

ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/AXM630-EN REV. L

Aztec 600 ISE ammonia and fluoride

Single-stream ion-selective analyzers



Measurement made easy

Introduction

This publication provides installation, operation and maintenance procedures for the Aztec 600 ISE ammonia and fluoride analyzers.

For more information

Further publications for the Aztec 600 ISE ammonia and fluoride analyzers are available for free download from <u>www.abb.com</u> (see links and reference numbers below) or by scanning this code:



	Search for or click:
AAM631 Aztec 600 ISE ammonia analyzer Data sheet	DS/AAM631
AFM631 Aztec 600 ISE fluoride analyzer Data sheet	DS/AFM631

Configuration Level Chart View Menu – see Section 2.1, page 8 Indicator View Menu – see Section 2.1, page 8



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1 Health and safety

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

1.1 Health and safety

To ensure that our products are safe and without risk to health, the following points must be noted:

- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
- Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
- When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) may be obtained from the Company, together with servicing and spares information.

1.2 Electrical safety – CEI/IEC 61010-1:2001-2

This equipment complies with the requirements of CEI/ IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

...1 Health and safety

1.3 Symbols - CEI/IEC 61010-1:2001-2

One or more of the following symbols may appear on the equipment labeling:



4

Protective earth (ground) terminal.

Functional earth (ground) terminal.



Direct current supply only.



Alternating current supply only.

Both direct and alternating current supply.

The equipment is protected through double insulation.

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 gualified to work with hazardous voltages should open the enclosure or remove the barrier.



This symbol indicates that the marked item can be hot and should not be touched without care.



This symbol indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.



This symbol identifies a risk of chemical harm and indicates that only individuals gualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.



This symbol indicates the need for protective eye wear.



This symbol indicates the need for protective hand wear.



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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.

1.4 Product recycling and disposal (Europe only)



ABB 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 that initially 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, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

NOTICE

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

1.5 Information on RoHS Directive 2011/65/ EU (RoHS II)



ABB, Process Automation, Measurement & Analytics, UK, fully supports the objectives of the RoHS II directive. All in-scope products placed on the market by PAMA UK on and following the 22nd of July 2017, will be compliant to the RoHS directive, 2011/65/EU.

1.6 Chemical reagents

⚠ WARNING

To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards. Protective eye wear and protective hand wear is always recommended when contact with chemicals is possible.

1.7 Safety precautions

Please read the entire manual before unpacking, setting up, or operating this instrument.

Pay particular attention to all warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

...1 Health and safety

1.8 Safety conventions

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

If a warning sign appears on the instrument, refer to Precautionary Labels – UL Certification and Electrical Safety – CEI / IEC 61010-1:2001-2 for an explanation.

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Note

'Note' indicates useful or important information about the product.

1.9 Safety recommendations

For safe operation, it is imperative that these service instructions be read before use and that the safety recommendations mentioned herein be scrupulously respected. If danger warnings are not heeded to, serious material or bodily injury could occur.

🗥 WARNING

The installation of the instrument should be performed exclusively by personnel specialized and authorized to work on electrical installations, in accordance with relevant local regulations.

1.10 Service and repairs

Other than the serviceable items listed in Appendix G, none of the instrument's components can be serviced by the user. Only personnel from ABB 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

1.11 Potential safety hazards

The following potential safety hazards are associated with operating the analyzer:

- Electrical (line voltage)
- · Potentially hazardous chemicals

2 Introduction

The Aztec ion-selective (ISE) range comprise advanced, singlestream, analyzers used to measure the levels of ammonia or fluoride in water treatment plants.

The measurement involves the addition of a reagent solution^{*} to the sample under constant temperature conditions. This results in a reacted solution containing ions whose presence can be detected by the sensor. When exposed to the reacted sample, the sensor generates an electrical potential that changes in proportion to changes in concentration of the target ion.

During operation, the signal generated from the sensing system is converted by the analyzer into data and this information is presented on the display.

Analyzer main components are shown in Figure 1. The hinged lower door provides environmental protection for the liquid-handling section to ensure stabilized measurement conditions. To maintain optimum measurement accuracy, the analyzer performs a 2-point calibration automatically by introducing standard solutions of known concentrations. The analyzer utilizes solenoid valves to introduce this solution automatically, at predetermined intervals.

Data is stored in the analyzer's internal memory and can be archived either to an SD Card or via an Internet connection. The SD card can also be used to upgrade the analyzer's software – see Appendix F.

This manual describes the operation and maintenance of the following Aztec 600 ion-selective analyzers:

- Aztec 600 ISE Ammonia
- Aztec 600 ISE Fluoride



Figure 1 Main components

...2 Introduction

2.1 Operator display overview

The **Operator** screen is the default display.



Table 1 Overview of Aztec 600 operator and log screens

Item	Feature	Item	Feature
1	Instrument name and measurement parameter	(10)	Measurement bar
2	Stream name	(11)	Status Icon – see Section 12.3.1 on page 62 (Audit Log icons), see Section 12.3.2 on page 63 (Alarm Log icons), see Section 12.3.3 on page 63 (Status icons)
3	Measurement unit	(12)	Indication of SD card capacity full/empty as a % – associated with displayed status icon
4	Measured value	(13)	Current date and time
5	Diagnostic icon and message – see section 12 on page 58	(14)	Audit Log screen
6	Chart view Note. Alarm Event and Operator Message annotations are not shown on the chart unless enabled – see section 6.6.1 on page 40	(15)	Audit Log icon, event, date and time – see Section 12.3.1 on page 62
7	Measured values and measurement units	(16)	Alarm Event Log screen
8	Chart trace		Alarm icon, event, date and time – see Section 12.3.2 on
9	Status bar	\square	page 63

Note

1 Alarm Status

- Flashing red alarm event icon alarm active and unacknowledged
- Continuous red alarm event icon alarm active and acknowledged

2 Alarm Event and Operator Message Annotations

If Alarm event annotation is enabled and an alarm becomes active, a red alarm event icon surrounded by a channel colored box is displayed at the point at which the alarm occurred, together with the alarm time and tag. For example:

🔀 🛃 11:58:00 1.1A High Level

If more than one alarm occurs in the same sample period:

- and the second alarm on a channel becomes active, its icon is added behind the first.
- and more than one operator message is active (max. 6), a second icon is added behind the first.
- the new alarm event icons appear to the left of earlier icons.
- the time and tag of the oldest alarm (right-most icon) only is displayed.

3 Installation

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3.1 Optional accessories

Optional accessories comprise:

- Reagent tray
- Calibration solution level sensor(s)
- PROFIBUS capability (including separate manual – part no. <u>IM/AZT6PBS</u>)

3.2 Sampling requirement

Selection of a good, representative sampling point is critical to obtain optimum performance from the analyzer.

To reduce sample dead time, locate the analyzer as close to the sampling point as possible.

Use small diameter tubing for the sampling line to minimize the lag time but large enough not to block.

The sample must also conform to the following conditions:

- Sample flow rate must be greater than 200 mL/min (7 US fl oz/min) and less than 500 mL/min (17 US fl oz/ min).
- Sample temperature must be within the range 1 to 40 °C (32 to 104 °F).
- Samples must not contain particles exceeding 100 μm in size. Above these levels, an external filter must be fitted to the sample lines.
- Sample must be at atmospheric pressure. It must be as close to the analyzer as possible and the sampling point must provide a thoroughly mixed representative sample.

3.3 Location

For general location requirements refer to Figure 2. Install in a clean, dry, well ventilated and vibration-free location giving easy access and where short sample lines can be used. Avoid rooms containing corrosive gases or vapors, for example, chlorination equipment or chlorine gas cylinders.

It is also advisable to have adjacent drains near ground level, so that the waste outlet from the analyzer can be as short as possible, together with maximum fall.

If the optional reagent tray is used, mount it directly below the bottom tray of the analyzer housing – see Section 3.4.1 on page 11.

The power supply and power isolation switch must be adjacent to the analyzer.



Figure 2 Location

3.4 Mounting

3.4.1 Mounting dimensions

Dimensions in mm (in)





...3 Installation

...3.4 Mounting

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3.4.2 Mounting the analyzer

Dimensions in mm (in)





Note. Clearance – the enclosure doors can open 180°. If mounting in a confined area, allow sufficient clearance for cables on the door hinge side (min. 270 mm [10.6 in]) and 100 mm (3.93 in) on door opening side.

Referring to Figure 4:

- 1 Mark the wall using the dimensions shown.
- 2 Drill and plug 3 holes (A) and (B), suitable for M6 or ¼ in fixings.
- 3 Screw in top fixing (A), leaving a gap of 20 mm (0.78 in) between the fixing head and the wall.
- 4 Hang the analyzer onto fixing (A), ensuring the analyzer is retained firmly against the wall.

Note. It is not possible to adjust fixing (A) once the analyzer is placed over it. If necessary, remove the analyzer and adjust the fixing.

5 Secure the analyzer to the wall using 2 fixings (B).

3.4.3 Mounting the optional reagent tray

Dimensions in mm (in.)





If used, place the reagent tray no more than 1,100 mm (43.3 in) from the analyzer's bottom tray – see Figure 3 on page 11.

Referring to Figure 5:

1 Mark the wall using the dimensions shown.

Alternatively, support the tray against the wall and mark through the mounting holes.

- 2 Drill and plug mounting holes suitable for M8 or 5/16 in fixings.
- 3 Secure the tray to the wall using M8 or 5/16 in fixings.

3.5 Electrical connections

⚠ WARNING

- The analyzer is not fitted with a switch therefore an isolation device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the analyzer within easy reach of the operator and must be marked clearly as the isolation device for the analyzer.
- Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- Use cable appropriate for the load currents: 3-core cable rated 3 A and 75 °C (167 °F) minimum, and voltage: 100/240 V that conform to either IEC 60227 or IEC 60245, or to the National Electrical Code (NEC) for the US, or the Canadian Electrical Code for Canada. The terminals accept cables 0.8 to 2.5 mm² (18 to 14 AWG).
- Ensure the correct fuses are fitted see Figure 6 on page 14 for fuse details.
- Use screened cable for signal inputs and relay connections.
- Replacement of the internal battery (type Varta CR2025 3 V lithium cell) must be carried out by an approved technician only.
- The analyzer conforms to Installation Category II of IEC 61010.
- All connections to secondary circuits must have insulation to required local safety standards.
- After installation, there must be no access to live parts, for example, terminals.
- If the analyzer is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- All equipment connected to the analyzer's terminals must comply with local safety standards (IEC 60950, EN61010-1).
- Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.
- The Ethernet and bus interface connectors must only be connected to SELV circuits.

USA and Canada Only

- The supplied cable glands are provided for the connection of signal input and Ethernet communication wiring ONLY.
- The supplied cable glands and use of cable/flexible cord for connection of the mains power source to the mains input and relay contact output terminals is not permitted in the USA or Canada.
- For connection to mains (mains input and relay contact outputs), use only suitably rated field wiring insulated copper conductors rated min. 300 V, 14 AWG, 90C.
 Route wires through suitably rated flexible conduits and fittings.

...3 Installation

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...3.5 Electrical connections

3.5.1 Connections overview



3.5.2 General connections

Note.

- Cable entry holes are located on both sides of the enclosure.
- Application board connection terminal blocks TB1 to TB8 are identified in Figure 6 on page 14.



Figure 7 Accessing and making electrical connections

Referring to Figure 7:

- Turn the electronics section door retaining screws (A)
 ¹/₄ turn counterclockwise and open the door.
- 2 Using a cross-head screwdriver, remove 4 screws (B) and remove transparent cover plate (C).
- 3 Slide retaining clip (D) off blanking plug (E) and remove the blanking plug.
- 4 Fit cable gland (F) and secure using nut (G).
- 5 Remove gland cover (H) and route cable (J) through it.
- 6 Route the cable through cable gland (F) and through the enclosure case.

Note. Cable glands are supplied with single- and twin-holed bushes. Use the single-holed bush for the mains power cable.

- Remove terminal block connection plug (K) and, using a small flat-bladed screwdriver, make connections to the plug. Ensure wires are connected to the correct terminals see Figure 6 on page 14.
- 8 Reconnect the terminal block connection plug to the application board socket.
- **9** Tighten gland nut (H).

10 Repeat steps 3 to 9 for each required connection.

- 11 If required, connect the Ethernet cable see section 3.5.3 on page 16.
- 12 Refit transparent cover plate \bigcirc and secure using 4 screws B. Close the door to the electronics section and turn door retaining screws A ¹/₄ turn clockwise to secure.

...3 Installation

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...3.5 Electrical connections

3.5.3 Ethernet connection



Figure 8 Ethernet connections

The Ethernet gland is different from the other connections to accommodate an RJ45 plug:

- Referring to steps 1 and 2 in section 3.5.2 on page 15, open the electronics section door and remove the transparent cover plate.
- 2 Referring to Figure 8:
 - **a** Slide retaining clip (A) off blanking plug (B) and remove the blanking plug.
 - **b** Fit cable gland \bigcirc and secure using nut \bigcirc .
 - **c** Remove gland cover (E) and route cable (F) through it.
 - **d** Fit the rubber split-bush (G) and split-washer (H) over the cable.
 - ${\bf e}\,$ Route the cable through cable gland \bigcirc and into the enclosure case.
 - f Plug the RJ45 connector (J) into the Ethernet RJ45 connector socket on the application board (see Figure 6 on page 14 for location details) and tighten gland nut (E).
- **3** Referring to step 12 in section 3.5.2 on page 15, refit the transparent cover plate and close and secure the electronics section door.







Figure 9 Relay contact protection

If the relays are used to switch loads on or off, the relay contacts can become eroded due to arcing. Arcing also produces RFI that can cause analyzer malfunctions and incorrect readings. To minimize the effects of RFI, arc suppression components are required; these are resistor/ capacitor networks for AC applications or diodes for DC applications. These components can be connected across the load.

Maximum relay ratings are:

- 250 V, 5 A AC, 1250 VA (non-inductive)
- 30 V, 5 A DC 150 W

For AC applications the value of the resistor/capacitor network depends on the load current and inductance that is switched. Initially, fit a 100R/0.022 μ F RC suppressor unit. If the analyzer malfunctions the value of the RC network is too low for suppression and an alternative value must be used.

For DC applications fit a diode – see Figure 9. For general applications use an alternative IN5406 type (600 V peak inverse voltage at 3 A).

Note. For reliable switching the minimum voltage must be >12 V and the minimum current >100 mA.

3.6 Preparing the analytical section

3.6.1 Connecting sample inlet and drain lines

The sample pot fills with sample and overflows at the top to maintain a constant head from where sample is taken to be measured.

The sample outlet line (\bigcirc in Figure 10) must be routed to maintain a gravity-fed drain.

The float inside the pot contains a small magnet that operates a reed switch. When the float is in the uppermost position the switch is held closed. If the sample stops flowing the float drops slowly, allowing the reed switch to open, providing a sample flow failure indication.

Using rigid nylon tubing:

- Connect the sample supply line to sample inlet connection (A) (6 mm OD tubing).
- 2 Connect the drain line to sample outlet connection (B) (10 mm OD tubing).

3.6.2 Connecting the waste line

A 0.5 m (1.64 ft) length of flexible $\frac{5}{16}$ in internal diameter PVC tubing (\bigcirc in Figure 10) is supplied fitted to the flowcell drain connection and routed through the grommet in the hole in the bottom tray. Connect it to either an appropriate waste drain or container.

Note. If necessary, a longer analyzer waste line can be fitted but its length must be kept to the absolute minimum required.

Ensure the tubing is kink-free, as short as possible and routed as vertically as possible to enable free drainage.

NOTICE

Analyzer waste is contaminated with reagents. Dispose of the waste in accordance with local regulations.



Figure 10 Connecting the sample inlet, drain and analyzer waste lines

...3 Installation

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...3.6 Preparing the analytical section

3.6.3 Fitting peristaltic pump pressure plate

To prevent premature wear to the pump tubing, the analyzer is supplied from the factory with the pump tubing pressure plate not fitted. The pressure plate must be fitted and secured for the pump to function correctly – referring to Figure 11:

- 1 Ensure pump tubing (A) is positioned correctly over pump capstan rollers (B).
- 2 Ensure pump tubing sleeves (C) and shims (D) are fitted correctly in pump lower plate.
- Fit pump pressure plate locking pin (E) to the pump pressure plate (F) as shown, ensuring that it does not protrude from the rear face of the pump pressure plate.

NOTICE

During step 4, it is very important to ensure that:

- the pump tubing is not pinched
- the pump tubing remains correctly located over the pump capstan rollers
- each tube enters its respective groove in the pressure plate
- the sleeves and shims remain in position
- 4 Position the pump pressure plate over the pump tubing and capstans and press down firmly until fully home, ensuring the pump tubing remains in position.
- 5 Press locking pin (E) fully home and turn ¼ turn clockwise to lock the pump pressure plate in position.



Figure 11 Fitting peristaltic pump pressure plate

3.6.4 Connecting reagent and calibration solutions

🗥 WARNING

- Reagents and calibration solutions may contain hazardous chemicals. Ensure that safety information is read and understood before handling the solutions.
- Wear appropriate protective clothing when handling reagent and calibration solutions.

Note

Take care when installing the reagent and calibration solution to prevent contamination. Keep the level sensors dry and avoid handling the stems.

- Place the unopened reagent and calibration solution containers in a suitable position no more than 1,100 mm (43.3 in) from the analyzer's bottom tray or on the optional reagent tray (if fitted – see Section 3.4.3 on page 12).
- 2 Referring to Figure 12, hold the reagent level sensor by clamp ring $\widehat{(A)}$ and:
 - **a** Using a dry, lint-free cloth, remove any foreign matter from level sensor stem (B).
 - **b** Remove the reagent container cap and store in a clean, safe place.
 - **c** Insert the reagent level sensor into the reagent container, ensuring that all connections are still in place.
 - **d** Check that the end of the level sensor is in close proximity to the bottom of the reagent container. If required, unscrew clamp ring (A), adjust nut (C) to position the sensor correctly, then secure with clamp ring (A).
 - e Secure the reagent level sensor to the reagent container with cap (D).
 - **f** Remove the calibration solution container cap and store in a clean, safe place.

Note. Step 2g is applicable only if the analyzer is fitted with the standard calibration solution tubing sinker.

g Lower the sinker on the end of the calibration solution line to the bottom of the calibration solution container.

Note. Step 2h is applicable only if the analyzer is fitted with the optional calibration solution level sensor.

h Repeat steps 2a to 2e to connect the calibration solution level sensor to the calibration solution container.



Figure 12 Reagent/calibration solution level sensor

Note.

- When using the analyzer to measure ammonia samples with concentrations typically above 300 ppm, it is strongly recommended that a mixer assembly (part number AW621 045) is fitted to ensure adequate mixing of the higher strength reagent solution – see Figure 26 on page 22.
- Refer to Appendix A on page 76 for further guidance on reagent and standard solutions.

...3 Installation

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...3.6 Preparing the analytical section

3.6.5 Ammonia electrode preparation

A new electrode is shipped with loose membranes and a reusable membrane cap. Install a new membrane before you use the electrode.

A new electrode is shipped dry. Soak the inner body of the electrode in the electrode filling solution for a minimum of two hours before you use the electrode. For the best results, soak the inner body overnight in the electrode filling solution.

Avoid excessive handling of the membrane during assembly. This can have an effect on the hydrophobic properties of the membrane, and decrease the membrane life. Use the tweezers when handling the membrane. A membrane will last from one week to several months, depending on usage.

3.6.6 Electrode assembly



Figure 13 Electrode

- 2 Carefully remove the glass inner body B from the outer body C. See Figure 13. Discard the electrode filling solution that is in the outer body.
- 3 Loosen and remove the membrane cap (D) from the outer body. See Figure 14. Remove the membrane from the membrane cap if a membrane was previously installed.



4 Wear gloves and use tweezers to carefully hold the corner of the white membrane from between the wax paper separators. See Figure 15.

NOTICE





Figure 15 Hold the membrane with tweezers

5 Hold the outer body with the threads at the top. Align the straight edge of the membrane against the threaded shoulder and hold the membrane with your thumb. See Figure 16.



Figure 16 Align the edge of the membrane

6 With your other hand, gently stretch the membrane up and across the opening. See Figure 17 and Figure 18.







Figure 18 Stretch the membrane across the opening

7 Place the membrane down to align the other edge with the opposite shoulder of the outer body. See Figure 19.



Figure 19 Align membrane

8 While you hold each edge of the membrane on both sides, gently stretch each serrated side of the membrane out and down over the threads. Make sure that the membrane surface is smooth and has no wrinkles. See Figure 20.



Figure 20 Stretch the membrane over threads

9 Smooth any loose material. Do not touch the center of the membrane. See Figure 21.

NOTICE

Do not overstretch the membrane. The membrane is overstretched if you can see the black body material through the membrane. Discard the membrane if it is overstretched and replace it with a new membrane. Continue from step 3.



11 Fill the outer body with approximately 2.5 mL or 50 drops of electrode filling solution. See Figure 23.



Figure 23 Fill the outer body



Figure 21 Smooth the membrane

10 Install the membrane cap onto the outer body. Do not touch the membrane. See Figure 22. Tighten the membrane cap on half-way and wrap loose membrane material onto the threads and under the cap. Fully tighten the membrane cap.



...3 Installation

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...3.6 Preparing the analytical section

...3.6.6 Electrode assembly

12 Insert the inner body into the outer body. Make sure that the inner body is fully inserted into the top of the outer body then install the electrode cap. See Figure 24.



Figure 24 Insert inner body

13 Carefully shake the fully assembled electrode (as if it were a clinical thermometer) to remove air bubbles. Gently pull the spring-loaded cable back then slowly release it to let the filling solution move between the membrane and inner body. See Figure 25.

3.6.7 Fluoride probe preparation

The fluoride probe is supplied with a protective end cap to prevent the lanthanum fluoride crystal (forming its tip) from drying out and from being scratched or chipped. To prepare for use, remove the end cap and carefully rinse the tip in distilled water.

3.6.8 Fitting the probe

Referring to Figure 26, fit the ammonia or fluoride probe as follows:

1 Hinge down temperature-controlled block cover (A) to gain access to block (B).

NOTICE

During step 2, when fitting ammonia probe, take care not to damage the membrane.

- 2 For ammonia electrodes only: Place the probe (C) into the sleeve (I) (3KXA831610L0100).
- **3** Position probe (C) and sleeve (1) into the recess in the temperature-controlled block (ensuring that probe tip (D) is fully inserted into flowcell (E)) and rotate retaining clip (F) to hold the probe in position.
- **4** Close the temperature-controlled block cover (A).
- **5** Connect probe lead (G) to coaxial socket (H).



Figure 25 Pull spring-loaded cable

14 Rinse the electrode well and wipe it dry.

15 Let the electrode soak in a 10 ppm ammonia standard for a minimum of 15 minutes before use.



Figure 26 Fitting ammonia/fluoride probe

4 Getting started

4.1 Overview

The following procedure describes how to start up and configure the analyzer prior to operation.

- 1 Ensure the analyzer is installed and electrically connected correctly see Section 3 on page 10.
- 2 Ensure the correct reagents/calibration solutions are connected to the analyzer see Section 3.6 on page 17.
- 3 Ensure sample is connected correctly to the analyzer and that the flow rate, temperature, pressure and particulate size are within the specified limits see Section 14 on page 70.
- 4 Switch on power to the analyzer.

After an initial power-up period, the main operator screen is displayed.

- 5 Press the key and use the ▲ and ▼ keys to select
 Common Configuration to configure the analyzer:
 - Setup see Section 6.1.1 on page 29
 - Screen see Section 6.1.2 on page 29
 - Time see Section 6.1.3 on page 30
 - Security see Section 6.1.4 on page 31
 - User see Section 6.1.5 on page 34
 - Operator Messages see Section 6.1.6 on page 34



- 6 Press the i key and use the ▲ and ▼ keys to select
 Measurement to set up the analyzer's measurement parameters:
 - Setup see Section 6.2.1 on page 35
 - Streams see Section 6.2.2 on page 35

	M	easure	ment		
Setup	Streams				
	Chemi	cal Units	NH3		2
	Measuri	ing Units	mg/l		1
	Temperatu	ure Units	°⊂		1
	Cell Temp	perature	35 °C		1

7 Press the keys and use the ▲ and ▼ keys to select Exit to exit configuration. A prompt is displayed asking if the current configuration is to be saved:

10_47_25 100511 Ammonia ISE.cfg			
Save As Current Configuration	í.		
Save Configuration			
Cancel	×		

- 8 Press the 🞝 key to save the configuration to the analyzer's internal memory.
- 9 Press the key and use the ▲ and ▼ keys to select Operate followed by Flush Monitor and press the ¬ key.



Allow the analyzer to flush for a minimum of 1 hour to enable the measurement probe to stabilize.

...4 Getting started

...4.1 Overview

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10 Press the key and use the ▲ and ▼ keys to select Operate followed by Prime lines and Calibrate and press the ↓ key.

Configuration	*
	Stop Monitor
Operate	Start Monitor Measurement
Diagnostics	Calibrate
Alarm Acknowl	Prime Lines & Calibrate
Help	Flush Monitor

When the priming sequence is complete, a stabilizing period is initiated to allow the measurement cell temperature to stabilize. Once stabilized, calibration is performed automatically. The analyzer then enters measuring mode.

4.2 Online help



Message Continued



If any alarms or messages appear on the operator screen, press the **,** key to open the help at the relevant diagnostic help topic. For example, if the **Calibration Failed** message is active and the help is opened, the help opens at the **Calibration Failed** diagnostic topic.

- Press the key and use the ▲ and ▼ keys to select Help.
 Press the ¬ key to open the help.
- 2 To exit the online help, press the ≡ key until returned to the screen from where help was selected from.

\land WARNING 🕝 🖤

Protective eye wear and protective hand wear is recommended when contact with chemicals is possible. Take appropriate health and safety precautions.

5.1 Front panel controls



Figure 28 Front panel controls

- a Menu key 🗐 Displays or hides the context-sensitive operator menu associated with each view. It also cancels the menu without making a change or returns to the previous menu level.
- b Group key I Toggles between the operator and audit log screens.
 Left key Scroll left.
- c Up/down keys ▲ ▼ Highlights menu items and scrolls through previously recorded data.
- d View key 🖕 Toggles between the operator and chart screens.

Right key - Scroll right.

e Enter key - Selects the highlighted menu item, operation button or edit selection.

5.2 Navigation and editing

Depending on the type of field to be edited, the software provides a variety of methods for entering values.

5.2.1 Text editing

If the field to be edited requires text, a keyboard is displayed:



To enter text, use the \blacktriangle , \blacktriangledown , \blacklozenge , \blacklozenge and \triangleright keys to highlight the required character and press \checkmark .

There are three set of characters, uppercase, lowercase and symbols. To toggle between each, highlight the bottom, right-hand button and press **.**

To finish, highlight **OK** and press \square or press \blacksquare to exit without making any changes.

...5 Operation overview – transmitter

....5.2 Navigation and editing

5.2.2 Numeric editing

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If the field to be edited requires a numeric value, a number pad is displayed:

Range	Range Low (0.0007.500)					
	0.000					
	7	8	9			
	4	5	6			
	1	2	3	с		
		0	Del	ок		

To enter a number, use the \blacktriangle , \bigtriangledown , \triangleleft and \triangleright keys to highlight the required number and press \checkmark .

To finish, highlight **OK** and press \square or press \blacksquare to exit without making any changes.

The **C** key cancels the edit operation and exits back to the previous screen.

The **Del** key executes the delete and backspace functions on characters or digits entered in the text box.

5.2.3 Other methods of editing

There are several other methods of editing, for example:

Checkboxes



To toggle the selection, use the \blacktriangle and \blacktriangledown keys to highlight the required checkbox and press \clubsuit .

To finish, highlight **OK** and press **7** to exit and save changes or press 🗐 to exit without making any changes.

Slider bars



To select a value, use the \blacktriangle and \blacktriangledown keys to move the slider.

To finish, press \mathbf{a} to exit and save changes or press \mathbf{b} to exit without making any changes.

Tabs

Common Configuration			
Setup Screen Time Security User>			
Language English	2		
Instrument tag Ammonia ISE	1		
Main View Timer Off	2		

To select a tab, use the \blacktriangleleft and \triangleright keys.

Note. The ---> tab indicates that there are more tabs available.

5.2.4 Menus

Press \equiv to open the menu and use the \blacktriangle and \bigtriangledown keys to select a menu item. Press \checkmark to open the menu item:



5.3 Software screen structure

5.3.1 Indicator view menus

When menus are accessed from the **Indicator View**, the **Operate** and **Diagnostics** menu options are displayed.



5.3.2 Chart view menus

When menus are accessed from the **Chart View**, the **Chart Functions** and **Statistics** menu options are displayed



6 Configuration



...6 Configuration

Note.

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- If **New Configuration** or **Open Configuration** is selected and the modified configuration file is saved, new data files for all log files are created and any unarchived data is lost
- Existing security configuration parameters are retained when a configuration is opened from file or when a new configuration is loaded (the security remains as currently configured). Check **Load security configuration from file** to overwrite the current configuration with data from the file to be loaded.
- The option to load or retain the security configuration applies only to advanced security mode and is available only to the system administrator (User 1 see Table 2 on page 32). If a new or existing configuration file is opened by a user other than the system administrator, existing security settings are retained.

Exiting configuration level

When exiting configuration level, the following conditions apply:

Note.

- The current, active configuration is saved to internal storage.
- Selecting Save as Current Configuration suspends recording for a short time while the new configuration is implemented.
- When saving the current configuration to internal storage, the file is saved automatically with a <time><date><instrument tag>.cfg filename.
- When saving the current configuration to external storage, the file is saved automatically to internal storage, as well as to the external archive media as <time><date><instrument tag>.cfg.
- When Save Configuration is selected, the configuration file is stored as <time><date><instrument tag>.cfg on internal or external storage.
- Changes are saved to non-volatile memory only when one of the save options above has been selected. Any powerdown before this results in lost configuration changes.
- Selecting Cancel discards unsaved changes and returns the analyzer to the Operate level.
- New internal data files for enabled recording channels are created if any of the following configuration parameters are changed:
 - Recording channel source
 - Channel tag
- A warning is displayed if a configuration change results in the creation of new internal data files for enabled recording channels. Select **Yes** to accept the configuration change. Select **No** to cancel the configuration change.

6.1 Common

There are nine tabs in the **Common** screen:

		Setup	Screen	Time	Security	User	>	<	Op. Messages 16	712	1318	1924	
--	--	-------	--------	------	----------	------	---	---	-----------------	-----	------	------	--

6.1.1 Setup

Fields	Description			
	Lists the available languages.			
Language	A new language selection does not take effect until the configuration is saved.			
Instrument Tag	The analyzer's instrument tag text is displayed in the top-left corner of the operator views. Up to 20 characters can be used.			
-	The instrument tag is also displayed on the analyzer on configuration files and audit log files.			
Main View Timer	The time after no key presses the display reverts to the main operator screen (excludes Configuration screens).			
6.1.2 Screen				
Fields	Description			
Screen saver wait time	The time delay for the screen-saver. The screen dims after the time set.			
	Toggles between Enabled and Disabled .			
Screen Canture	Note. An SD card must be fitted for screen capture.			
Serveri captare	If enabled, press 🞜 to capture the current log or chart screen to the VRD\BMP folder on the SD card. A confirmation dialog box is displayed for each screen capture.			
Brightness	Adjusts the brightness of the screen.			

...6 Configuration

...6.1 Common

6.1.3 Time

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Fields	Description
Date and Time	Warning. Changing the time can result in the permanent loss of data. Once it is changed a warning is displayed stating that recording is disabled until the configuration has been saved.
	Enables automatic daylight saving time adjustment. Options are:
	• Off. The Daylight Saving – Start and Daylight Saving – End fields are not available.
Daylight Saving – Enable	• Auto – USA. The start and end of the daylight saving period in the USA is calculated automatically. The clock is incremented automatically by 1 hour at 2:00 am on the second Sunday in March and decremented automatically by 1 hour at 2:00 am on the first Sunday in November.
	• Auto – Europe. The start and end of the daylight saving period in Central Europe is calculated automatically. The clock is incremented automatically by 1 hour at 2:00 am on the last Sunday in March and decremented automatically by 1 hour at 2:00 am on the last Sunday in October.
	 Auto – Custom. The start and end date and time can be edited.
Daylight Saving – Start	If Daylight Saving – Enable is set to USA or Europe, the start date is displayed but cannot be edited.
	If Daylight Saving – Enable is set to Custom , the date and time can be edited.
Daylight Saving – End	If Daylight Saving – Enable is set to USA or Europe, the end date is displayed but cannot be edited.
	If Daylight Saving – Enable is set to Custom , the date and time can be edited.

6.1.4 Security

The analyzer is fitted with an internal security switch that, in combination with the **Configuration security** parameter settings (see page 31), is used to prevent unauthorized access to the **Configuration** Level. Two methods of configuration access protection are available:

- 1 Password protection (factory default) The Configuration level can be accessed only when the correct password has been entered.
- 2 Internal security switch protection The Configuration level can be accessed only when the internal security switch is set to the 'Enabled' position.

ssword protected' (factory def Password Access Free Access	ault)	'Internal switch protected' (alternative) No Access
Password Access Free Access		No Access
Free Access		
		Free Access
Enabled D	isabled	Switch Disabled Position: Configuration Level Access Disabled
Enabled	isabled	Switch Enabled Position: Configuration Level Access Enabled
	Enabled D	Enabled Disabled

To access the internal security switch:

- Switch off the power supply to the analyzer and turn the two door retaining screws (A) ¹/₄ turn counterclockwise.
- 2 Using a cross-head screwdriver, remove the four cover plate retaining screws (B) and remove the cover plate.
- **3** Set the security switch \bigcirc to the required position.

Note. The Internal Security Switch is, by default, set to Disabled and should only be used to access the Configuration level when Configuration security is set to Internal switch protected – see page 31. Do Not use the switch to access the Configuration level when Configuration security is set to Password protected (default setting) unless the Password has been forgotten. The switch overrides Password protection, enabling free access to the Configuration level.

...6 Configuration

...6.1 Common

32

User 1 is the **System Administrator** and the only user with access to the **Security type** parameter – see Table 2.

Table 2 System administrator security rights

User 1	User 1 (System Administrator) Security Rights			
	Set initial password-protected access to Calibration & Maintenance and Logging menus.			
	Is the only user with access to the Security type parameter.			
	Set initial password-protected access to the Configuration menu when Security type / Configuration security parameter is set to Password Protected .			
System Administrator	Set initial user permissions – other users can subsequently change their own passwords if permission has been set by User 1.			
	Set password expiry dates and disable inactive user accounts after a set time.			
	Set password failure limits and minimum password lengths.			

Fields	Description
	A page opens with two fields:
	 Security system – toggles between Basic and Advanced.
	– Basic:
	Allows access to the Configuration menu for up to four users (User 1 to 4) – a unique password of up to four digits can be set for each user.
	A separate password can be set to access the Calibration & Maintenance and Logging menus – up to four users share this password.
	– Advanced:
	Allows up to twelve users password-protected access to any of the Configuration , Calibration & Maintenance or Logging menus.
Socurity type	Each user can be assigned a unique 20-digit (alphanumeric) case-sensitive password (minimum password lengths can be set).
Security type	 Configuration security – toggles between Password protected and Internal switch protected.
	 Password protected (factory default):
	With the internal security switch set to Disabled (factory default), the Configuration level can be accessed only when the correct password is entered.
	 Internal switch protected:
	With the internal security switch set to Disabled (factory default), the Configuration level cannot be accessed.
	Note. If the internal security switch is set to ' Enabled , the Configuration Level can be accessed without the need to enter a password and should be used only if the password has been forgotten.
	See Figure 30 for switch positions.

Fields	Description
	Sets access to the Calibration & Maintenance and Logging menus.
	If set to Off , no password is required.
Operator level security	If set to On and Security type is set to Basic an additional Operator level password field is displayed.
	If set to On and Security type is set to Advanced , all users are required to enter their user password to gain access to the Calibration & Maintenance and Logging menus.
The following field is displayed or	ly if Security system is set to Basic and Operator level security is set to On .
Operator level password	All users are required to enter this password to gain access to the Calibration & Maintenance and Logging menus.
The following fields are displayed	only if Security system is set to Advanced .
Descrifiques reseat	Passwords are set initially by User 1 (system administrator) but any user can make subsequent changes to their own password.
Reconfigure preset	When set to Yes each user must change their password after it is used for the first time following initial configuration.
Password expiry	Select the number of days that the password is valid for. When a password expires, the user is prompted to provide a new password.
Inactive user disabling	Select the number of days after which an inactive user's access privileges are deactivated.
Password failure limit	Enter the number of consecutive incorrect password entries allowed by a user. If the number of incorrect entries exceeds this limit, the user's access privileges are deactivated and can be reinstated only by the system administrator (User 1).
Min password length	Sets the minimum length required for user's passwords.

...6 Configuration

...6.1 Common

6.1.5 User

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Fields

If **Security system** is set to **Basic**, this tab lists the four users, User 1 to User 4. Selecting a user opens a new page with two fields: Name – the user's name, up to 20 characters.

Password – each user can be assigned a unique 4-digit security code for **Configuration** level access.

Description

If Security System is set to Advanced and User	r 1 (administrator) is logged on, the User tab shows additional	fields:
--	--	---------

User 1 Name	User 1 identification tag – up to 20 characters.	
User 1 Access	A page opens with two checkboxes to select whether User 1 has Calibration and Maintenance and/or Logging access .	
User 1 Password	User 1's password – a unique 20-character (alphanumeric) security code. A minimum password length applies.	
View / Edit Other Users	Selects the other user's access levels and passwords. If selected additional fields appear:	
User X Name	Where X is the user number (2 to 12) – up to 20 characters can be used.	
User X Access	 Where X is the user number (2 to 12). A dialog box is displayed listing the access available for the user: Logging Configuration (No access) Configuration (Load) Configuration (Limited) Configuration (Full) 	
User X Password	Where X is the user number (2 to 12). The password for User X.	
If Security System is set to Advan	ced and a user other than User 1 is logged on, the User tab has three fields.	
These fields can be edited only if User 1 has set the security field Reconfigure preset to Yes – See page 32.		

Where X is the user number (2 to 12).

User X Name	User X identification tag. Up to 20 characters.
User X Access	Where X is the user number (2 to 12). A dialog box is displayed listing the access available for the user: • Logging
User X Password	User X's password – a unique 20-character (alphanumeric) security code. A minimum password length applies.

6.1.6 Operator messages

Fields	Description
Messages (1 to 24)	Up to 24 messages can be defined to indicate a particular event or action has occurred. These are displayed on the chart when the relevant annotation is enabled.
6.2 Measurement

There are two tabs in the **Measurement** screen:

Setup Streams

6.2.1 Setup

Fields	Description		
Chemical Units	For certain parameters there is a choice of units to display the results.		
Measuring UnitsThe results can be expressed in a variety of units, for example by weight (mg or μg) of volume (ppm or ppb).			
Temperature Units	The results can be expressed in either celsius (°C) or fahrenheit (°F).		
	The flowcell and heated block are heated and can be controlled at temperatures between 25 and 50 °C (77 and 122 °F).		
Flowcell and Heated Block	Default temperatures are:		
lemperature	• Ammonia – 35 °C (95 °F)		
	 Fluoride – 30 °C (86 °F) 		

6.2.2 Streams

Fields	Description
Stroom 1	The Stream tag text is displayed in the operator views. Up to 20 characters can be used.
Stream I	The Stream tag is also displayed in the configuration files and audit log files.

...6 Configuration

6.3 Calibration

There is one tab in the **Calibration** screen.

Setup

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6.3.1 Setup

Fields	Description	
Calibration Time	The time the analyzer calibrates.	
Calibration Date	The next date when a calibration is due.	
Calibration FrequencyFrequency at which an automatic calibration is performed.		
Low Standard	The concentration of the low standard.	
High Standard	The concentration of the high standard.	
	The gradient coefficient is an indication of the variation between the actual calibration curve and the ideal calibration curve.	
Gradient Coefficient	A limit to the gradient coefficient can be set (ideal coefficient =1).	
	Above this limit the analyzer fails a calibration.	
	Default fail criteria occurs when the coefficient exceeds 1 ± 0.6 .	
	If set to Fail (default), the analyzer stops and displays a failed calibration message when a calibration fails.	
Calibration Fail Event	If set to Attention , the analyzer continues running after a failed calibration (using the last valid calibration data).	
	Both passed and failed calibration data can be viewed in the Audit Log.	

6.4 Alarm relays







Figure 32 High/low latch alarms



Figure 33 High/low annunciate alarms

...6 Configuration

...6.4 Alarm relays

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There are six tabs in the **Alarm Relays** screen, one for each alarm:

Alarm A Alarm B Alarm C Alarm D Alarm E Alarm F

Fields	Description		
Alarm Source	Each of the six alarms can be configured independently to one of the following sources: None – no other fields are visible 		
	Stream 1		
The following fields are o	lisplayed only if Alarm Source is set to Stream 1 :		
	If Alarm Source is set to Stream 1, the alarm type can be set to:High/Low process – see Figure 31.		
	 High/Low latch – see Figure 32. 		
Alarm lype	 High/Low annunciate – see Figure 33. 		
	 Out of sample – the alarm state is active if an out-of-sample condition occurs in the selected stream source. 		
Alarm Tag	The Alarm identification tag – up to 20 characters.		
Trip	The value at which the alarm is to activate.		
Hysteresis	When an alarm trip value is exceeded, the alarm does not become active until the time hysteresis value has expired. If the signal goes out of the alarm condition before the time hysteresis has expired, the hysteresis value is reset – see page 36 for hysteresis actions.		
	The hysteresis value is set in concentration units and the hysteresis time is set in seconds (0 to 5000 s).		
Fail Safe	If set to Yes the alarm relay is normally energized and is de-energized when an alarm condition occurs.		
	If set to No the alarm relay is normally de-energized and is energized when an alarm condition occurs.		
Log Enable	If set to On all changes in the alarm state in the Alarm Event log are recorded – see Section 7.5.3 on page 50.		

6.5 Current outputs

There are seven tabs in the **Outputs** screen, one for each output and an output calibration tab:

Out 1 Out 2 Out 3 Out 4 Out 5 Out 6 O/P Cal.

6.5.1 Outputs 1 to 6

Fields	Description	
Output Source	 The Output Source field can be set to one of the following options: None – no other fields are visible Stream 1 	
The following fields are displayed only if Output Source is set to Stream 1 :		
Output Range	The low and high limits for the output range. Both values can be set independently. If the difference between the low and high limits is too small, the output is very noisy.	
Output Type	The electrical low and high limits (0 to 22 mA). For example, if the low and high limits for Output Range are set to 0 and 1000 mg/L respectively, and the electrical low and high limits are set to 4.00 and 20.00 mA, at 0 mg/L the output is 4.00 mA and at 1000 mg/L the output is 20.00 mA.	
Out of Sample Ind.	Out of sample indicator. If set to Yes , the output goes to the default output value when an out of sample condition occurs for the selected stream source.	
The following field is displayed only if Out of Sample Ind. is set to Yes :		
Default Output	The output value used when an out of sample condition occurs and Out of Sample Ind. is set to Yes (0 to 22 mA).	

6.5.2 Output calibration

Fields	Description
Calibrate Output 1 (to 6)	Enables each output to be calibrated.

...6 Configuration

6.6 Logging

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There are four tabs in the **Logging** screen:

Chart Recording Ranges Archive

6.6.1 Chart

Fields	Description	
Chart view enable	The orientation and direction of the chart display. Options are:	
	Horizontal>	
	Horizontal <	
	• Vertical	
	Enables chart annotations to be visible. Options are:	
Chart appatation	• None	
Chart annotation	• Alarms	
	Alarms & Operator Messages	
Chart divisions	The major and minor chart divisions.	
Trace pointers	Toggles the trace pointers on/off.	
Screen interval	The amount of data shown on the screen.	
Trace width	The width of each trace in pixels (1 to 3).	
6.6.2 Recording		
Fields	Description	
Sample Rate	The recording sample rate for stream 1. Default setting is 30 seconds.	
6.6.3 Ranges		
Fields	Description	
Chart Low Chart High	The chart low/high scale settings for stream 1.	

6.6.4 Archive

Used to configure the data that is to be recorded on the SD card – see Section 7.1 on page 46.

When external archive media contains approximately 300 files, its read/write performance becomes too slow, archiving is stopped automatically and the icon is displayed alternating with the icon. In this condition, data continues to be recorded to internal memory. Replace the SD card with an empty card to prevent loss of unarchived data.

Fields	Description		
Archive file format	Select the archive file format required – Text format or Binary format.		
	At least one of these options must be selected for data to be archived automatically to an SD Card.		
	A dialog box is displayed showing the log files that are to be recorded:		
	 Text format file containing the channel data (*.d). 		
Archive file enables	or		
	Binary format file containing channel data (*.b).		
	Alarm event log file enable (*.e)		
	 Audit log file enable (*.a) 		
	Available only if Wrap is set to Off and Archive file format is set to Text format .		
	The interval that text format stream data files are created. Options are:		
Now file interval	• Off		
New the interval	• Hourly		
	• Daily		
	• Monthly		
	If set to On , the oldest archived data on the SD card is deleted automatically when the SD card approaches its maximum capacity.		
Wrap	If set to Off , archiving stops when the SD card is full. The analyzer continues to store data internally – see Section 7.1, page 45. When an empty SD card is inserted, archiving continues from the point that the last archive was made.		

...6 Configuration

6.7 Communications

There are four tabs in the **Communications** modules screen:

Ethernet email 1 email 2 Profibus

6.7.1 Ethernet

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Configures the way in which the analyzer can be accessed via an Ethernet network – see Appendix E on page 85.

Fields	Description	
IP-address	The IP-address to be assigned to the analyzer. The IP address is used by the TCP/IP protocol to distinguish between different devices. The address is a 32-bit value expressed with four values (0 to 255), each separated by a period (.).	
Subnet mask	The subnet mask is used to indicate which part of the IP address is for the network ID and which is for the host ID. Set each section that is part of the network ID to 255.	
	For example, 255.255.255.0 indicates first 24 bits are for the network ID.	
Default Gateway	The IP address for the Default gateway (for example, router, switch) required to communicate with other networks.	
	The default setting is 0.0.0.0	
	Enables up to four users to access the analyzer via the internet. A dialog box is displayed with four options:	
	 User name – the name of user granted FTP access (up to 12 characters). 	
	 Password – the password required for FTP login (up to 12 characters). 	
FIP user 1 to FIP user 4	 Access Level – toggles between Full or Read-only access. 	
	 Remote Operation – toggles between None, Operator or Configuration. 	
	Note. If a user is given full access via FTP, that user is able to select from the saved configuration files in the analyzer.	

6.7.2 Email 1 and Email 2

The analyzer can be configured to send emails to a maximum of six recipients in response to certain events. The addressees can all subscribe to the same SMTP server or the analyzer can be configured to send emails via two different SMTP servers to a maximum of three addressees per server.

Up to 10 independently configurable triggers may be enabled to generate an email when the selected source becomes active. When a trigger source becomes active, an internal 1-minute delay timer is started. At the end of that minute, an email is generated that includes not only the event that initiated the delay timer, but every other event that occurred during the delay period together with any enabled reports. The data returned in the email therefore reflects the real-time alarm state at the time the email was generated, not the state when the first trigger source became active.

Each email sent includes a link to the analyzer's embedded web server, enabling the analyzer's data and status to be viewed remotely using an Internet browser on a PC.

Fields	Description
SMTP server IP address	The IP address of the SMTP server emails are routed through.
Recipient 1 to recipient 3	The email address of recipient 1 to 3.
Inverted triggers	The option to invert triggers 1 to 6.
	The trigger for an email message to be sent. A dialog box is displayed with three options:
	• None – no triggers are set.
	 Archive state – a dialog box is displayed with six options:
	– Archive media not present
	- Too many files on the archive media
	– Archive media 100 % full
	– Archive media 80 % full
Trigger 1 to 10	– Archive media present
	– Archive online
	 Event group – A dialog box is displayed with four options:
	– None
	– Process alarm
	– NAMUR type
	– Diagnostic event
	Open an event group option to display further sub-options.

6.7.3 PROFIBUS

Refer to separate PROFIBUS manual – IM/AZT6PBS.

...6 Configuration

6.8 Commissioning

Access to the **Commissioning** Level is protected by an internal security switch. The switch is, by default, set to **Disabled** and should be set to **Enabled** only if the measurement parameter is to be changed. For further information on the function of the internal security switch, refer to section 6.1.4 on page 31.

There is one tab in the **Commissioning** screen:

с,	F		_
26	90	u	P

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6.8.1 Setup

Fields	Description	
	The parameter to be measured by the analyzer. The options for ISE analyzers are:	
Instrument type	Ammonia ISE	
	Fluoride ISE	
Streams Fitted	Fixed at 1.	
Serial Number	The serial number of the analyzer.	
	Options are:	
	Normal Run Mode	
	Demonstration Mode	
Mode of Operation	Test Mode	
	Note.	
	 Test mode is for diagnostic use only. Do not leave the analyzer running in this mode. 	
	• Before selecting Test Mode , disable archiving to SD card to prevent stored data conflicts.	
	Select Yes to clear the analyzer's non-volatile memory.	
Clear NonVol	Note. Selecting Yes resets Instrument type (see above) to its default setting of Iron monitor	
	therefore the correct measurement parameter must be reselected.	
Motor Speed	Default setting is 2.80 rpm	
	Reduces reagent consumption (thereby lowering running costs) at the expense of a slower response time. The options are:	
Economy Mode	• Off	
	• 2.0 rpm	

7 Logging



Figure 34 Recording and archiving

Data recorded in the analyzer's internal memory can be archived to a removable SD card. The analyzer records all data continuously to its internal memory and keeps track of which data has been archived.

Note. ABB's DataManager Pro software can be used to store and view data archived from the analyzer.

Sample data can be saved to removable media as either binary-encoded or comma-separated files.

Additional files can also be archived:

- Alarm event log data
- Audit log data
- Configuration files
- Screen capture images

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The measured value is logged at default intervals of 30 seconds.

Approximate durations for continuous recording of 1 stream is shown in Table 3 (internal storage), Table 4 (external text format files) and Table 5 (external binary format files).

Storage capacity onto internal (Flash) memory:

Table 3	Internal stora	ge capacity	(1 Stream)
		ge capacity	. (= = = = = = = =)

Capacity	30 seconds
8 Mb	3 years

External (archive) capacities for text format files:

Table 4 Text formatted archive files (1 Stream)

Sample Rate	128 Mb
30 seconds	>10 years

External (archive) capacities for binary format files:

Table 5Binary formatted archive files (1 Stream)

Sample Rate	128 Mb
30 seconds	3 years

7.1 SD cards

There are two methods of archiving to an SD[™] card:

• An SD card is kept in the analyzer

Data is copied automatically to the SD card at set intervals. The SD card is then swapped periodically for an empty one.

Depending on how the configuration has been set, data is added either to the card until it is full and then stops archiving or the oldest data on the SD card is overwritten by the newest.

Note. To set up the analyzer to archive data to an SD card automatically – see Section 6.6.4 on page 41.

It is advisable to back-up critical data stored on an SD card regularly. The analyzer's internal memory provides a buffer for the most recent data so if data stored on an SD card is lost, it can be re-archived – see Section 7.2 on page 47.

• Data is copied to an SD card when required

An SD card is inserted into the analyzer and a prompt is displayed asking the user to select the unarchived data to be copied – see Section 12 on page 58.

7.1.1 SD card insertion and removal



Figure 35 SD card removal

To access the SD card:

- 1 Ensure the analyzer is offline.
- 2 Use a large flat-headed screwdriver to release the two door catches (A).
- **3** Open the door and insert the SD card (B).

The red LED (D) is illuminated when the SD card is in use by the analyzer.

- 4 To remove the SD card, If the red LED is illuminated, press the button \bigcirc and wait until the LED goes out.
- 5 Remove the SD card from the socket. The SD card can then be inserted into an appropriate card reader attached to a PC and the data downloaded.

When an SD card is inserted and there is <1 day (binary format) or <1 hour (text format) of data in internal memory, a dialog box is displayed giving the user the choice of putting the media online or remaining offline. If no selection is made within 10 seconds, the media card is placed online automatically:

Select Line Status	
Stay Offline Go Online	External Media Inserted. Select required operation and Press Enter. If no action taken Archiving will Go Online in 6 secs.
	ок 😎

Note. Data stored in the internal memory buffer can still be transferred to the archive media when the archive media is placed online again (providing it is not offline so long that the unarchived data in the internal memory is overwritten).

When an external archive media card is inserted and there is >1 day (binary format) or >1 hour (text format) of data in internal memory, a dialog box is displayed prompting the user to select either the data to be archived or remain offline:



Select the data to be archived and press the $rac{1}{2}$ key. A progress bar is displayed:

Updating archiving	
	ĺ
DO NOT REMOVE STORAGE CARD	
Cancel	•

The files are copied to the SD card.

7.1.2 External media status icons

The status of external media is indicated by icons displayed in the status bar – see Table 1.

For a list of status icons, refer to Section 12.3.3 on page 63.

7.2 Reset archiving

If **Reset Archiving** is selected, all data in the internal memory is rearchived to external media.

Note.

Ideally, insert a blank media storage card before selecting this function.

To rearchive data:

- Insert an SD card, with sufficient free space, into the analyzer.
- 2 Select **Offline** in the menu.
- 3 Select Reset archiving in the menu.
- 4 Select Online in the menu.
- 5 Select the data to be archived if >1 hour (text format) or
 >1 day (binary format) of data in internal memory and press the key.

7.3 File viewer

A prompt is displayed providing the option to view either internal or external files (if an SD card is present).

External file view	
Name	Size
08454716Jun08Ch1_1AnlgIron Monitor.B00	186572
08495618Aug08Ch1_1AnlgIron Monitor.B00	2764
08495618Aug08Ch1_2AnlgIron Monitor.B00	2764
08495618Aug08Ch1_3AnlgIron Monitor.B00	2764
10501813Aug08Ch1_1AnlgIron Monitor.B00	8396
10501813Aug08Ch1_2AnlgIron Monitor.B00	8396
10501813Aug08Ch1_3AnlgIron Monitor.B00	8396
15273708Aug08Ch1_2AnlgIron Monitor.B00	177868
15273708Aug08Ch1_3AnlgIron Monitor.B00	177868
15420013Aug08Ch1_1AnlgIron Monitor.B00	1228
Delete 🗜	Exit 🕶

Use the \blacktriangle and \blacktriangledown keys to scroll up and down the screen.

If viewing files on the SD card, files can be deleted by highlighting a file and pressing the **G** key.

7.4 Archive file types

Archive files are created in text format or binary format, depending on the format selected at the **Archive File Format** parameter – see Section 6.6.4 on page 41.

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7.5 Text format data files

Text format archived data is stored in a comma-separated value format and can be imported directly into a standard spreadsheet, for example, Microsoft® Excel.

The files can also be saved in ASCII text format.

Alternatively, the data can be analyzed graphically in detail on a PC using ABB's DataManager Pro data analysis software.

	A	В	С	D	E	F	G	Н		J
1	Instrument tag	Aluminium Monitor	Serial Number		Date format	0	Instrument type			
2	Configuration file		15_12_12 170908 Aluminium Monitor.cfg							
3	Tag		Data							
4										
5	CH1.1	Stream 1		No. dp's =	3	Eng lo =	0	Eng hi =	0.4	mg/l
6	CH1.2	OFF								
7	CH1.3	OFF								
8										
9	Date	Time	Stream 1							
10			CH1.1	CH1.2	CH1.3					
11			mg/l							
12			instant	OFF	OFF					
13	17/09/2008	07:12:47	0.112							
14	17/09/2008	07:17:47	0.104							
15	17/09/2008	07:22:47	0.104							
16	17/09/2008	07:27:47	0.104							
17	17/09/2008	07:32:47	0.104							

Figure 36 Example of text format channel data file

	A	В	С	D	E	F	G	Н
1	Instrument tag	Aluminium Monitor	Serial Number		Date format	0	Instrument type	Aztec 600
2								
3								
4	Date	Time	Type of event	Description	Op id			
5								
6								
7	15/09/2008	12:27:16	Power recovery					
8	15/09/2008	12:28:10	Monitor Stopped					
9	15/09/2008	12:37:55	Config changed		Operator 1			
10	15/09/2008	13:01:00	Calibration Passed					
11	15/09/2008	13:01:00	OD Low = 0.056	OD High = 0.545				

Figure 37 Example text format audit log file

7.5.1 Text format stream data filenames

Text format stream data files can be configured to contain data gathered over a predefined period of time (selected at the **New File Interval** parameter) – see Section 6.6.4 on page 41. The **Instrument Tag** is set in the configuration – see Section 6.1.1 on page 29.

Note. The time and date are formatted according to the date format set in **Common Configuration** – see Section 6.1.3 on page 30.

Once configured, the filenames for each archive file are assigned automatically.

Table 6 Text format stream data format

New File Interval	Filename
Hourly	<hour> <day, month,="" year=""> <filename tag="">.d00</filename></day,></hour>
Daily	<day, month,="" year=""> <filename tag="">.d00</filename></day,>
Monthly	<month, year=""> <filename tag="">.d00</filename></month,>
None	<filename tag="">.d00</filename>

Filename extensions are assigned according to the data type archived:

Table 7 Text data filename extensions

Data	Text Format File Extension
Stream data	*.D**
Alarm Event Log data files containing the historical record of the alarm events related to the stream plus the history of any operator messages – see Section 7.5.3 on page 50.	*.E**
Audit Log data files containing the historical entries from the audit log – see 7.5.3 on page 50.	*.A**

In addition to creating new stream data files according to the **New File Interval**, they are also created in the following circumstances:

- If the analyzer's power is lost then restored.
- If the analyzer is taken offline and the archive media removed, replaced or refitted.
- If the analyzer's configuration is changed.
- If one of the current files exceeds the maximum permissible size.
- When the daylight saving period starts or ends.

Note. The analyzer's internal clock can be configured to adjust automatically at the start and end of **Daylight Saving Time** periods.

When one of the above conditions occurs, new stream data files are created for each enabled group and the file extension index on each new file is incremented by one from the previous file.

Example: If the original file had an extension of .D00, after one of the above events a new file is created with the same filename but an extension of .D01.

7.5.2 Text format stream data – example filenames New file interval set to hourly, filename tag set to Process Group 1; date is 10th April 2012; Channel data and alarm event log files only enabled:

9:00am new file created in which all channel data recorded between 9:00 and 9:59:59 is archived in the following file:

09_00_10 Apr12_Process_Group_1.d00

09:12 a.m. Power interrupt occurs

09:13 a.m. Power restored and new file created:

09_00_10 Apr12_Process_Group_1.d01

10:00 am New file created in which all data recorded between 10:00 and 10:59:59 is archived.

10_00_10 Apr12_Process_Group_1.d00

Note.

Hourly files start exactly on the hour (for example, 8:00 a.m., 9:00 a.m., 10:00 a.m.).

Daily files start at 00:00:00.

Monthly files start at 00:00:00 on the first of the month.

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7.5.3 Text format log files (audit and alarm log)

Alarm event logs for each process group and the audit log are archived into individual files.

The filenames are formatted as shown:

Table 8 Text format log file format

Log file	Filename
Alarm Event	<hour min=""> <day, mm,="" yy=""> <process group="" tag="">.e00</process></day,></hour>
Audit Log	<hour min=""> <day, mm,="" yy=""> <instrument tag="">.a00</instrument></day,></hour>

If one of the archive log files becomes full (>64,000 entries) a new file is created with an extension incremented by 1, for example: a01, e01.

New text format log data files are also created when the daylight saving period starts.

7.5.4 Daylight saving

Files containing data generated during the daylight saving period have '~DS' appended to the filename.

Start of daylight saving period

A daily file is started at 00:00:00 on 30th March 2012 filename: 30Mar12AW633.D00

Summertime starts at 2:00 a.m. on 30th March 2012 and the clock changes automatically to 3:00 a.m.

The existing file is closed and a new file is created filename: 30Mar12AW633~DS.D00

The file '30Mar12AW633.D00' contains data generated from 00:00:00 to 01:59:59.

The file '30Mar12AW633~DS.D00' contains data generated from 03:00:00.

End of daylight saving period

A daily file is started at 00:00:00 on 26th October 2012 filename: 26Oct12AW633~DS.D00

Summertime ends at 3:00 a.m. on 26th October 2012 and the clock changes automatically to 2:00 a.m.

The existing file is closed and a new file is created filename: 26Oct12AW633.D00

The file '26Oct12AW633~DS.D00' contains data generated from 00:00:00 to 02:59:59.

The file '26Oct12AW633.D00' contains data generated from 02:00:00.

7.5.5 Text format data verification and integrity When text format data is saved to the archive media, it is checked automatically to verify that the data stored on the media matches exactly what is stored in the internal memory.

7.6 Binary format data files

Binary format archived data is stored in a secure binary encoded format. A separate file is created for each recording channel. The log data is stored in an encrypted text format.

The files can be read on a PC using ABB's DataManager Pro data analysis software package.

7.6.1 Binary format data filenames

When the **Archive file format** parameter is set to **Binary format**, the **New File Interval** parameters (see Section 6.6.4 on page 41) are disabled and binary format filenames are created with the content:

Table 9Binary format data filenames

	Filename content
Stream Data	<start hhmmss="" time=""> <start date="" ddmmmyy=""> Ch<group><channel><monitor tag=""> e.g.: 14322719Mar12Ch1_2Final Water3</monitor></channel></group></start></start>
Alarm Event Log Data	<start hh_mm="" time=""> <start date="" ddmmmyy=""> <process group="" tag=""> e.g.: 14_3219Mar12Final Water5</process></start></start>
Audit log Data	<start hh_mm="" time=""> <start date="" ddmmmyy=""> <instrument tag=""> e.g.: 14_3219Mar12Final Water3</instrument></start></start>

Filename extensions are assigned according to the data type archived:

Table 10 Binary format data filename extensions

Data	Binary format file extension
Stream data	*.B**
Alarm Event Log data files – the historical record of the alarm events related to the stream plus the history of any operator messages	*.EE*
Audit Log data files – the historical entries from the audit log	*.AE*

7.6.2 Binary format stream files

A new binary format archive file is created under the following conditions:

- When the current file for the stream does not exist on the media card.
- When the maximum permissible size (5 MB) of the existing data file is exceeded.
- When the recording channel's configuration is changed.
- When the daylight saving period starts or ends (stream data files generated during the daylight saving period have –DS appended to the filename).

Note. The analyzer's internal clock can be configured to adjust automatically at the start and end of 'Daylight Saving Time' periods.

Filename examples:

Example 1 – Start of daylight saving period: Archiving is started at 01:45:00 on 30th March 2012 – filename: 01450030Mar12Ch1_1AnlgAW633.B00.

Summertime starts at 2:00 a.m. on 30th March 2012. The clock changes automatically to 3:00 a.m. The existing file is closed and a new file is created – filename: 03000030Mar12Ch1_1AnlgAW633~DS.B00.

The file '01450330Mar12Ch1_1AnlgAW633.B00' contains data generated from 01:45:00 to 01:59:59 (before summertime starts).

The file '03000030Mar12Ch1_1AnlgAW633~DS.B00' contains data generated from 03:00:00 (after summertime starts).

Example 2 – End of daylight saving period: Archiving is started at 00:15:00 on 26th October 2012 – filename: 00150026Oct12Ch1_1AnlgAW633~DS.B00.

Summertime ends at 3:00 a.m. on 26th October 2012. The clock changes automatically to 2:00 a.m. The existing file is closed and a new file is created –filename: 02000026Oct12Ch1_1AnlgAW633.B00.

The file '00150026Oct12Ch1_1AnlgAW633~DS.D00' contains data generated from 00:15:00 to 02:59:59 (before summertime ends).

The file '02000026Oct12Ch1_1AnlgAW633' contains data generated from 02:00:00 (after summertime ends).

7.6.3 Binary format log files

A new binary format log file is created under the following conditions:

- When an existing (valid) binary file does not exist on the media card.
- When the maximum size (64,000 entries) is exceeded.
- When the daylight saving period starts or ends.

7.6.4 Daylight saving

Files containing data generated during the daylight saving period have '~DS' appended to the filename – see Section 7.5.4 on page 50 for examples of appended filenames.

Note. Binary format archive files created during the daylight saving period (summertime) are compatible with the database feature of Version 5.8 (or later) only of ABB's DataManager Pro data analysis software package.

7.6.5 Binary format data verification and integrity

When data is saved to the archive media it is checked automatically to verify that the data stored on the media matches exactly what is stored in the internal memory.

Each block of data in the channel data files has its own data integrity check. This enables the integrity of the data stored on the external media card to be verified when it is viewed using ABB's DataManager Pro software package.

The log files also contain built-in integrity checks enabling the integrity of the data to be verified by the DataManager Pro software.

8 Chart functions

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The **Chart Functions** menu can be accessed only from the **Chart View** screen.



Figure 38 Chart functions

8.1 Historical review

While in Historical Review mode:

- Invalid historical data (for example, when recording has stopped) is denoted by '- - -' in the digital indicator.
- Operator messages generated are added to the alarm event log at the present time, not the time indicated by the cursor.
- All data stored in the analyzer's internal memory can be viewed.
- If daylight saving is enabled (see Section 7.5.4 on page 50) and the selected 'Goto' target date/time is within the daylight saving period, **Daylight Saving** is displayed on the dialog box.

Enables a historical view of the chart. While in the **Historical Review** screen an animated **R** icon is displayed at the top of the screen. The analyzer exits **Historical Review** mode automatically after 15 minutes if no key is pressed.

Selecting the **Historical Review** menu item changes the screen to the history view – use the $\blacktriangle \nabla$ keys to scroll up and down the screen.

Selecting the **Historical Review** menu item a second time gives the option of either exiting the historical review or to go to a specified date/time:

Select Review Time	
Oldest data 03/05/11 11:02:09	Newest data 12/05/11 13:43:59
12 / 02 :	05 / 11 00 : 00
Cancel 🕲	Cursor 🚏 Goto 큿

Press the \blacktriangleleft keys to select the date/time and press the \blacktriangle \blacktriangledown keys to change the selected value.

To finish, press \checkmark or press \boxdot to escape without making any changes. The screen displays the chart at the selected date/ time. Use the \blacktriangle \checkmark keys to scroll up and down the screen.

8.2 Operator messages

These are messages that can be used to annotate the chart. These can be selected from up to 24 predefined messages – see Section 6.1.6 on page 34. Alternately, the messages can be user-defined.

Annotations can also be added remotely via the web – see Appendix E on page 85.

The annotation is added to the chart at the time it is entered. For example:



An entry is also included in the Alarm Event Log.

Note. Annotations added while in **Historical Review** are added to the chart at the time of entry not on the chart as it is displayed on the screen.

8.3 Chart annotation

Toggles any operator messages and/or alarms on/off.

8.4 Screen interval

Used to control the amount of data displayed on the screen. A longer screen interval displays more data, a shorter screen interval displays data over a shorter time period. In both cases, the full trace is preserved by plotting the maximum and minimum samples for each display.

When a different screen interval is selected from this menu, it is retained only as long as the **Chart View** screen is displayed. To save a different screen interval (as the default for future use), refer to Section 6.6.1 on page 40, select the screen interval required and save the revised configuration on exit.

Selection of higher sampling rates during configuration (see Section 6.6.2 on page 40) may reduce the maximum **Screen interval** permitted (unavailable selections are grayed out in the menu). This ensures that large amounts of data do not slow the screen refresh rate.

9 Operate

The **Operate** menu can be accessed only from the **Indicator View** screen.

Configuration Logging	*	_∕-₽->	see Section 9.1, page 53
	Stop Monitor	∕୷⋥►	see Section 9.2, page 53
Operate	Start Monitor Measurement		and Contine 0.2 mars 52
Diagnostics	Calibrate	•	see Section 9.3, page 53
Alarm Acknowl	Prime Lines & Calibrate	→	see Section 9.4, page 53
Help	Flush Monitor	-€	see Section 9.5, page 53

Figure 39 Operate menu

9.1 Stop monitor

Select to stop the analyzer. The temperature of the measurement cell is maintained at the set level ensuring no warm-up delay when the analyzer is restarted.

9.2 Start monitor measurement

Select to start the analyzer. If the analyzer was switched off at the mains, or a fault had occurred, measurement does not start until the measurement cell reaches the operating temperature set during configuration – see Section 6.2.1 on page 35. The message **Temperature Stabilising** appears at the bottom of the screen until the cell is up to temperature.

If the analyzer has not been used for an extended period of time, allow it to operate for a few hours and then recalibrate.

The analyzer runs automatically until it is switched off.

9.3 Calibrate

A manual calibration can be performed at any time. It is not necessary to stop the analyzer.

Operate	V C 0% 12/05/11
High Standard	4.86mg/l
Low Standard	1.21mg/l
Last Calibration	10:15 02/02/2011
Calibrate	• •

Highlight the button and press 7 to initiate calibration. When calibration is complete, the measurement cycle begins automatically.

9.4 Prime lines and calibrate

When the reagents are changed, or the analyzer is either operated for the first time or operated following an extended period of shut down, prime the reagent and sample lines – see Section 4.1 on page 23. The **Prime** function draws in each reagent, sample and standard in turn, filling the lines and then pumping to waste. An automatic calibration is then started. After calibration the measurement sequence begins automatically.

If the analyzer is switched off at the mains without stopping operation via the menu, or if a power supply failure occurs, the analyzer starts the Prime Lines and Calibrate routine automatically when power is restored.

9.5 Flush monitor

This facility pumps sample through the flow cell continuously but does not store or display measurement values.

The routine can be used **without** a prior calibration and is useful when the measurement parameter is changed, for example, from ammonia to fluoride.

When flushing is selected, the operation continues until stopped by the user or a different operation such as **Calibration** is selected.

10 Diagnostics

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The **Diagnostics** menu can be accessed only from the **Indicator View** screen.



Figure 40 User diagnostic screens

10.1 Monitor status

There are four tabs in the **Monitor Status** screen:

Status Cal I/O Info

10.1.1 Status

Fields	Description
Current state	Displays the current state of the analyzer (for example, Measuring, Calibrating, Off).
Sample Conc./Millivolts	Sample Concentration is the current estimated concentration, derived from the raw electrode signal. This is displayed only when there is a valid calibration.
Cell temperature	The current recorded cell temperature.

10.1.2 Cal

Fields	Description
Calibration State	Displays the standard currently being measured during the calibration cycle (for example, Measuring Low, Measuring High, Sample, Recovery Period).
Percentage Complete	A 'real-time' indication of calibration progress.
mV, Low / High	The measured electrode mV of the low standard and high standard of the previous calibration.
Sample Conc. / Millivolts	The raw signal from the measuring electrode shown as a voltage (–2048 to 2047 mV) and also converted into a concentration value. This value is displayed only when a valid calibration exists.
	The Last Gradient is the mV change per decade change in concentrate.
Last Cradiant (The Gradient Coefficient is an indication of the difference between the calculated calibration
Gradient Coefficient	gradient and the Nernstian calibration gradient.
	If the gradient exceeds the limits set by the user, the analyzer fails calibration. Default fail criteria occurs when the coefficient is outside the range 0.4 to 1.6.
m)/ Offect / %/ Slene	mV offset is the mV difference from the expected mV value for any standard, compared to a reference value.
my Onset / %Slope	% slope is the slope compared to the theoretical temperature-compensated change in mV (% absolute).
Time Last Calibration	The date and time of the previous calibration.

10.1.3 I/O

Fields	Description
mA o / p 1 to 6	Displays the current mA output for each of the analog outputs.
Sample	Displays the side sample pot level sensor reading (empty or OK).
High Std	Displays the calibration high standard level sensor reading (empty or OK).
Low Std	Displays the calibration low standard level sensor reading (empty or OK).
Buffer	Displays the buffer solution level sensor reading (empty or OK).
Clean Sol	Displays the cleaning solution level sensor reading (empty or OK).

10.1.4 Info

Fields	Description
Software Version	The version number of the software release.
LL App.	The version number of the low level application code
OS	The version number of the Operating System.
НМІ	The version number of the user interface code.
Head	Not applicable to ion-selective analyzers.
Serial Number	The analyzer's serial number.

...10 Diagnostics

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10.2 Cell diagnostics

Cell diagnostics enables the user to control the operation of the analyzer manually – bringing in reagents and sample, etc. It also displays the detector output in real time, giving an insight into how the analyzer is performing.

Note. If this procedure is selected when the analyzer is in operation, a warning is displayed:



Note. Select Back and press . to return to normal operation. Select Continue and press . to continue to cell diagnostics. This stops the current analyzer operation:

Pump Motor	On	1
Heater	On	1
Valve	Sample	1
Millivolts	631.0mV	
Temperature	35.8°C	
		-

Fields	Description
Pump Motor	Enables the user to toggle the pump on and off.
Heater	Enables the user to toggle the heater on and off.
Valve	Enables the user to select which valve to open (and therefore which liquid to import). Only one valve can be opened at any one time.
Millivolts	Displays the probe voltage (-1,280 to 2,047 mV) in real time.
Temperature	Displays the flow cell temperature in real time.

10.3 Relay test

All of the alarm relays can be set individually or reset to check their operation.

This procedure affects the analyzer relay functions and the analyzer **overrides** the normal state.

10.4 Current output test

Within the current output test screen, the user is able to check the analyzer current outputs manually.

A calibrated ammeter is required for this test. Put the leads from the ammeter onto the two current output terminals on the I/O board – see Section 3.5.1 on page 14.

Check that the value shown on the analyzer LCD is the same value shown on the ammeter.

Use the \blacktriangle and \bigtriangledown keys to increase/decrease the milliamp value.

If the ammeter and analyzer do not agree, it may be necessary to recalibrate the current outputs – see Section 6.5.2 on page 39.

Note. This procedure affects the current outputs of the analyzer and the analyzer **overrides** their normal state

11 Statistics

The **Statistics** menu can be accessed only from the **Chart View** screen.

Configuration	۲
Logging	۲
Chart Functions	F
Statistics	
Alarm Acknowledge	۲
Help	۲

Figure 41 Statistics selection

Statistics displays the highest, lowest and mean values of the sample since the analyzer was either switched on or the value was reset.

Statistics	▲ ^{11/05/11} 13% ^{15:19:09}
1 Stream 1	⊠ 505.22 ⊠ 479.66 ∑ 492.28
2	
3	
Reset All 🛛 🥮	Last Reset At 15:18 Exit 41/05/11

Press the 🗐 key to reset the value.

12 Diagnostic information and icons

12.1 Analyzer diagnostic information

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The analyzer is programmed to display diagnostic messages to provide information on servicing requirements and any other conditions that develop during operation.

All diagnostic messages displayed on the analyzer are added to the analyzer's audit log.

Table 11 shows icon types, diagnostic messages and ON/OFF status for the fixed relays, all of which operate in the fail-safe condition.

Note. The diagnostic icons in the following table conform to NAMUR 107.

Diagnostic icon	NAMUR status
\bigotimes	Failure
V	Check function
?	Out of specification
\bigotimes	Maintenance required

Table 11	Diagnostic information,	relay operations and	inhibits (sheet 1 of 4)
	-		• •

Icon	Diagnostic message	Stop Relay	Attention Relay	Calibration Relay	Failure Relay
	Monitor in Service				
\checkmark	The analyzer is measuring correctly.	ON	ON	ON	ON
<u> </u>	20 Character User-defined Alarm Tag				
44	User-defined alarm message.	—	_	_	_
\land	Sample Flow Failure				
	The analyzer cannot detect any sample flow.				
•	If there is sufficient flow to the analyzer, check that:				
	1. The float is located in the side-sample pot and is unrestricted.	ON	OFF	ON	ON
	The end cap of the side-sample pot is positioned to allow the magnetic float to be within the area of operation of the reed switch.	ÖN		ÖN	ÖN
	3. The float switch lead is connected correctly to the interconnection board.				
	4. The magnetic reed switch is operating correctly.				
	Monitor Stopped				
V	Analyzer operation has been stopped by the user.	OFF	ON	ON	ON
	Monitor Off				
V	Analyzer operation has not been started.	ON	ON	ON	ON
	Monitor Off				
V	A failure has caused the analyzer to stop operation and switch off all services.	ON	ON	ON	OFF
	Priming				
V	The analyzer is priming the tubing. The priming routine draws in each reagent, sample and standard in turn, filling the tubing and then pumping to waste.	OFF	ON	ON	ON
	An automatic calibration starts when the priming routine is completed.				

Table 11 (sheet 2 of 4) (continued)

lcon	Diagnostic message	Stop Relay	Attention Relay	Calibration Relay	Failure Relay
	Calibrating				
V	A calibration routine is being run.	ON	ON	OFF	ON
	Temperature Stabilizing				
	In Measurement Mode	OFF	ON	ON	ON
•	In Calibrate Mode	OFF	ON	OFF	ON
	This message is displayed at startup and remains until the measurement head temperature has stabilized to within 1% of the programmed operating temperature.				
	Override Mode				
	The analyzer is in Override Mode.				
V	Normal running has been overridden by the operator.	OFF	ON	ON	ON
	The Override Mode is useful to check analyzer operation manually.				
	The analyzer remains in Override Mode until it is stopped.				
	Flushing				
	The analyzer is in flushing mode.				
v	This facility carries out a continuous routine but does not store or display measurement values.	OFF	ON	ON	ON
	The routine can be used without a prior calibration and is useful when a analyzer is swapped from one parameter to another.				
	The analyzer remains in flushing mode until it is stopped.				
	A / D Error				
(\times)	A hardware error exists on the main board.				
\checkmark	Power the analyzer down, wait for 10 seconds and power-up again.	ON	ON	ON	OFF
	If the error persists, contact the local ABB representative.				
	Calibration Failed				
(\times)	'Calibration Fail Event' set to 'Fail' (see Section 6.3.1, page 35)	OFF	ON	OFF	OFF
•	'Calibration Fail Event' set to 'Attention' (see Section 6.3.1, page 35) or Calibration Failed with Probe Stability Failure	OFF	OFF	OFF	OFF
	Note. If 'Calibration Fail Event' is set to 'Attention', the analyzer continues to measure after a failed calibration using the last valid calibration.				
	The analyzer has failed calibration. Check that:				
	 the reagents are of the correct type, connected correctly and are within their shelf life. If it is possible that the reagents have become contaminated replace them. 				
	2. the calibration settings are correct.				
	3. there are no restrictions or blockages in the analyzer tubing.				
	4. each reagent / sample is drawn into the measurement head correctly.				
	5. the electrode is connected correctly.				
	If the error persists, contact the local ABB representative.				

...12 Diagnostic information and icons

...12.1 Analyzer diagnostic information

Table 11 (sheet 3 of 4) (continued)

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lcon	Diagnostic message	Stop Relay	Attention Relay	Calibration Relay	Failure Relay
	Calibration Standard Empty				
\mathbf{X}	The calibration standard bottle is empty.	OFF	ON	ON	OFF
-	Replace the calibration solution.				
	Critical Temperature Reached				
\mathbf{X}	This alarm is initiated if the analyzer temperature rises above 60 °C (140 °F) during temperature control.	ON	ON	ON	OFF
	1. Check that the ambient temperature limits have not been exceeded.				
	2. Contact the local ABB representative.				
	Excessive Secondary Current in Electronics				
$\mathbf{\overline{\mathbf{A}}}$	Too much current is being drawn by the electronics in the system; this causes the analyzer to go into automatic shutdown.	ON	ON	ON	OFF
	Contact the local ABB representative.				
	Heating Failure				
\mathbf{X}	The analyzer has failed to reach operating temperature.				
•	This alarm is initiated if the analyzer temperature fails to rise 0.5 °C (0.9 °F) within 2 minutes during the temperature stabilizing routine.	OFF	ON	ON	OFF
	 Check the integrity of the cable connecting the temperature probe in the flow cell to the interconnection board. 				
	2. Contact the local ABB representative.				
	High Standard Solution Empty				
\mathbf{X}	The high standard solution bottle is empty.	OFF	ON	ON	OFF
-	Refill or replace the high standard solution bottle.				
	Internal Communications Failed				
\mathbf{X}	Communication between the main board and the display assembly has failed.		ON	ON	OFF
-	1. Check the ribbon cable connection to the main board.	UN			
	2. Contact the local ABB representative.				
	Internal Electronics Temperature Too High / Low				
\bigotimes	The internal temperature of the electronics enclosure is either too high or too		ON	ON	OFF
	low.	ON			
	1. Check that the ambient temperature limits have not been exceeded.				
	2. Contact the local ABB representative.				
	Low Standard Solution Empty	_		_	
\checkmark	The low standard solution bottle is empty.	OFF	ON	ON	OFF
	Refill or replace the low standard solution bottle.				

Table 11 (sheet 4 of 4) (continued)

lcon	Diagnostic message	Stop Relay	Attention Relay	Calibration Relay	Failure Relay
	No Valid Calibration				
	There is no valid calibration stored within the analyzer memory.				
-	Calibrate the analyzer.				
	Non-Volatile Memory Error				
$\mathbf{\overline{\mathbf{X}}}$	There is a problem with either the display electronics or the main board memory.				
	 Power the analyzer down, wait for 10 seconds and power-up again. 				
	If the error persists, contact the local ABB representative.				
	Probe Failure				
	The probe is disconnected or the probe has failed.				
•	1. Check the probe connections.				
	2. Replace the probe.				
	Restart the analyzer in either Measurement Mode or Calibrate Mode to clear the message.				
	Reagent Empty				
	The reagent bottle is empty.				
-	Refill or replace the reagent bottle.				

...12 Diagnostic information and icons

12.2 Analyzer diagnostic information

To acknowledge a particular alarm, use the \blacktriangle and \blacktriangledown keys to highlight it in the menu and press the \clubsuit key.

Note. Active unacknowledged alarms are identified by a flashing red alarm event icon. Active acknowledged alarms are identified by a continuous red alarm event icon.

To acknowledge all active alarms simultaneously, select All and press the \mathbf{A} key.



Figure 42 Alarm Example

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12.3 Audit log and alarm event log

The **Audit Log** and **Alarm Event Log** are used to display a list of events and alarms identified by icon, sequence number, date and time.

The **Audit Log** provides an historical log of system activity and the **Alarm Event Log** provides an historical log of all alarm events in the sequence they occurred.

When the number of entries in each log has reached 500, the oldest data is overwritten by the newest data. Entries are renumbered so that the number of the oldest entry is always 00.

Both logs are accessible from the chart view and bar view – see Section 2.1 on page 8for details of how to navigate to these logs.

Note. Use the \blacktriangle and \blacktriangledown keys to scroll through log data.

12.3.1 Audit Log – Icons

lcon	Event
₩	Power failed
×	Power restored
Ø	Configuration changed
43	File created
×	File deleted
4 2	Archive media inserted
V	Archive media removed
	Archive media offline
	Archive media online
8	Archive media full
≜	System error/reset archiving
18	Date / time or daylight saving start/end changed
₽	Security change
	FTP logon
i	Information
8	Failure – see Section 12.1, page 58
ا الج	Maintenance Required – see Section 12.1, page 58
Δ	Out of Specification - see Section 12.1, page 58
V	Check Function – see Section 12.1, page 58

12.3.2 Alarm event log – icons

Note.

- A **flashing** red alarm icon indicates an active and unacknowledged alarm.
- A **continuous** red alarm icon indicates an active and acknowledged alarm.

lcon	Event
🕇 û	High process alarm – active/inactive
↑ û	Low process alarm – active/inactive
<mark>↑</mark> 잡	High latch alarm – active/inactive
₽	Low latch alarm – active/inactive
🕈 ជ័	High annunciate alarm – active/inactive
👆 ሌ	Low annunciate alarm – active/inactive
CIP CIP	Clean-in-progress alarm – active/inactive
۳	In sample alarm
3	Out of sample alarm
18	Daylight saving start/end changed
4	Alarm acknowledged
\geq	Operator message

12.3.3 Status Icons

Note. Status icons are displayed in the Status Bar – see Section 2.1 on page 8.

lcon	Event
R	Historical review active
4%	External archive media online with % used indication
4%	External archive media offline with % used indication
# (<mark>)</mark>	External archive media not inserted (yellow flashing exclamation mark)
🗕 🥌 4%	Media update in progress. Do not remove media while this symbol is displayed
××	External media 100 % full, archiving stopped (green/gray icon, flashing white cross)
1	Warning! Too many files (green icon – media online, gray icon – media offline)

13 Maintenance

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🗥 WARNING 😔 🕅

- Ensure personal protective equipment (PPE) such as gloves and eye protection are worn during any maintenance and that any spillages are cleaned up using clean water.
- To familiarize yourself with handling precautions, dangers and emergency procedures, always review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards.
- Take care if cleaning any spillages and observe all relevant safety instructions see Section 1 on page 3.
- General cleaning of the instrument should be carried out using a damp cloth only, mild detergent can be used as a cleaning aid. Do not use acetone or any organic solvents.
- Isolate electrical components before maintenance or cleaning.
- Observe all health and safety procedures for handling chemicals see Section 1 on page 3.

Aztec 600 analyzers are designed to be as maintenance-free as possible. The inherent product design and auto-calibrating features reduce the amount of maintenance required to external cleaning (sample lines, etc.), changing the reagents and scheduled annual maintenance only.

If followed correctly, the recommendations in this section help prolong the life and enhance the performance of the analyzer, thus reducing long-term operating costs. Operating costs can be further reduced by selecting **Economy Mode** during Commissioning – see Section 6.2 on page 35. This is designed to reduce reagent consumption at the expense of a slower response time.

Maintenance is divided into three categories:

- Changing reagents,
- Regular visual checks,
- Annual scheduled maintenance.

13.1 Changing reagents and standard solutions

Reagent and standard solution requirements and consumption rates are illustrated in Appendix A of this manual.

To prevent the reagent and standard solutions from running out, check consumption as regularly as possible to predict the optimum changeover time.

Use the following procedure when changing the reagent/ standard solutions:

- 1 Stop the analyzer see Section 9.1 on page 53.
- 2 Check that the shelf lives of the new reagent/standard solution bottles are sufficient for the expected period of use.
- **3** Remove the caps from each bottle and change them one by one.

- Avoid contamination of the solutions.
- When removing the reagent/standard solution level sensors, ensure that no contact is made with the stem, especially with bare hands.
- Do not top up solution bottles.
- Dispose of the used bottles and contents safely, according to national or local regulations. Analyzer performance relies heavily on the integrity of these solutions so it is very important to prepare, store and handle them with care.
- 4 Ensure the tubes are inserted correctly and the float switches are free to move.
- 5 When the level sensors are correctly in place, hand-tighten the bottle caps. This protects against the ingress of dust, water etc.
- 6 Select Prime lines and Calibrate and press the 🗸 key.

Take care when storing the bottles. Ensure they are date stamped, used in strict rotation and not used after the expiry date.

13.2 Regular visual checks

Inspect the analyzer on a regular basis to ensure the correct functioning of the system and to check the integrity of the readings:

- Check for leaks, particularly around the sample and drain pipework connections.
- Confirm sample flow by checking delivery to the constanthead unit and effluent from the drain.
- Check liquid levels in the reagent and standard solution bottles.
- Inspect all tubing and liquid-handling components for leaks and deterioration.
- Check for malfunction indications on the analyzer display.

13.3 Annual maintenance

Annual maintenance required:

- Replace pump tubing and capstans see Section 13.3.1 on page 65.
- Replace analyzer tubing see Section 13.3.2 on page 67.

Annual maintenance kits, that include all the components required, are available.

Annual refurbishment ensures a high level of reliability from the analyzer.

Re-order the kit when used so that all the items are available throughout the following year's operation.

For part numbers, refer to the Spares section – see Appendix G on page 90.

13.3.1 Replacing pump tubing and capstans

Note. Flush replacement tubing with clean water before fitting it to the analyzer

Tools required

- No. 2 Pozidriv[®] screwdriver
- Long-nosed pliers

Procedure

- Press the key and use the ▲ and ▼ keys to select Operate followed by Stop Monitor and press the ↓ key.
- 2 Referring to Figure 43:
 - **a** Release thumbscrews (A) and open the liquid-handling section door.
 - **b** Unlock catch (B), pull the liquid-handling section panel forward and lock into the vertical position using catch (B).



Figure 43 Accessing the pump

...13 Maintenance

...13.3 Annual maintenance

3 Referring to Figure 44:

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- Press down on pump pressure plate (C), turn pressure plate locking pin D ¼ turn counterclockwise and withdraw the pin. Lift the pump pressure plate clear of the pump.
- b Disconnect the heated block assembly inlet tube (Ammonia analyzer only) or mixer assembly inlet tube (Fluoride analyzers only) (E) from tee-piece (F) and pull tee-piece, reagent and sample tubes free of slots in lower support plate.
- **c** Disconnect sample pump tube (G) from the valve manifold connector.
- **d** Disconnect reagent pump tube (H) from the in-line mini barbed nipple connector located below the lower valve manifold.
- e Remove shims (J) and sleeves (K), complete with pump tubing and tee-piece from the lower support plate and discard the complete assembly.
- f Remove pump capstan securing screw and washers (L).
- **g** Remove nameplate (M), front pump capstan, center spacer and rear pump capstan. Discard the 2 × pump capstans.
- **h** Fit new rear pump capstan to pump drive shaft, followed by the center spacer and the new front pump capstan, ensuring pump rollers are aligned. Fit nameplate (M) and secure with screw and washers (L).
- i Fit new sleeves (K) to new reagent (H) and sample (G) pump tubing (hold the hole in the sleeves open with a pair of long-nosed pliers while pushing the tubes through).
- **j** Insert sleeves (K) and pump tubing into the lower support plate, ensuring the thin (reagent) tubing (H) is fitted to the rear location and the thick (sample) tubing (G) to the front. Route end of reagent tubing (H) through holes in valve manifolds.
- k Fit reagent and sample pump tubing to new tee-piece part no. 26-1003-B (F) as shown. Slide tubing into correct slot in lower support plate.
- I Fit new shims (J) to the slots in the support plate as shown.
- **m** Gently pull the new tubing down through sleeves (K)and into contact with pump rollers. Ensure tee-piece (F)is positioned under the lower support plate as shown and reagent tubing (H) is correctly routed through holes in valve manifolds.
- **n** Ensure the tubing is aligned correctly over the rollers.
- Ensure pump tubing sleeves (K) and shims (J) are located correctly in pump lower plate as shown.
- **p** Ensure pump pressure plate locking pin (D) is not protruding from the rear face of the pump pressure plate (C).

Note. During step q, it is very important to ensure that:

- The pump tubing is not pinched,
- The pump tubing remains correctly located over the pump capstan rollers,
- Each tube enters its respective groove in the pressure plate,
- The sleeves and shims remain in position.
- **q** Position the pump pressure plate over the pump tubing and capstans and press down firmly until fully home.
- Press locking pin (D) fully home and turn ¼ turn clockwise to lock the pump pressure plate in position.
- **s** Connect sample pump tube (G) to the valve manifold connector.

Note. DO NOT reconnect tubes (E) and (H) at this stage – they are reconnected during steps 3 and 7 or 8 in Section 13.3.2.



Figure 44 Replacing the Pump Tubing and Capstans

13.3.2 Replacing analyzer tubing

Note. Take note of the routing of all tubes removed in the following procedures to ensure the replacement tubing is routed correctly.

Referring to Figure 45:

Remove low calibration solution tubing (A) from valve connector and discard.

Fit 1.5 m (5 ft), 3/32 in ID Tygon[®] tube part no. 0212362.

2 Remove high calibration solution tubing (B) from valve connector and discard.

Fit 1.5 m (5 ft), 3/32 in ID Tygon tube part no. 0212362.

3 Remove in-line mini barbed nipple connector (C), complete with reagent inlet tubing (D) and discard.

Connect one end of new in-line mini barbed nipple connector part no. 0214060 to reagent tubing – see (H) in Figure 45.

Fit 1.5 m (5 ft) size 13 Tygon tube part no. 26-0027-A to other end of mini connector.

4 Remove flowcell drain tube (E) from flowcell drain/outlet connector and discard.

Fit 1 m (39 in) tube part no. 0212176.

5 Remove sample inlet tubing (F) from valve connector and side sample pot lower connector and discard.

Fit 420 mm (16.5 in) of 3/32 in ID Tygon tube cut from remaining length of tube part no. 0212362.

6 Remove valve manifold interconnect tubing (G) from valve connectors and discard.

Fit 120 mm (4.7 in) of $3/_{32}$ in ID Tygon tube cut from remaining length of tube part no. 0212362.

Note. Step 7 is applicable only to ammonia analyzers.

7 Remove heated block assembly inlet tube (J) and discard.

Fit remaining 140 mm (5.5 in) of 3/32 in ID Tygon tube part no. 0212362.

Note. Steps 8 and 9 are applicable only to fluoride analyzers (ammonia optional).

8 Remove mixer assembly inlet tube (J) and discard.

Fit 75 mm (3 in) of $\frac{3}{32}$ in ID Tygon tube cut from remaining length of tube part no. 0212362.

9 Remove heated block assembly inlet tube (K) and discard.

Fit 30 mm (1.2 in) of $3/_{32}$ in ID Tygon tube cut from remaining length of tube part no. 0212362.

...13 Maintenance

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...13.3 Annual maintenance

Note. Mixer fitted to fluoride analyzers – optional fitting on ammonia analyzers.

13.4 Replacing ammonia probe membrane

Refer to "3.6.5 Ammonia electrode preparation" on page 20.



Figure 45 Replacing the analyzer tubing

10 Referring to Figure 43:

- **a** Release catch (B), push the liquid-handling section panel rearwards into the enclosure and lock it into position with catch (B).
- **b** Close the liquid-handling section door and secure with thumbscrews $\widehat{(A)}$.
- 11 Replace reagent tube in reagent bottle.
- 12 Prime and calibrate the analyzer see Section 4.1 on page 23.

13.5 Replacing the DC fuse

⚠ CAUTION

Use only replacement fuse: 12.5 A 125 VDC Type T, SCHURTER, Model SPT 5 x 20 Series



Figure 46 Replacing the DC fuse

Referring to Figure 46:

Isolate the analyzer and cables from electrical supply.

- Turn the electronics section door retaining screws (A)
 ¹/₄ turn counterclockwise and open the door.
- 2 Using a cross-head screwdriver, remove 4 screws (B) and remove transparent cover plate (C).
- 3 Carefully remove the fuse from fuse holder (D) on DC power board (E).
- Fit a new fuse (12.5 A 125 VDC Type T, SCHURTER, Model SPT 5 x 20 Series) into fuse holder (D) on DC power board (E).
- 5 Refit transparent cover plate C and secure using 4 screws
 (B). Close the door to the electronics section and turn door retaining screws (A) ¼ turn clockwise to secure.

14 Specifications – Aztec ISE Ammonia

Measurement

Units

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- NH₃
- NH₃-N
- NH4

Range

+ 0.050 to 1,000 ppm $\rm NH_3$

Measurement principle

Gas-sensing ammonia probe

Measurement mode

Continuous

Measurement performance

Accuracy

- <±5 % of reading[™] or ±0.02 ppm for 0.05 to 500 ppm NH₃ (whichever is the greater)
- + <±7.5 % of reading² for 500 to 1000 ppm NH $_3$

Repeatability

• <±2 % of reading*** or ±0.02 ppm (whichever is the greater)

Response time

- Normal operating mode: T90 typically 5 minutes
- EcoMode: T90 typically <7.5 minutes

Resolution

- 0 to 10 ppm 0.001 ppm
- 10 to 100 ppm 0.01 ppm
- 100 to 1,000 ppm 0.1 ppm

Calibration

2-point, automatic calibration, with the option of manual initiation. The interval between automatic calibrations is selectable manually from four times a day to once per week.

Environmental data

Ambient operating temperature 5 to 40 °C (41 to 104 °F)

Ambient operating humidity Up to 95 % RH non-condensing

Sample temperature

1 to 40 °C (32 to 104 °F)

Sample flow

Continuous, 200 to 500 mL/min

Sample pressure

5 psi maximum

Sample limitations

Samples containing particles 100 μm (0.004 in) in diameter or larger may require pre-filtration.

Maintenance

Routine service interval

12 months

Display

Color, TFT, liquid crystal display (LCD) with built-in backlight and brightness adjustment

Diagonal display area:

- 145 mm (5.7 in)
- 76,800 pixel display****

Dedicated operator keys

- Group select/left cursor
- View select/right cursor
- Menu key
- Up/increment key
- Down/decrement key
- Enter key

Maximum measured errors across full measurement range.

^{**} Testing based on IEC 61298 Parts 1-4: Edition 2.0 2008-10.

^{***} Testing based on BS ISO 15839: 2003.

A small percentage of the display pixels may be either constantly active or inactive.
 Max. percentage of inoperative pixels <0.01 %.
Ingress protection

IP31*

Sample connections

- Inlet
- 6 mm OD × ¼ in BSP push-fit elbow
- Outlet
- 10 mm OD × ¾ in BSP push-fit elbow

Dimensions

- Height
- 653 mm (25.7 in)

Width

• 366 mm (14.4 in) max.

Depth

- 183 mm (7.2 in) door closed
- 430 mm (16.9) door open

Weight

• 15 kg (33 lb)

Materials of construction

- Electronics enclosure
- + 10 % glass-loaded polycarbonate

Main enclosure

• NORYL

Lower tray

• 20 % glass-loaded polypropylene

Door

Acrylic

Electrical

Power supply ranges

- 100 to 240 V max. AC 50 / 60 Hz ± 10 % (90 to 264 V AC, 45/65 Hz)
- 18 to 36 V DC (optional)

Power consumption

75 W max. – AC 100 W max. – DC

Analog outputs

6 isolated current outputs, fully assignable and programmable over a 0 to 20 mA range (up to 22 mA if required)

Alarms/relay outputs

- One per unit:
- Stop relay
- Attention relay
- Failure relay
- Calibrate relay

Six per unit:

• Fully user-assignable alarm relays

Rating

- Voltage:
- 250 V AC
- 30 V DC

Current:

- 5 A AC
- 5 A DC
- Loading (non-inductive):
- 1,250 VA
- 150 W

...14 Specifications – Aztec ISE Ammonia

Connectivity/communications

Ethernet connection

Web server with ftp for real-time monitoring, configuration, data file access and e-mail capability

Communications

PROFIBUS DP V1.0 (optional)

Data handling, storage, and display

Security

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Multilevel security:

• Operator and configuration password or security switch

Storage

Removable SD card

Trend analysis

Local and remote

Data transfer

SD card or FTP

Approvals, certification, and safety

Safety approval

cULus

CE mark

Covers EMC & LV directives (including latest version EN 61010)

General safety

EN61010-1 Over-voltage Class II on inputs and outputs Pollution category 2

EMC

Emissions & immunity

Meets requirements of IEC61326 for an industrial environment

DS/AAM631-EN Rev. D

15 Specifications – Aztec ISE Fluoride

Measurement

Range

• 0.100 to 100 ppm F

Measurement principle

Combination fluoride ion-selective electrode

Measurement mode

Continuous

Measurement performance

Accuracy^{*}

- <±2 % of reading^{**} or ±0.02 ppm for 0.1 to 10 ppm F (whichever is the greater)
- <±3 % of reading²

Repeatability

<±2 % of reading*** or ±0.02 ppm (whichever is the greater)

Response time

- Normal operating mode: T90 typically 5 minutes
- EcoMode: T90 typically <7.5 minutes

Resolution

- 0 to 10 ppm 0.001 ppm
- 10 to 100 ppm 0.01 ppm

Calibration

2-point, automatic calibration, with the option of manual initiation. The interval between automatic calibrations is selectable manually from four times a day to once per week.

Environmental data

Ambient operating temperature 5 to 40 °C (41 to 104 °F)

Ambient operating humidity Up to 95 % RH non-condensing

Sample temperature

1 to 40 °C (33.8 to 104 °F)

Sample flow

Continuous, 200 to 500 mL/min

Sample pressure

5 psi maximum

Sample limitations

Samples containing particles 100 μm (0.004 in) in diameter or larger may require pre-filtration.

Maintenance

Routine service interval

12 months

Display

Color, TFT, liquid crystal display (LCD) with built-in backlight and brightness adjustment

Diagonal display area:

- 145 mm (5.7 in)
- 76,800 pixel display****

Dedicated operator keys

- Group select/left cursor
- View select/right cursor
- Menu key
- Up/increment key
- Down/decrement key
- Enter key

^{*} Maximum measured error across full measurement range.

^{**} Testing based on IEC 611298 Parts 1-4: Edition 2.0 2008-10.

^{***} Testing based on BS ISO 15839: 2003.

A small percentage of the display pixels may be either constantly active or inactive.
 Max. percentage of inoperative pixels <0.01 %.

...15 Specifications – Aztec ISE Fluoride

Mechanical data

Ingress protection

IP31*

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Sample connections

- Inlet
- 6 mm OD × ¼ in BSP push-fit elbow

Outlet

• 10 mm OD × ¾ in BSP push-fit elbow

Dimensions

- Height
- 653 mm (25.7 in)

Width

• 366 mm (14.4 in) max.

Depth

- 183 mm (7.2 in) door closed
- 430 mm (16.9) door open

Weight

• 15 kg (33 lb)

Materials of construction

- Electronics enclosure:
- + 10 % glass-loaded polycarbonate

Main enclosure

Noryl[®]

Lower tray

• 20 % glass-loaded polypropylene

Door

Acrylic

Electrical

Power supply ranges

- 100 to 240 V max. AC 50/60 Hz ± 10 % (90 to 264 V AC, 45/65 Hz)
- 18 to 36 V DC (optional)

Power consumption

75 W max. – AC 100 W max. – DC

Analog outputs

6 isolated current outputs, fully assignable and programmable over a 0 to 20 mA range (up to 22 mA if required)

Alarms/relay outputs

- One per unit:
- Stop relay
- Attention relay
- Failure relay
- Calibrate relay

Six per unit

• Fully user-assignable alarm relays

Rating

- Voltage
- 250 V AC
- 30 V DC

Current

- 5 A AC
- 5 A DC
- Loading (non-inductive)
- 1,250 VA
- 150 W

Connectivity/communications

Ethernet connection

Web server with ftp for real-time monitoring, configuration, data file access and e-mail capability

Communications

PROFIBUS DP V1.0 (optional)

Data handling, storage, and display

Security

Multi level security:

Operator and configuration password or security switch

Storage

Removable SD card

Trend analysis

Local and remote

Data transfer

SD card or FTP

Approvals, certification, and safety

Safety approval

cULus

CE mark

Covers EMC & LV directives (including latest version EN 61010)

General safety

EN61010-1 Over-voltage Class II on inputs and outputs Pollution category 2

EMC

Emissions & immunity

Meets requirements of IEC61326 for an industrial environment

DS/AFM631-EN Rev. C

Appendix A – Reagents and standard solutions

\land WARNING 뎡 🖤

- Ensure personal protective equipment (PPE) such as **gloves** and **eye protection** are worn during any maintenance and that any spillages are cleaned-up using clean water.
- Observe all health and safety procedures for handling chemicals.

A.1 Reagent and standard solutions – Ammonia-ISE

A standard set of reagents for the Aztec 600 ISE ammonia analyzer comprises 1 reagent, a low calibration standard and a high calibration standard.

A.1.1 Reagent

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The ammonia reagent is a mixture of EDTA-di-sodium salt and alkali solution (NaOH-sodium hydroxide) held in a 10 L container.

The EDTA in the reagent is added to prevent blockages in the analyzer's internal pipework. Blockages are caused when, due to the high pH, metal ions (for example, calcium and magnesium) present in the sample form insoluble hydroxides. EDTA combines with the metal ions to prevent this happening. It also prevents hardness precipitation and inaccuracies caused by complexing of ammonia with some metal ions.

The sodium hydroxide releases the available ammonia in a free form by adjusting the pH of the sample solution to a value greater than 11.

Note. There are 2 options of ammonia reagent solution. For applications that may typically be expected to exceed 300 ppm NH₃, it is recommended that reagent AWRS620/0304 is used. For most other applications, reagent AWRS620/0301 is likely to be suitable.

A.1.2 Standard Solutions

2 standard solutions of known concentration appropriate to the measuring range are required for analyzer calibration:

- Low ammonia standard solution (factory default is 1.214 mg/L NH₃ = 1 mg/L NH₃-N)
- High ammonia standard solution (factory default is 4.856mg/L NH₃ = 4 mg/L NH₃-N)

Note. Solutions as low as 0.25 mg L⁻¹ NH₃-N at an ambient temperature of 25 °C and under normal light conditions can be prepared with care, but must be used immediately. A solution prepared in this way loses 10 % of its concentration over a 7 day period, making it unsuitable for long-term use.

A.2 Reagent and standard solutions – Fluoride-ISE

A standard set of reagents for the Aztec 600 ISE fluoride analyzer comprises 1 reagent, a low calibration standard and a high calibration standard.

A.2.1 Reagent

The fluoride reagent is a hexametaphosphate buffer solution held in a 10 L container.

The hexametaphosphate adjusts the pH of the sample to 5.25 to prevent the formation of hydrogen fluoride (HF) and hydroxide ions that act as an interferent. The buffer also complexes other potential interferents such as aluminum and iron.

A.2.2 Standard solutions

Note. The user has the ability to assign different standard concentration values. It is strongly recommended that the appropriate standard solutions are selected to suit the application measuring range.

2 standard solutions of known concentration appropriate to the measuring range are required for analyzer calibration:

- Low fluoride standard solution (factory default is 0.5 mg/L F)
- High fluoride standard solution (factory default is 1.5 mg/L F)

A.3 Reagent and standard solution consumption

The reagent consumption rate depends on the selected operating mode:

- Standard operating mode 10 L (2.6 galUS) every 2 months
- Economy operating mode 10 L (2.6 galUS) every 3 months

The standard solution consumption rate is dependant on both the selected operating mode and the frequency and type of calibration but is typically:

- Standard operating mode 2.5 L (0.7 galUS) every 2 months
- Economy operating mode 2.5 L (0.7 galUS) every 3 months

However, ABB recommend that the standard solution is replaced every 3 months to ensure accuracy.

Typical reagent and sample flow rates are:

- Standard operating mode
 - Reagent 0.12 mL (0.003 fl oz US) per minute
 - Sample 2 mL (0.07 fl oz US) per minute
- Economy operating mode
- Reagent 0.085 mL (0.002 fl oz US) per minute
- Sample 1.43 mL (0.05 fl oz US) per minute

Appendix B – Troubleshooting

B.1 Analyzer malfunction

In the majority of cases, problems experienced are associated with the probe so check this first – see Appendix B.3. If the problem remains, check the chemistry (see Appendix B.2) and the liquid handling section as described below. Other faults, their possible causes and suggested remedies are shown in Table 12.

Check mechanical components that are involved with the liquid handling systematically. For example, check pump and valves for correct operation and tubing and tubing connections for leaks or blockages that could change the chemical conditions within the analyzer.

To minimize malfunctions, ensure the system is functioning correctly. To check the integrity of the readings, ABB recommended that the analyzer and the sampling system is visually inspected on a regular basis as follows:

- Check for leaks, particularly around the sample and drain pipe connections.
- Confirm sample flow by checking delivery to the constant head unit and effluent from the drain.
- Check the liquid flow over the probe membrane/sensing surface.
- Check liquid levels in the reagent and standard solution containers.
- Check for malfunction indications on the analyzer's display.

B.2 Reagent and standard solutions

Any unpredictable problems may be due to the standard or reagent solutions or their flow through the analyzer. If any doubts exist regarding the integrity of these solutions, replace them with freshly prepared solutions in the early stages of the fault-finding process. Ensure that appropriate concentrations of the reagent and standard solutions are used. When changing standard or reagent solutions, replace the container also, removing the empty/used one for thorough cleaning. **DO NOT** top-up reagent and/or standard solutions.

B.3 Probe malfunction

B.3.1 Ammonia analyzer

In the event of an ammonia probe malfunction, check for leakage past the membrane. This is indicated by the internal filling solution – it incorporates a yellow-colored indicator that changes to blue if the probe membrane, or membrane seal, allows alkaline reagent to leak into the probe. If this has occurred replace the membrane – see Section 13.4 on page 68. The solution keeps indefinitely.

B.3.2 Fluoride analyzer

A noisy sensor output can be caused by excessive bubble build-up on the sensing end of the fluoride probe.

... Appendix B – Troubleshooting

...B.3 Probe malfunction

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Table 12 Faults, causes and suggested remedies

Fault	Possible cause	Remedy		
Noisy electrode output	Air bubbles present on probe tip	 Remove probe to clear air bubbles and refit Check sample supply and check for air leaks 		
	Heated block temperature too high	Lower temperature setting in configuration		
	Osmotic effects due to high concentrations of dissolved species	Take appropriate measures to ensure the sample is suitable for measurement		
	Ammonia analyzers only – Interferents in sample (sample may contain high concentrations of anionic detergents)	Take appropriate measures to ensure the sample is suitable for measurement		
	Ammonia probe membrane fault	Check membrane is not punctured, creased, blistered or loose – adjust or replace membrane as required		
	Faulty electrical connections	Check BNC connector and other probe electrical connections		
	Inadequate mixing of the reagent solution	Ensure mixer is in place (if required)		
Ammonia probe response slow	Probe membrane damaged or sensing end fouled	 Check membrane is not punctured, creased, blistered or loose adjust or replace membrane as required Carefully clean probe membrane surface with jet of clean wate from wash bottle or syringe. 		
Fluoride probe response slow	Probe sensing end fouled	Clean probe end face		
Excessive reading drift	Heated block assembly temperature control faulty	 Check temperature setting in configuration Check Pt1000 		
	Electrode unstable	 Ammonia - 1. Membrane loose - adjust membrane 2. Membrane swollen or damaged - replace membrane 3. Filling solution exhausted - replace filling solution 4. If fault persists, replace electrode 		
		Fluoride – Replace probe		
	Faulty reference electrode	Ammonia – Replace glass electrode		
		Fluoride – Replace probe		
High readings	Ammonia probe response slow	 Check probe and replace membrane if required Check reference electrode for signs of stripping of chloridized layer 		
	Calibration configuration values input incorrectly	Check calibration input values and calibration solutions values. Use mV Offset to give indication – the further from 0 mV, the more likely it is that the standard values are different to the true standard concentrations		
	Sample contaminated	Take appropriate measures to ensure the sample is suitable for measurement		

Table 12 (continued)

F	ault	Possible cause	Remedy	
L	ow readings	Incorrect calibration	Check calibration solutions for accuracy	
		Ammonia probe response slow	 Check probe and replace membrane if required Check reference electrode for signs of stripping of chloridized layer 	
		Calibration values incorrectly input into configuration	Check calibration input values and calibration solutions value. Use mV Offset to give indication – the further from 0mV, the more likely it is that the standard values are different to the true standard concentrations	
		Ammonia stripping in tubing and instrument feed lines	Check for contamination in all tubing and feed lines – clean or replace as required	
		Sample contaminated	Take appropriate measures to ensure the sample is suitable for measurement	
С	alibration failure	Incorrect calibration solution value(s) entered in configuration	Enter correct value	
		Incorrect calibration solution(s)	Check quality – replace / remake if necessary	
		Insufficient / incorrect calibration solution supply	 Check valve manifold fluid connections Check valve electrical connections Check calibration solution levels and refill if required Check tubing for blockages Check pump speed and pump tubing for wear 	
		Insufficient or incorrect reagent	Check levels and quality – replace if required	
		Faulty probe	Ammonia & – Check end of probe is clear of any possible fouling Fluoride	
			Fluoride – Replace membrane and recalibrate	
	Calibration failure	Incorrect calibration solution(s)	As above	
	with low Gradient Coefficient or % Slope	Insufficient / incorrect calibration solution supply	As above	
	indication	Insufficient or incorrect reagent	As above	
		Faulty probe	As above	
		Electrode insensitive	Ammonia – Replace membrane – if symptom resists, replace probe. See also 'Calibration failure' remedies	
			Fluoride – Replace probe. See also 'Calibration failure' remedies	
	Calibration failure	Incorrect calibration solution(s)	As above	
	with High Gradient Coefficient or % Slope indication	Insufficient / incorrect calibration solution supply	As above	

... Appendix B – Troubleshooting

...B.3 Probe malfunction

Table 12 (continued)

Fault	Possible cause	Remedy	
Calibration failure with slow probe response	Probe sensing end fouled	 Check end of probe is clean and clear of any possible fouling Check pump speed and tubing Check for loss of coating on reference element (Ammonia probes only) 	
	Pump speed too slow	Check pump speed	
	Analyzer and/or pump tubing obstructed or damaged	Check analyzer and pump tubing for signs of blockage or damage	
	Ammonia probe reference electrode coating damaged	e Replace glass electrode	
Excessive mV Offset*	Incorrect calibration solution(s)	Check quality and replace / remake if necessary	
	Insufficient/incorrect calibration solution supply	 Check valve manifold fluid connections Check valve electrical connections Check calibration solution levels and refill if required Check tubing for blockages Check pump speed and pump tubing for wear 	
	Faulty probe	Ammonia & – Check end of probe is clear of any possible fouling Fluoride	
		Fluoride – Replace membrane and recalibrate	

Recommended mV offset to be below ±45 mV.

Appendix C - Principle of operation: Ammonia analyzers





C.1 General operation

The analyzer uses an ammonia probe. The probe contains a glass pH electrode (whose pH-sensitive glass membrane forms a slightly convex tip) and a robust, long-life reference electrode. The two electrodes are combined into a single assembly and are connected as a pH measuring pair through an internal reservoir of filling solution. The filling solution is 0.1 M ammonium chloride saturated with silver chloride and is separated from the sample by a gas-permeable hydrophobic membrane fitted to the tip of the probe.

As sample flows past the probe membrane, the partial pressures of the ammonia gas in the sample on one side of the membrane and the filling solution on the other equalize, transferring gas across the membrane. At equal pressure, the concentration of ammonia in the thin film of filling solution between the probe membrane and the pH-sensitive glass electrode membrane equals that in the sample. The resultant change in the pH value of the thin film is measured by the pH electrode pair, creating an output potential related to the ammonia concentration in the sample. Like most ion-selective electrodes, the ammonia probe produces an output that is logarithmic in respect to concentration.

The analyzer's sequence of operation is as follows:

1 Sample is supplied to a side sample pot constant head unit by a sample pump. Excess sample overflows to drain.

Note.

The constant head unit is fitted with a float switch that signals an 'Out-of-sample' condition by triggering an 'Out-of-Sample' alarm.

2 From the constant head unit, the sample is drawn through the normally open ports of solenoid valves SV1 and SV2 by one channel of a peristaltic pump. **3** Reagent is drawn through another channel of the peristaltic pump and mixed with the sample.

Note.

The sample and reagent tube diameters are sized to obtain the correct ratio of sample and reagent.

- 4 The conditioned sample is pumped into a flowcell containing the ammonia probe. The probe is enclosed in a heated block housing a heat-exchanger, ensuring that the body of the probe remains at a constant temperature and also at a temperature in agreement with that of the sample and standard solutions.
- 5 When exposed to the reacted sample, the probe produces an electrical potential that changes in proportion to the changes in activity of the measured ion.
- 6 The probe is connected to the electronics section where, after digital conversion, the signal is processed by microprocessor.
- 7 After measurement, the sample flows to waste via a contaminated drain connection.

During calibration, Low and High standard solutions are introduced sequentially in place of the sample by means of solenoid valves SV1 and SV2. The resultant millivolt Low and millivolt High readings from the probe are stored as the calibrated readings. The analyzer can be configured to perform automatic calibrations from every 6 hours to once per week. A calibration can also be initiated manually if required.

... Appendix C - Principle of operation: Ammonia analyzer

C.2 Theory of operation

Ion-selective electrodes are useful tools in analytical chemistry. Rapid measurements of a great variety of species over wide concentration ranges can be made with the appropriate ion-selective electrode with parts-per-billion sensitivity.

The ion-selective electrode used for ammonia measurement is a gas sensing electrode. This type of electrode comprises a plastic body with a hydrophobic, gas-permeable membrane at one end. An electrode with a pH-sensitive glass membrane is screwed down against this membrane, trapping a thin film of an internal filling solution. At equilibrium, the membrane potential is mainly dependent on the activity of the target ion outside the membrane and is described by the following Nernst equation:

 $E = E^{\circ} + (2.303 RT/ nF) \times Log (A)$

Where:

E	=	total potential (in mV) developed between the sensing and reference electrodes
Eº	=	constant characteristic of the particular ISE/ reference pair
2.303	=	conversion factor from natural to base10 logarithm
R	=	Gas Constant (8.314 joules/degree/mole)
т	=	Absolute Temperature
n	=	charge on the ion (with sign)
F	=	Faraday Constant (96,500 coulombs)
Log (A)	=	logarithm of the activity of the measured ion

The measured voltage (Eq.1) is proportional to the Logarithm of the concentration and the sensitivity of the electrode is expressed as the electrode slope (in millivolts per decade of concentration). Therefore the electrodes can be calibrated by measuring the voltage in solutions containing, for example, 10 ppm and 100 ppm of the target ion. The Slope is the slope of the (straight) calibration line drawn on a graph of mV versus Log concentration.

For example:

Slope = $\frac{mV_{High STD} (100 \text{ ppm}) - mV_{Low STD} (10 \text{ ppm})}{Log100 - Log10}$

Therefore, the slope equals the difference in the voltages since Log100 – Log10 = 1.

Unknown samples can be determined by measuring the voltage and plotting the results versus the concentration values on a calibration graph. Essentially, the only variables in the above expression are $E - E^{\circ}$ (ΔE) and concentration which, when plotted against each other, produces a linear relationship assuming a constant sample temperature. The exact value of the slope can be used as indication of the efficiency of the ion-selective electrode in use. The slope value for a monovalent cation determined at 25 °C = 59 mV (-59 mV for a monovalent anion). This indicates that for every decade change in concentration there will be a 59 mV change in the potential output from the electrode.

To maintain a high degree of measurement accuracy, periodic calibration is required. This is usually performed automatically in online analyzers at which time the slope is recalculated. However, most of the changes in the output from the electrode pair are a result of zero drift that over a period of time can become quite large (for example, ±50 mV) before it begins to adversely affect performance.

Appendix D - Principle of operation: Fluoride analyzers





D.1 General operation

The analyzer uses an ion-selective electrode comprising a fluoride sensing tip and a reference electrode. The fluoride sensing tip contains a single crystal of Lanthanum Fluoride, an ionic conductor in which fluoride ions are mobile. When the electrode is immersed in a solution containing fluoride ions, the difference in fluoride ion activity across the membrane causes an electrical potential be generated. Like most ionselective electrodes, the fluoride probe produces an output that is logarithmic with respect to the measured concentration.

The analyzer's sequence of operation is as follows:

1 Sample is supplied to a side sample pot constant head unit by a sample pump. Excess sample overflows to drain.

Note.

The constant head unit is fitted with a float switch that signals an 'Out-of-sample' condition by triggering an 'Outof-Sample' alarm.

2 From the constant head unit, the sample is drawn through the normally open ports of solenoid valves SV1 and SV2 by one channel of a peristaltic pump.

3 Reagent is drawn through another channel of the peristaltic pump and mixed with the sample.

Note.

The sample and reagent tube diameters are sized to obtain the correct ratio of sample and reagent.

- 4 The conditioned sample is pumped first through a static mixer, then into a flowcell containing the fluoride probe. The probe is enclosed in a heated block housing a heatexchanger, ensuring that the body of the probe remains at a constant temperature and also at a temperature in agreement with that of the sample and standard solutions.
- **5** When exposed to the reacted sample, the probe produces an electrical potential that changes in proportion to the changes in activity of the measured ion.
- 6 The probe is connected to the electronics section where, after digital conversion, the signal is processed by microprocessor.
- 7 After measurement, the sample flows to waste via a contaminated drain connection.

During calibration, Low and High standard solutions are introduced sequentially in place of the sample by means of solenoid valves SV1 and SV2. The resultant millivolt Low and millivolt High readings from the probe are stored as the calibrated readings. The analyzer can be configured to perform automatic calibrations from every 6 hours to once per week. A calibration can also be initiated manually if required.

... Appendix D - Principle of operation: Ammonia analyzer

D.2 Theory of operation

Ion-selective electrodes are useful tools in analytical chemistry. Rapid measurements of a great variety of species over wide concentration ranges can be made with the appropriate ionselective electrode with parts-per-billion sensitivity.

The ion-selective electrode used for fluoride measurement is a solid-state electrode. This type of electrode comprises a plastic body containing an internal reference and Lanthanum Fluoride half-cells. At equilibrium, the membrane potential is mainly dependent on the activity of the target ion outside the membrane and is described by the following Nernst equation:

$$E = E^{\circ} + (2.303 RT/ nF) \times Log (A)$$

Where:

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E	=	total potential (in mV) developed between the sensing and reference electrodes
Eº	=	constant characteristic of the particular ISE/ reference pair
2.303	=	conversion factor from natural to base10 logarithm
R	=	Gas Constant (8.314 joules/degree/mole)
т	=	Absolute Temperature
n	=	charge on the ion (with sign)
F	=	Faraday Constant (96,500 coulombs)
Log (A)	=	logarithm of the activity of the measured ion

The measured voltage (Eq.1) is proportional to the Logarithm of the concentration and the sensitivity of the electrode is expressed as the electrode slope (in millivolts per decade of concentration). Therefore the electrodes can be calibrated by measuring the voltage in solutions containing, for example, 10 ppm and 100 ppm of the target ion. The Slope is the slope of the (straight) calibration line drawn on a graph of mV versus Log concentration.

for example:

Slope =
$$\frac{mV_{High STD} (100 \text{ ppm}) - mV_{Low STD} (10 \text{ ppm})}{Log100 - Log10}$$

Therefore, the slope equals the difference in the voltages since Log100 – Log10 = 1.

Unknown samples can be determined by measuring the voltage and plotting the results versus the concentration values on a calibration graph. Essentially, the only variables in the above expression are $E - E^{\circ}$ (ΔE) and concentration which, when plotted against each other, produces a linear relationship assuming a constant sample temperature. The exact value of the slope can be used as indication of the efficiency of the ion-selective electrode in use. The slope value for a monovalent cation determined at 25 °C = 59 mV (-59 mV for a monovalent anion). This indicates that for every decade change in concentration there will be a 59 mV change in the potential output from the electrode.

To maintain a high degree of measurement accuracy, periodic calibration is required. This is usually performed automatically in online analyzers at which time the slope is recalculated. However, most of the changes in the output from the electrode pair are a result of zero drift that over a period of time can become quite large (for example, ±50 mV) before it begins to adversely affect performance.

Appendix E – Web server



Figure 49 Web server screen

The analyzer is fitted with an Ethernet card as standard and, when the appropriate configuration settings have been made, users can access the analyzer's data via an Ethernet network.

In addition, files can be transferred to and from the analyzer via an FTP connection.

- (1) Log On click to log on to the analyzer to enable configuration access (displayed only if the analyzer is configured for FTP access – see Section 6.7.1 on page 42).
- (2) Analyzer View displays the current screen of the analyzer. If the analyzer has a screensaver set, it does not affect this view.
- (3) Access Buttons provides access to the analyzer's data if the user has the appropriate access permission.
 - Stream Values see Appendix E.1 on page 86
 - Operate see Appendix E.2 on page 86
 - Monitor Status see Appendix E.3 on page 86
 - Statistics see Appendix E.4 on page 86
 - Logging Status see Appendix E.5 on page 86
 - Operator Message see Appendix E.6 on page 86
 - Configuration see Appendix E.7 on page 87

- (4) Language Selection selects the language for the web pages.
- (5) Auto-Refresh updates the analyzer view automatically.
- (6) View Selection selects the required analyzer view:
 - Alarm/Event Log
 - Audit Log
 - Chart View
 - Bar View

... Appendix E – Web server

E.1 Stream values

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Stream	Tag	Value	Time of last measurement	Alarms	Alaım Ack
1	Stream 1	4 ppm	11.00 2 Mar 2012		

E.2 Operate

Note. Menu options from the 'Operate' window start the routine described when the associated button is selected.

🚰 Aztec - Microsoft Internet Explorer provided by ABB	- II X
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Operate	
Home	
Stop Monitor	
Start Monitor	
Calibrate	
Rime Lines and Calibrate	
Flush Monitor	
Home	
Copyright © 2007ABB	
)	

E.3 Monitor status



E.4 Statistics

Stream	Tag	Minimum	Maximum	Average	Since
1	Stream 1	127.7ppm	156.3ppm	142.0ppm	10:21 2 Mar 2012

E.5 Logging status

Description	Status
Media Status	Off-Line
Memory Used	11%
Time Remaining	< 1 Hour
Archive Status	OFF

E.6 Operator message

ABB					
Ammonia IS	E Monitor Analyser - A	mmonia ISE			
Operator N	1essage				
Username	Smith				
Password					
Message		Instruction	Boiler Water A been exceeded.	larm Limit	has 📩
	*				*

<u>Home</u>

An **Operator Message** is displayed on the chart view. For example:



An entry is also included in the alarm event log.

An Instruction is displayed on the analyzer as a warning, for example:



Operator instructions can be removed only by pressing the \mathbf{a} key.

To send an operator message or instruction to the analyzer:

- Type the user name and password. Up to 160 characters can be used. These are the FTP username and password that are set in the configuration – see Appendix E on page 85.
- **2** Type either the message or an instruction (only one field can be populated at any one time).
- 3 Click the ***** button to send the message or instruction to the analyzer.

E.7 Configuration

Note.

A user must be logged-on for the configuration button to be enabled.

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Load accurry configuration from the	
Reads sea only configuration to compared	
Salact A tenetro Corf grador 💌	
New Date & Time Selection.	
Refer Date & Thine 20 m 3ct m 2000 m 9 m ; 40 m ; 42 m	
Non-John W. M. 197	

E.8 FTP access

Files can be transferred between the analyzer and a remote computer via an FTP connection if the analyzer has been configured with the appropriate settings – see Appendix E on page 85.

Either Microsoft Internet Explorer version 5.5 (or later) or MS-DOS can be used as an FTP client.

E.9 FTP access via Internet Explorer

Note.

FTP access requires Internet Explorer version 5.5 or later.

Before data can be accessed via FTP, Internet Explorer must be configured with the appropriate options.

To ensure that the latest data file is copied, Internet Explorer must be set to check for newer versions of stored pages on every visit to a page. Internet Explorer must also be set to enable FTP access.

To configure Internet Explorer:

- 1 From the Internet Explorer **Tools** menu select **Internet Options**.
- 2 In the General tab of the displayed dialog box, click the Settings button in the Temporary Internet Files grouping.
- 3 From the options for Check for newer versions of stored pages, select Every visit to the page and click OK.
- 4 Select the Advanced tab of the Internet Options dialog box, ensure that the Enable folder view for FTP sites option under the Browsing heading is selected and click OK.

To access data stored on the analyzer via Internet Explorer:

- **1** Start Internet Explorer.
- 2 In the **Address** bar, enter ftp:// followed by the IP address of the analyzer from which the files are to be copied. A log-in dialog box is displayed:

Log On As 🛛 🔀			
۲	Either the server accepted.	does not allow anonymous logins or the e-mail address was not	
	FTP server:	10.44.211.49	
	User name:	Operator 1	
	Password:		
	After you log on, you can add this server to your Favorites and return to it easily.		
A	FTP does not encrypt or encode passwords or data before sending them to the server. To protect the security of your passwords and data, use Web Folders (WebDAV) instead.		
	Learn more about using Web Folders.		
	Log on anonymously		
		Log On Cancel	

- 3 Type the user name and password and press enter.The folders that are present on the analyzer are displayed.
- 4 Open the folder containing the file to be displayed. The files within the folder can be displayed in any standard Explorer view (small icon, large icon, list or details) by selecting the appropriate option from the **Views** menu.

Note.

The SDMMC folder containing the data files is visible only if an SD card is present and logging is set to 'Online' – see Section 9 on page 53.

5 Files/folders can be copied to/from the analyzer.

Note.

An audit log entry is created and displayed for each FTP logon giving details of the logon user name and access (full or readonly). When Internet Explorer is used as the FTP client, two logons are performed at the start of each session, resulting in two log entries.

... Appendix E – Web server

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E.10 FTP access via DataManager

DataManager can be used with FTP to access data files that have been saved to the archive media (SD card) inserted in the analyzer. For DataManager configuration details for FTP access, refer to the DataManager User Guide (IM/DATMGR).

E.11 File transfer program

A file transfer scheduler program (FTSP) is available that enables archive and configuration files to be transferred automatically to a PC using FTP. The transferred files can be stored either on the local drive of the PC or on a network drive for easy access and secure back-up.

To download the FTSP program (FTS.exe), enter the following (without spaces) in your web browser's Address bar:

http://search.abb.com/library/ABBLibrary.asp?DocumentID= FTS.exe&LanguageCode=en&DocumentPartId=&Action=Launch

To download the FTSP User Guide (IM/SMFTS), enter the following (without spaces) in a web browser's address bar:

https://library.abb.com/d/IM%2FSMFTS

Appendix F - Updating the software



Figure 50 SD card removal

- 1 Stop analyzer operation by selecting **Stop Monitor** from the main operator menu.
- 2 Ensure the analyzer is switched off.
- 3 Use a large flat-headed screwdriver to release the two door catches (A).
- **4** Remove the SD card (B).
- 5 Refer to the documentation on the web site (<u>http://www.abb.com</u>) for details of any software updates.
- **6** Download the software and transfer it to a blank SD card using an appropriate card reader.
- 7 Set the switch (C) (above the SD card socket) to the lower position (Software Update).
- 8 Insert the SD card, close the door and switch on the analyzer.
 A start-up message appears for a short duration
 (approximately 5 seconds) followed by a File Load Progress
 bar then the ABB splash screen:



9 A warning screen appears next. This provides the option to upgrade the existing system software or exit without upgrading:

Warning
The System Boot switch is in the
down position. System Upgrade – Press Enter
Power off the unit, Move the System Boot switch to the up
position and Power on

10 To proceed, press the 🞝 key.

11 The Commissioning V2.0 screen appears with the Upgrade Firmware button selected:

commissioning V2.0	ок 🗙
	Upgrade Analyser. Insert Upgrade SD card. Select Upgrade Firmware.
HELP	
File Viewer	Opyraue Firmware
Clear Files	Start Unit
Test Program	000023080D54

- 12 To upgrade the existing system software, press the 7 key to start the process. The software is transferred to the analyzer in sections.
- 13 Press the 7 key as each section is installed (installation may take a few minutes).
- 14 Open the door and move the switch to the up position.
- **15** Close the door and re-tighten the door catches ((A) in Figure 50).
- 16 Turn power off and then on to restart the analyzer.

Appendix G - Spare parts

G.1 Maintenance kits

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G.2 Upgrade kits

Part No.	Description
AW600 067	PROFIBUS PCB assembly
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G.3 Reagents

Part No.	Description
AWRK620/0300	 Set of ammonia reagents – 1 each of: Ammonia reagent (10 L) Ammonia low standard 1 mg/L NH₃-N (2.5 L) Ammonia high standard 4 mg/L NH₃-N (2.5 L)
AWRS620/0301	Ammonia reagent (10 L). For use with ABB AAM631 ammonia analyzer when measuring in waters with a Ca hardness of 0 to 70 mg/L
3KXA092201L0239	Ammonia ISE buffer (mid-range hard water) 10 L. For use with ABB AAM631 ammonia analyzer when measuring in waters with a Ca hardness of 70 to 400 mg/L
AWR112B001	Ammonia ISE buffer (hard water) 10 L. For use with ABB AAM631 ammonia analyzer when measuring in waters with a Ca hardness of 400 to 700 mg/L
AWRS620/0302	Ammonia low standard 1 mg/L NH₃-N (2.5 L)
AWRS620/0303	Ammonia high standard 4 mg/L NH₃-N (2.5 L)
AWRS620/0304	Ammonia reagent high strength (10 L) (for use when measuring greater than 300 ppm NH₃)
AWRS620/0305	Ammonia standard 10 mg/L NH₃-N (2.5 L)
AWRS620/0306	Ammonia standard 100 mg/L NH₃-N (2.5 L)
AWRK620/1200	 Set of Fluoride Reagents – 1 each of: Hexametaphosphate buffer 1 (10 L) Fluoride low standard 0.5 mg/L F (2.5 L) Fluoride high standard 1.5 mg/L F (2.5 L)
AWRS620/1201	Fluoride buffer (10 L) – Hexametaphosphate buffer used when measuring >0.2 mg/L F
AWRS620/1202	Fluoride low standard 0.5 mg/L F (2.5 L)
AWRS620/1203	Fluoride high standard 1.5 mg/L F (2.5 L)
8002 240	Ammonia electrode filling solution (60 mL)

G.4 Valve assemblies and associated parts

Part No.	Description
AW620 030	Valve solenoid assembly
AW620 031	Valve manifold assembly – complete with barbed connectors

...Appendix G - Spare parts

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G.5 Side sample pot assembly and associated parts



G.6 Pump motor assemblies and associated parts

G.7 Flowcell assemblies and associated parts



...Appendix G - Spare parts

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...G.7 Flowcell assemblies and associated parts

Part No.	Description	Part No.	Description
AW620 026	Heated block assembly	AW622 051	Ammonia flowcell assembly (Red)
		AW621 051	Fluoride flowcell assembly (Blue)

G.8 Plumbing and tubing



...Appendix G - Spare parts

G.9 Electronic boards

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Part No.	Description	Part
AW600 051	Aztec/Navigator PSU kit – AC	AW6
Â		
AW600 056	Aztec/Navigator PSU kit – DC	
Ń		AW6
AW630 068	Front door assembly with membrane keypad plus display	
Ń		G.1 Part
AW630 073	Application PCB assembly	
<u>^</u>		
AW630 087	Interconnection PCB assembly	
À		

G.10 Transmitter assembly

Part No.	Description
AW630 010	Transmitter assembly (fully tested) – AC
AW630 011	Transmitter assembly (fully tested) – DC

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1 Accessories

Part No.	Description
03-0051	Reagent support tray – stainless steel
AW620 045	Reagent and standard bottle pack comprising: 1 × empty 10 L bottle + cap + labels 2 × empty 2.5 L bottles + caps + labels



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