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ORBISPHERE Model 6110 Package Analyzer V3

USER MANUAL

06/2020, Edition 13

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In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website..

1.1 Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

1.1.1 Use of hazard information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially or imminently hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

1.1.2 Safety precautions

⚠ DANGER

Risk of finger trapping.

A silicon insert is located on the transparent front door to assist in lifting and lowering the door when adding or removing packages for analysis. Under no circumstances must this silicon insert be removed.

⚠ WARNING

Electrical danger and fire hazard. Only use the supplied power cable. Only qualified experts may perform the tasks detailed in the installation section of this manual, while adhering to all locally valid safety regulations.

⚠ WARNING

Removable power cables must not be replaced with inadequately dimensioned power cables.

1.1.3 Service and repairs

None of the instrument's components can be serviced by the user. Only personnel from Hach Lange or its approved representative(s) is (are) authorized to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the warranty null and void and could compromise the correct working of the instrument and the electrical integrity or the CE compliance of the instrument.

If you have any problems with installation, starting, or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service.

1.1.4 Class 1 LASER

A Class 1 LASER is installed in this instrument. Class 1 LASERS are products where the radiant power of the LASER beam accessible (the accessible emission) is always below the Maximum Permissible Exposure value. Therefore, for Class 1 LASERS the output power is below the level at which it is believed eye damage will occur. Exposure to the beam of a Class 1 LASER will not result in eye injury. Class 1 LASERS may therefore be considered safe. However, Class 1 LASER products may contain LASER systems of a higher Class but there are adequate engineering control measures to ensure that access to the beam is not reasonably likely.

This Class 1 Laser product complies with 21 CFR Chapter 1, sub-chapter J. It is evaluated and tested in accordance with EN 61010-1, Safety Requirements for Electrical Equipment for Measurement and Control and Laboratory Use and IEC/EN 60825-1, Safety of Laser Products.

1.1.5 Use of antifoam

Antifoam is injected into the sample as part of the measurement process. Once a sample has completed the measurement process it will therefore contain a small amount of antifoam. After measurement, ensure the sample is disposed of in a sink (or similar) to avoid any risk of ingestion. Refer also to the material safety data sheet (MSDS) Silicon antifoam (part number 33156) on page 65 for additional antifoam safety information.

1.1.6 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol, when noted on the product, indicates that the marked item can be hot and should not be touched without care.
	This symbol, when noted on the product, indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol, when noted on the product, identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol, when noted on the product, indicates a laser device is used in the equipment.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for protective earth (ground).
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.

1.2 Product recycling information

ENGLISH

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

Note: *For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.*

DEUTSCH

Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben.

Hinweis: *Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.*

FRANCAIS

A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur.

Remarque: *Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.*

ITALIANO

Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore.

Nota: *Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.*

DANSK

Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren.

Bemærk: *I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.*

SVENSKA

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller utrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! *Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.*

ESPANOL

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

NEDERLANDS

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgegeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

POLSKI

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkownia.*

PORTUGUES

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

1.3 Product disposal

Note: *The following only applies to European customers.*

Hach Lange is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) that came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.

In conformity with European local and national regulations (EU Directive 2002/96/EC stated above), electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

Hach Lange will offer to take back (**free of charge to the customer**) any old, unserviceable or redundant instruments and systems which carry the above symbol, and which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

In addition, Hach Lange will offer to take back (**at cost to the customer**) any old, unserviceable or redundant instruments and systems which do not carry the above symbol, but which were originally supplied by Hach Lange. Hach Lange will then be responsible for the disposal of this equipment.

Should you wish to arrange for the disposal of any piece of equipment originally supplied by Hach Lange, please contact your supplier or our After Sales Service department in Geneva for instructions on how to return this equipment for proper disposal.

Section 2 Specifications

2.1 Technical specifications

Specifications are subject to change without notice.

Analysis		
Measurement range	O_2	1 ppb - 12 ppm
	CO_2	0.75 - 5 V/V or 1.5 - 10 g/kg
Repeatability r^{95}	Total Package Oxygen	± 5 µg/L ± 10% whichever is the greater
	CO_2 on equilibrated packages at T = 10 to 25°C (50 to 77°F)	± 0.05 V/V or 0.10 g/kg ± 2% whichever is the greater
	O_2	± 2 ppb ± 10% whichever is the greater
Typical analysis time	About 4 minutes	
Display units	O_2 concentration	ppb or ppm
	CO_2 concentration	V/V, g/kg, g/L or %W
	Pressure	bar, mbar, psia
	Temperature	°C, °F or K
Operating limits	Package temperature	-2 to 30°C (28 to 86°F)
	Package pressure	1.4 to 6.8 bar absolute (20 - 99 psia)
	Ambient temperature	0 to 40°C (32 to 104°F)
	Relative humidity	Up to 80%
Package setup	Maximum package height	340 mm (13.39 ins)
	Minimum package height	90 mm (3.54 ins)
	Minimum volume	150 ml
	Material	Glass, PET or aluminum
Enclosure		
Dimensions (L x W x H)	537 x 540 x 942 mm (21.1 x 21.3 x 37.1 ins)	
Weight	55 kg (121 lbs)	
Maximum altitude	2000 m (6562 ft) maximum	
Enclosure protection	IP20	
Power requirements	100-240 VAC ±10% @ 50-60 Hz	
Power consumption	Max. 250 VA	
Purge gas	CO_2 with purity > 99.9% at 6 to 7 bar absolute (87 to 102 psia)	
Purge gas consumption	0.4 mL/second (1.5 L/hour)	
Forcing gas	Air or N_2 at 5.5 to 6 bar absolute (80 to 87 psia)	
Forcing gas consumption	0.25 mL/minute in standby mode	
Compliance		
European directives	Low voltage directive EMC directive	
EMC standards	EN 61326-1	
EMC requirements	This product is intended to be used in a domestic or basic electromagnetic environment	
Safety standard	IEC/UL/CSA	61010-1
Laser product safety	IEC/UL/CSA	60825-1
International standards	cETLus	
Interface		
Digital display	TFT VGA (640 x 480) color display touch screen with backlight	
Operating system	Windows CE 4.2	
Languages	English, German, Spanish, Chinese, Japanese	
Digital connections	1 x USB-A connection, 1 x Ethernet connection	

2.2 Instrument dimensions

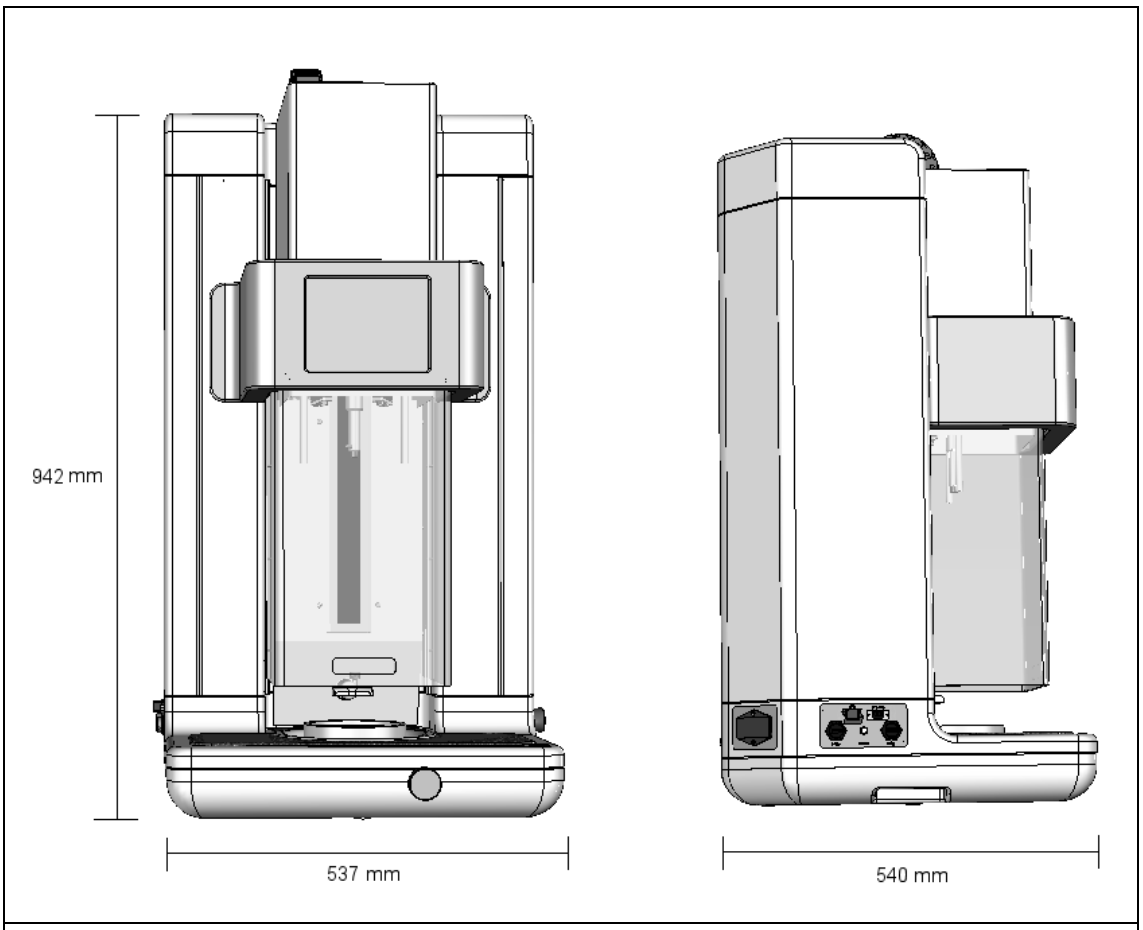
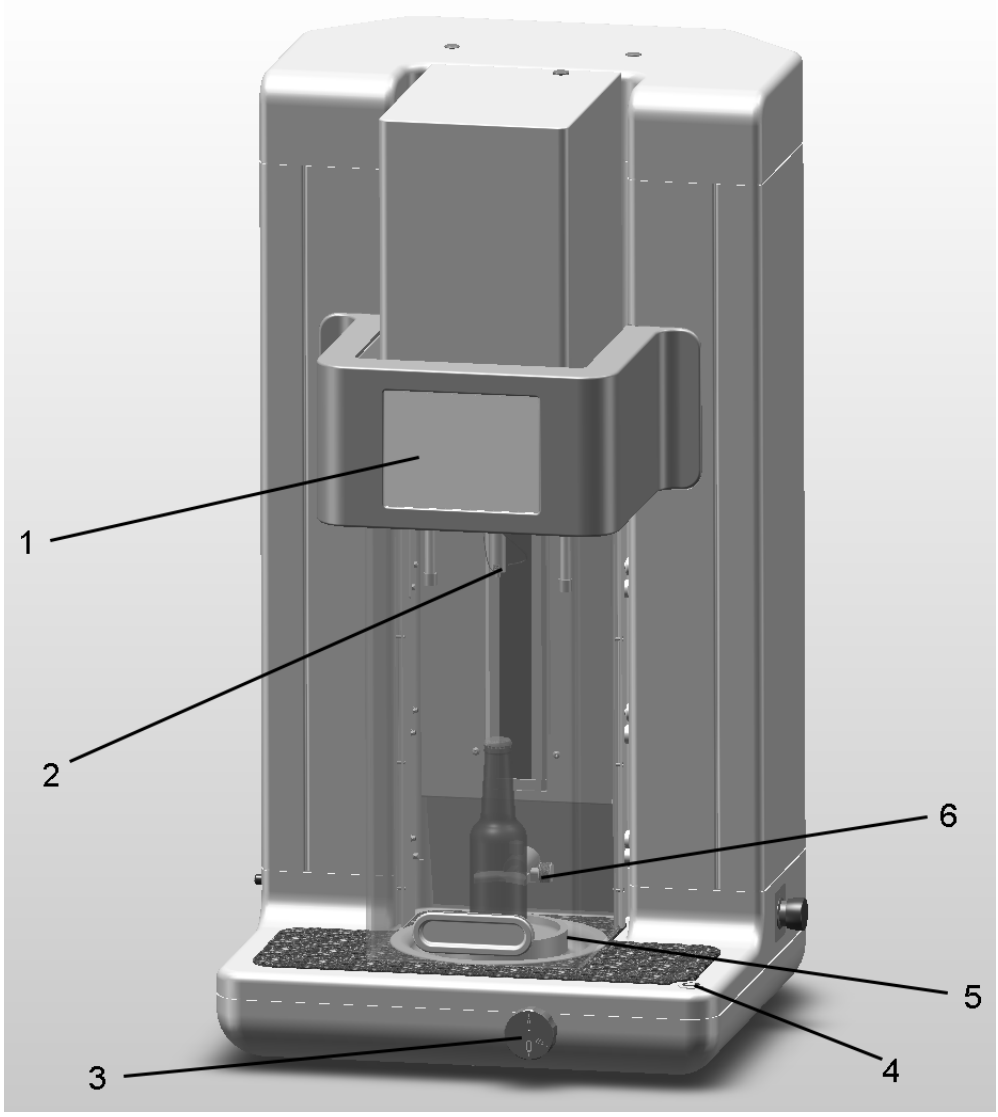


Figure 1 Instrument dimensions

2.3 Main instrument components

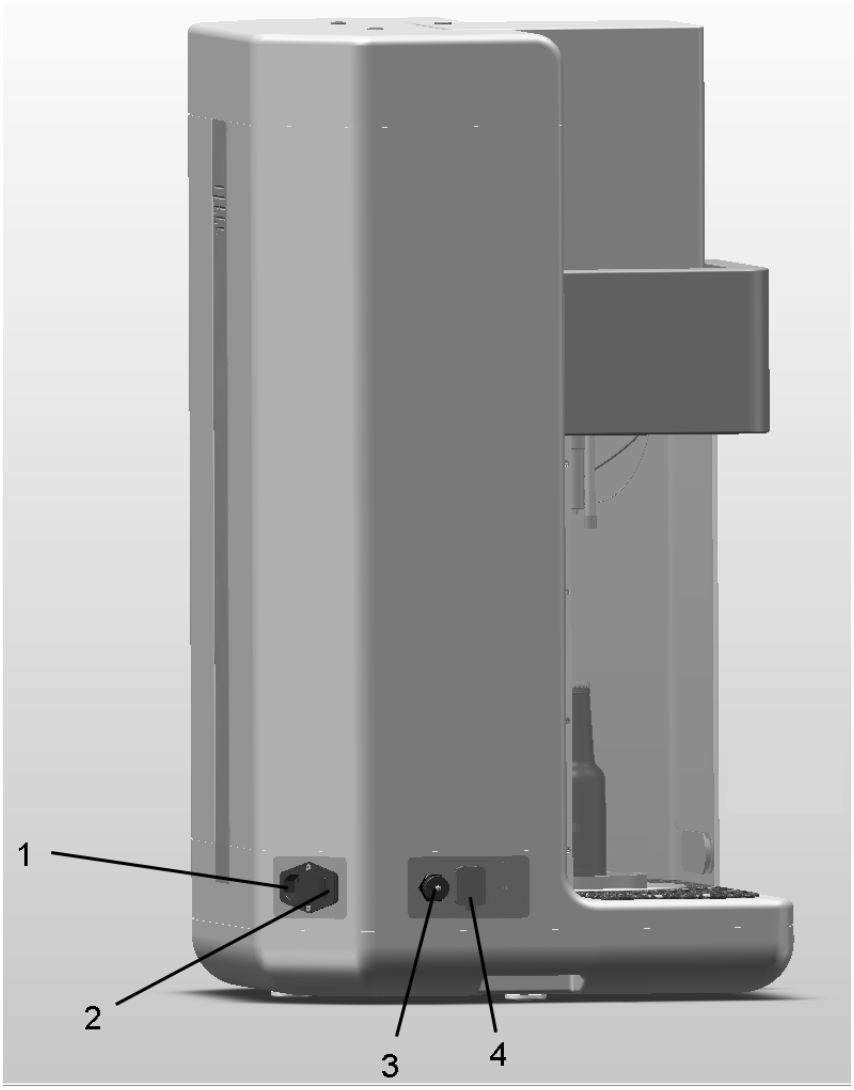
2.3.1 Front view



1. Display panel	4. Measurement start button with LED
2. Package piercing device	5. Package holder
3. Knob to tilt package	6. Package backstop

Figure 2 Instrument components - front view

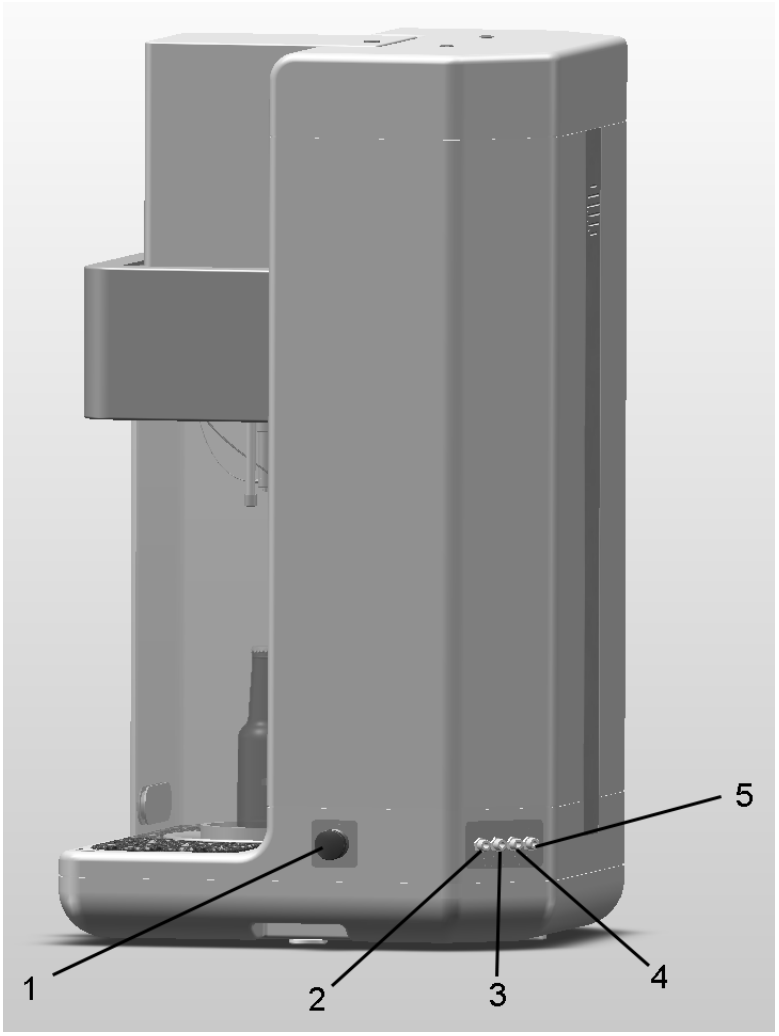
2.3.2 Left side view



1. Power socket	3. USB-A connector for mass storage device
2. Power ON/OFF rocker switch	4. Ethernet connection

Figure 3 Instrument components - left side view

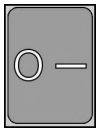
2.3.3 Right side view



1. Emergency STOP button	4. Gas connection No. 3 (IN) - Reference gas (CO_2 only)
2. Gas connection No. 1 (IN) - Forcing gas (Air or N_2)	5. Gas connection No. 4 (OUT) - Pressure sensor calibration
3. Gas connection No. 2 (IN) - Purge gas (CO_2 99.9% purity)	

Figure 4 Instrument components - right side view

2.4 Instrument switches and buttons

	The mains power switch is located at the rear left of the instrument. Refer to Figure 3 on page 14. To switch the instrument on and off, press the rocker switch to the required position: “**O**” for **Off** and “**I**” for **On**.
	The measurement button is located at the front right of the instrument. Refer to Figure 2 on page 13. Press this button to start a package measurement.

2.5 Operation overview

1. Piercing

The reference volume is filled with the purge gas and the whole of the gas sampling path is fully purged. The purge stops when the rubber seal of the piercing device contacts the top of the package. Once the package is pierced, a pump injects an antifoam solution into the headspace.

2. Oxygen in headspace and CO_2

The pressure is measured, then the regulating valve is opened and the gas contained in the headspace flows over the O_2 and the CO_2 sensors at a given rate. The quantity of O_2 in the headspace is obtained by integrating the volumes of O_2 leaving the package per unit of time. The temperature is measured and combined with the pressure to calculate the CO_2 P/T value.

3. Liquid analysis (O_2)

The gas flow is stopped and the ultrasonic sonotrode is activated. The regulating valve is then opened and the gas escaping the liquid mixes with the gas of the headspace. The O_2 signal is an exponential function to which coefficients can be included and the total O_2 contained in the bottle is calculated by integrating this function.

Note: *For faster measurements, the liquid analysis step can be skipped and the O_2 value calculated from the headspace by setting specific parameters for the package. Refer to Package parameters on page 30 for additional details.*

4. Headspace volume

At the end of the run, the gas flow is stopped and the valve is opened. The gas of the reference volume expands in the headspace and the pressure reaches a new value. The headspace volume is calculated with the ideal gas law principle.

5. End of measurement

The piercing head assembly is lifted out of the package. A short burst of gas purges the gas sampling path to flush out any residual liquid or foam. The system returns to the standby mode where the sensors are kept under a slight purge gas flow.

⚠ WARNING

This section provides necessary information to install and connect the analyzer. The installation of the analyzer should be performed in accordance with relevant local regulations, and only by personnel trained and experienced in the installation of the 6110 analyzer. Disconnect the power supply of the analyzer before carrying out any work inside the analyzer. Any work inside the analyzer should be performed exclusively by personnel specialized and authorized to work on electrical installations. In addition, and in accordance with safety standards, it must be possible to disconnect the power supply of the analyzer in its immediate vicinity.

⚠ WARNING

Electrical danger and fire hazard. Only use the supplied power cable. Only qualified experts may perform the tasks detailed in the installation section of this manual, while adhering to all locally valid safety regulations.

⚠ CAUTION

Risk of finger trapping. A silicon insert is located on the transparent front door to assist in lifting and lowering the door when adding or removing packages for analysis. Under no circumstances must this silicon insert be removed.

NOTICE

This is a class A product. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

NOTICE

Proper ESD (electrostatic discharge) protocols must be followed to prevent damage to the product when working with the electronic boards.

NOTICE

Measurement variations of approximately 10% on CO2 values can occur in the 80 MHz to 1 GHz band. Although this variation is unlikely to occur at customer installations, user care must be taken in the routing of the instrument power line to avoid ambient field interference.

3.1 Unpacking

⚠ CAUTION

The instrument is heavy (55 kg) so extreme care must be taken with handling to avoid damaging the instrument or inflicting personal injury. It is **highly recommended** to use a pulley system (or similar) attached to the lifting ring located on the top of the instrument when unpacking. The instrument should always be moved and stored in a vertical position.

Carefully remove the instrument and its accessories from the box and packing material, referring to the packing list included to confirm that everything has been delivered. Please visually inspect the instrument for shipping damage. If anything is missing or damaged, contact the manufacturer or your dealer immediately.

You may want to retain the box and other packing material in case you later need to ship the instrument. Please dispose safely and ecologically of the box and packing material (if not stored for future use).

Please read through this manual thoroughly before carrying out the installation.

3.2 Main components

Your 6110 Total Package Analyzer is shipped with the following components:

Equipment delivered	Part No.
Box contents	
6110 instrument including all sensors pre-installed	
Power supply cable (if ordered)	
GA2400 sensor recharge kit	2956A-AT
6110 user manual	
GA2X00 sensor user manual	
6110 and GA2400 conformity and test certificates	
PPS sensor storage with calibration cap and sensor support	part of GA2400-S00T
6110 installation kit box	
Installation kit contents	
Seal to package (6 items)	33117
Solenoid valve 2/2 NC with O-ring	33122
Filter with Goretex® membrane (52 items)	DG33491
Piercing tip for metal	DG33496
Piercing tip for PET	DG33497
Piercing tip mounting tool	DG33500
USB key	60930
Protection for rim detector (4 items)	DG33362
Protection film for screen	DG33366
Outlet sample tube assembly	DG33492
Pneumatic tubing kit	33154
Antifoam recharge bottle 1L	33156
Antifoam refilling bottle	DG33480
Antifoam priming beaker	33161
USB client cable including connectors	32533.03
Loctite® 243	DG33431
2.5 mm Allen key	N/A
Installation kit contents checklist	N/A

3.3 Positioning

⚠ CAUTION

The instrument is heavy (55 kg) so extreme care must be taken when handling, to avoid damaging the instrument or inflicting personal injury. It is **highly recommended** to use a pulley system (or similar) attached to the lifting ring located on the top of the instrument when moving it.

Hach Lange recommends installing the instrument on a sturdy laboratory table that can more than support the 55kg weight. Place it on a clean flat surface, and convenient to the power source. The display screen should be at head-height for easy viewing and operation.

3.4 Installation

3.4.1 Pre-installation

Make sure you have suitable standards available before performing any calibration. Refer to Standards requirements on page 41 for calibrating the instrument sensors.

The following must be provided locally by the user and be available for installation:

Purge gas for O_2 and CO_2 sensor (CO_2)	6 to 7 bar (87 to 102 psia), purity > 99.9%
Forcing gas for piercing device (Air or N_2)	5.5 to 6 bar (80 to 87 psia)
Reference gas for CO_2 sensor (optional)	5.5 to 6 bar (80 to 87 psia)
Precision certified barometer	For calibrating the barometric pressure sensor
Precision certified pressure gauge (0-7 bar)	For calibrating the pressure sensor

Instructions for connecting the gas supplies to the instrument are described in the installation wizard that will start automatically once power is connected to the instrument for the first time. Refer to Physical installation on page 19.

Make sure that the GA2400 sensor recharge kit (supplied with the instrument) is available. A new cartridge is included in the kit and must be installed on the sensor prior to first use. Instructions for cartridge replacement are described in the installation wizard that will start automatically once power is connected to the instrument for the first time. Refer to Physical installation on page 19.

3.4.2 Physical installation

1. Connect the instrument to a power source. Refer to Power supply on page 20.
2. Turn the instrument **ON**. An instrument auto check routine will start automatically. As this is the first time the instrument will have been powered up, the **O2 sensor residual** LED will always be red. This is normal as the system has not yet been fully commissioned and this can be ignored at this stage.
3. The installation wizard will start automatically. The wizard will take you through the process of connecting all the gas inputs, filling the antifoam cartridge (refer also to Antifoam cartridge preparation on page 55), EC sensor cartridge replacement, antifoam pump maintenance and the instrument auto-check (refer also to Instrument auto check on page 24).
4. At the end of the process select the auto-check option. Refer to Instrument startup on page 24 for a more detailed explanation of the auto-check process and results.

3.4.3 Post-installation procedures

1. The instrument has been delivered with English as the default language. However, a USB memory stick is supplied with other available languages (German, Spanish, Chinese, and Japanese). If you wish to keep English as the preferred language please proceed to the next step (**Step 2** below), otherwise follow these instructions for installing a new language:
   - Set the instrument power to **OFF**.
   - Insert the supplied USB memory stick into the USB port on the instrument.
   - Set the instrument power to **ON**.
   - Follow the on-screen instructions to install the preferred language.
   - Remove the USB memory stick and restart the instrument.
2. Enter the default login credentials “**0001**” for the ID and “**1234**” for the password. Refer to 4.2.2 User identification and access level on page 25.
3. Change the default login and set the security levels, users ID’s and passwords. Refer to Security and user management on page 34.
4. Configure the instrument parameters. Refer to Configuration on page 29.
5. Perform a barometric sensor calibration. Refer to Barometric pressure sensor on page 42.

6. Perform an O_2 sensor calibration. Refer to Oxygen sensor on page 44. Wait until the residual value of the sensor is low enough (controlled automatically by the instrument). This operation may take around 1-2 hours depending on storage conditions.

Note: *The pressure, flow, temperature and CO_2 sensors are more stable and will not require calibration prior to use.*

The instrument should now be ready for use.

If a problem should arise with the instrument, please refer initially to Troubleshooting on page 59. If the problem cannot be overcome, please contact your Hach Lange representative who will be happy to assist you.

3.5 Additional installation information

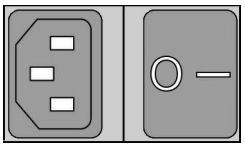
3.5.1 Power supply

⚠ WARNING

A power cable can be ordered with the instrument and this cable must be used to connect the instrument to the power supply. If no power cable was ordered, please contact your Hach Lange representative for cable specifications. Inadequately dimensioned power cables must not be used.

⚠ CAUTION

Check voltage requirement sticker on the rear panel of the instrument before connecting (100-240 VAC).



Connect the power cable supplied with the instrument to the socket at the rear of the instrument (left in diagram) for AC power connection.

To switch the instrument on and off, press the rocker switch (right in the diagram) - “**I**” for **On** and “**O**” for **Off**.

Important Note: *In order to get optimum performance from the instrument always keep the gas and power supplies switched on.*

3.5.2 Emergency STOP button

This is located on the right side of the instrument. Refer to Figure 4 on page 15. Should the need arise to stop the machine at any time during operation, press this button. An audible click can be heard as the button locks in position.

The instrument should then be disconnected from the power supply.

Once disconnected, unlock the button by turning it clockwise. The instrument can then be reconnected to the power supply and restarted.

3.5.3 Define security levels

At startup all menus are locked and a valid ID and password combination is required to get access beyond the standard measurement view. Refer to 4.2.2 User identification and access level on page 25.

Section 4 User Interface and Startup

4.1 User interface

4.1.1 Turning the instrument ON and OFF

The instrument has a power switch located at the rear of the left side of the base. Refer to Figure 3 on page 14. The LED on the instrument measurement start button is illuminated when the instrument is powered on. Refer to Figure 2 on page 13.

Important Note: *It is recommended to keep the instrument powered **ON** at all times, unless the instrument is to be moved to another location, if it will not be used for a long period of time, or if maintenance procedures need to be carried out inside the instrument.*

4.1.2 Touch screen

The instrument front panel is comprised of a TFT VGA (640x480) color display touch screen acting as display, touch pad and keyboard.

4.1.3 Data entry

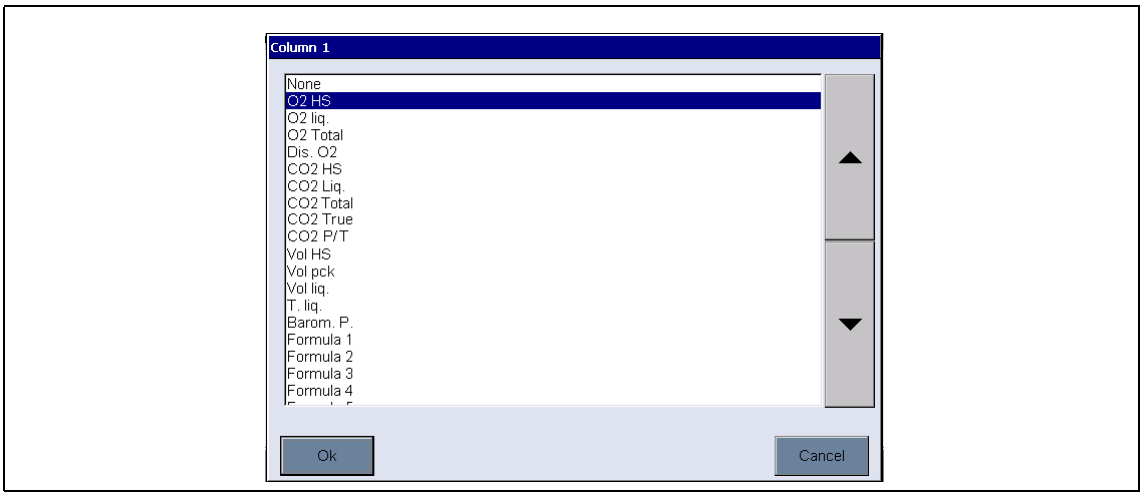
When a text box (alphanumeric field) is selected for data entry, a virtual keyboard appears on screen as illustrated below. This is used in a similar way to a standard PC keyboard.

Once values have been entered, press the ↵ (**Enter**) key on the right of the keyboard to confirm input and exit the virtual keyboard.

Note: *Use the **Cap** key at the bottom left of the keyboard to switch between upper and lower case characters. This is important for case-sensitive information such as passwords.*

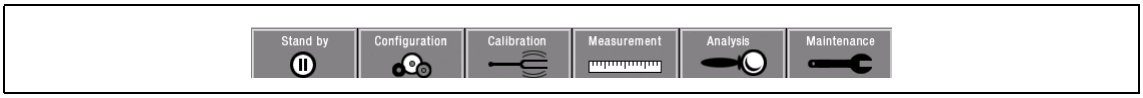
4.1.4 Rolling lists

For convenience, selection through a possible large list of items has been designed with a rolling list as in the example below. Use the up and down arrows at the side to navigate through the list, or select one item directly. Press **Ok** to confirm.



4.1.5 Instrument options

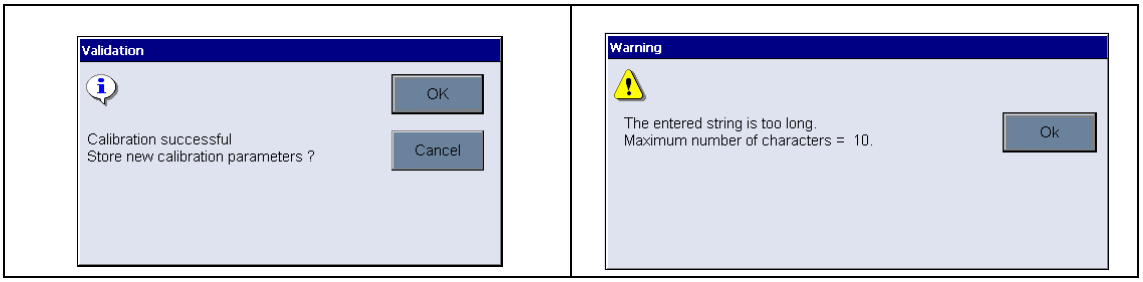
A banner will be displayed at the foot of each screen showing the options available:



- **Standby** - Press this button to leave the instrument in operational mode if there is a long time delay between measurements. The screen will go blank, but can be reactivated by tapping it. Once reactivated, you will need to enter a valid user ID and password combination if this has been set up. Refer to User identification and access level on page 25.
- **Configuration** - Refer to Configuration on page 29
- **Calibration** - Refer to Calibration on page 41
- **Measurement** - Refer to Measurement on page 45
- **Analysis** - Refer to Analysis on page 51
- **Maintenance** - Refer to Maintenance on page 53

If any of the options are not available for any reason (e.g. access level not high enough), they will be greyed out.

4.1.6 Information and warning windows



At various stages, an information or warning message may be displayed to request confirmation from the operator that his last action(s) must be applied, or that there is a problem that did not enable the requested action to be performed.

Note: *Warning messages can be suppressed by unchecking the warning messages parameter. Refer to* *Instrument parameters on page 33**.*

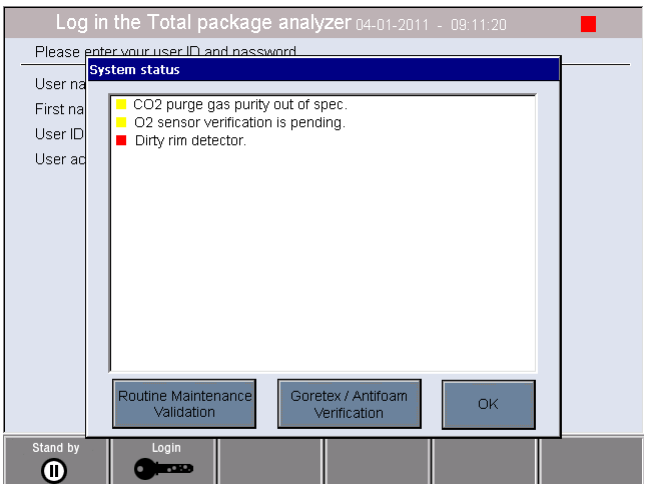
For a full list of all possible warning and error messages, and the recommended action to take, please refer to the section entitled Troubleshooting on page 59.

4.1.7 Instrument status indicator

A colored LED indicator on the top right of the screen will indicate the current status of the system:

- A green indicator means that no problems have been found
- A yellow indicator means that a problem has been found, but is not serious enough to stop measurements being taken
- A red indicator means that there is a serious problem with the system which must be corrected before any measurements can be performed

If multiple problems have been detected, the color of the LED will reflect the most severe error (red in the example below). If the LED indicator is not green, pressing it on any screen will display a list of errors and warnings:



It is advisable to correct all of the errors listed before continuing, to ensure the instrument is working correctly.

On completion of all startup checks you may be required to enter a valid identification number and password to continue. Refer to User identification and access level on page 25.

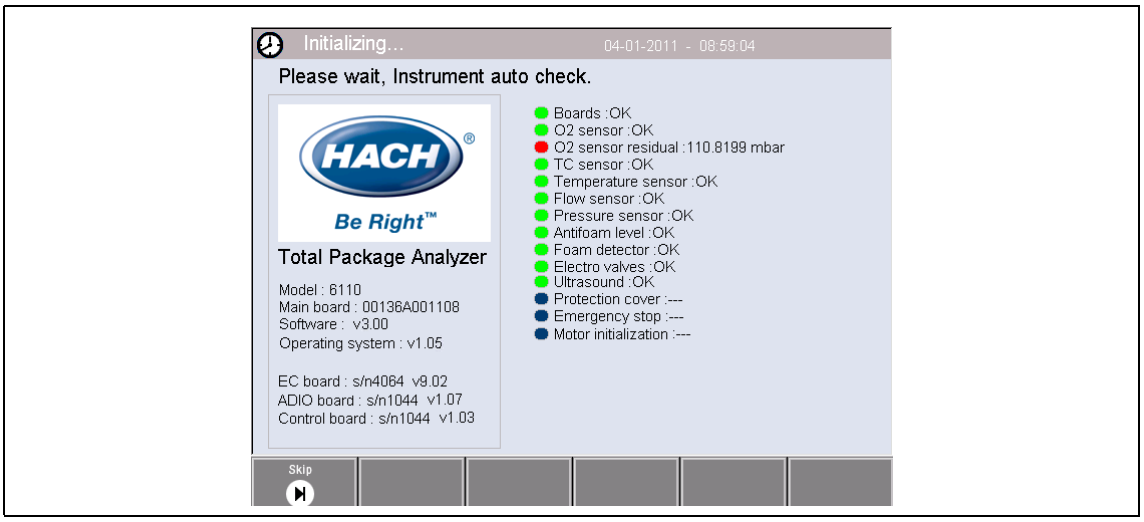
Provided all startup checks were successful, the measurement screen will be displayed.

4.2 Instrument startup

Important Note: *The following assumes that the instrument is already fully operational and has been used for taking measurements. For* ***first time startup*** *of the instrument refer to* *Installation on page 19* *to ensure additional procedures have been completed successfully for the instrument to start up without errors occurring during the auto check procedures.*

4.2.1 Instrument auto check

When the instrument is powered **ON** it goes through a number of startup procedures to check all components are installed and functioning correctly. A number of instrument parameters are also displayed down the left side of the screen indicating the current software and board versions installed:



Note: *It is possible (but not recommended) to skip individual checks by pressing the* ***Skip*** *button when the component has the yellow indicator against it to indicate the component check is in progress.*

The right side of the screen lists each of the instrument components that are being checked, and a colored indicator to the left of each component shows the current status:

- A green indicator means that the component is installed and working correctly
- A red indicator means that there is a problem with that particular component
- A yellow indicator means that the component is in the process of being checked
- A blue indicator means that the component has not yet been checked

If there are errors encountered on startup that mean the instrument cannot function correctly, a warning screen will be displayed indicating the next course of action.

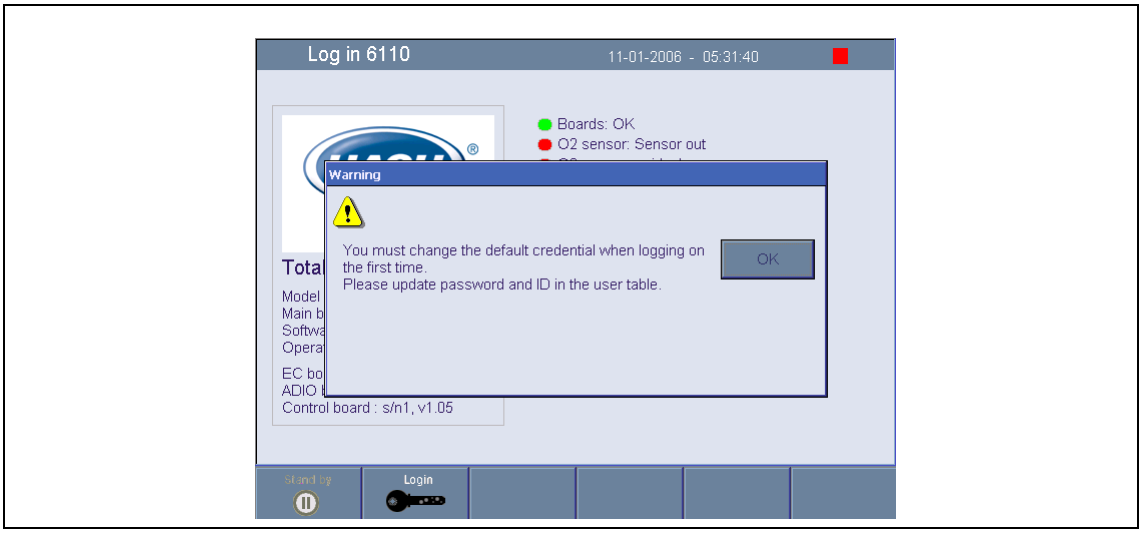
Important Note: *Once the instrument is switched on you will need to wait until the oxygen sensor residual value reaches the threshold of* ***0.1 mbar****. This operation can take as much as two hours depending on the instrument and sensor conditions prior to startup.*

4.2.2 User identification and access level

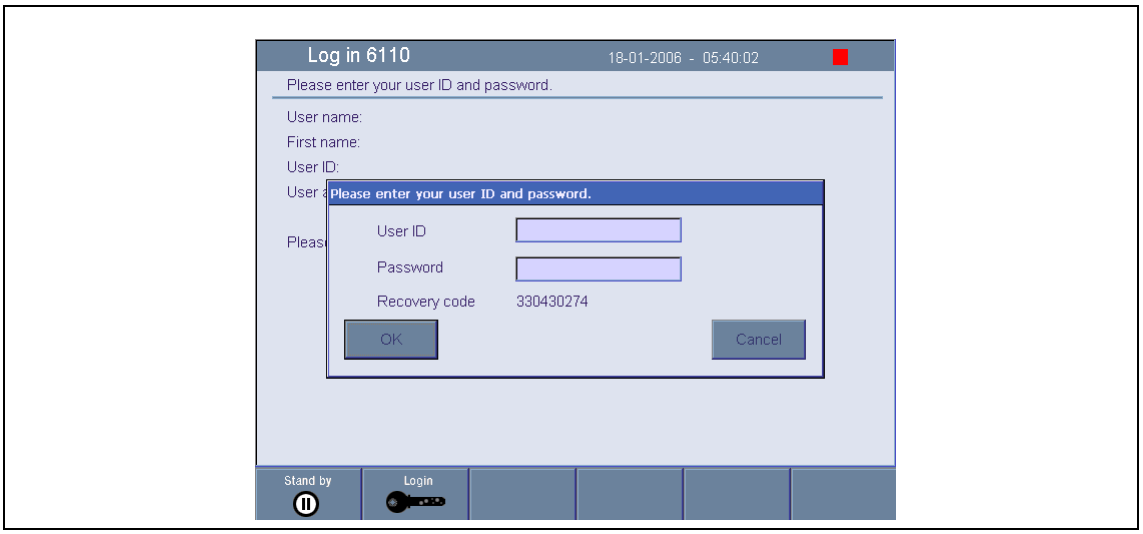
When the instrument is started for the first time, security is enabled. The user must enter a factory configured login credentials (user ID and password) to get access to the instrument. Make sure to change the default login credentials at startup. Refer to Security and user management on page 34 for additional information.

Do the steps that follow to change the default login credentials, add users and add user access rights:

1. When the message to change the default login and password shows on the display, push **OK**.

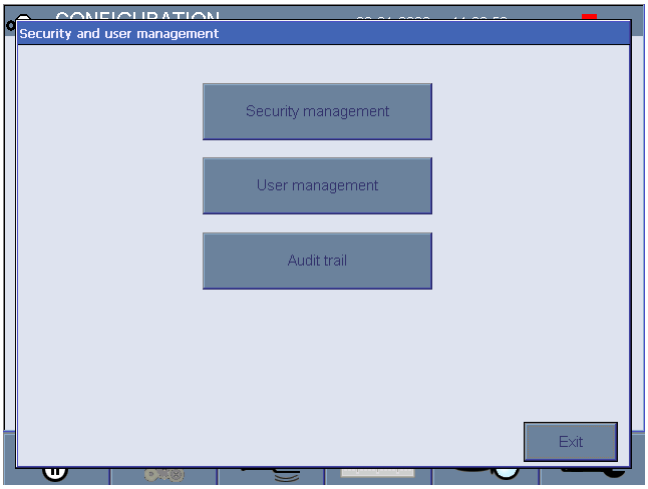


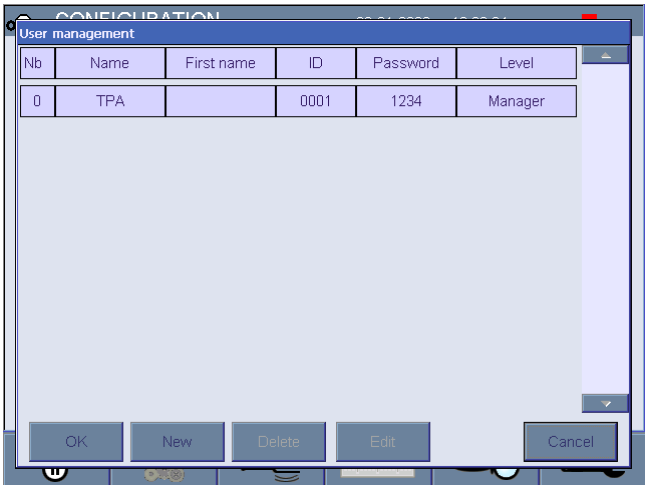
2. Push the key icon at the footer bar of the bottom of the display. The login window shows on the display.



3. Enter the default login credentials **0001** for the ID and **1234** for the password. Push OK.

4. To change the default ID and password go to CONFIGURATION > SECURITY AND USER MANAGEMENT. Select USER MANAGEMENT. The users table, which is used to manage the registered users, shows on the display.

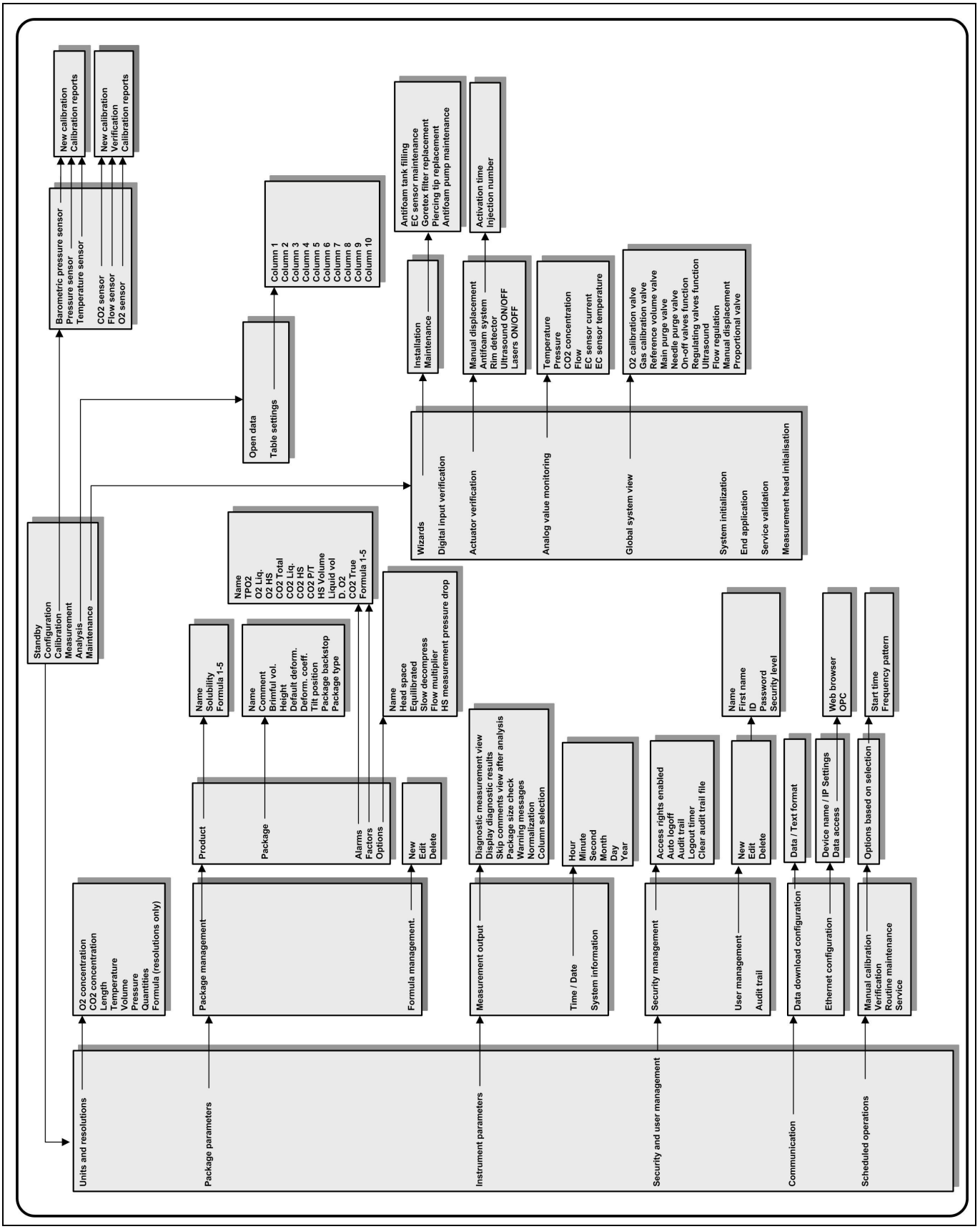




5. Push on the row of the default user. The user modification window shows.
6. Change the Name, ID, Password and security level values. Push OK to save the values.
7. Complete the table with the necessary users or push OK to leave.

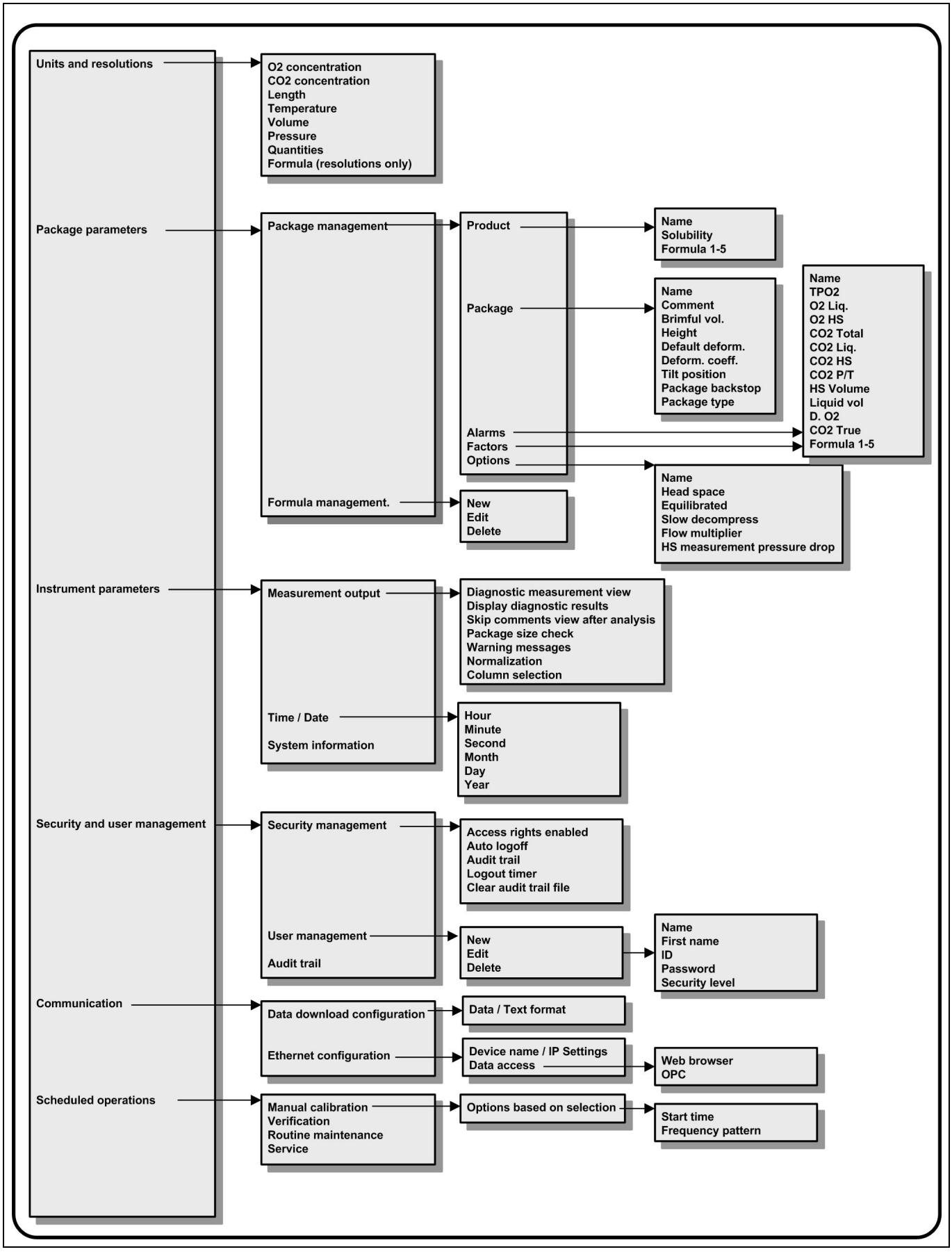
Note: *If the instrument security is enabled and the login credentials are not known, contact Hach Service support with the recovery code to get the login credentials. The recovery code shows on the login window. The supplied login credentials expire in one day. Make sure to change the login credential with known values.*

4.3 Menu structure overview



Section 5 Configuration

5.1 Configuration menu overview



This section describes the sequence of actions required to configure the instrument. The following configuration options are available from the main screen:

- Units and resolutions
- Package parameters
- Instrument parameters
- Security and user management
- Communication
- Scheduled operations

5.2 Units and resolutions

Units
Define the units for all values displayed by the instrument: • O2 concentration • CO2 concentration • Length • Temperature • Volume • Pressure • Quantities For each parameter select the required unit from the drop-down list and press **Ok** to continue. When all units have been assigned, press **Ok** on the main screen to save these values and continue.

Resolutions
Define the display resolution for all values displayed by the instrument. These are the same as listed for units with the addition of Formula. For each parameter select the required display resolution from a drop-down list. A maximum of 4 digits and a decimal point can be displayed (i.e. 1234, 123.4, 12.34, or 1.234). This does not affect the actual resolution of data measured and stored, only the data displayed on screen. Select the required resolution from the list and press **Ok** to continue. When all display resolutions have been defined, press **Ok** on the main screen to save these values and continue. ***Note:*** *The instrument performance and specifically the sensitivity and accuracy of each measured parameter is not affected by the choice of resolution. This is purely for screen display purposes. Refer to* *Technical specifications on page 11* *to view the accuracy of each measured parameter.*

5.3 Package parameters

5.3.1 Package management

Package management	
Add new package definitions (up to a maximum of 100), and edit or delete existing definitions. To edit or delete a package, first select the package from the list displayed by touching the package name on the screen, and then press either **Edit** or **Delete** as appropriate.	
New	Create a new package. The new package will be created using the default package parameters. You will then need to select the new package and edit these default parameters to define the new package parameters.
Delete	Confirm the deletion to delete the package from the list
Edit	A new screen is displayed to allow you to change the definition of the package. Select each tab in turn (detailed below) to define the package definitions.

Product tab	
Solubility	Enter the type of beverage in the package.
Formula	Define up to five different formulae for computing a new parameter. The formula definitions must already have been entered into the system. Refer to Formula management on page 32 for details.

Package tab	
Comment	Enter a free-format alphanumeric text. This text will appear against the package description in the main package management screen.
Brimful volume	Enter the volume of the package when full to overflowing.
Height	Enter the overall height of the package. This information is used if you activate the Package size check option in Instrument parameters on page 33.
Default deformity	The default deformity of the package caused by internal pressure. The value is zero for glass bottles and increases for cans and plastic bottles. This value cannot be changed.
Deformity coefficient	The deformity coefficient defaults to the default deformity value. This value can be increased or decreased if necessary.
Tilt position	Enter the tilt position of the package holder (optional). This should be 1, 2, or 3 and corresponds to the number on the tilt knob on the front of the instrument. Refer to Figure 2 on page 13.
Pck backstop	Position of the package backstop (optional). The backstop is calibrated on a scale of zero to seven.
Package type	Select the correct image for the type of package being measured (bottle, can, etc.). The setups for each icon are different, so it is important to select the correct one.
Note: *The above reference values are also displayed at the start of the measurement process for that package, so the operator can adjust the instrument accordingly (tilt position, etc.).*	

Alarms tab	
Alarm parameters	Select the parameter to define the alarm settings, and enter the minimum and maximum values allowable for each parameter listed. When the measurement value falls below the minimum level or exceeds the maximum level for any parameter listed, an alarm will be triggered.

Factors tab	
Factors	Small adjustments can be made to the measurements listed by entering a factor. This defaults to 1.000 for all measurements to indicate no adjustment. If this is changed then the measurement calculated by the instrument will be multiplied by this factor to give an adjusted measurement value.

Options tab	
Headspace	Check this box for a fast measurement sequence that provides data from the headspace only.
Equilibrated	This is only available if Headspace (previous box) is checked. Check this box if you require the additional total O_2 and dissolved O_2 measurements taken from the headspace.
Slow Decompress	If checked, then after the measurement process has completed, a slow release of any remaining pressure will take place so the package can be handled safely.
Flow multiplier	This defaults to 1. Set this value to between 0.5 and 5 to decrease or increase the time taken for the pressure release process at the end of the measurement. The higher the value, the quicker the pressure is released. This is especially useful for large packages.
HS measurement pressure drop	This defaults to 0.5 bar. Set this value to between 0.1 and 5 bar. When the pressure has decreased by this amount, the headspace measurement stops. This is useful for packages that contain a gas widget. This parameter can be used to determine if the headspace is measured before or after the gas from the widget is released. If foam is detected during the headspace measurement or during the sonication, it is advised to reduce this value. It will also reduce the analysis time. However, if this value is too small the accuracy of the HS O_2 measurement will be reduced.

5.3.2 Formula management

Formula management	
This option allows you to add new formula definitions (up to a maximum of 40), and edit or delete existing definitions. You can use up to 16 variables pre-defined by the instrument and 2 user defined numerical variables that are set up manually at the end of each measurement. When the option is selected a screen will be displayed listing all existing formulae.	
New	Press the **New** button to create a new formula. The formula editor screen is displayed (Refer to Figure 5) and used to define the formula. The measurement values that can be used are listed down the left side of the screen and are defined as listed in Table 1 on page 33. The operators and operands are listed down the top right. In the bottom right of the screen are a number of screen navigation options to assist in editing. The colored indicator in the top right corner shows the validity of the formula as it is being created. It is initially colored yellow but will turn red if the formula is invalid and green when valid. When the indicator is red, the **Ok** button will be unavailable. Use the **Select** button to select an existing formula to include in the new formula. The list of existing formulae is displayed as a rolling list. When a valid formula has been entered, press the **Ok** button to continue. You are then requested to assign a name to the new formula, after which an information box is displayed showing the name of the user who created the formula and the date and time it was created. If required, add any free format alphanumeric text to identify the formula and press **Ok** to continue.
Edit or Delete	To edit or delete a formula, first select the formula from the list displayed and then press either **Edit** or **Delete** as appropriate. If **Delete** was selected, you will be asked to confirm deletion before the formula is deleted from the list. If **Edit** was selected the formula editor screen is displayed to allow you to change the definition of the formula.
Info	This button can be used to display information about the selected formula, such as the operator who created it, the date and time of creation (or the last edit), and any comments associated with it.

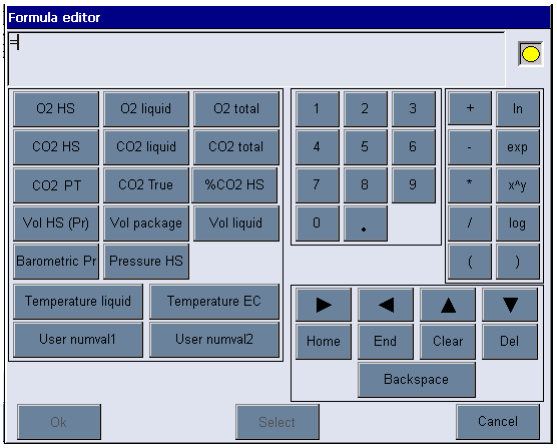


Figure 5 Formula editor screen

Table 1 Formula terms and definitions	
Term	**Definition**
O2 HS	O_2 in headspace
O2 liquid	O_2 in liquid
O2 total	O_2 in headspace + O_2 in liquid
CO2 HS	CO_2 in headspace
CO2 liquid	CO_2 dioxide in liquid
CO2 total	CO_2 in headspace + CO_2 in liquid
CO2 PT	Concentration of dissolved CO_2 using headspace pressure obtained by a pressure/temperature (PT) method after package shaking
CO2 True	Concentration of the real dissolved CO_2 (corrected with CO_2 purity in the package)
%CO2 HS	CO_2 purity during headspace analysis
Vol HS (Pr)	Volume of headspace
Vol package	Volume of headspace + volume of liquid
Vol liquid	Volume of liquid
Barometric Pr	Barometric pressure
Pressure HS	Headspace pressure after piercing
Temperature liquid	Temperature of package liquid
Temperature EC	Temperature of the O_2 sensor in the instrument
User numval1	The values are defined in the **Num 1** and **Num 2** fields of the comments section on the measurement results screen. Refer to Figure 7 Measurement results screen on page 48 for an example of measurement.
User numval2	

5.4 Instrument parameters

5.4.1 Measurement output

Measurement output	
Define the parameters shown on the screen after and during the measurement process.	
Diagnostic measurement view	Use this option to troubleshoot measurement problems. If this box is checked, then instead of the standard measurement progress screens being displayed during the measurement process, the measurement values are displayed instead. Refer to example in Measurement view on page 49.
Display diagnostic results	Use this option to troubleshoot measurement problems. If this box is checked, then instead of the standard measurement results screen being displayed at the end of the measurement process, more detailed measurement values are displayed instead, Refer to example in Results view on page 49.
Skip comments view after analysis	If checked, the comments section on the measurement results screen is not displayed.
Package size check	If checked, the instrument will verify that the package size is the same as that defined in the height parameter for the package being measured. If different a warning message will be displayed. The height detection resolution is 1 mm.
Warning messages	If checked, any warning messages will be displayed during the package measurement process. If left unchecked, all warnings will be suppressed. For a full listing of possible warnings, refer to Warning messages on page 60.
Normalization	If checked, enter the temperature value for CO_2 normalization. CO_2 calculations will then be made based on the temperature entered rather than the sample temperature.
Column selection	From the drop down list, define the three measurements to display on the right side of the measurement results screen after the measurement process has completed. Refer to example in Figure 7 Measurement results screen on page 48.
When all details have been entered, select **Ok** to confirm.	

5.4.2 Time and date

Time / Date
Set the system date and time parameters and the display format. Select **Ok** to confirm.

5.4.3 System information

System information
Display the system information about the currently configured boards. Select **Exit** to exit the screen.

5.5 Security and user management

5.5.1 Security management

Note: *When the instrument is started for the first time, security is enabled by default. Refer to* *4.2.2 User identification and access level on page 25**.To avoid any unauthorized access, it is highly recommended that each user be entered into the system and given appropriate access rights as soon as possible. Details are provided in this section.*

Security management	
Configure parameters related to confidentiality. On completion, select **Ok** to confirm.	
Access rights enabled	When checked (recommended), it is required to log on as a registered user to access the menus. When disabled (default), users are logged on at **Administrator** level, all menus are access free and there will be no name recorded against any actions in the log file. To set up valid users, refer to User management on page 34.
Auto logoff	When checked, the user is logged out automatically when the set delay for inactivity (**Logout timer**) is reached and the instrument goes on standby.
Logout timer	Enter a maximum time of inactivity (in minutes) for all users. Users are logged out automatically when the period of inactivity exceeds this value and the **Auto logoff** feature is enabled.
Audit trail	When checked, every action from a user is recorded in an audit file for traceability. These actions cover the configuration, calibration, and maintenance options. Each record holds the date and time of the action, the action ID and description, and the operator name and ID. The audit file is a rolling buffer recording the last 1000 actions.
Clear audit trail file	This option deletes the audit file.
Clear result file	This option deletes the package measurement data.

5.5.2 User management

User management		
When selected, the list of registered users (up to a maximum of 99) for this instrument are displayed. ***Note:*** *To have the* ***Delete*** *and* ***Edit*** *options available, select one of the existing users first.*		
New	To add a new user, all of the following fields must be entered, then select **Ok** to add the new user.	
	Name	Enter the user surname (3-15 characters).
	First Name	Enter the user first name (3-15 characters)
	ID	Enter an alphanumeric ID (1-10 characters).
	Password	Enter an alphanumeric password (3-15 characters).
	Security level	Select the security level from the drop-down list. For a list of options available at each level refer to Table 2.
Edit or Delete	To remove or modify an existing user, select the user in the user management screen and select **Edit** or **Delete** as appropriate. To save all changes, press **Ok** (you will be required to confirm the changes) or press the **Exit** button to exit the screen without making any changes.	

Table 2 Security level table	
Level	**Available options**
Operator	Measurement and Analysis
Supervisor	Calibration, Measurement, Analysis and Maintenance
Manager	Configuration, Calibration, Measurement, Analysis and Maintenance
Administrator	Configuration, Calibration, Measurement, Analysis and Maintenance

5.5.3 Audit trail

Audit trail
View the list of user actions performed on the instrument. The actions are listed chronologically with the latest action always at the top of the list. When the maximum of 1,000 recorded actions is reached, the oldest is deleted and replaced with the newest. Scroll through the audit trail screens using the **First**, **Previous**, **Next** and **Last** buttons, or select the **Exit** button to leave this option. ***Note:*** *To clear the audit trail file, use the option available in* ***Security management****.*

5.6 Communication

This option sets the parameters required for exporting instrument data files to your PC or USB storage device.

Select from:

- Data download configuration. Refer to Data download configuration on page 35.
- Ethernet configuration. Refer to Ethernet configuration on page 36.

5.6.1 Data download configuration

Scroll through the list of available data files using the up/down arrow keys on the right, and select if the file to be exported is in data or text format. By default, the text format is set to **YES** and the data format to **NO**. Set both formats to **NO** if you do not require the file downloaded. Use the **Invert Selection** button under each column to toggle between **YES** and **NO**.

Note: *It is recommended to set the files to text format for easy loading into standard software applications on the PC such as Microsoft Excel or similar. The data format is only required for Hach Lange service and support personnel.*

When the data formats have been configured, select **Ok** to confirm.

The following files can be transferred:

- Audit trail: **Audit trail.txt**
- Calibration files: **Calib Barometer.txt**, **Calib CO2.txt**, **Calib Flow.txt**, **Calib O2.txt**, **Calib Pressure.txt** and **Calib Temperature.txt**
- Liquid: **Liquid.txt**
- Package: **Package.txt**
- Result: **Result.txt**
- Configuration: **Configuration.txt**
- Formula: **Formula.txt**
- Raw data: **Raw data.txt**

To transfer the data files, plug an external mass storage device (such as a USB memory stick) into the USB-A port at the rear left of the instrument (**No. 3** in Figure 3 on page 14). The instrument should automatically recognize the presence of the device.

It may be that some USB memory sticks are not compatible with the instrument and will not be recognized. In this case, the only solution is to try another brand of memory stick, or to access the instrument using an Ethernet connection. Refer to Ethernet configuration on page 36.

Note: *It is recommended to use an empty USB storage device, as the more files it contains the longer the instrument will take to scan the device for files already downloaded.*

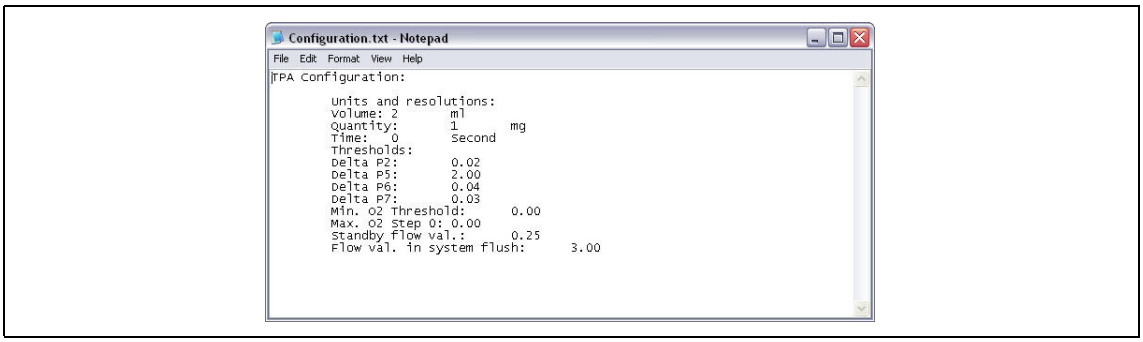
The files are automatically copied and on completion a pop-up window will inform you the process completed successfully and you can remove the device.

Remove the device and press YES in the pop-up window to continue, followed by EXIT in the main window to complete the process.

Next, insert the device into an available USB port on your computer and download the data to an appropriate folder using standard computer software.

The text files (with a **.txt** file extension) are in a readable format on a PC and most document editors (MS Word, Notepad, etc.) can be used to open these files as well as spreadsheet and other reporting tools (e.g. MS Excel).

The following is an example of the instrument configuration report (**Configuration.txt**) as viewed using the Notepad utility.



5.6.2 Ethernet configuration

NOTICE

Network and access point security is the responsibility of the customer that uses the wireless instrument. The manufacturer will not be liable for any damages, inclusive however not limited to indirect, special, consequential or incidental damages, that have been caused by a gap in, or breach of network security.

This option allows you to set up an Ethernet connection to download data from the instrument to a PC. This can be to a web page (Refer to Web browser on page 36) using an HTTP connection, or to an OPC client (Refer to OPC client on page 38) using a DCOM connection.

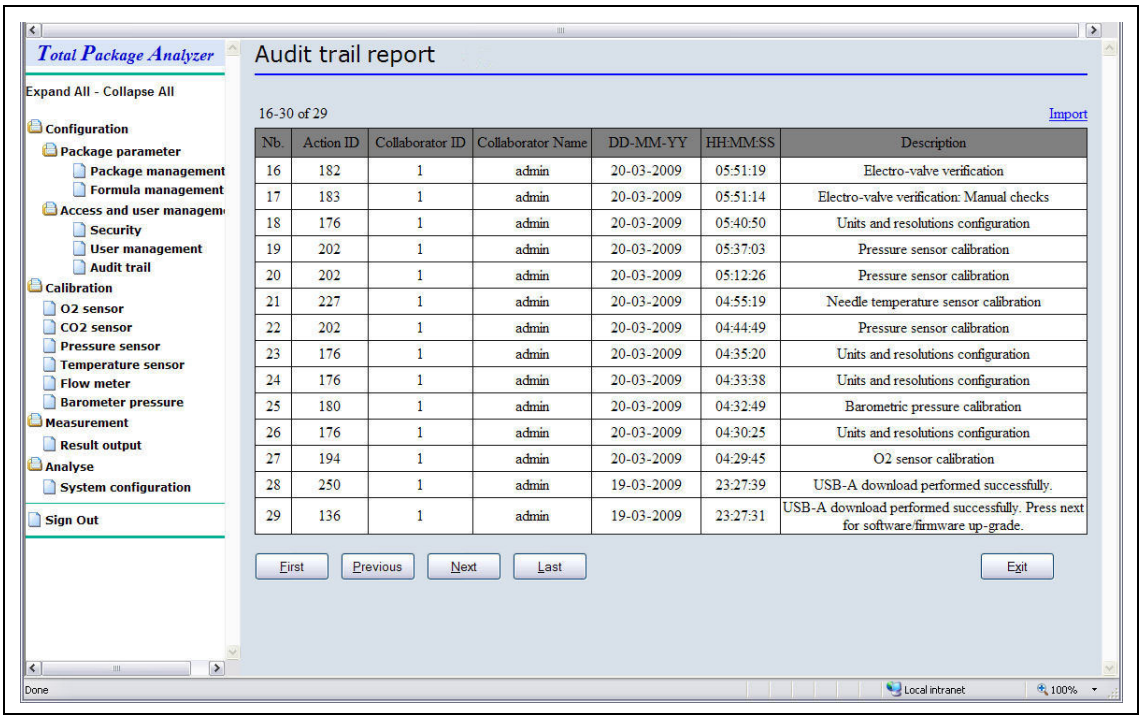
These options allow you to perform several operations directly from your PC. To be able to use these options, the instrument must be connected to the network.

At the bottom of the ethernet connection screen, check the data access box required.

5.6.2.1 Web browser

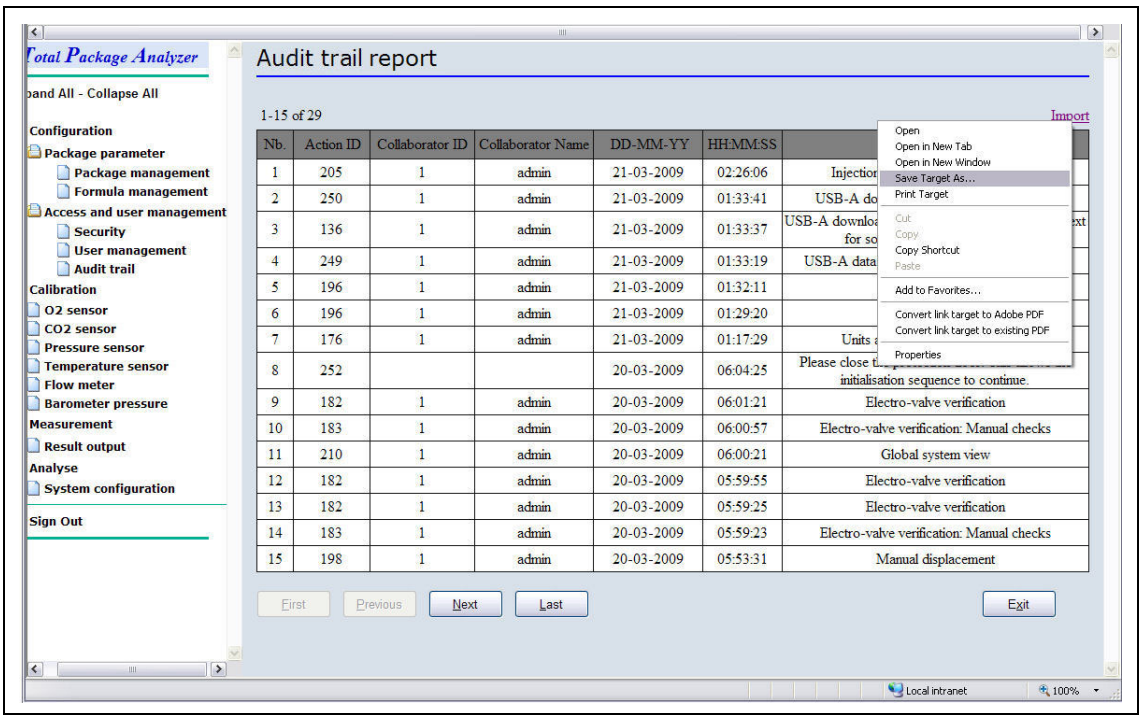
Access the information by launching an internet browser on your PC and typing “http://” followed by the device name assigned to the instrument. The home page will then be displayed.
You will be required to enter a valid username and password combination. Refer to Security and user management on page 34.

The initial screen will then be displayed. You can then click on **Expand All** to see all the available options. Then click on the report you wish to view (as in **Audit trail** below).



Depending on the option selected, you will have the possibility to browse through all pages of the reports, by clicking on the **First**, **Previous**, **Next** and **Last** buttons at the bottom. Click on **Exit** to select another report or click directly on the list of reports on the left.

To download the data for your selected option, right click on **Import** (top right of the screen) and select **Save Target As**.



Then selected a location on your PC to store the file. The files and filenames are the text files that are listed in Data download configuration on page 35.

5.6.2.2 OPC client

OPC (Open Process Control) is a software interface standard that allows Windows PC programs to communicate with industrial hardware devices. The OPC client software is installed on a PC and communicates directly with the OPC server embedded in the 6110 instrument.

To activate the link, check the OPC option on the ethernet configuration screen.

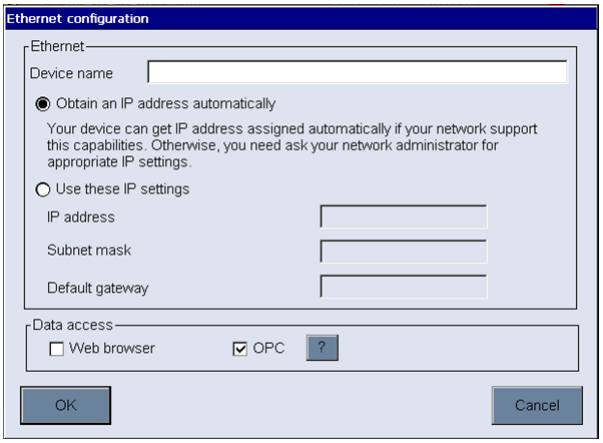


Figure 6 Ethernet configuration screen

The first time this option is selected, a registration key is required. This can be found on the case of the supplied CD-ROM. Enter the registration key.

Once validated, press the information button next to the OPC checkbox to display the CLSID number. Enter the instrument ID (shown in the device name box in the configuration screen) and the CLSID into the OPC client software on the PC to establish the two-way network link to the instrument.

The OPC protocol identifies the data passed between server and client with a three level hierarchy called an item. The item may contain data, error messages or warning messages.

To ensure total synchronization between PC and instrument, all modifications that are made to data elements on the instrument are automatically sent to the client PC as a message item.

Three data items are sent in read-only format from the instrument to the OPC client:

- Package - Containing data about the currently selected package
- Measure - Containing data about the last measurement made by the instrument
- Calibration - Containing data about the current calibration parameters being used

Message items can be sent from the instrument to the OPC client and from the OPC client to the instrument.

5.7 Scheduled operations

This option defines the sensor service and calibration schedule for all the sensors installed on the instrument.

5.7.1 Manual calibration

Manual calibration	
Select a sensor and check the activation flag as required.	
Calibration frequency	When set, the system will set a yellow status indicator message to inform you when a sensor calibration is required. Refer to Instrument status indicator on page 23.

Frequency selection	Press the button to set the desired frequency:
	• Choose between **Daily, Weekly**, **Monthly** or **Yearly** by pressing the appropriate radio button
	• With the **Weekly** option, define the day of the week when the operation will take place
	• With the **Monthly** option, define:
	  • The date and monthly interval (e.g. every 15th day of every 3 months), or
	  • The day and monthly interval (e.g. every 1st Sunday of every 2 months)
	• With the **Yearly** option, define:
	  • The date and month (e.g. every 1st February), or
	  • The day and month (e.g. every 2nd Saturday of every July)

5.7.2 Verification

The process is the same as for **Manual calibration** but defines a verification frequency for selected sensors.

5.7.3 Routine maintenance

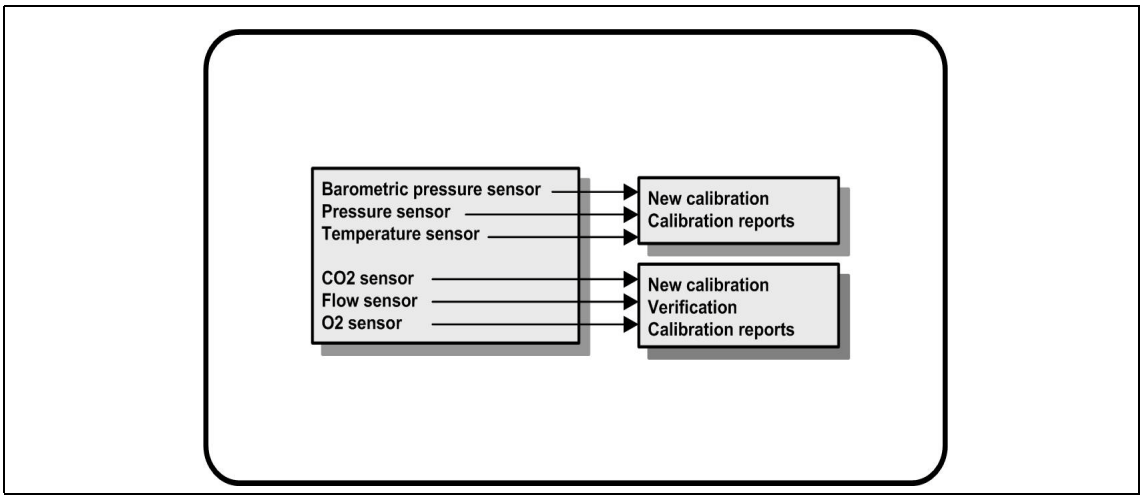
The process is the same as for **Manual calibration** but defines a service frequency for selected instrument maintenance options.

5.7.4 Service

The process is the same as for **Manual calibration** but defines a service frequency for selected instrument service options.

Section 6 Calibration

6.1 Calibration menu overview



This section describes the sequence of actions required to calibrate the sensors and flow meter on the instrument:

1. Barometric pressure sensor
2. Pressure sensor
3. Temperature sensor
4. CO2 sensor
5. Flow sensor
6. O2 sensor

Note: *The above is the actual sequence of events that must be followed for any calibration (i.e. if you calibrate the CO_2 sensor, then the barometric sensor, pressure sensor and temperature sensor must be calibrated first and in that order).*

6.2 Standards requirements

It is recommended that calibrations should be made with external certified standards at least once a year.

The instrument will provide accurate results provided accurate reference standards are used. The following table shows the maximum ranges for the standards. These ranges should not be exceeded.

Standard	Range
Pressure	± 0.02 bar
Barometric pressure	± 2 mbar
Temperature	± 0.2°C
CO_2 sensor	CO_2 at 99.9% purity at ± 0.1% which is the purge gas for the normal operation

6.3 Calibration schedule

This following table shows the recommended sensor calibration intervals (using the instrument's automatic calibration feature) based on an average of 500 package analyses per week. This proposed schedule can be modified according to operating conditions.

Sensor	Interval
Barometric pressure sensor	6 months
Flow meter	6 months
Temperature sensor	6 months

Sensor	Interval
O_2 sensor	2 months
CO_2 sensor	6 months
Pressure sensor	6 months

6.4 Barometric pressure sensor

After selecting this option, the details of the last barometric pressure sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

Barometric pressure sensor	
New calibration	**1.** A calibration screen is displayed showing the current values measured by the instrument. **2.** Using a precision certified barometer, measure the barometric pressure in the location where the instrument is used and compare with the current barometric pressure value displayed. If the values are the same press **Cancel**, otherwise enter the new barometric value in the **New barometric value** box and press **Validation** to store the new setting. **3.** On completion a calibration report is created.
Calibration reports	View the last 10 barometric pressure sensor calibration reports.

6.5 Pressure sensor

After selecting this option, the details of the last pressure sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

Important Note: *This procedure uses information from the barometric pressure sensor. Be sure that this parameter is reliable (i.e. a recent barometric pressure sensor calibration has been performed - Refer to Barometric pressure sensor on page 42).*

Pressure sensor	
New calibration	**1.** A calibration screen is displayed showing the current values measured by the instrument. **2.** Using a precision certified barometer, measure the barometric pressure in the location where the instrument is being used. Provided a barometric pressure sensor calibration has recently been performed (as described in the ***Important Note*** above) this measurement should be the same as the value displayed in the **Reference pressure** box. If this is the case, press **Enter** and go to the next step. Otherwise, enter the measured barometric pressure value in the **Reference pressure** box and press **Enter**. **3.** Connect a precision certified pressure gauge (0-7 bar) to the gas out connection on the rear of the instrument (**No. 4** in Figure 4 on page 15) and measure the reference pressure. Enter this value in the **Reference pressure** box and press **Enter**. **4.** Finally press the **Validation** button at the bottom left of the screen to accept the new calibration and complete the process. **5.** On completion a calibration report is created.
Calibration reports	View the last 10 pressure sensor calibration reports.

6.6 Temperature sensor

After selecting this option, the details of the last temperature sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

The temperature calibration is made using an accurate internal resistor.

Temperature sensor	
New calibration	**1.** A calibration screen is displayed and the instrument measures two temperature values and checks the stability of the measurements. Provided the measurements are stable, you can choose to accept or reject the new values. Press **Validation** to store the new setting. **2.** On completion a calibration report is created.
Calibration reports	View the last 10 temperature sensor calibration reports.

6.7 Carbon dioxide sensor

After selecting this option, the details of the last carbon dioxide sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

The CO_2 sensor needs to be calibrated approximately once every 6 months and is calibrated using pure CO_2 and air. CO_2 is supplied by the purge gas and air is provided by an internal pump that takes air directly from the atmosphere.

Carbon dioxide sensor	
New calibration	**1.** A calibration screen is displayed showing the gas purity data of the main gas. If the value is incorrect, enter the correct value in the **Gas purity** box. **2.** When the measurement stabilizes press the **Validation First Point** button. A new measurement is then initialized and the internal air pump automatically activated. **3.** When the measurement stabilizes press the **Validation Second Point** button. **4.** You now have the opportunity to accept the calibration, store the new values, and write the details to the calibration report file. If the calibration cannot be performed, an error message will be displayed giving the reason.
Verification	**1.** The process is similar to a new calibration, but once verification is complete press the **Ok** button to complete the process. No report is produced.
Calibration reports	View the last 10 flow sensor calibration reports.

6.8 Flow sensor

After selecting this option, the details of the last flow sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

Important Note: *This procedure uses information from the pressure sensor. Be sure that this parameter is reliable (i.e. a recent pressure sensor calibration has been performed - Refer to Pressure sensor on page 42).*

Flow sensor	
New calibration	**1.** A calibration screen is displayed and the instrument will then compute the measured flow in four steps (at 0.200 ml/s, 0.400 ml/s, 0.800 ml/s and at 0.000 ml/s). The results are displayed on screen. **2.** After a few minutes, when the process is complete, the **Validation** button is highlighted. Press this button to accept the calibration (you will need to confirm acceptance). **3.** On completion a calibration report is created.
Verification	**1.** The process is exactly the same as for a new calibration, but once the details have been displayed on screen press the **Cancel** button to complete the process. No report is produced.
Calibration reports	View the last 10 flow sensor calibration reports.

6.9 Oxygen sensor

After selecting this option, the details of the last oxygen sensor calibration are displayed. This shows the values recorded, and information about who performed the last calibration and when. The due date of the next calibration is also shown (determined by the parameters entered in Scheduled operations on page 39).

Important Note: *This procedure uses information from the barometric pressure sensor. Be sure that this parameter is reliable (i.e. a recent barometric pressure sensor calibration has been performed - Refer to Barometric pressure sensor on page 42).*

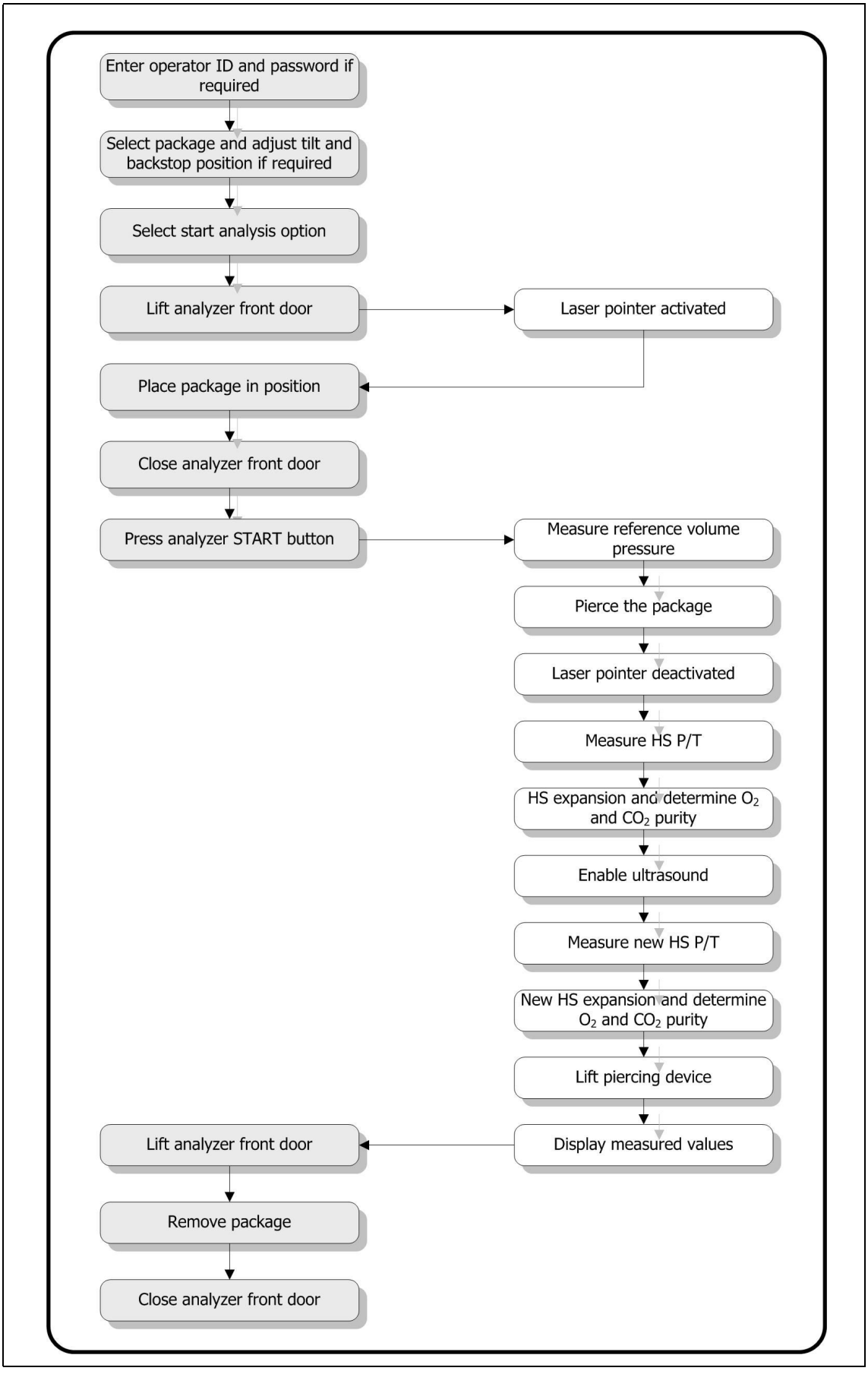
The O_2 sensor should be calibrated after each sensor service or when the calibration due date parameter has been passed. After a sensor service, wait at least 30 minutes after mounting a new membrane before calibrating.

Note: *For full details on sensor servicing, please refer to the **GA2X00 Sensor Installation and Maintenance Manual** that was delivered with the instrument.*

The O_2 sensor is calibrated in-situ with an air pump providing a continuous flow of fresh air in front of the sensor head.

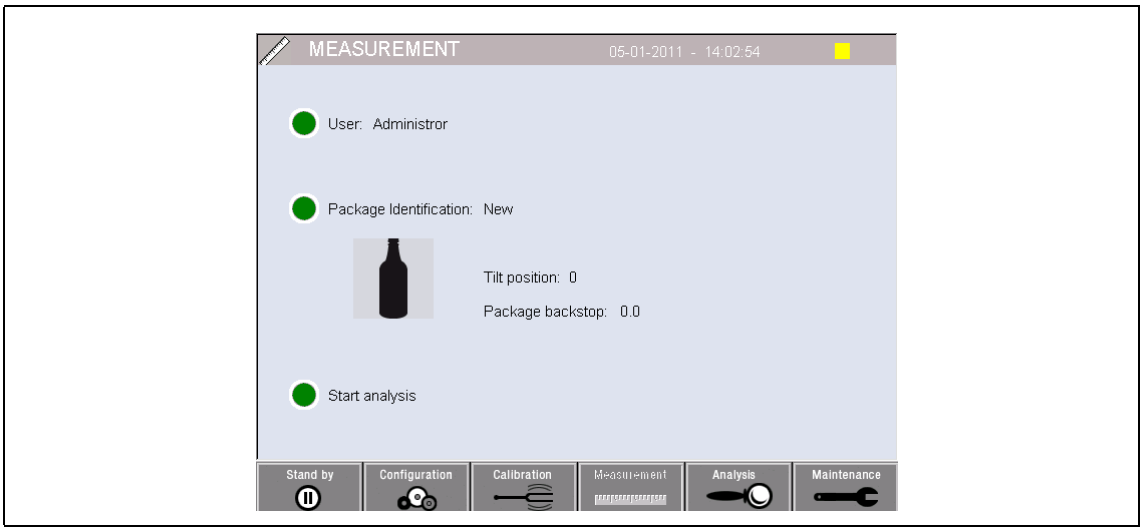
Oxygen sensor	
New calibration	**1.** A calibration screen is displayed. **2.** The value **Ratio ideal membrane** is a percentage of the current against the ideal current for the membrane being used. **3.** The value **Variation** shows the percentage of this measurement against the last sensor calibration measurement. **4.** The **Calibration Status** box at the bottom of the screen shows the current calibration process with a bar graph below it to indicate the progress. **5.** On completion, only if the calibration is valid will the **Validation** button be displayed. Press this button to accept the calibration, store the new values, and write the details to the calibration report file. If the calibration cannot be performed, an error message will be displayed giving the reason.
Verification	**1.** The process is similar to a new calibration, but once verification is complete press the **Exit** button to complete the process. No report is produced.
Calibration reports	View the last 10 flow sensor calibration reports.

The following flow chart shows an overview of the measurement process. The actions listed on the left are performed by the user, and those on the right by the instrument.



7.1 Main screen

The initial screen displays standard information about the package to measure:



You have the option to change the details displayed or to start the measurement process:

- User
- Package ID
- Start analysis

7.1.1 User

User
Enter a valid User ID and Password. The new user name will be displayed.

7.1.2 Package ID

Package ID
Define the package to be measured. The package details must have already been entered into the system. Refer to Package parameters on page 30 for details. Select the package from the list provided and press **Ok**. If necessary, you can change the package details using the **Edit** button. For details on editing a package. Refer to Package parameters on page 30.

7.1.3 Start analysis

Important Note: *Once a sample has completed the measurement process it will contain a small amount of antifoam. Therefore, after measurement, ensure the sample is disposed of in a sink (or similar) to avoid any risk of ingestion.*

Note: *If the Diagnostic measurement view and the Display diagnostics results boxes have been checked during configuration (Refer to Instrument parameters on page 33), then the screens will differ (Refer to examples in Diagnostic measurement and results views on page 49) but the process is the same.*

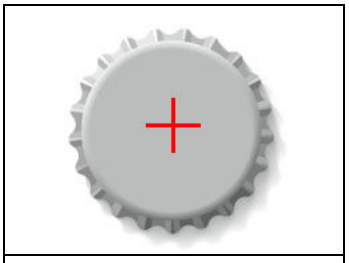
For optimal operation, the base of the package holder should **always** have a layer of water for improved transfer of the ultrasound energy to the liquid in the package. For the correct amount of water, tilt the package holder forward by turning the tilt knob to position 3 (small can icon). Refer to Figure 2 on page 13. Next, fill the holder with water until the water level reaches the top without spilling over. Finally, put the holder back to the correct tilt position for the package to be measured in readiness for the measurement process.

Select the **Start Analysis** option to start the measurement process. The instrument will display information regarding the measurement step being taken, instructions on any user involvement required, and the measurement progress throughout the duration of the measurement process.

The first screen gives details of the package being analyzed and gives the user information on what action to take. As instructed, raise the transparent front door in order to place the package in the measuring chamber. As soon as the door is raised, the initialization screen is displayed with the next set of instructions.

Place the package to be analyzed on the circular platform, and set the tilt position as defined for this package by turning the black knob on the front. Two red laser beams are activated as the front door is raised. Where the two red beams intersect is where the package will be pierced.

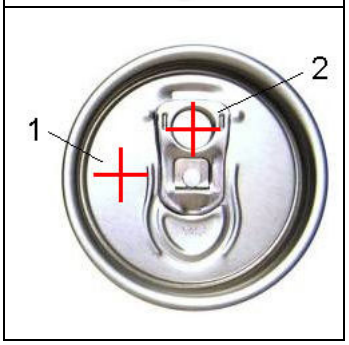
For bottles, position the package so that the two red beams intersect in the centre of the bottle top (as illustrated right).



For cans, position the package so that the two red beams intersect at position **1** (as illustrated right). This is the recommended piercing position.

Alternatively, position the package so that the two red beams intersect at position **2**.

Note: *If piercing at position* ***2****, turn the ring pull 90° left or right, in order to clear the piercing position. Do* ***not*** *pierce the can with the ring pull in the position illustrated.*



Make sure that the package is also hard up against the backstop. This may require realigning the backstop by turning the locking wheel counter clockwise and adjusting its position to that defined for this package. Lock it in place by turning the locking wheel clockwise finger tight.

Once the package is secure against the backstop and the piercing position aligned with the two red laser beams, close the front door.

Start the measurement process by pressing the **START** button on the right side of the instrument base. Refer to Figure 2 on page 13.

A progress bar is displayed at the bottom of the screen showing the elapsed time to date, and the estimated time for measurement completion. This bar is updated on an on-going basis.

No intervention or action from the user is required until the measurement process has completed. However, you do have the option to **Abort** the process at any point.

The measurement goes through four main stages during which time a number of measurements are taken and calculated:

- The piercing arm is lowered and the package is pierced

- The head space is analyzed

- The liquid is analyzed

Note: *This step will* ***not*** *be executed if the* ***Headspace*** *measurement has been defined for this package. Refer to* *Package parameters on page 30**.*

- The measurement completes and the piercing arm is raised to its home position

Once complete, the measurement results are displayed. The three columns of data displayed are those that have been defined in Instrument parameters on page 33:

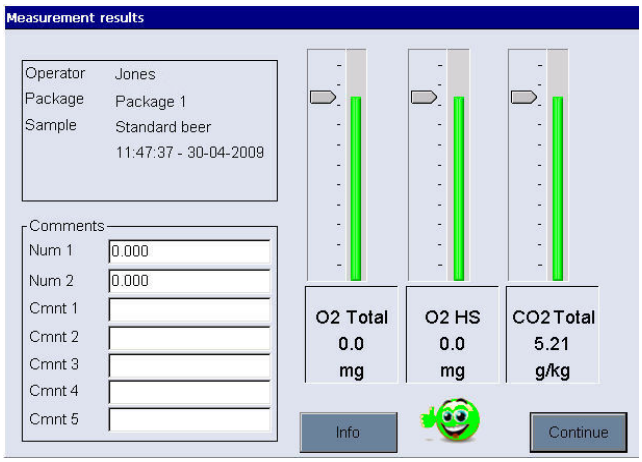


Figure 7 Measurement results screen

The three measurements are displayed graphically and are color coded. Those in green show that the measurements are within the defined limits for this package. Those in red signify that the measurements are outside the defined limits. These limits have been defined in the alarms section of Package parameters on page 30.

It is possible to add 2 numerical values and 5 comments to these results by entering them in the text boxes displayed down the left. The numerical values will be required if they have been defined as part of a formula. Refer to Formula management on page 32.

Press the **Continue** button to return to the main measurement screen, or press the **Info** button to display more detailed results (again color coded) in a tabular format.

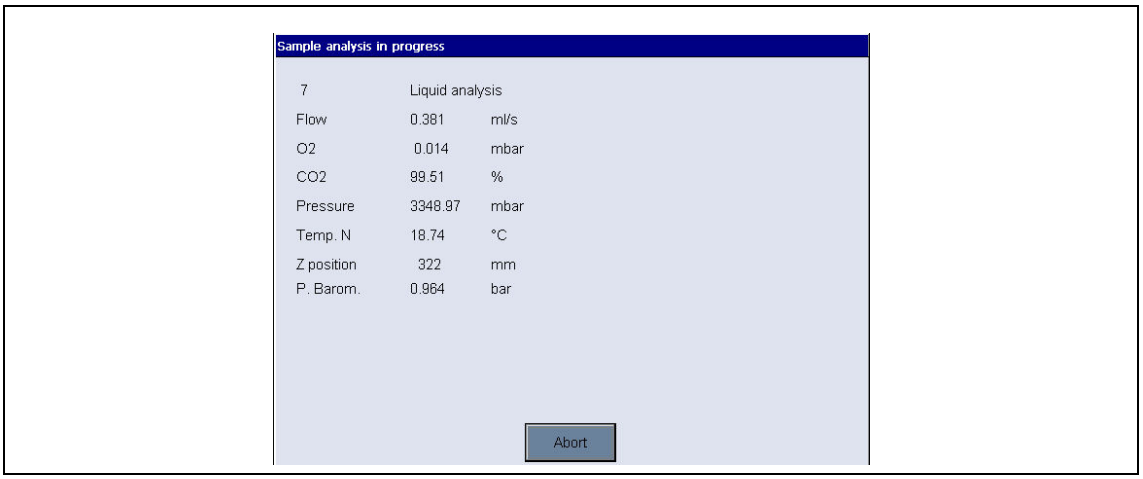
For additional information on viewing the full set of measurement results, Refer to the section entitled Open data on page 51.

7.2 Diagnostic measurement and results views

These views are essentially used for troubleshooting purposes by Hach Lange service technicians, therefore no detailed explanation of the data displayed is given in this manual.

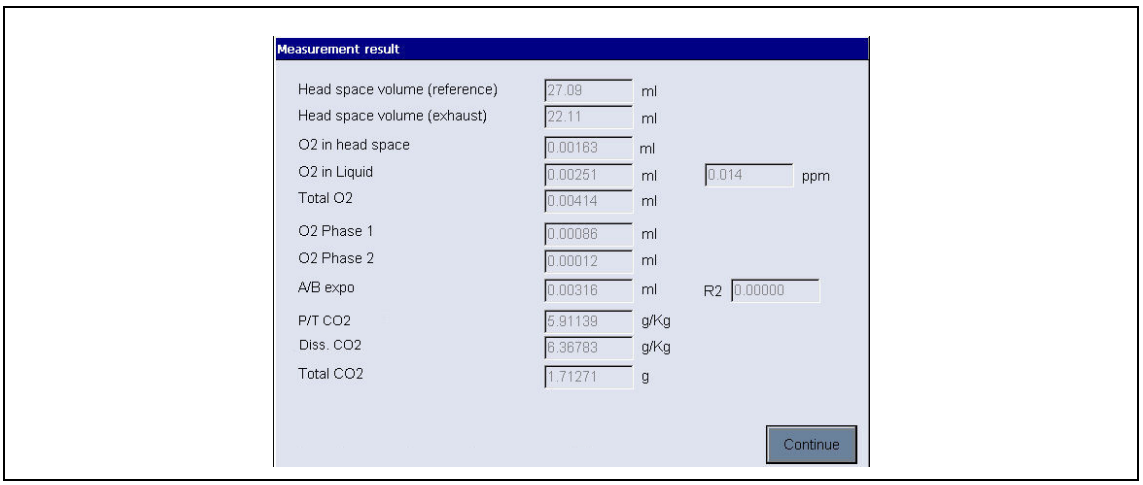
7.2.1 Measurement view

As the measurement process executes, the measurement details are displayed down the left side of the screen. The first line of the display shows the current stage in the process. The right side of the screen gives additional textual information.



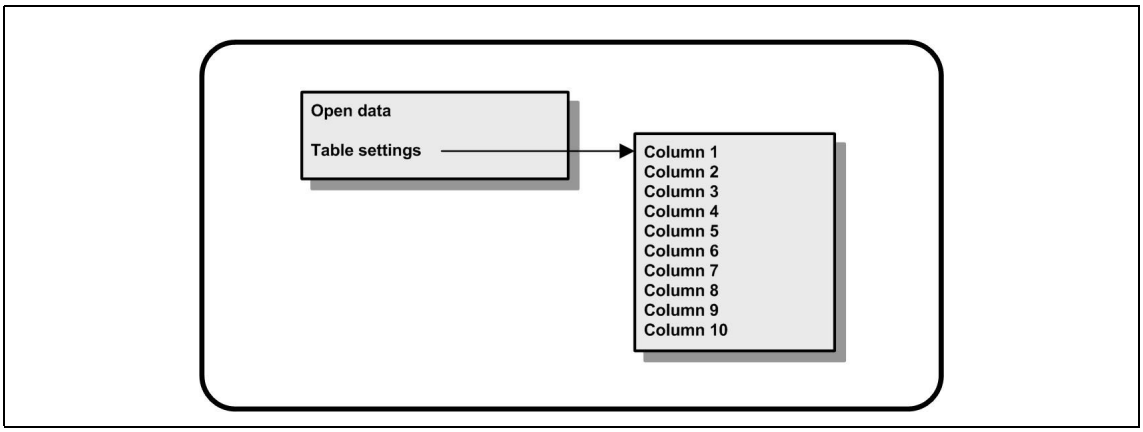
7.2.2 Results view

The following screen is displayed on completion of the measurement process:



Section 8 Analysis

8.1 Analysis menu overview



8.1.1 Open data

Open data
This option allows you to view the measurement data from the last 1000 measurements. The data elements displayed are those defined in **Table settings** below. Use the **Previous** and **Next** buttons to scroll through the data. Select one of the lines of data and the **Info** button will be made available. Press the **Info** button to see more details of the measurement in a new screen. Use the **Exit** button to return to the main analysis menu.

8.1.2 Table settings

Table settings
This options allows you to define up to 10 data elements that the instrument will display for each measurement. More data is recorded, but only 10 values can be displayed on screen. Define for each of the 10 columns the data to view from the drop-down list of available data elements. Select **Validation** to accept and save the selected data elements.

Section 9 Maintenance

9.1 Schedule

The following table shows the recommended maintenance schedule for an average of 500 package analyses per week. This proposed schedule should be modified according to operating conditions.

Action	Interval
Clean instrument exterior	Daily
Refill sonotrode base with water	Daily
Check piercing tip is tight	Daily
Check the purge gas pressure and purity	Daily
Run a reference sample (old beer) through the system to verify the CO_2 sensor and the O_2 response/residual (< 20 ppb)	Daily
Goretex filter replacement. Refer to Wizards on page 54.	Weekly
Remove and clean instrument front door inside and out	Weekly
Clean optical barrier windows	Weekly
Clean the sonotrode surface of the package holder	Weekly
Clean laser optics used to position the package	Weekly
Refill the antifoam cartridge. Refer to Antifoam cartridge preparation on page 55.	Approximately every 6 weeks
O_2 sensor cartridge replacement and calibration. Refer to Wizards on page 54.	Every 2-3 months
Piercing gasket replacement. Refer to Wizards on page 54.	Every 3 months
Piercing tip replacement. Refer to Wizards on page 54.	Every 6 months
Clean antifoam cartridge	Every 6 months
Purge and clean antifoam system	Every 6 months
Replace the display protection film	Every 6 months
Replace the rim detector protection	Every 6 months
Replace flow chamber O-ring	Every 6 months
Replace the blue sample tubing	Every 6 months
The following are performed by a Hach Lange service technician	
Sensor calibrations	Twice a year
Replace needle valve	Yearly
Replace antifoam cartridge internal membrane	Yearly
Antifoam pump maintenance	Yearly
Piercing module maintenance	Yearly

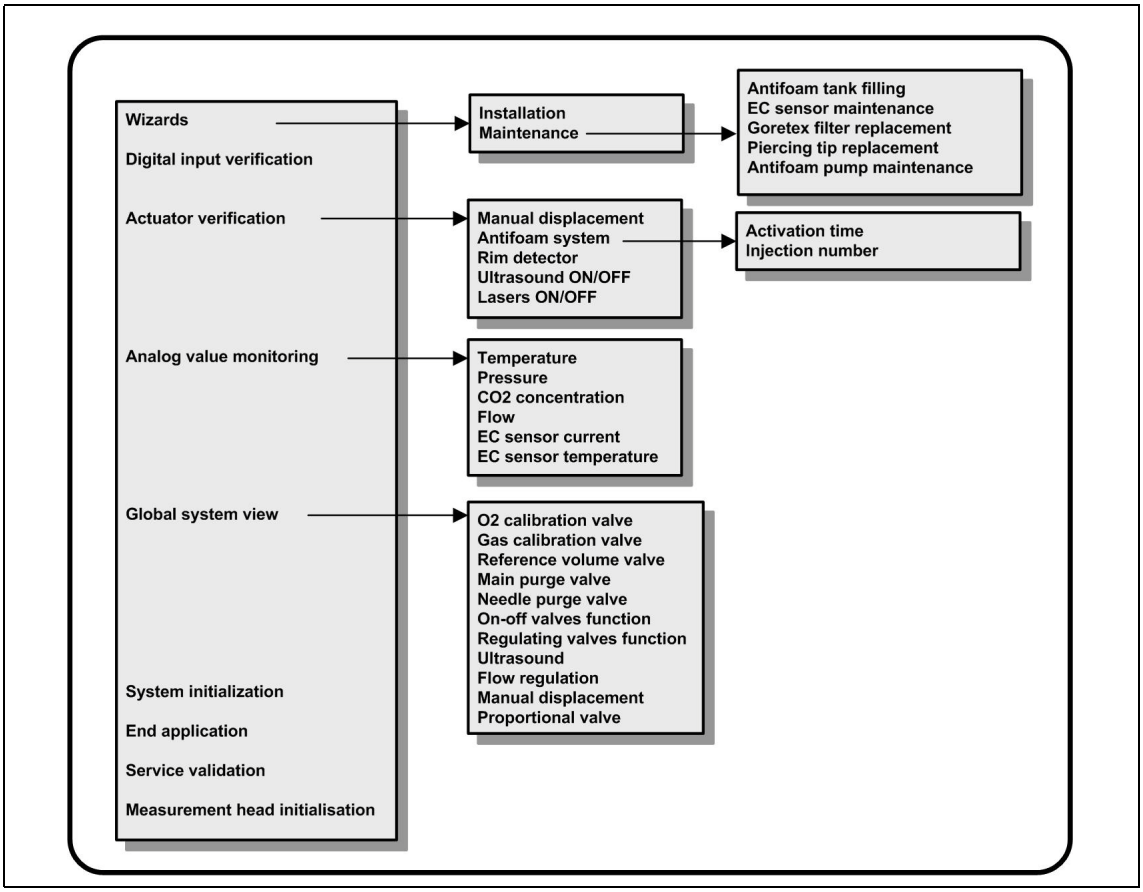
9.2 Purge gas cylinder

Check the purge gas cylinder (CO_2 99.9% purity) daily to ensure there is an adequate supply of gas.

⚠ CAUTION

On no account should the cylinder become empty while the instrument is switched on, as this can cause damage to the carbon dioxide sensor.

9.3 Maintenance menu overview



9.3.1 Wizards

This option gives an on-screen visual guide through a number of standard maintenance procedures to perform on the instrument.

Installation	
The installation wizard will be invoked automatically the first time the instrument is switched on to help you complete the installation of the instrument. Once the instrument has been successfully installed, the **Skip installation wizard on device startup** checkbox should be checked to ensure a normal startup from there onwards.	
Maintenance	
It is recommended to use the maintenance wizards for maintenance of the instrument. Simply follow the on-screen instructions available for each of the options.	
Antifoam tank filling	When refilling the cartridge, follow the instructions given in Antifoam cartridge preparation on page 55. To ensure the performance and reliability of the instrument, it is strongly recommended to only use the silicone antifoam supplied by Hach Lange (part number 33156).
EC sensor maintenance	Chemical reactions within the gas sensor requires that the oxygen sensor be serviced regularly to restore its original sensitivity. A clear sign that a sensor maintenance is required is when measurements are noticeably less stable than usual. For EC sensor maintenance, please also refer to the instruction sheet entitled **GA2400 cleaning procedure for 6110 TPA** which is supplied with the instrument.
Goretex filter replacement	It is recommended to replace this filter every week.

Piercing tip replacement	It is recommended to replace these about every six months. ***Note:*** *When replacing the tip, use the mounting tool supplied with the installation kit and apply some Loctite® 243 sealant (or similar) on the screw thread of the tip before mounting.*
Antifoam pump maintenance	Refill or replace the antifoam cartridge as required.

9.3.2 Antifoam cartridge preparation

To optimize the performance and reliability of the instrument, it is strongly recommended to only use the silicone antifoam supplied by Hach Lange (part number 33156). To fill the cartridge, refer to the steps that follow and Figure 8.

1. Lower the piercing assembly (refer to Manual displacement on page 56) for easier access to the antifoam cartridge connector. Raise the transparent front door.
2. Push the refill bottle onto the antifoam cartridge connector until the bottle clicks into place.
3. Squeeze the refill bottle to force as much antifoam as possible out of the bottle and into the antifoam cartridge.
4. Maintain pressure on the bottle to avoid any antifoam being sucked back into the bottle. Press on the lock on the top of the bottle to release it from the antifoam cartridge, and pull the bottle down to remove it.

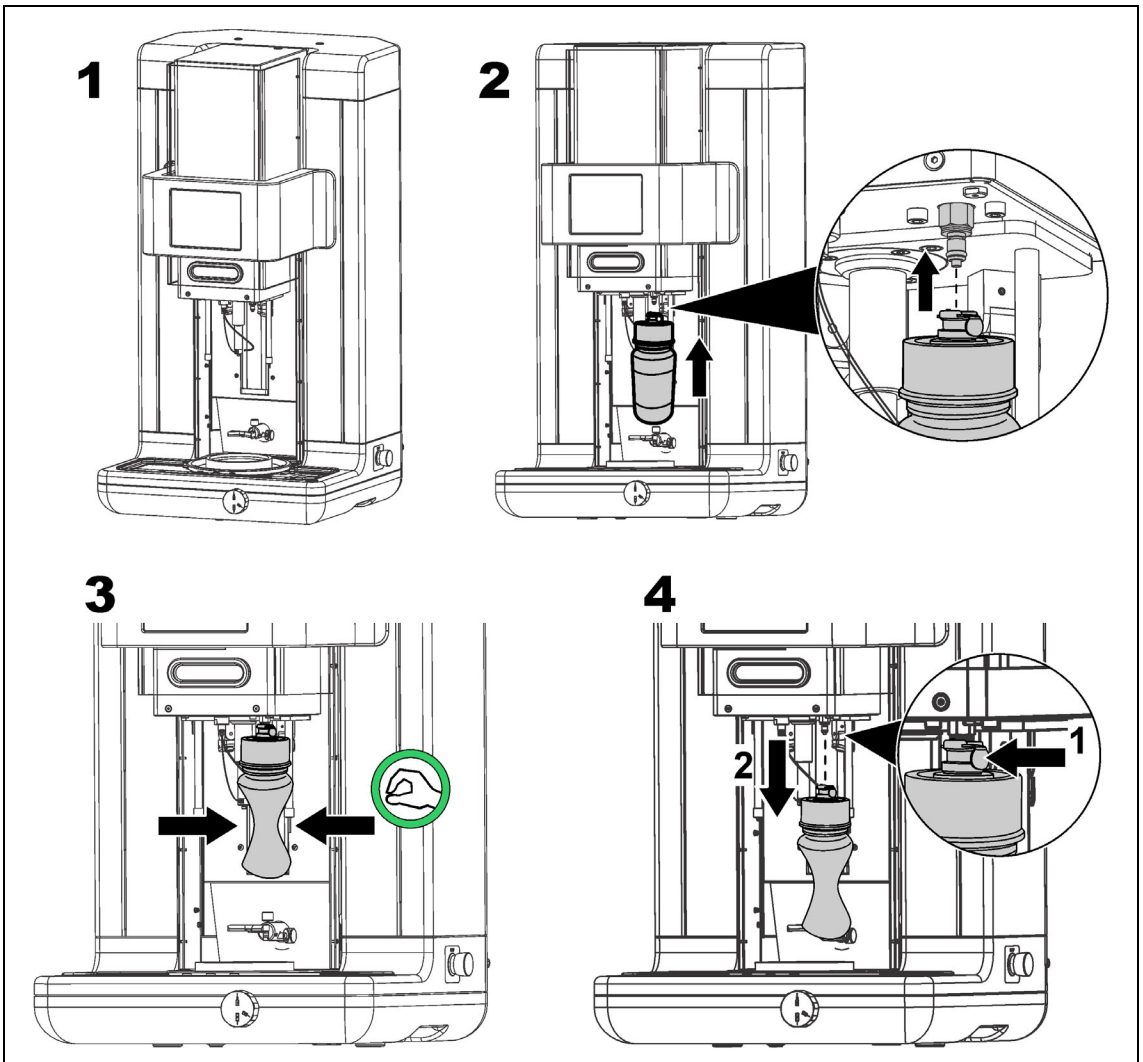


Figure 8 Antifoam cartridge preparation

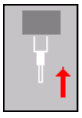
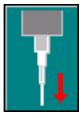
Important Note: *After installation of the antifoam, it is critical that any air bubbles be cleared from the antifoam circuit before taking any measurements. To do this, select the* ***Antifoam system*** *option from the* ***Actuator verification*** *option in the* ***Maintenance menu*** *and follow the instructions as described in* *Antifoam system on page 57**. Select 200 injections and stop the process when the system constantly spits a small stream of antifoam at each stroke denoting the antifoam circuit is free of air bubbles.*

Note: *A cartridge completely filled with antifoam is sufficient for approximately 3,000 measurements.*

9.3.3 Digital input verification

Digital input verification	
This allows you to check all devices that provide digital inputs to the instrument microprocessor. A black dot in the circle to the right of the option signifies that the specific sensor has been activated.	
Emergency stop pushed	Activated when the emergency stop button is pushed. The ultra sound option will also have a black dot as the power supply of the sonotrode is deactivated at the same time.
Axis reference position activated	The black dot indicates that the piercing device is positioned in the reference (home) location.
End of travel upper bound activated	The upper bound limit is located higher than the reference position. If this button is activated it means that the system is in an abnormal state of operation and you should call your local Hach Lange representative.
End of travel lower bound activated	Activated when the piercing device is in its lowest position.
Front door closed	Activated when the front door is closed.
Protection cover closed	Activated when the top protection cover is not in place.
Ultra sound error	Activated when the sonotrode is not working correctly.
Foam detection activated	Activated when foam or liquid has ingressed into the gas sampling tube.
Bottle rim detection activated	Activated when a package is detected by the optical barrier. For control purposes, this can be activated by passing the hand between both optical detectors.

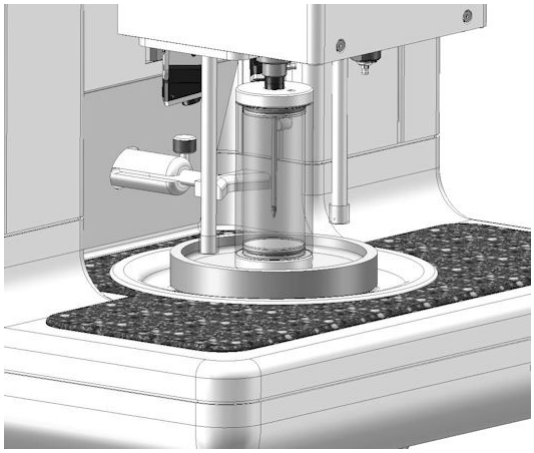
9.3.4 Actuator verification

Manual displacement	
 Move to the home position (top)  Move up  Stop (only applicable when moving to the home position)  Move down	Press on the icons displayed left to perform the required operation on the piercing assembly. The current position is displayed on the left side of the screen as the assembly moves either up or down.
 	It is advisable to check the displacement process using the two different speed settings by pressing on these two buttons (tortoise for slow and hare for fast).
 	Press on the icon with the up arrow to raise the needle back into the home position. Press on the icon with the down arrow to lower the needle without moving the piercing assembly.
Pressure Booster	Check this box to make sure the pressure booster is working correctly. The forcing gas pressure will increase from 2.5 to 4 bar.

Antifoam system
Use this option to check the level of antifoam remaining, to reset the antifoam level, and to test that the antifoam injector system is working. This option is useful to purge the system before an extended stand-by (several weeks) or when performing start up procedures.
Injection number | Enter the number of injections.

Follow this procedure:

1. An antifoam priming beaker is available from the spares kit delivered with the instrument. Place this on the ultrasonic base of the instrument, using the lasers to center it and lower the plastic front door.
2. Activate the motor to lower the instrument head, allowing the needle to penetrate approximately to the center of the beaker (illustrated below). Refer to Manual displacement on page 56 for details on lowering the instrument head.



3. Press the **Start injection** button and you should hear the injector working. You should hear as many clicks as you have defined for the injection number. In addition, the liquid should be seen exiting from the tip of the needle.
   Note: *If the system appears to be clogged in any way, press the* ***Presssure Valve*** *button to increase the forcing gas pressure from 2.5 to 4 bar.*
4. On completion of the test press the **Stop injection** button and raise the instrument head to its home position. Remove the beaker and rinse well with water. Store with the syringe and antifoam container for next usage.

Rim detector
Select this option to check that the rim detector is working correctly. If any faults are reported, these must be corrected before using the instrument for measurements.

Ultrasound ON/OFF
Check the box to turn the ultrasound **OFF** or **ON**. With some water in the base of the package holder, test the system is working by moving your finger across the base of the package holder and switching between **ON** and **OFF**. You should sense a noticeable difference.

Lasers ON/OFF
Check the box to turn the lasers **OFF** or **ON**. Test the system is working by switching to **ON** and you should see the two red laser beams intersecting on the package holder. Switch to **OFF** and the laser beams should disappear.

9.3.5 Analog value monitoring

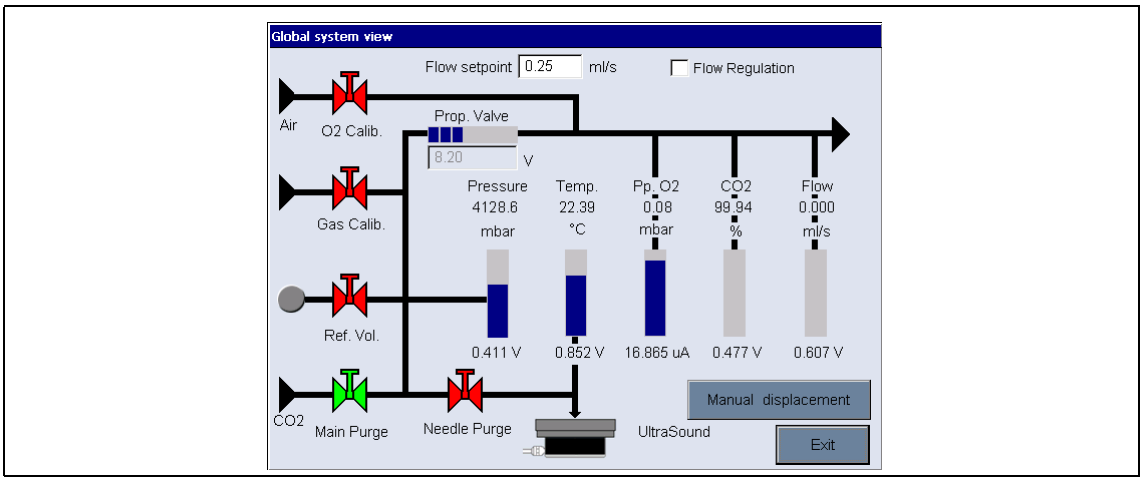
This screen shows all the main analog signals related to the main components of the instrument. Select this option to view the analog and actual values for:

- Temperature
- Pressure
- CO_2 concentration
- Flow
- EC sensor current
- EC sensor temperature

9.3.6 Global system view

This option allows you check various components of the instrument:

- O2 calibration valve
- Gas calibration valve
- Reference volume valve
- Main purge valve
- Needle purge valve
- On-off valves function
- Regulating valves function
- Ultrasound
- Flow regulation
- Manual displacement
- Proportional valve



Check a component by pressing on the button/schematic (which will turn to green) and observe the values being displayed.

Note: *If the gas flow rate is manually changed, be aware that the automatic purge procedure (every 5 minutes) will reset the gas flow rate back to 0.25 mL/s, which will have an impact on the values being observed.*

9.3.7 System initialization

Selecting this option initiates the standard system startup process, without having to power the instrument off and on. Refer to Instrument startup on page 24 for more information on system startup.

9.3.8 End application

Select this option to perform an orderly shut down of the instrument. On completion, the instrument can be powered **OFF**.

9.3.9 Service validation

This option lists the service due date for a number of options. These are user-defined, refer to option Service on page 39. As each service due date is passed, the **Service done** button will be made available. Press this button after the service has been performed to reset the service due date based on how the service has been configured.

9.3.10 Measurement head initialization

Use this option to return the measurement head to the home position by pressing the **Initialize motor** button.

Section 10 Troubleshooting

10.1 Error and warning messages

Note: *If any error or warning persists, please contact your Hach representative for assistance.*

10.1.1 Error messages

Code	Displayed message	Probable cause	Solution
HEX001	E1: Emergency STOP.	Emergency STOP button pushed.	Release emergency STOP button by turning it clockwise. If necessary, initialize the motor.
HEX002	E2: Motor error.	The measuring head has missed an obstacle.	Initialize the motor.
		Emergency STOP button pushed if the motor is moving.	
HEX004	E4: The front door has been opened. The measurement process has been stopped.	The front door has been opened before the end of the measurement process.	Close the front door.
		The front door is not closed properly.	Control the front door mechanism.
HEX010	E10: Foam has been detected in the gas path. The measurement process is canceled.	There is a problem with the antifoam injection.	Try another measurement.
		Incorrect tilt of the sonotrode.	Check the tilt of the sonotrode.
		There is no more antifoam.	Check the antifoam level and refill if necessary. Prime the antifoam pump.
		The pressure in the package is greater than the purge gas pressure.	Increase the purge gas pressure.
HEX020	E20: Not enough pressure in the system. The measurement process is canceled.	Problem of flow regulation during the measurement.	Check the purge gas pressure. Change the Goretex filter.
		The gas path is partially or totally blocked.	Control the antifoam injection.
HEX040	E40: Check gas supply, current pressure: nn.	Before filling the reference volume, the pressure is lower than 1.5 bar.	Check the purge gas pressure.
HEX080	No message displayed	No package installed.	Install a package.
HEX100	E100: Ultrasound error.	The ultrasound power supply is OFF.	Check the ultrasound power supply.
		The emergency STOP button is not released.	Release emergency STOP button by turning it clockwise.
		There is too much water in the ultrasound generator.	Remove any excess water.
HEX200	E200: Motor error - High limit.	The motor is above the reference position.	Go to the maintenance menu and initialize it.
HEX800	E800: Measurement stopped. The needle pressure is too low.	The needle pressure is too low, probably caused by air leaking from the piercing position.	Pierce the package in a different position.
HEX1000	E1000: Measurement stopped. Headspace pressure is not stable.	The headspace pressure is unstable.	Change the Goretex filter if clogged. Check correct piercing tip is being used for the package (PET/metal). Check for package leaks.
HEX2000	No message displayed.	Measurement aborted by user.	N/A
HEX4000	E4000: Calibration fails. A leak during the headspace determination prevents a correct measurement.	Bad piercing position.	Pierce the package in a different position. Change the Goretex filter.
HEX10000	E10000: The measurement could not start. The rim detector is faulty.	The detector has become clogged with old sample and dirt.	Clean the two metal rods either side of the piercing device with a damp cloth. Turn the instrument off and restart it. Check the connections. Change the rim detector.

10.1.2 Warning messages

Code	Displayed message	Probable cause	Solution	Code in results file
HEX001	W1: Unstable reference pressure.	The variation of reference pressure is too high.	Check the pressure stability of the input reference gas.	1
HEX002	W2: Unmatched package size.	The measured package height is different from the value defined in the package definition.	Check the package size definition.	2
HEX004	W4: Measurement timeout. Accuracy of dissolved O2 not guaranteed.	The measurement pressure is lower than 3.5 bar.	Check the black seal on the piercing unit. Check the purge gas pressure. Check the forcing gas pressure. Check the Goretex filter.	4
		Gas path not airtight.	Check the airtightness of the gas path between the piercing unit and the measurement chamber.	
HEX010	No message displayed.	A spontaneous and/or too fast degassing has occurred.	Restart the measurement with another package.	10
		The package (especially in the case of cans) is losing pressure due to a leak.	Verify the package is leak free i.e. watertight and airtight	
		The sensor has become unstable.	Perform an oxygen sensor maintenance procedure	
HEX020	W20: Measurement process incomplete. Insufficient initial package pressure.	The pressure in the package is too low to continue with a measurement.	Restart the measurement with another package.	20
HEX040	No message displayed.	A spontaneous degassing is detected at the end of the first expansion.	Restart the measurement with another package.	40
HEX080	W80: Measurement process incomplete. Insufficient package pressure during ultrasound stage.	The measured pressure is too low to compute the second phase of the measurement.	Check foam intrusion in the gas path. Check Goretex filter.	80
HEX100	No message displayed.	Possible problem with instrument configuration	Contact your Hach representative to analyze the problem.	100
HEX200	No message displayed.	Possible problem with instrument configuration	Contact your Hach representative to analyze the problem.	200
HEX400	No message displayed.	True CO2 may not be reliable due to CO2 purge gas purity out of specification.	Check gas cylinder purity, tubing and connections to 6110 and recalibrate CO2 sensor	400
HEX1000	No message displayed.	Possible problem with instrument configuration.	Contact your Hach representative to analyze the problem.	1000

Important Note: *The value in the right hand column of the above table is a direct correlation to the value in the warning flag column in the measurement file* ***Result.txt****. If a value in the warning flag column does not exist in the above table it is because it is a composite code meaning more than one warning is relevant (e.g. a value of* ***6*** *in the warning flag column equates to warning messages* ***4 and 2*** *from the table above). Be aware that this is a hexadecimal code meaning that if warning codes* ***10 and 2*** *from the above table are relevant, it will be displayed as a* ***C*** *in the warning flag column of the measurement file. If you have any difficulties relating the measurement file warning flags to the codes in the above table, please contact your Hach representative for assistance.*

10.1.3 Red LED's on startup screen

Item	Possible cause	Corrective action
Boards	Bad communication between boards. This may happen when switching the instrument on.	Switch instrument off, wait 10 seconds and switch back on. If the LED is still red call Hach service support.
O_2 sensor	No communication between sensor and board.	Check connection of the oxygen sensor. If problem persists, call Hach service support.
O_2 sensor residual too high	O_2 concentration is not below residual threshold (0.1 mbar)	Wait until a residual < 0.1 mbar is reached. Check gas purity and gas connections. Perform an O_2 sensor verification. Check sensor protection cap positioning. If required, perform an O_2 sensor maintenance (necessary for the initial start up). ***Note:*** *A high residual value will also affect the TC sensor readings and may cause them to go out of bounds. The problem with the TC sensor readings should self-correct as the residual value returns to normal.*
TC sensor	No communication between sensor and board. Sensor damaged.	Switch instrument off, wait 10 seconds and switch back on. If the problem persists call Hach service support.
Temperature sensor	No communication between sensor and board. Sensor damaged.	Switch instrument off, wait 10 seconds and switch back on. If the problem persists call Hach service support.
Flow sensor	No communication between sensor and board. Sensor damaged.	Switch instrument off, wait 10 seconds and switch back on. If the problem persists call Hach service support.
Pressure sensor	No communication between sensor and board. Sensor damaged.	Switch instrument off, wait 10 seconds and switch back on. If the problem persists call Hach service support.
Foam detector	Ingress of foam or liquid in the sampling tube.	Activate the needle and the purge valves in the Global System View screen (Refer to Global system view on page 58).
Electrovalves		Switch instrument off, wait 10 seconds and switch back on. If the problem persists call Hach service support.
Motor	Bad initialization or communication.	Initialize motor position in the Actuator Verification screen (Refer to Actuator verification on page 56).
Ultrasound	Sonotrode failure	Activate the emergency STOP button and call Hach service support.
Protection cover	Cover is not on the instrument or is badly positioned. Cover detection sensor failure.	Check that the cover is correctly in place and fixed with screws. Check that the position detector is in place (in the back of the instrument).
Emergency STOP	The emergency STOP button is in the activated position (pushed in).	This can happen during transportation. Release the button by turning it clockwise.

10.1.4 Measurement problems

Observation	Explanation
Negative TPO results	CO_2 purge gas is not of the required purity of > 99.9%
	Bad headspace volume computed.
The instrument never reaches the threshold value	CO_2 purge gas is not of the required purity of > 99.9%
	There is a leak with the CO_2 gas supply.
The bottle goes up with the piercing head	Stop the analysis by pressing the emergency STOP button. Disconnect instrument from the power supply and remove the bottle. Check that the piercing spike is in place and not unscrewed. Release emergency STOP button by turning it clockwise and restart the instrument.
	Open the front door to stop the process. Remove the bottle and check that the piercing spike is in place and is not unscrewed. Close the front door and press the **Abort** button on the screen.
No antifoam being injected	Go to the antifoam section of the maintenance wizard (Refer to the **Antifoam system** section of Actuator verification on page 56) and prime the pumps until antifoam can be seen being regularly injected into the antifoam priming beaker. ***Note:*** *At startup, approximately 300 injections will be required in order to prepare the system correctly.*

Section 11 Spare Parts and Accessories

Part N°	Description
32912	O-ring kit for oxygen flow chamber
33001	Power Cord - EU Plug
33002	Power Cord - US Plug
33003	Power Cord - Swiss Plug
33004	Power Cord - UK Plug
33117	Seal to package
33122	Solenoid valve 2/2 NC w/o-ring
33123	Red nut for filter block
33142	Sonotrode seal
33143	Staron bottom plate
33156	Antifoam recharge bottle 1L
2956A-AT	Membrane kit2956A
GA2400-S00T	Oxygen sensor for the 6110
DG33343	Feet
DG33362	Plastic protection for IR arm
DG33366	Display protection film for 6110
DG33373	Air injection starting kit
DG33374	Air injection recharge kit
DG33458	Installation kit for 6110 V3
DG33480	Antifoam filling kit for 6110 V3
DG33491	Filter with GoreTex membrane for 6110 V3
DG33492	Sample tube assembly for 6110 V3
DG33496	Piercing tip for metal cap & can for 6110 V3
DG33497	Piercing tip for plastic cap for 6110 V3
DG33500	Tool for piercing tip tightening for 6110 V3
DG33518	Basic kit for intermediate maintenance for 6110 V3
DG33520	Consumables kit for 6110 V3
DG33521	Protection shield for 6110 V3

Section 12 Material Safety Data Sheets (MSDS)

12.1 Silicon antifoam (part number 33156)

PRODUCT AND COMPANY IDENTIFICATION			
PRODUCT NAME		Silicon antifoam, emulsion, 30% in water	
COMPANY		Hach Lange SA 6 Route de Compois Case Postale 212 CH-1222 Vésenaz, Switzerland	
PHONE NO.		0041 22 594 64 00	
COMPOSITION / INFORMATION ABOUT THE COMPONENTS			
INGREDIENT	CAS NO	PERCENT	HAZARDOUS
Silicone antifoam emulsion Water	N/A 7732-18-5	70% 30%	No No
IDENTIFICATION OF HAZARDS			
OVERVIEW	SPECIAL INDICATION OF HAZARDS TO HUMANS AND THE ENVIRONMENT Not hazardous according to Directive 67/548/EEC.		
FIRST AID			
INHALATION		If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.	
INGESTION		If swallowed, wash out mouth with water provided person is conscious. Call a physician.	
SKIN CONTACT		In case of contact, immediately wash skin with soap and copious amounts of water.	
EYE CONTACT		In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.	
FIRE FIGHTING MEASURES			
FIRE EXTINGUISHING MEDIA		Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.	
SPECIAL INFORMATION		Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.	
MEASURES IN CASE OF SPILLAGE			
Wash spill site with soap solution. Flush spill area with copious amounts of water. Absorb on sand or vermiculite and place in closed containers for disposal.			
HANDLING AND STORAGE			
Directions for Safe Handling: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure. Conditions of Storage: Keep tightly closed.			
EXPOSURE CONTROLS / INDIVIDUAL PROTECTION			
ENGINEERING CONTROLS		Safety shower and eye bath. Mechanical exhaust required.	
GENERAL HYGIENE MEASURES		Wash thoroughly after handling.	
PERSONAL PROTECTIVE EQUIPMENT		Eye Protection: Chemical safety goggles.	

PHYSICAL AND CHEMICAL PROPERTIES			
APPEARANCE	Color: White.	Form: Turbid viscous liquid	
	Property	Value	At temperature or pressure
	pH	6.5 - 7.5	
	BP/BP range	100 °C	760 mmHg
	MP/MP range	- 1.0 °C	
	Flash point	N/A	
	Flammability	N/A	
	Autoignition temp	N/A	
	Oxidizing properties	N/A	
	Explosive properties	N/A	
	Explosion limits	N/A	
	Vapor pressure	N/A	
	SG/density	0.999 g/cm^3	
	Partition coefficient	N/A	
	Viscosity	N/A	
	Vapor density	N/A	
	Saturated vapor conc.	N/A	
	Evaporation rate	N/A	
	Bulk density	N/A	
	Decomposition temp.	N/A	
	Solvent content	N/A	
	Water content	N/A	
	Surface tension	N/A	
	Conductivity	N/A	
	Miscellaneous data	N/A	
	Solubility	N/A	

STABILITY AND REACTIVITY	
STABILITY	Stable
HAZARDOUS EXOTHERMIC REACTIONS	Will not occur
HAZARDOUS POLYMERIZATION	Will not occur.
MATERIALS TO AVOID	Strong oxidizing agents.

TOXICOLOGICAL INFORMATION		
ACUTE TOXICITY		LD50 Oral Rat > 5,000 mg/kg LD50 Skin Rat > 2,000 mg/kg
SENSITIZATION		Sensitization: Will not occur
SIGNS AND SYMPTOMS OF EXPOSURE		To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
ROUTE OF EXPOSURE	Skin Contact	May cause skin irritation.
	Skin Absorption	May be harmful if absorbed through the skin.
	Eye Contact	May cause eye irritation.
	Inhalation	Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
	Ingestion	May be harmful if swallowed.

ECOLOGICAL INFORMATION			
Test Type: LC0 Fish Test Type: LC50 Fish Test Type: LC100 Fish	Species: Brachydanio rerio Species: Brachydanio rerio Species: Brachydanio rerio	Time: 96 h Time: 96 h Time: 96 h	Value: 180 mg/l Value: 250 mg/l Value: 350 mg/l
DISPOSAL CONSIDERATIONS			
Incinerate in a furnace providing environmental regulations permit. Observe all federal, state, and local environmental regulations.			
TRANSPORT INFORMATION			
RID/ADR		Non-hazardous for road transport.	
IMDG		Non-hazardous for sea transport.	
IATA		Non-hazardous for air transport.	
REGULATORY INFORMATION			
Not hazardous according to Directive 67/548/EEC. Caution: Substance not yet fully tested (EU).			
COUNTRY SPECIFIC INFORMATION		Germany	WGK: 1 Self-Classification
OTHER INFORMATION			
WARRANTY	The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product.		
PRODUCT USE	For laboratory use only. Not for drug, household or other uses.		
The information in this sheet is believed to be correct at the time of printing. The details should be reviewed periodically and should be checked for special uses.			

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