alarm
- Calibration Interval
- Bump Interval
- Self-Test interval
- User ID
- Display

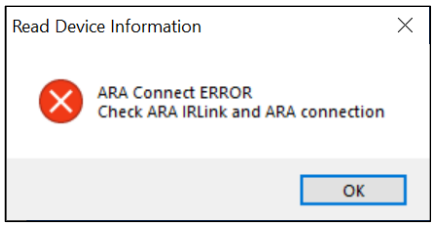


In order to communicate, the ARA needs to be in front of the IR Link.

When the ARA is in position, click ‘Read Device’.

The settings will be retrieved from the device and displayed within the software.

NOTE: If the communication fails, the following message will be displayed “ARA Connect ERROR”.



Simply adjust and reposition the ARA in relation to the IR Link. If you have tried this a few times and haven’t had any success, please contact ION Science.

Once the instrument is connected and has successfully been read, the settings can be changed. Click on Write Device to save the settings to the ARA.

Saving Event Logs

The ARA stores the last 30 events. To retrieve and save the events use IR Command and connect the ARA using IR Link then select ‘Save Event Log’.

This will then transfer the last 30 events to a spreadsheet and will contain the following information.

- Serial Number
- Firmware Version
- User ID
- Life Remaining
- Number of events
- Duration of events
- Number of self-tests
- Date
- Time
- Bump test
- Duration
- Reading
- Alarm

Failures

- Where the self-test fails, the detector emits an audible alarm and the LEDs will flash 10 times. The detector will also continuously display the self-test icons on the screen.
- Where the self-test fails three consecutive times, the detector will display “EOL” on the screen and SHUT-DOWN alarm will appear. If this warning occurs, please contact ION Science.
- During the detector’s lifetime, the battery will be continuously monitored. If the battery voltage is too low or below a certain level when 3 hours passed, the detector will display EO4 and SHUT-DOWN alarm will appear. If this warning occurs, please contact ION Science.
- If the detector displays EOL, it has reached the end of its operating life. Please discontinue use.
- When the detector restarts shortly after downloading firmware, the detector may display "E01" or "E02". If the warning occurs, please remove the warning by pressing the button. If this warning occurs, please contact ION Science.
- When the detector restarts shortly after downloading Firmware, the detector may display "E03". If this occurs, please re-attempt to download the Firmware. If the "E03" error continuously occurs, please contact ION Science.
- E01 – This is when ARA is experiencing a CRC error (firmware problem or power problem) . By pressing the button, the alarm will stop.
  To solve this E01, the unit should be reset to the factory setting. Therefore, the unit should be returned to the factory.
- E02 - This is also because of firmware problem or power problem. By pressing the button, the alarm will stop.
  To solve this E02, the unit should be reset to the factory setting and calibrated. Therefore, the unit should be returned to the factory.

Cleaning

The detector can be cleaned with a soft damp cloth using an anti-static, neutral cleaner. Do not use solvents, soaps or polishes.

Different Models

Model

Model	Description
ARA100	Hydrogen Sulphide (H_2S) Gas Detector
ARA200	Carbon Monoxide (CO) Gas Detector
ARA300	Oxygen (O_2) Gas Detector
ARA400	Sulphur Dioxide (SO_2) Gas Detector
ARA100H	Hydrogen Sulphide (H_2S) Gas Detector - Hibernation Option
ARA200H	Carbon Monoxide (CO) Gas Detector - Hibernation Option

Technical Specifications

ARA Specifications

Size:	87 x 50 x29 mm (3.4 x 2.0 x 1.1 in)
Weight:	92 g (3.2 oz)
Temperature:	H_2S, CO, SO_2: -40 to +60°C
	O_2: -30 to +60°C
Humidity:	5 – 95% RH
Ingress Protection:	IP67
Alarms:	Audio Alarm: (= 95 dB @ 10 cm)
	Visual Alarm: LED
	Vibrating Alarm: Vibrator (Operates at -10 °C +)
LED:	4 Red LCDS
Display:	Liquid Crystal Display (LCD)
Battery:	ER14335(EVE) or XL-055F(XENO ENERGY)
Battery Characteristics:	3.6Vdc, 1.65Ah, Lithium battery (Primary)
Battery Life:	24 months of operation
	2 minutes of alarm per day
Event Log Storage:	Last 30 events
Shelf Life:	H2, CO & SO2: 12 months O2: 6 months
Sensor Type:	Single plug-in electrochemical cell
Detect Range:	H_2S: 100 ppm, CO: 300 ppm, SO_2: 50 ppm & O_2: 25 %
User Option:	User ID, LOW/HIGH Alarms set up, Bump-Test Interval, Self-Test Interval, Display sensor, life Remaining, Hide Bump Due LED flashing

Approvals	Ratings: Class I, Division 1, Groups A, B, C and D, T4; Class I, Zone 0, AEx ia IIC T4 Ga; Ex ia IIC T4 Ga; -40 °C ≤ Ta ≤ +60 °C: ARA100, ARA200, ARA400, ARA100H, ARA200H -30 °C ≤ Ta ≤ +60 °C: ARA300 Applicable Standards: CAN/ CSA C22.2 No. 60079-0:19 CAN/CSA C22.2 No. 60079- 11:14 ANSI/UL 60079-0 7th ed. ANSI/UL 60079-11 6th ed

Limited Warranty

Where a product within the warranty period has a defect or a quality issue, ION Science provides a buyer with a repair or a replacement for free of charge by ION Science or through an ION Science authorized agency and service centre. This warranty is valid only on the origin buyer making a purchase personally. Also, this warranty is valid only if the detector is activated by the date on package.

This warranty does not include:

1) Fuses, disposable batteries, or routine replacement of parts due to the normal wear and tear of the product arising from use.
2) Any product which in ION Science opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling, or use.
3) Any damage or defects attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product.

The obligations specified this warranty are conditional on:

1) Proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of ION Science;
2) The purchaser promptly notifying ION Science of any defect. No products shall be returned to ION Science until receipt by the purchaser of shipping instructions from ION Science; and
3) The right of ION Science to require that the purchaser provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

In no event shall ION Science be liability hereunder exceed the purchase price actually paid by the buyer for the Product.

The buyer agrees that this warranty is the buyer's sole and exclusive remedy and is in lieu of all other warranties, express or implied, including but not limited to any implied warranty or merchantability or fitness

for a particular purpose. ION Science shall not be liable for any special, indirect, incidental, or consequential damages or losses, including loss of data, whether arising from breach of warranty or based on contract, tort, or reliance on any other theory. Some countries or states do not allow limitation of the term of an applied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. In any event any liability shall not exceed the original value of purchase. If any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Intended Use

This product is classified for use in hazardous atmospheres that are not more than 21% O_2.

Certifications / Approvals:

IEC 60079-0:2017

IEC 60079-11:2011

IECEx : Ex ia IIC T4 Ga CML 18.0158

ATEX : CML 18ATEX2340

KCs : KTL 19-KB2BO-0387

Ratings: Class I, Division 1, Groups A, B, C and D, T4; Class I, Zone 0, AEx ia IIC T4 Ga; Ex ia IIC T4 Ga; -40 °C ≤ Ta ≤ +60 °C: ARA100, ARA200, ARA400, ARA100H, ARA200H -30 °C ≤ Ta ≤ +60 °C: ARA300

Applicable Standards: CAN/CSA C22.2 No. 60079-0:19 CAN/CSA C22.2 No. 60079-11:14 ANSI/UL 60079-0 7th ed. ANSI/UL 60079-11 6th ed

ION ARA Dock4

The ARA Dock4 is a bump test and calibration station that can test up to 4 ARA Single Gas Detectors simultaneously reducing gas usage and testing time.

The ARA Dock4 is simple to operate and records calibration and bump test readings late along with the serial number, date and time.

To order the ARA Dock4 please contact ION Science or your local ION Science representative and reference 'ARADOCK4'.



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Manual Log

Manual version	Amendment	Issue date	Instrument firmware	PC software
V1.1	O2 ARA fresh air zero added. Calibration of all sensors added	14/10/2021	V2.7	V2.0.0.10