ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/AHM550-EN REV. H

Navigator 500
Hydrazine analyzer

Navigator 500
hydrazine analyzer

Measurement made easy

Introduction

The Navigator 500 hydrazine analyzer is designed to provide continuous monitoring and control of power station boiler feed water.

The analyzer comprises a Navigator 540 transmitter with multiple wet-section capability for up to 4 wet-sections.

This Operating Instruction provides installation, operation and maintenance procedures for the Navigator 550 hydrazine wet-section and a Navigator 540 transmitter.

For more information

Further publications for the Navigator 500 hydrazine analyzer are available for free download from:

www.abb.com/measurement

or by scanning this code:

	Search for or click on
Commisioning Instruction Navigator 550 Hydrazine wet-section	CI/AHM550-EN
Commisioning Instruction Navigator 540 Transmitter	CI/AWT540-EN

Contents

1 Health & Safety

1.1 Safety precautions

Be sure to read, understand and follow the instructions contained within this manual before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.

Warning. Installation, operation, maintenance and servicing must be performed:

- by suitably trained personnel only
- in accordance with the information provided in this manual
- in accordance with relevant local regulations

1.2 Potential safety hazards

1.2.1 Navigator 550 hydrazine wet-section – electrical

The Navigator 550 hydrazine wet-section operates on 24V DC supplied from the transmitter.

There are no hazardous voltages present.

1.2.2 Navigator 550 hydrazine wet-section – chemical reagents

Warning. To ensure safe use when handling chemicals, the following points must be observed:

- Review the Material Safety Data Sheets prior to handling containers, reservoirs, and delivery systems that contain chemical reagents and standards.
- Protective eye wear and hand wear must always be used when contact with chemicals is possible.
- 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.
- 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.

1.2.3 Navigator 540 transmitter – electrical

Warning. To ensure safe use when operating this equipment, the following points must be observed:

- Up to 240V AC may be present. Be sure to isolate the supply before removing the terminal cover.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.

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.

1.3 Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

1.4 Safety conventions

Warning. In this manual, a warning is used to indicate a condition which, if not met, could cause serious personal injury and / or death. Do not proceed beyond a warning until all conditions have been met.

Caution. A caution is used to indicate a condition which, if not met, could cause minor or moderate personal injury and / or damage to the equipment. Do not proceed beyond a caution until all conditions have been met.

Note. A note is used to indicate important information or instructions that should be considered before operating the equipment.

1.5 Symbols

1.5.1 Navigator 550 hydrazine wet-section

Symbols that appear on this product are shown below:

⎓	Direct current supply only.
	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 identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol indicates the need for protective eye wear.
	This symbol indicates the need for protective hand wear.
	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.

1.5.2 Navigator 540 transmitter

Symbols that appear on this product are shown below:

	Functional earth (ground) terminal.
	Protective earth.
	Alternating current supply only.
	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death. The user should reference this instruction manual for operation and / or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	Recycle separately from general waste under the WEEE directive

1.6 Product recycling and disposal (Europe only)

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

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

1.6.1 End-of-life battery disposal

The transmitter contains a small lithium battery (located on the processor / display board) that must be removed and disposed of responsibly in accordance with local environmental regulations.

1.7 Restriction of Hazardous Substances (RoHS)

	The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment. Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however ABB has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.

2 Overview

2.1 Navigator 550 hydrazine wet-section

The Navigator 550 hydrazine wet-section has been designed for use with an ABB Navigator 540 transmitter to provide continuous monitoring and control of power station boiler feed water, using an electro-chemical sensor to measure the amount of hydrazine in the boiler water. The information provided by the wet-section can be used to avoid expensive overdosing of hydrazine or costly damage to boiler plant due to under-dosing of hydrazine.

The hydrazine wet-section contains a measurement sensor (that can be refurbished), calibration valve, dosing chamber, delay / mixing coil, constant-head unit and electronics that store the calibration data and calculate the concentration reading. Reagent solution* to raise the pH of the sample is added via a microporous disc. During the calibration sequence, a solenoid valve switches the sample to drain and enables the standard solution to flow through the sensor instead. A calibration can be initiated manually when required or automatically with programmable daily frequency ranges, from 1 to 7 days and 1 to 8 weeks.

Reagent and standard solution tanks are located in the upper half of the wet-section. The measurement range specification is 0.0 to 1000 ppb.

**For information about reagent solutions, contact the local ABB representative.*

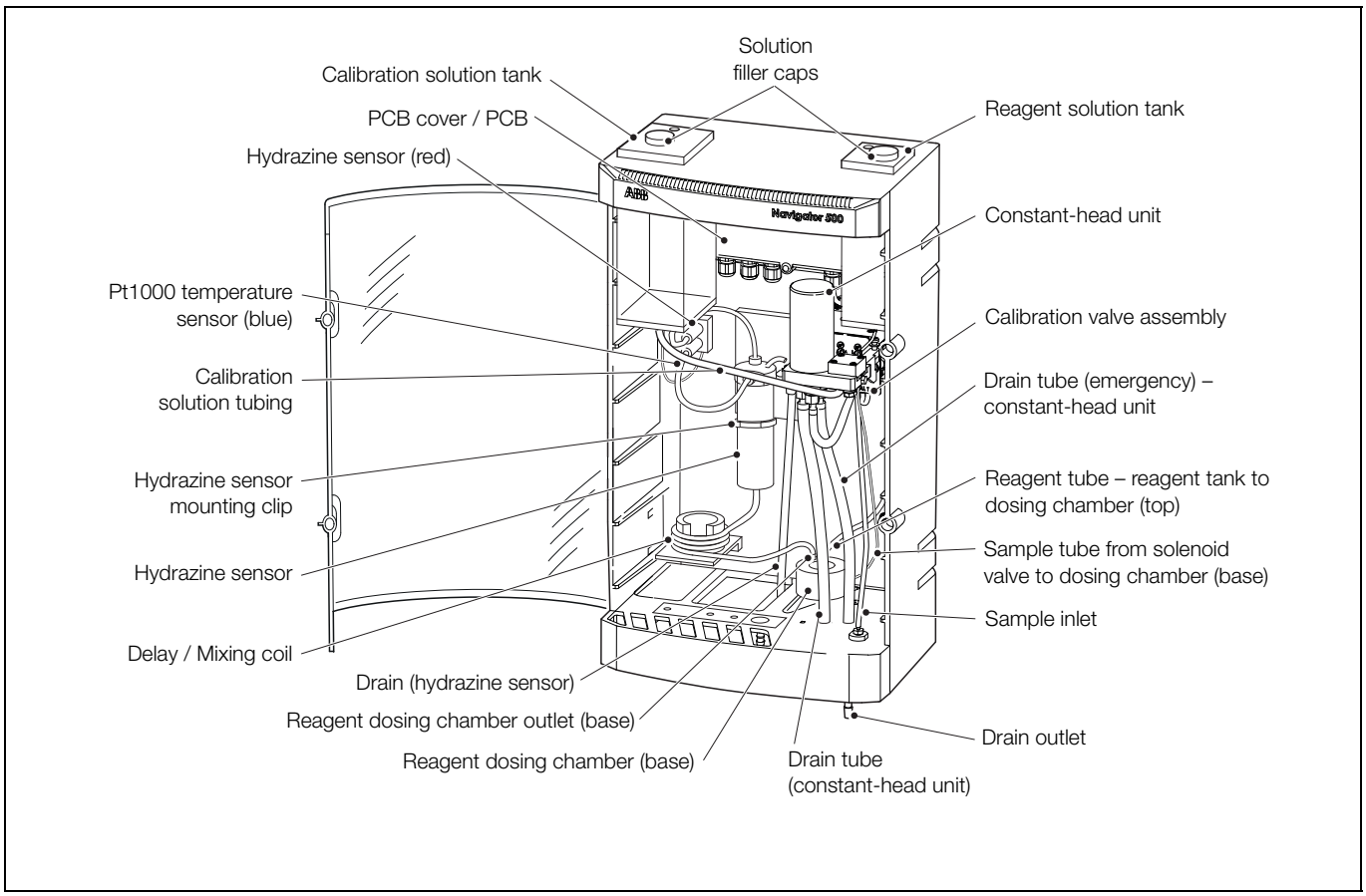


Fig. 2.1 Navigator 550 hydrazine wet-section – main components

2.2 Navigator 540 transmitter

The Navigator 540 transmitter is designed for continuous monitoring and control of power station boiler feed water / steam condensate and must be used in conjunction with an associated ABB wet-section to measure levels of low level dissolved oxygen / sodium / hydrazine. Wet-sections are parameter-specific.

Information from the wet-section is sent to the transmitter via a communication board, where the process reading is displayed on the main page and can be displayed as a graph in the *Chart View* – refer to Section 6.6, page 30 for details of view options.

Diagnostic messages inform the user of the analyzer status and can be logged for review. The analyzer status can also be assessed remotely using programmable alarms and current output diagnostic functions using optional Ethernet communications.

The transmitter has a multiple wet-section capability which enables it to control and display information from up to 4 wet-sections (excludes multi-stream wet-sections). Section 3.3, page 13 shows an example of the multiple wet-section setup.

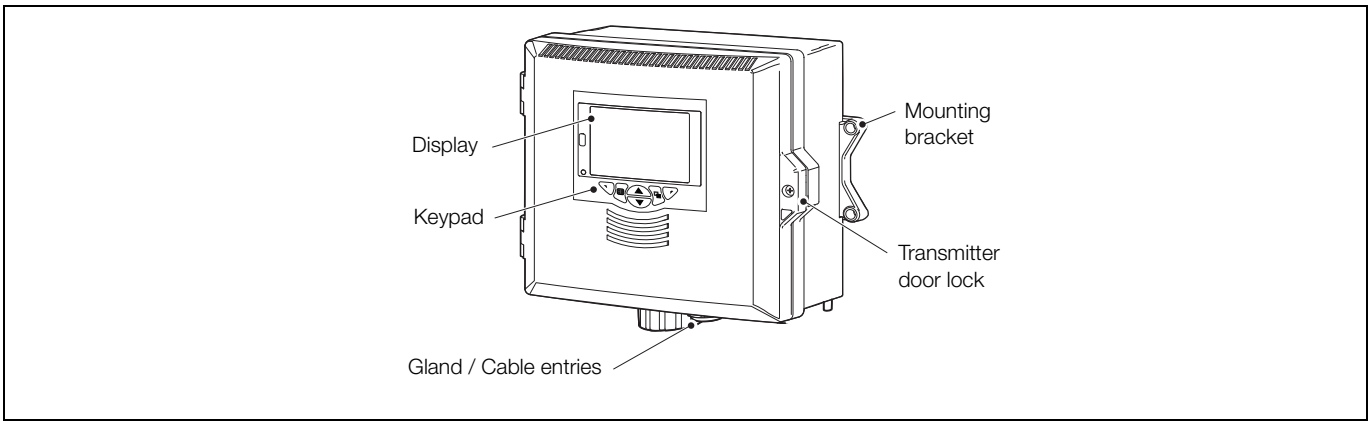


Fig. 2.2 Navigator 540 transmitter – main components

3 Installation

3.1 Installing the wet-section

3.1.1 Sample requirements

Ensure the sampling point is as close as possible to the wet-section and provides a thoroughly-mixed representative sample.

- Sample must contain less than 10 ppm suspended solids with a particle size no greater than 60 µm. (If particle sizes exceed 60 µm, use a 60 µm filter.)
- Sample temperature must be within the range 5 to 55 °C (41 to 131 °F).
- Sample flow rates must be within the range 100 to 400 ml/min (6.01 to 24.40 cu in./min).
- Sample must be at atmospheric pressure.

3.1.2 Location

For general location requirements refer to Fig. 3.1. Install in a clean, dry, well ventilated and vibration-free location giving easy access. Avoid rooms containing corrosive gases or vapors, for example, chlorination equipment or chlorine gas cylinders.

Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.

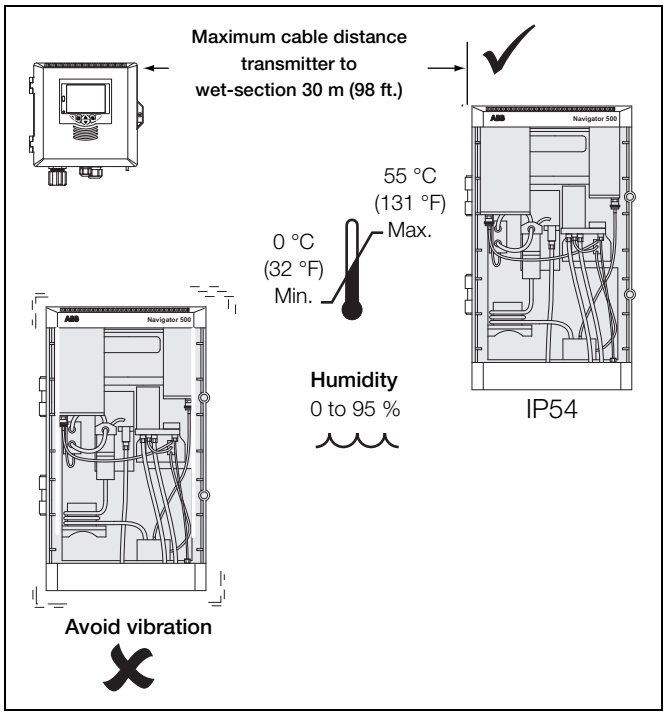


Fig. 3.1 Locating the wet-section

3.1.3 Mounting the wet-section

Refer to Fig. 3.2 for wet-section dimensions. The wet-section weighs 4.5 kg (10 lb).

Note. Clearance – the enclosure doors can open 180°. If mounting in a confined area, allow sufficient clearance for door opening.

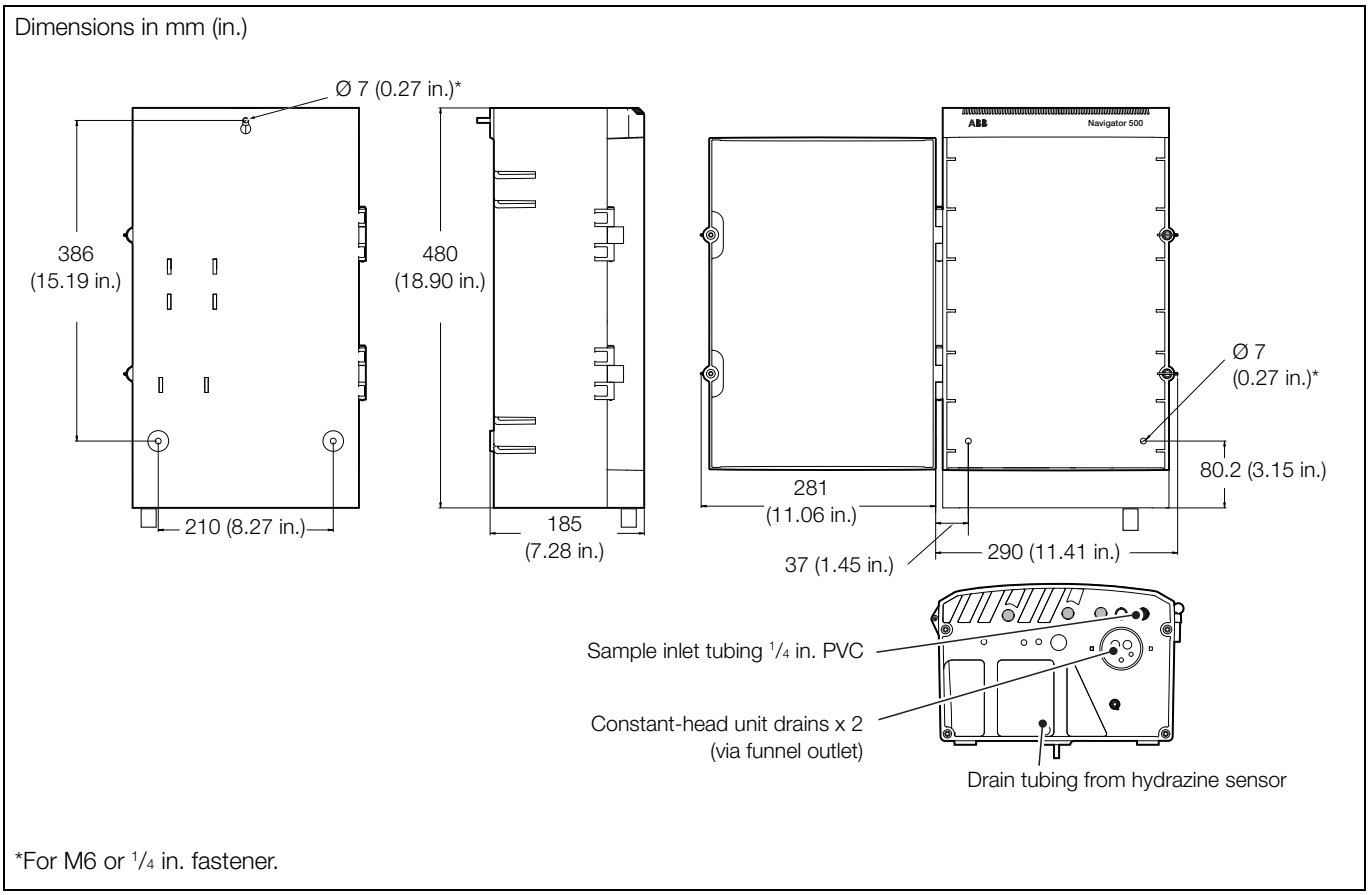


Fig. 3.2 Hydrazine wet-section dimensions

Referring to Fig. 3.3:

1. Mark the wall using the dimensions shown.
2. Drill and plug 3 holes (A) and (B) in the wall suitable for M6 or 1/4 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 wet-section onto fixing (A), ensuring the wet-section is retained firmly against the wall.

   Note. It is not possible to adjust fixing (A) once the wet-section is placed over it.

5. Secure the wet-section to the wall using 2 fixings (B).

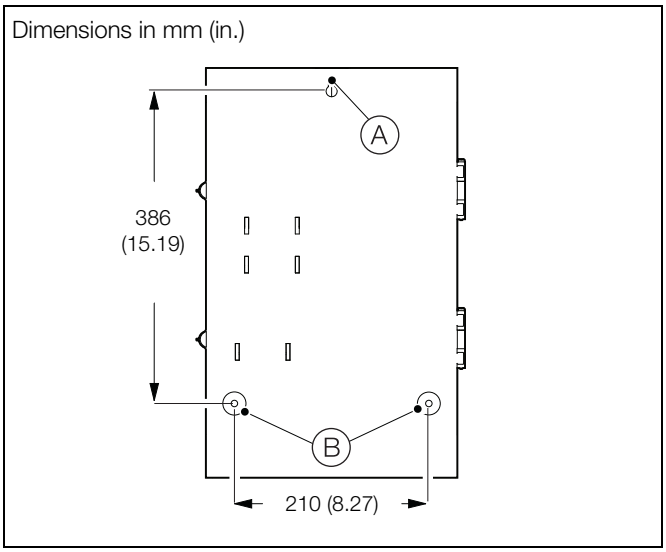


Fig. 3.3 Mounting the wet-section

3.1.4 Connecting the external sample inlet line and drains

Note.

- Sample inlet and drain tubing from the funnel is customer-supplied.
- Keep sample outlet tubing as short and vertical as possible to enable the sample to drain freely during a calibration routine.

Referring to Fig. 3.4:

1. Connect the sample inlet tubing as follows:
   a. For wet-sections **without a flowmeter** fitted, connect the sample inlet tubing (A) using flexible PVC tubing (1/4 in.) ID to barbed connector (B) at the base of sample inlet (C).
   b. For wet-sections **with a flowmeter** fitted, connect the sample inlet tubing (A) using flexible PVC tubing (3/8 in.) ID to barbed connector (B) at the base of sample inlet (D) (the inlet tubing is routed through the next entry on wet-sections fitted with a flowmeter).
2. Ensure the drain tubing (E) is kept as straight as possible and is routed to a suitable drain.
3. Ensure the 2 drain tubes (F) from the constant-head unit (G) are kept as straight as possible and routed through to the funnel (H) at the base of the wet-section.

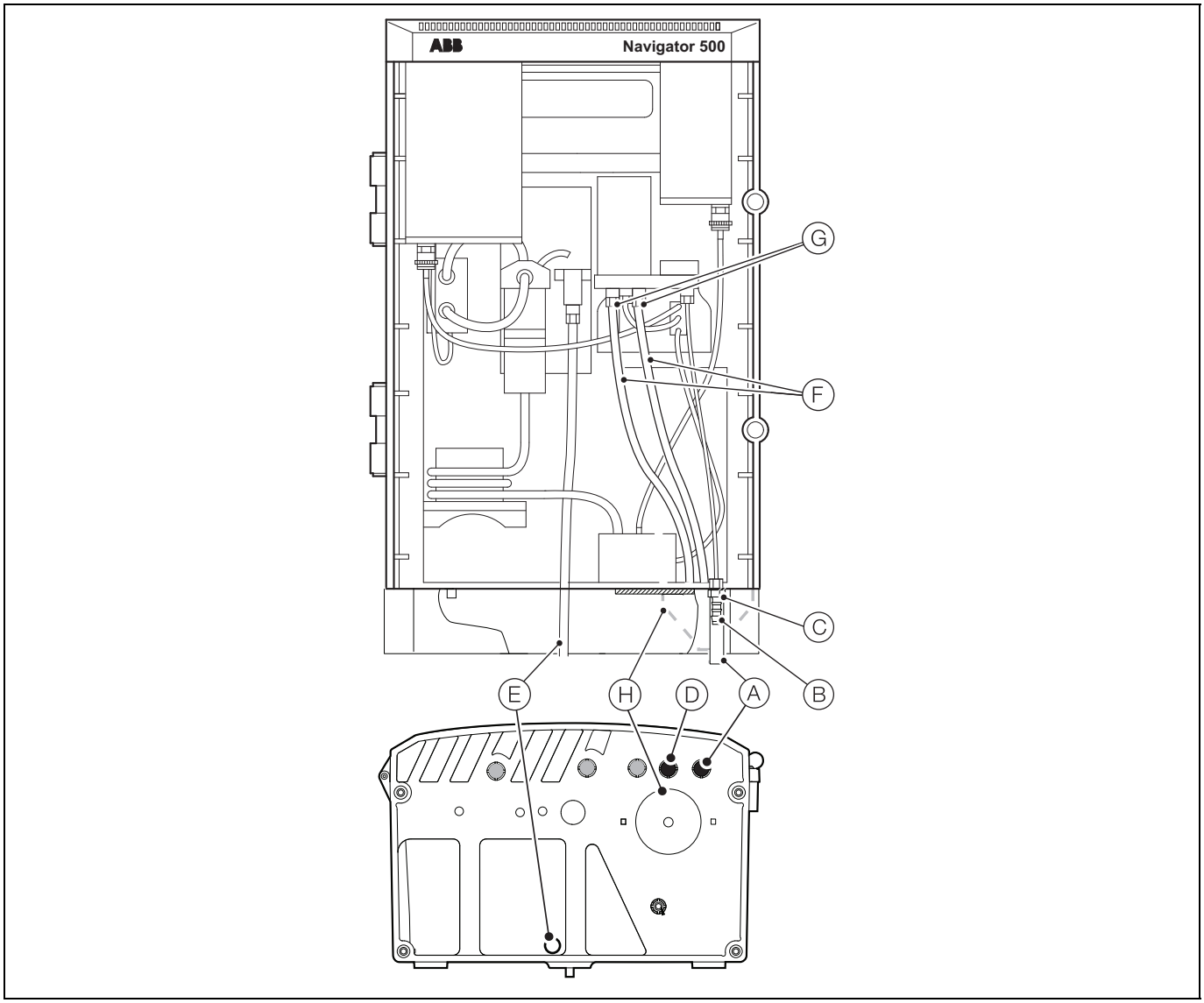


Fig. 3.4 Connecting the external sample lines and drains

3.1.5 Connecting the standard solution 2 (high) and reagent tubing

Connections to the standard solution 2 (high) and reagent containers must be made on site. All other internal wet-section tubing connections are factory-made.

1. Fill the standard solution and reagent containers with the correct solutions – refer to Section 8.1, page 53, for solution details.

Referring to Fig. 3.5:

2. Connect the standard solution 2 (high) tubing QD coupling plug (A) to the mating connector (B) at the base of the standard solution 2 (high) container.
3. Connect the reagent solution tubing QD coupling plug (C) to the mating connector (D) at the base of the reagent solution container.

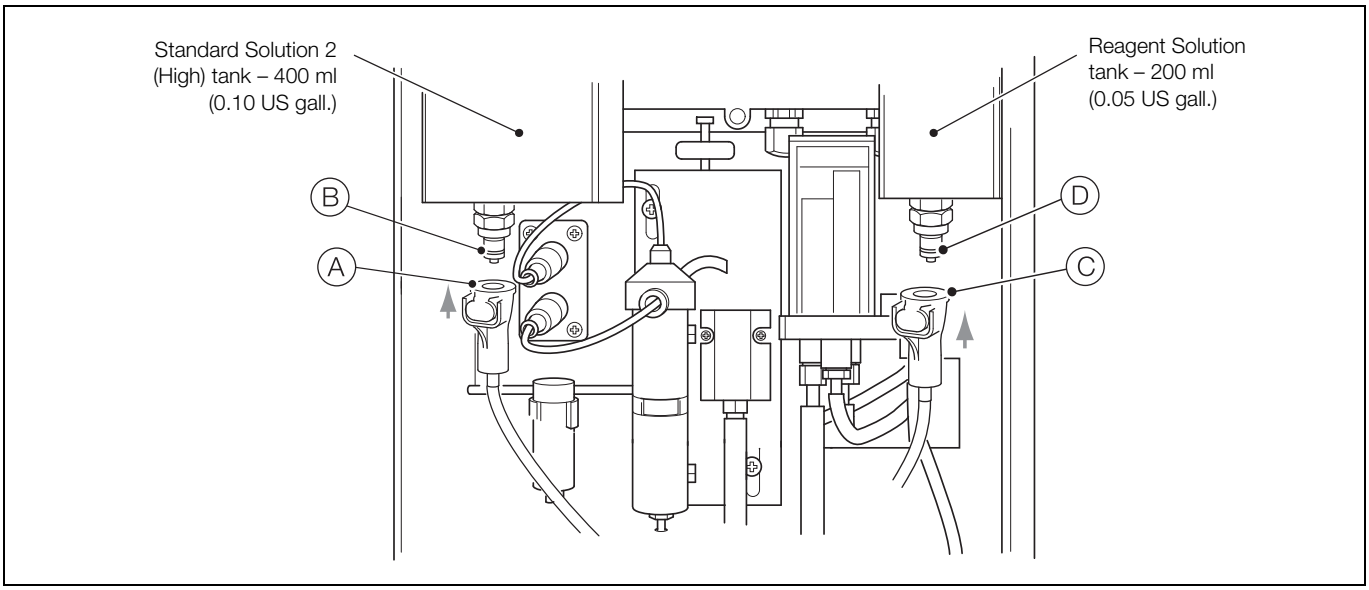


Fig. 3.5 Standard solution 2 (high) and reagent tubing connections

3.2 Installing the transmitter

3.2.1 Transmitter optional accessories

Optional accessories comprise:

Cable gland kit

3.2.2 Transmitter location

For transmitter general location requirements refer to Fig. 3.6. Install in a clean, dry, well ventilated and vibration-free location giving easy access. Avoid rooms containing corrosive gases or vapors, for example, chlorination equipment or chlorine gas cylinders.

Warning. The transmitter is not fitted with a switch – 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 transmitter, within easy reach of the operator and marked clearly as the isolation device for the transmitter.

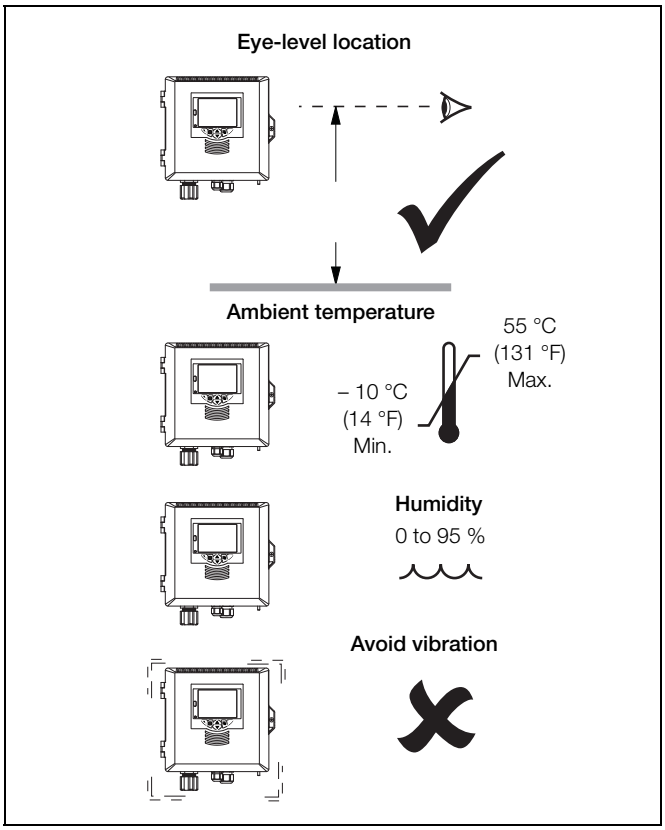


Fig. 3.6 Transmitter location

3.2.3 Panel mounting

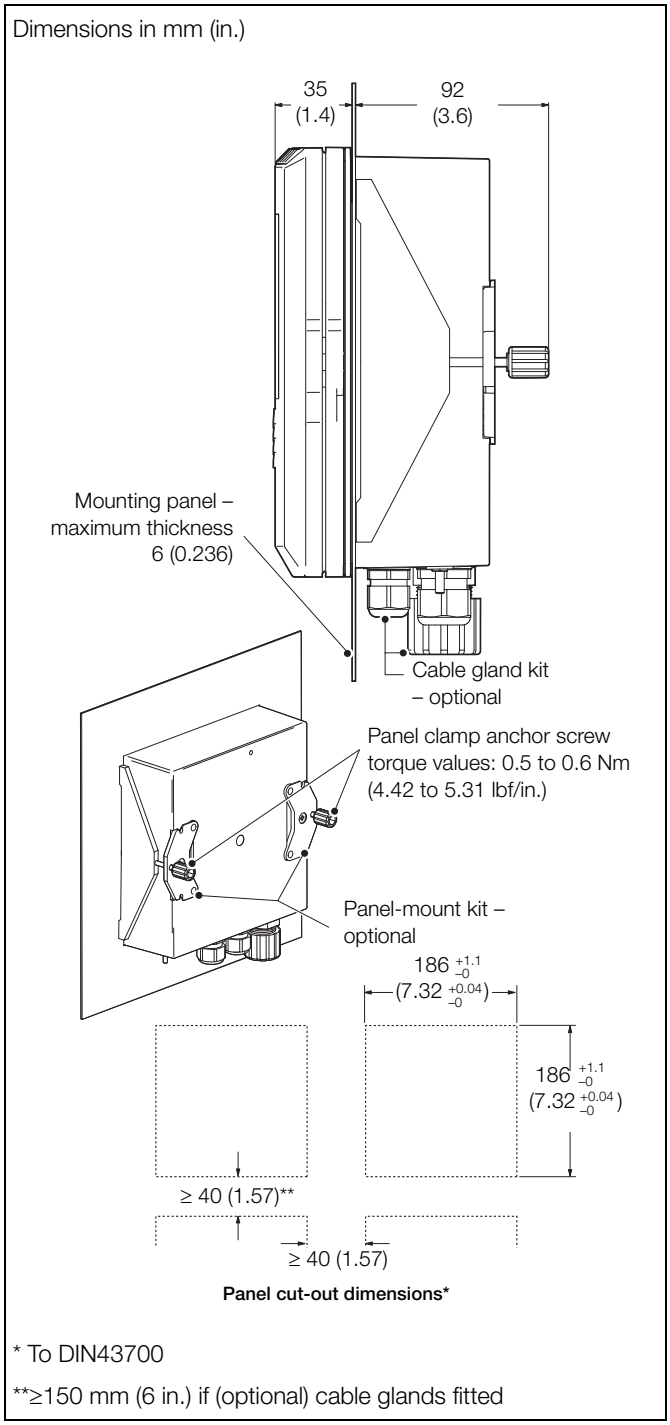


Fig. 3.7 Transmitter panel-mount option

3.2.4 Pipe mounting

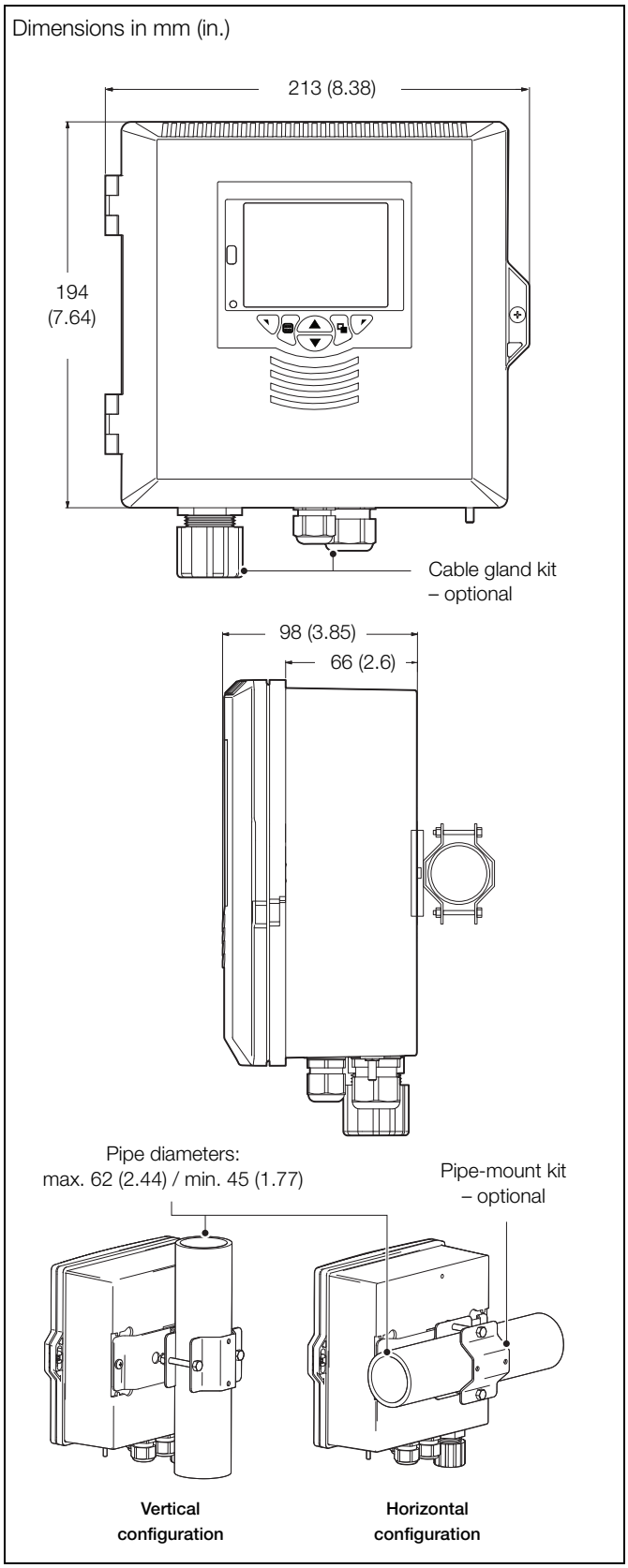


Fig. 3.8 Transmitter pipe-mount options

3.2.5 Wall mounting

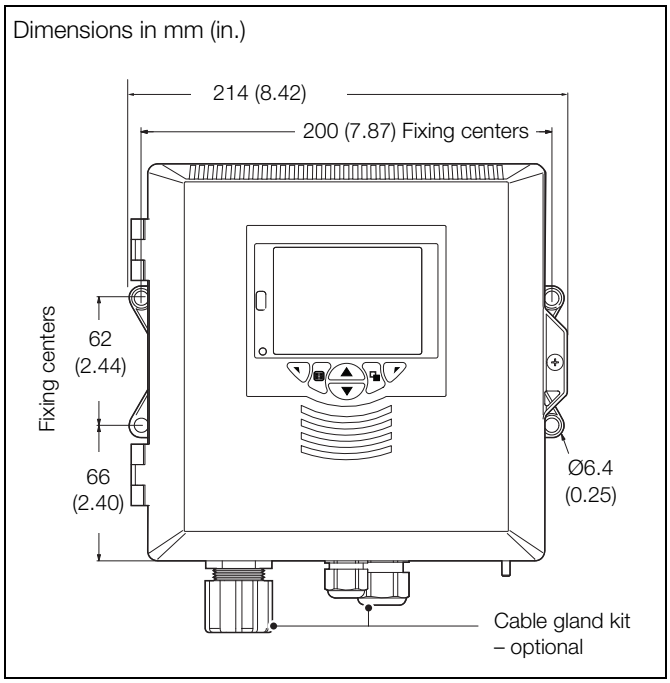


Fig. 3.9 Transmitter wall-mount option

3.3 Multiple wet-section setup

Fig. 3.10 shows the multiple wet-section setup (4 wet-sections maximum).

Note.

- Maximum length of cable from transmitter to single-stream wet-section(s) = 30 m (92 ft.).
- Multi-stream wet-sections cannot be connected.

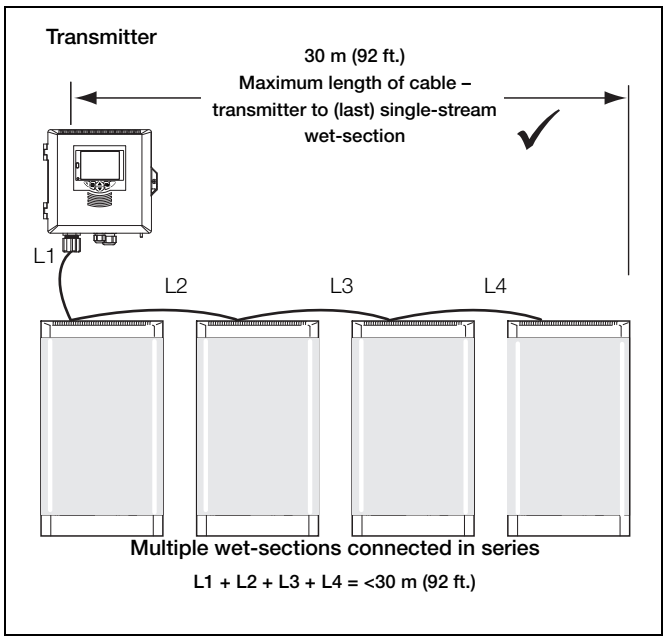


Fig. 3.10 Multiple wet-section setup – maximum cable length

3.4 Electrical connections – wet-section

3.4.1 Accessing the wet-section PCB

This section is applicable only to multiple wet-section systems.

Note.

- For single wet-section systems, the Modbus cable is connected to the wet-section at the factory – only transmitter connections are required.
- If additional wet-sections are added they must be connected in series – refer to Appendix B, page 67.
- The following procedure is required only when connecting additional wet-sections to an existing analyzer.

Warning. Isolate power supplies to the transmitter and wet-section before attempting to access the wet-section PCB.

Referring to Fig. 3.11:

1. Open the wet-section door by releasing the 2 door locks (A).
2. Remove the 4 screws (B) and associated plastic screw retaining washers (C) holding the wet-section PCB cover in place and remove the cover.
3. Feed the supplied communications cable through the channel in the rear corner of the main case (as fitted cable), then through the cable gland and make the connections shown in Fig. 3.12, page 15.

Note. When refitting the cover, ensure that the O-ring seal (D) in the PCB housing is located correctly in its groove.

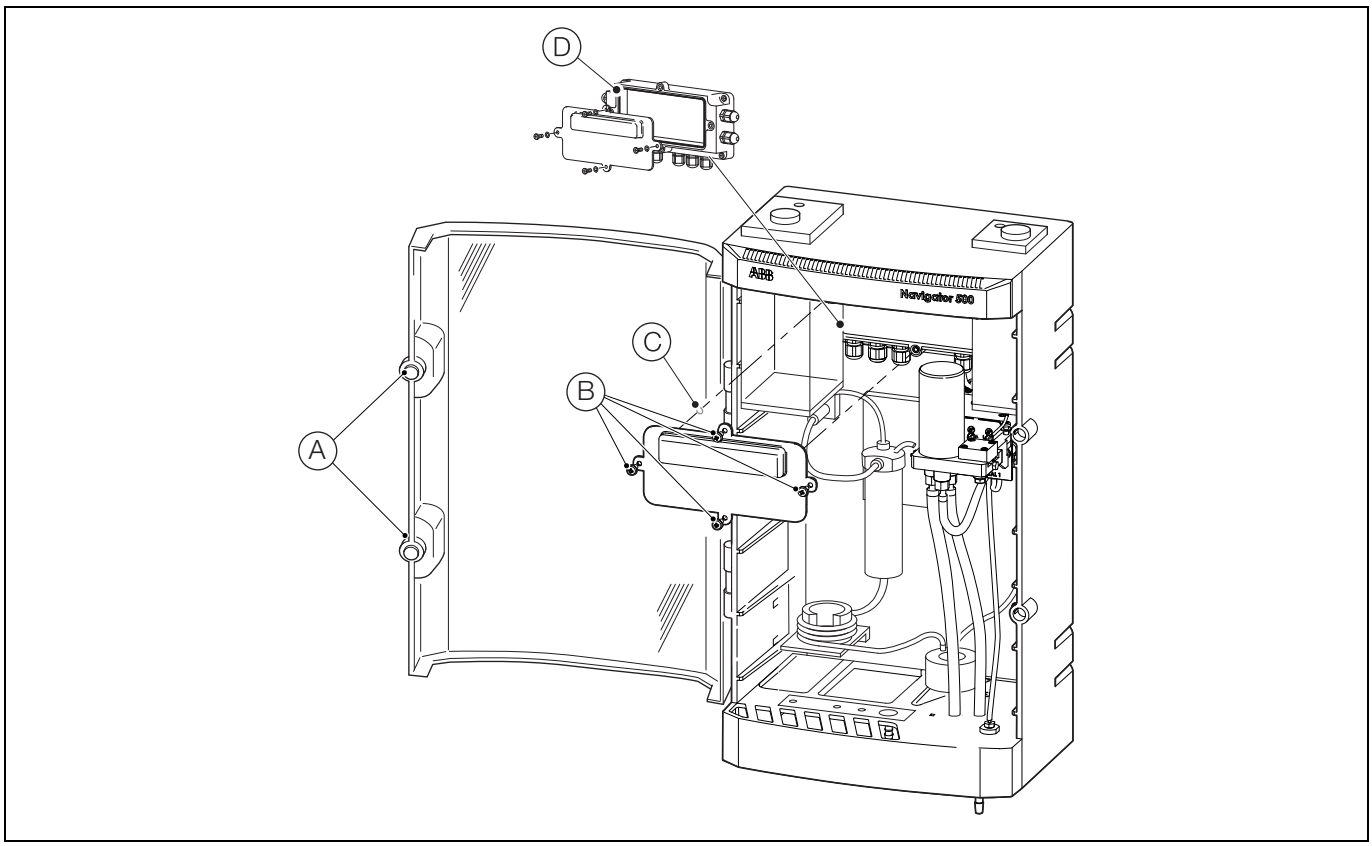
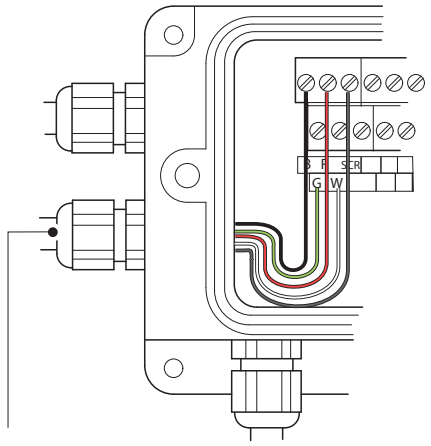


Fig. 3.11 Accessing the wet-section PCB

3.4.2 Wet-section PCB connections

Note.

- Refer to Section 3.5.2, page 18, for connection details at the transmitter.
- Serial cable connections at each additional wet-section are made into the same terminal IDs as the factory-fitted serial cable.
- Refer to Appendix B, page 67, for multiple wet-section setup and serial connection details.



Red – R (24 V)
Black – B (0 V)
Green – G (Data +ve)
White – W (Data –ve)
Screen – SCR

Fig. 3.12 Additional serial cable connections to multiple wet-sections

Cable	Color	Terminal ID	Description
Serial	Red	R	24 V
	Black	B	0 V
	Green	G	Data +ve
	White	W	Data –ve
	Screen	SCR	Screen
Calibration valve	Red	9	+ve
	Black	10	–ve
Flowmeter (if fitted)	Red	13	+ve
	Brown	15	GND
	Black	17	–ve
Pressure switch	Red	25	N/A
	Black	26	N/A
Sensor block	Red	31	Hydrazine sensor
	Blue	32	Hydrazine sensor
	Black	33	Pt1000
	Yellow	35	Pt1000

Table 3.1 Factory-made connections

3.5 Electrical connections – transmitter

Warning.

- If the transmitter is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- Remove all power from supply, relay, 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 AWG 26 to 16 (0.14 to 1.5 mm^2).
- Ensure the correct fuses are fitted – see Fig. 3.14, page 18 for fuse details.
- Replacement of the internal battery must be carried out by an approved technician only.
- The transmitter 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. Use screened cable for signal inputs and relay connections. Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.
- All equipment connected to the transmitter's terminals must comply with local safety standards (IEC 60950, EN61010-1).
- 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 (the mains input and relay contact outputs), use only suitably rated field wiring insulated copper conductors rated min. 300 V, 16 AWG, 90C. Route wires through suitably rated flexible conduits and fittings.

3.5.1 Accessing the transmitter connection board

Note. Electrical connections at the wet-section connection board are identified in Section 3.4.2, page 15. Before fitting cable glands, identify the connections required and cable gland entries to be used.

Referring to Fig. 3.13:

1. Using a suitable screwdriver, release door retaining screw (A) and open the transmitter door.
2. Release cover plate retaining screw (B) and remove 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 mains power supply cable (J) through it.
6. Route the cable through cable gland (F) and into the enclosure case.

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

7. Make connections to the power supply connection terminals (K).
8. Tighten gland cover (H).
9. Refit cover plate (C) and secure it with retaining screw (B).
10. Close the transmitter door and secure with door retaining screw (A).

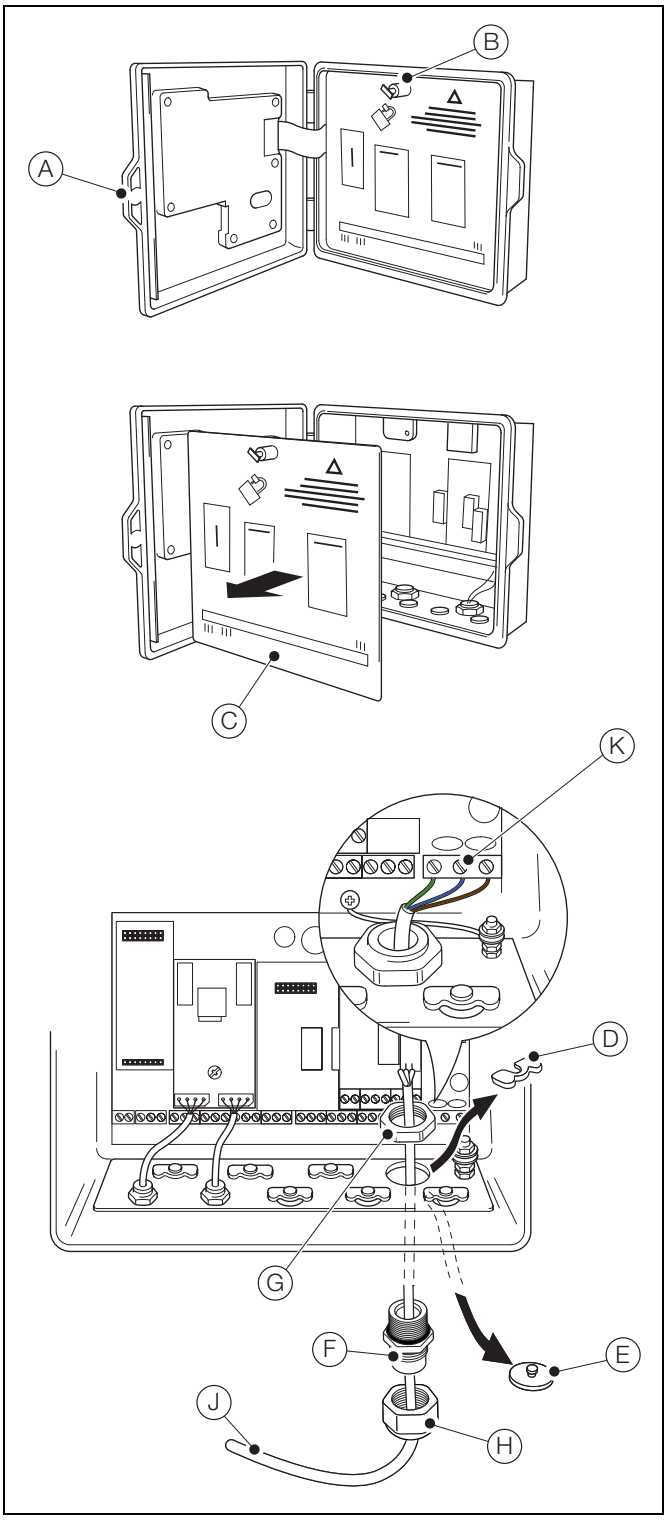


Fig. 3.13 Accessing the transmitter board and making electrical connections

3.5.2 Transmitter connections

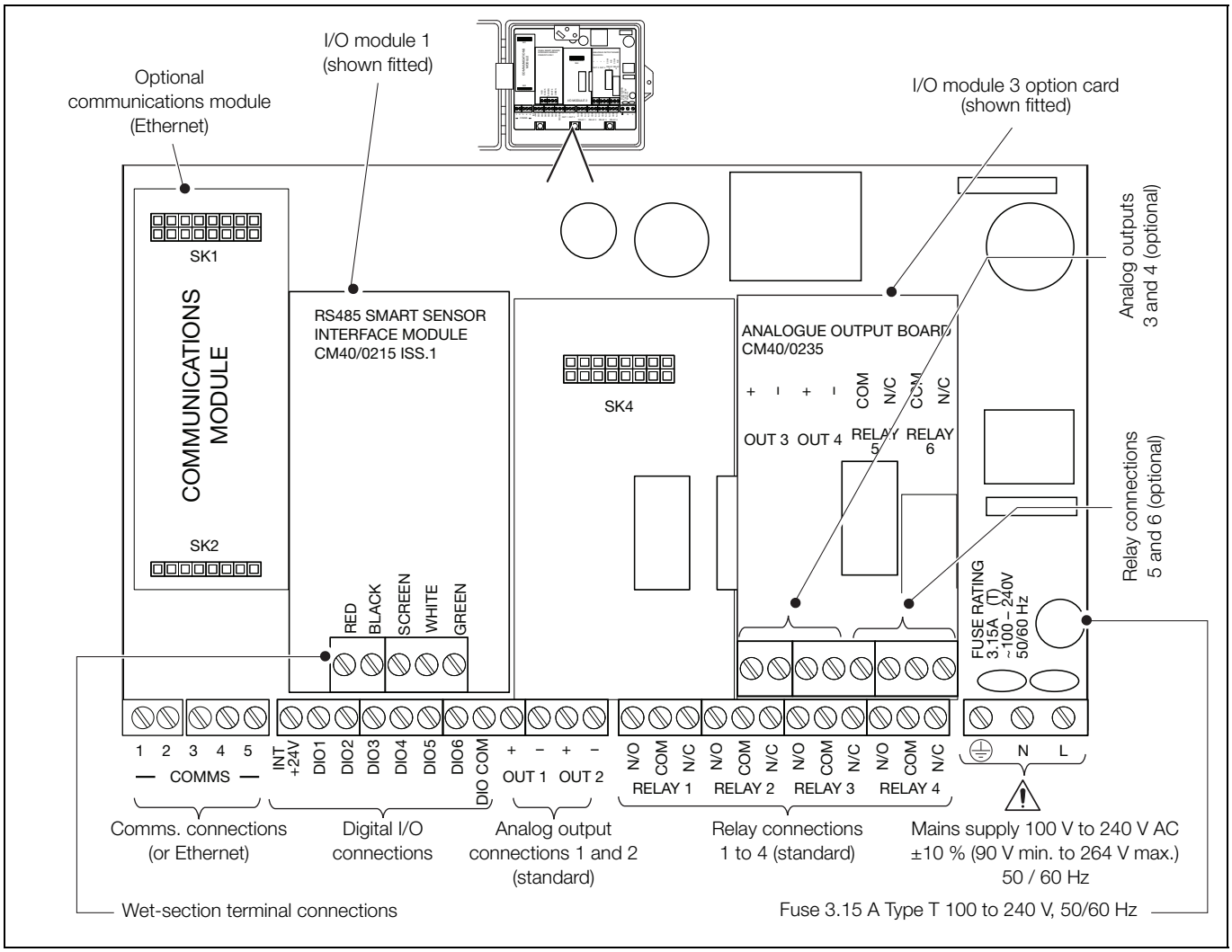


Fig. 3.14 Connections overview

3.5.3 Digital I/O, relays and analog output connections

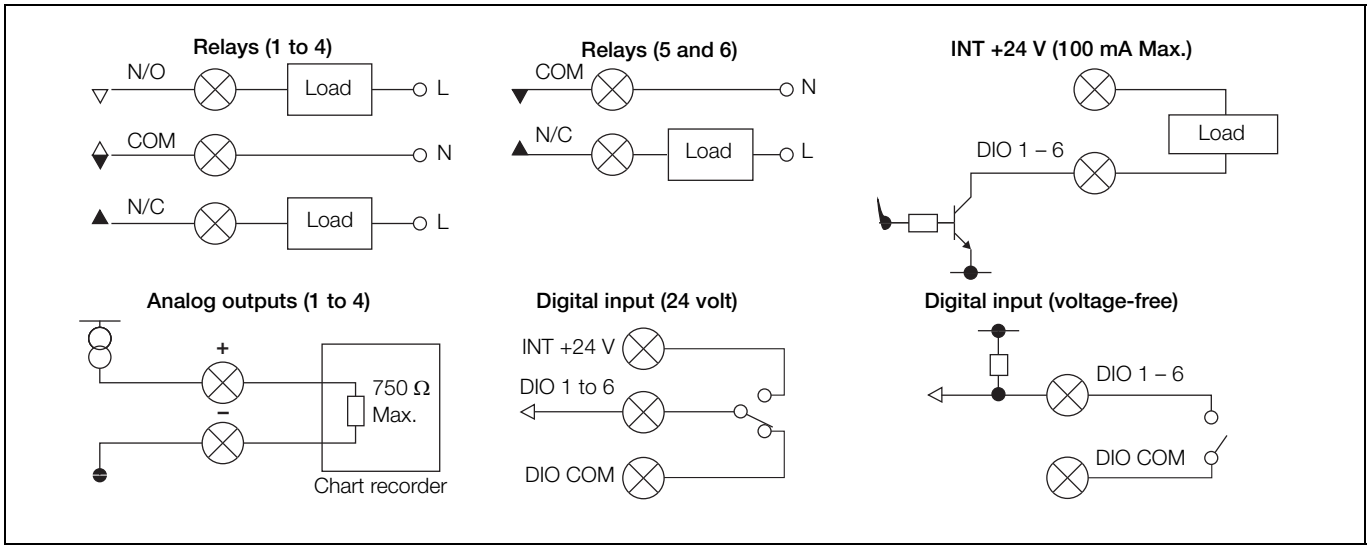


Fig. 3.15 Digital I/O, relays and analog output connections

4 Setup

This section describes how to set the analyzer up for first-time use.

Caution. Do not attempt to setup the analyzer unless the wet-section and transmitter are fully installed and ready for operation.

If multiple wet-sections are to be connected to a transmitter, an additional setup procedure is required – see Appendix B, page 67.

Warning. This equipment uses chemical solutions in its operation. Suitable precautions must be taken to ensure safe handling.

Caution. This equipment will be damaged if subjected to freezing conditions.

4.1 Transmitter start-up

Ensure all electrical connections have been made and switch the power on to the transmitter. If the wet-section is being commissioned for the first time, calibration and programming of parameters is required – refer to Section 5.1, page 23 to perform a calibration for the first time.

The menu structure, general operation and menu descriptions, including *Calibration* are detailed in Section 7, page 39.

4.2 Setting up the wet-section

Referring to Fig. 4.1 (overleaf):

1. Fill the hydrazine sensor assembly with fresh gel as follows:
   a. Holding the black closure cap tightly in place on the filling syringe, snap the syringe plunger into position and remove the black closure cap.
   b. Slowly inject the filling gel through the lower hole in the outer jacket until it reaches the top hole.
   c. Remove the syringe and replace its closure cap.
   d. Fit lower 10-32 UNF blanking plug (A).
   e. Fit upper 10-32 UNF blanking plug (B).
2. Push the hydrazine sensor assembly (C) into clip (D) on the sub-panel, ensuring sensor outlet tube (E) is positioned directly above drain tundish (F).
3. Connect the tube (G) from the mixing / delay coil to inlet nipple (H).

   Note. Hold the sensor firmly at the top so that the centre portion is not pushed out when the tube is connected.

4. Connect the hydrazine sensor (I) (red) and temperature sensor (J) (blue) electrical connectors to the corresponding color-coded sockets on the hydrazine sensor connector block.
5. Set an appropriate sample flow into the wet-section – check that the solution weirs over the adjustable overflow pipe in the constant-head unit and flows through the sensor.
6. Fill standard solution and reagent solution containers with appropriate solutions – see Section 8.1, page 53.
7. Remove reagent tube (K) from membrane clamp (L), located on the top of the reagent dosing chamber (M).
8. Place a small beaker into the main case and hold the end of reagent tube (K) over it to enable the reagent to flow through the tube to displace any air bubbles.
9. Reconnect reagent tube (K) to membrane clamp (L).
10. Remove mixing / delay coil tubing (G) from reagent dosing chamber outlet (N).
11. Establish flow through the new disc by clamping the sample inlet tube (O) and applying suction from a plastic syringe to the reagent dosing chamber outlet (N).
12. Refit the mixing / delay coil tubing (G) to the reagent dosing chamber outlet (N).
13. Remove the clamp from sample inlet tube (O).
14. Allow approximately one hour for caustic dosing to be established (the pH of the effluent at the sensor outlet must be at least 10.5).

Note. If, during normal operation, the transmitter does not display the expected hydrazine level, refer to Appendix A, page 63, for troubleshooting procedures.

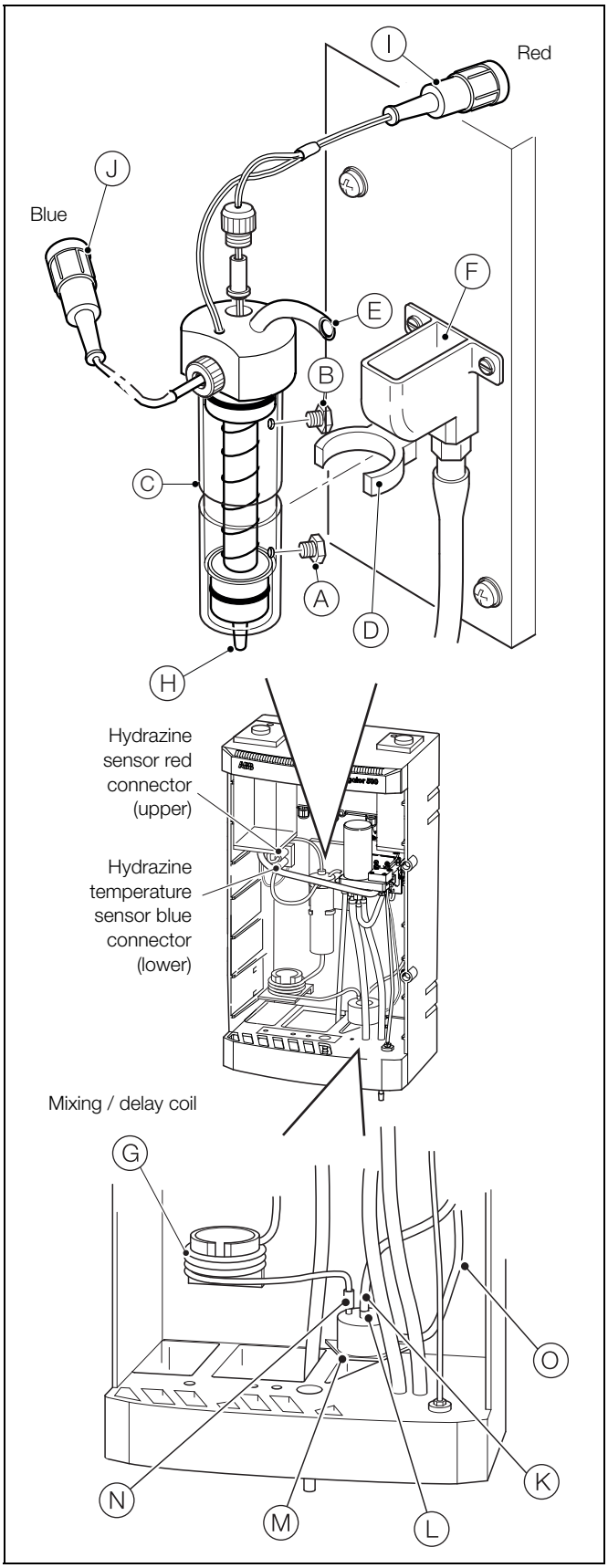


Fig. 4.1 Setting up the sample flow

4.3 Setting flow rates

Warning. The sample is dosed with sodium hydroxide and the concentration, although low at first, increases if any spillage is left to evaporate. Take care to dispose of the outflow safely.

The flow rates of standard solution and sample through the wet-section are preset at the factory. It is advisable to check the flow rates prior to the initial calibration – see Table 4.1, page 22.

The overflow from the sensor drains into a drain tundish that is drained to waste via a drain tube.

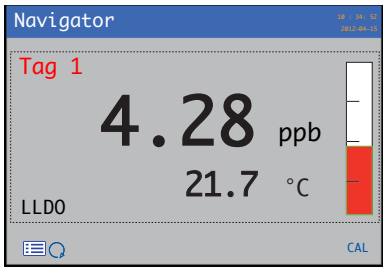
4.3.1 Checking the standard solution 2 (high) flow rate

The flow rate is factory-set. To check the standard solution flowrate:

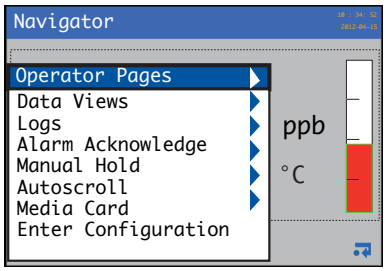
1. Fill the standard solution container with standard solution or high purity water.

At the transmitter:

2. Access the Calibration level menus by pressing the key (below the icon).

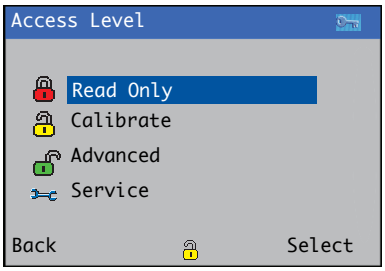


The *Operator* menus are displayed:



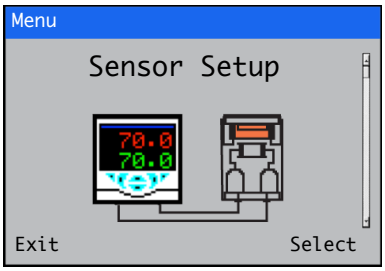
3. Press the ▽ key to select the *Enter Configuration* menu and press the ◸ key (below the ↵ icon).

   The *Access Level* page is displayed:

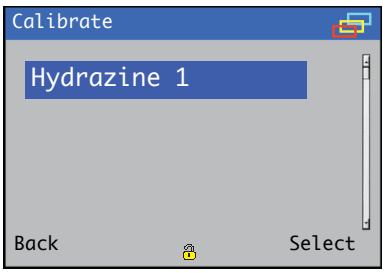


4. Use the ▽ key to scroll to the *Advanced* access level and press the ◸ key (below the *Select* prompt) to enter the top level *Configuration* menus.

   Use the △ / ▽ keys to scroll to the *Sensor Setup* menu and press the ◸ key (below the *Select* prompt) to enter the *Sensor Setup* level menus.

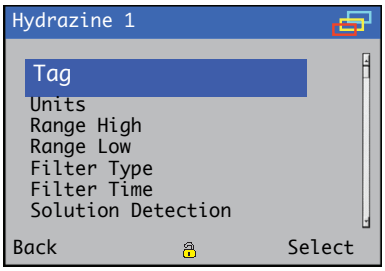


   The *Hydrazine 1 (4)* page is displayed:



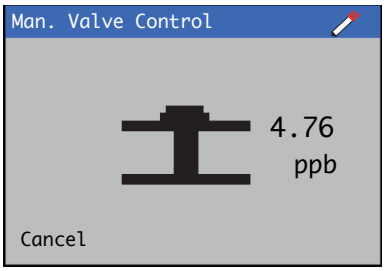
5. Press the ◸ key (below the *Select* prompt).

   The *Hydrazine 1 (4)* menu page is displayed:

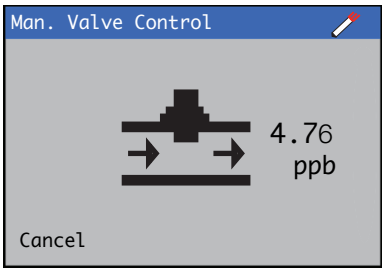


6. Press the ▽ key to select the *Man. Valve Control* menu and press the ◸ key (below the *Select* prompt).

   The *Man. Valve Control* page is displayed with the valve in the closed position:



7. Press the △ key to energize (open) the solenoid valve to allow the flow of standard solution.



Note. When the page is exited (by pressing the ◹ key below the *Exit* prompt), the valve reverts to the previous state (closed).

Referring to Fig. 4.2:

8. Use a 50 ml (1.7 fl. oz.) syringe to slowly draw solution from the sensor drain tube (A) until any air bubbles are removed. Top-up the standard container as necessary.
9. Wait ten minutes for the temperature to stabilize. Read the temperature of the standard and refer to Table 4.1.
10. Rotate the sensor (B), using the main body of the sensor, to allow access for a 50 ml (1.7 fl. oz.) measuring cylinder under the drain tube outlet (C).

> **Caution.** Use the main body only to rotate the hydrazine sensor – do not rotate using the top of the sensor.

11. Allow the liquid to drip freely into the 50 ml (1.7 fl. oz.) measuring cylinder. It must not run down the side of the cylinder.

    If the flow rate is not within 0.2 ml min^{-1} of the value in Table 4.1, adjust by loosening the 2 sensor plate securing screws (D) and move the panel up or down (using the thumb wheel (E)) to decrease or increase the flow, respectively.

    Left to right adjustment increases flow. Tighten the 2 sensor plate securing screws (D) when the correct flow rate has been achieved.

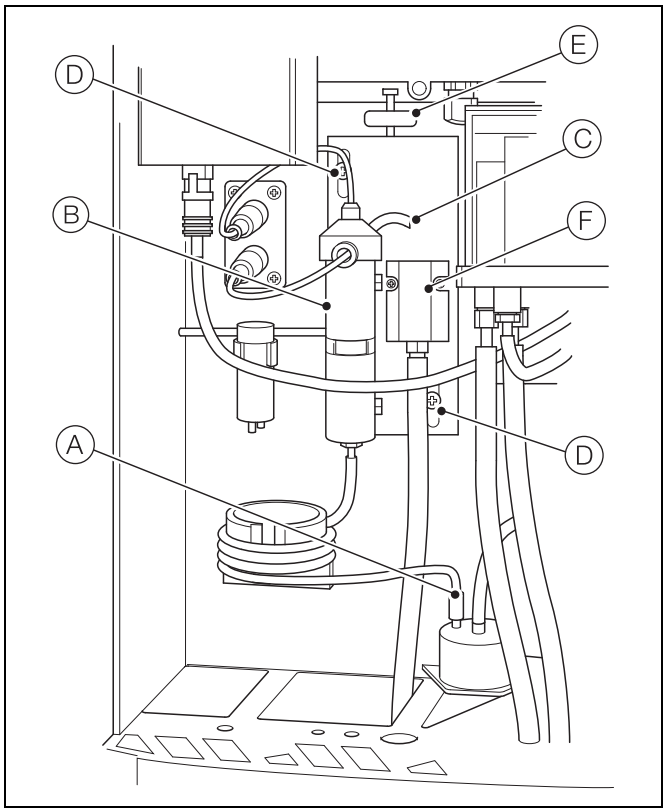


Fig. 4.2 Setting the standard solution flowrate

4.3.2 Sample flow rate

1. The flow rate of sample (from the constant head unit) through the sensor can now be checked. Ensure that sample is flowing through the sensor rather than standard solution and the calibrated valve is de-energized.

Sample Temp. ° C	Sample Flow (ml/min)	Sample Temp. ° C	Sample Flow (ml/min)
5	14.0	32	21.7
6	14.3	33	21.9
7	14.7	34	22.1
8	15.0	35	22.3
9	15.4	36	22.5
10	15.7	37	22.7
11	16.0	38	22.9
12	16.3	39	23.1
13	16.6	40	23.3
14	16.9	41	23.5
15	17.2	42	23.7
16	17.5	43	23.9
17	17.8	44	24.1
18	18.1	45	24.3
19	18.4	46	24.4
20	18.7	47	24.6
21	19.0	48	24.8
22	19.2	49	24.9
23	19.5	50	25.1
24	19.7	51	25.2
25	20.0	52	25.4
26	20.3	53	25.5
27	20.5	54	25.7
28	20.8	55	25.8
29	21.0	54	25.7
30	21.2	55	25.8
31	21.5		

Table 4.1 Relationship of sample temperature to flow

Wait ten minutes for the temperature to stabilize. Read the temperature of the sample and refer to Table 4.1. Measure the flow rate with a measuring cylinder as described in Section 4.3.1. If the flow rate is not within 0.2 ml min^{-1} of the value given in the table, adjust by rotating the overflow tube in the constant head unit. Anti-clockwise adjustment increases flow.

2. Referring to Fig. 4.2, rotate the sensor to position the drain tube outlet (C) over the sensor drain tundish (F).

5 Calibration

This section describes how to calibrate the analyzer once it is operational. Calibration involves measuring the wet-section's sensitivity to a solution containing a known hydrazine concentration. Calibrations are initiated via the *Cal* prompt displayed on *Operator* pages, or via the *Calibration Level* and *Advanced Level* menus or as a *Scheduled* calibration.

Note.

- Calibration menus can be accessed from the *Advanced* level only – refer to Section 4.3.1, page 20, steps 2 to 4) to access the *Calibrate* level.
- If calibration standard solution values need to be changed from their default values, the values must be set from the *Advanced / Calibrate / Calibration Setup* menu only.

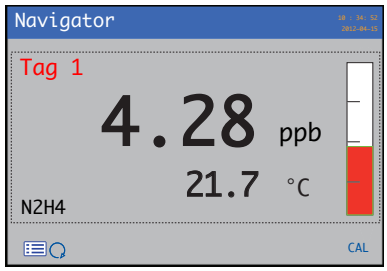
Caution.

- Do not calibrate the analyzer until the wet-section and transmitter are installed and ready for operation – Refer to Section 4, page 19.
- Allow at least 1 hour for the wet-section to stabilize before running a calibration.

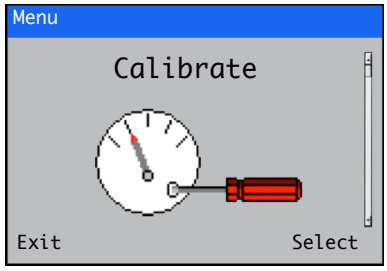
5.1 Performing a calibration for the first time

To perform a quick calibration from an *Operator* page:

1. Press the key (below the *Cal* prompt).

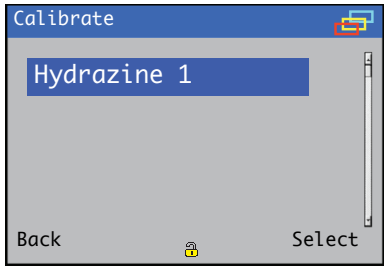


The *Calibrate* page is displayed:



2. Press the key (below the *Select* prompt).

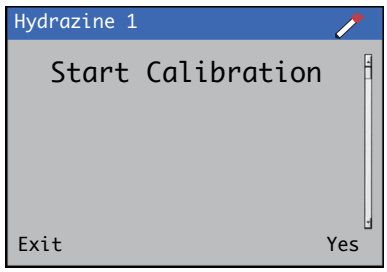
The *Calibrate / Hydrazine 1 (4)* page is displayed with all available wet-sections shown:



Use the / keys to select the wet-section to be calibrated.

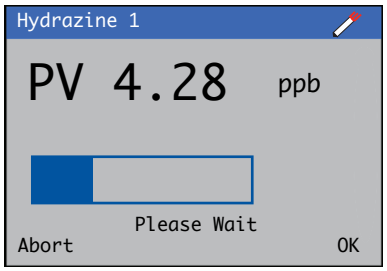
3. Press the key (below the *Select* prompt).

The *Hydrazine 1 (2, 3 or 4) / Start Calibration* page is displayed:



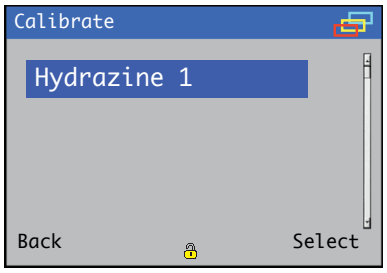
4. Press the key (below the *Yes* prompt).

   The *Calibration* page is displayed with a bar graph indicating calibration progress:



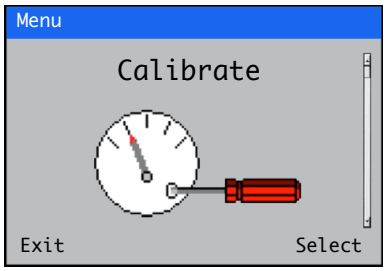
5. To exit the *Calibration* page, press the key (below the *OK* prompt). Calibration continues and calibration progress can be monotored from the *Calibration View* – see Fig. 5.1.

   The *Calibrate /Hydrazine 1 (4)* page is displayed.



6. Press the key (below the *Back* prompt).

   The *Calibrate* page is displayed:



7. Press the key (below the *Exit* prompt) to return to the *Operator* page.

5.2 Calibration options

5.2.1 Scheduled calibration

Automatic calibrations can be performed with a frequency of 1 day to 1 month. Perform calibrations frequently to ensure accurate readings and verify the performance of the wet-section, but it is advised to use freshly made standard solutions to achieve accurate calibrations as hydrazine solutions degrade with time.

To set up a scheduled calibration:

1. Access the configuration level *Calibrate* menu – see Section 4.3.1, page 20, steps 2 to 4.
2. Configure the schedule at the *Sensor 1 (4)* / *Scheduled Calibration* / *Type*, *Frequency*, *Interval* and *Time of Next Cal.* menu options.

5.2.2 Monitoring calibration progress

If the *Calibration* page is exited by press the key (below the *OK* prompt) before the calibration has completed, progress can be monitored from the *Calibration View* mode – see Fig. 5.1.

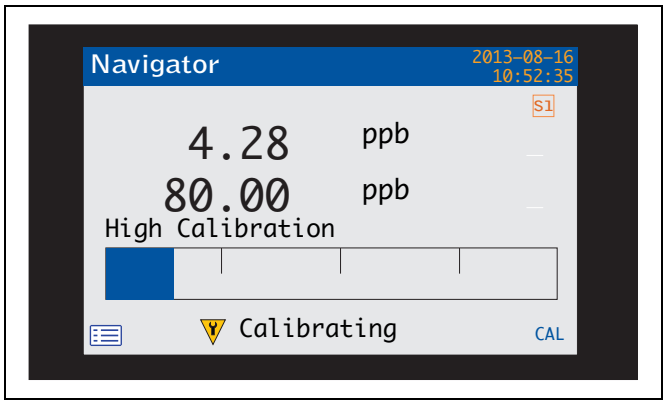


Fig. 5.1 Calibration View

At the end of the calibration, the *Active Efficiency* and *Last Efficiency* values in the *Signals View* are updated if the calibration is successful.

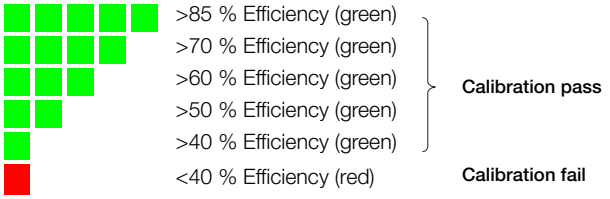
Note. The *Active Efficiency* value is not updated if the calibration fails. The *Calibration Log* is updated with the *Cal Efficiency* value.

5.2.3 Abort calibration

A calibration can be aborted by pressing the (*Abort*) key while the *Calibration* page is displayed (see Section 5.1, page 23) – the calibration valve closes enabling the sample to flow past the sensor. A calibration recovery period commences and the *Calibration Log* (see page 31) displays the message *Cal Aborted* – see Section 6.7.1, page 32 for *Calibration Log* entries.

5.2.4 Sensor efficiency

At the end of the calibration, the *Efficiency* and *Last Efficiency* values in the *Signals View* (see page 31) and *Calibration Log* (see page 31) are updated if the calibration is successful. An indication of efficiency is displayed as a 1 to 5-bar line:



Note. The *Active Efficiency* value is not updated if the calibration fails. The *Calibration Log* is updated with the *Cal Efficiency* value.

5.3 Recovery period

The recovery period allows time for the wet-section to return to the *Process Value* after a calibration. Current Outputs and Alarms are still held during the recovery period if the Hold Output option is enabled. The default value for the recovery period is 15 minutes but can be configured between 10 and 60 minutes.

To enable the *Hold Outputs* option:

1. Access the configuration level *Calibrate* menu (see Section 4.3.1, page 20, steps 2 to 4).
2. Select *Enable* at the *Sensor 1 (4)* (single-stream) or *Sensor Three Stream* / *Hold Outputs* menu option.

The default value for the recovery period is 15 minutes but can be configured between 10 and 60 minutes.

6 Operation overview – transmitter

6.1 Front panel keys

The transmitter is operated using the keys on the front panel. These enable local navigation and selection of software options on all displays, acknowledgement and data logging and monitoring. Prompts associated with active keys are displayed on each screen. Diagnostic messages are detailed in Appendix A.1, page 63, display icon descriptions are detailed in Section 6.10, page 37.

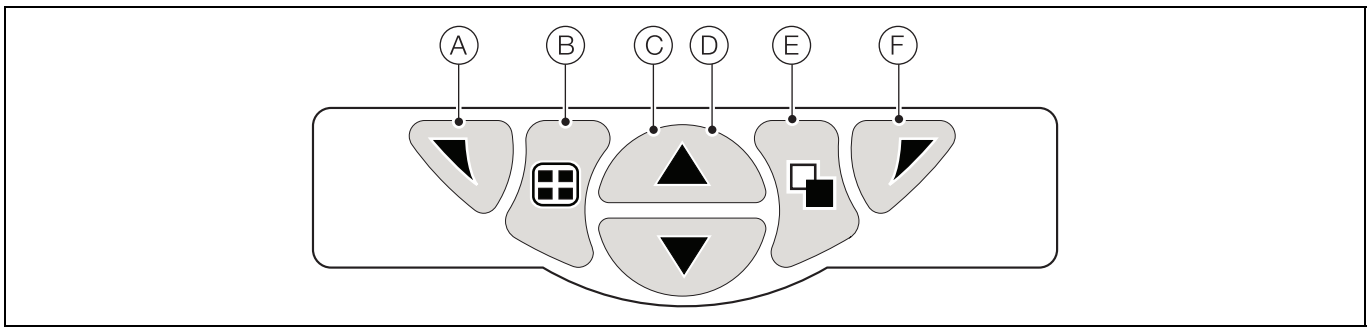


Fig. 6.1 Front panel keys

Key functions are described in the following table:

Key	Function	Description
Ⓐ	Navigation key – left and *Operator Level* access key	At menu level, selects the highlighted menu item, edit a selection or return to the previous menu level. When *Operator* page is displayed, opens or closes the *Operator* menu.
Ⓑ	View key	Toggles the view between *Operator* pages, *Diagnostic View* and *Calibration Log* screens.
Ⓒ	Up key	Used to navigate up menu lists, highlight menu items and increase displayed values.
Ⓓ	Down key	Used to navigate down menu lists, highlight menu items and decrease displayed values.
Ⓔ	Group key	Toggles between: ■ *Operator* pages (1 to 5) when an *Operator* page is selected at the *Group* key. ■ *View* screens (*Alarms, Outputs, Signals, Chart* and *Diagnostic*) when the *Diagnostic View* screen is selected at the *Group* key. ■ *Log* screens (*Alarm, Audit, Diagnostic and Calibration*) when the *Calibration Log* screen is selected at the Group key. **Note**. Not enabled in *Configuration* mode.
Ⓕ	Navigation key – right and *Cal* shortcut key	At menu level, selects the highlighted menu item, operation button or edits a selection. At *Operator* page level, used as a shortcut key to access the *Calibrate* level.

Table 6.1 Front panel key functions / descriptions

6.2 Transmitter operation modes

The transmitter has 4 modes of operation – all modes are accessed from the *Operator* menu – see Fig. 6.2.

- *Operating* – used to display real-time wet-section values on *Operating Pages* – refer to Section 6.5, page 28.
- *View* – used to display diagnostic messages, alarms, output values, signals (including the flow rate where applicable) and (chart) traces – refer to Section 6.6, page 30.
- *Log* – used to display recorded (diagnostic, calibration, audit) events and alarms – refer to Section 6.7, page 31.
- *Configuration* – used to configure the transmitter – refer to Section 7, page 39.

6.3 Operator menus

Note. *Operator* menus **cannot** be accessed directly from the *Configuration* level.

Referring to Fig. 6.2, *Operator* menus (A) are accessed from any *Operating*, *View* or *Log* page by pressing the ▽ key (B).

To select *Operator* sub-menus (indicated by the ▶ arrow) press the ▷ key (C).

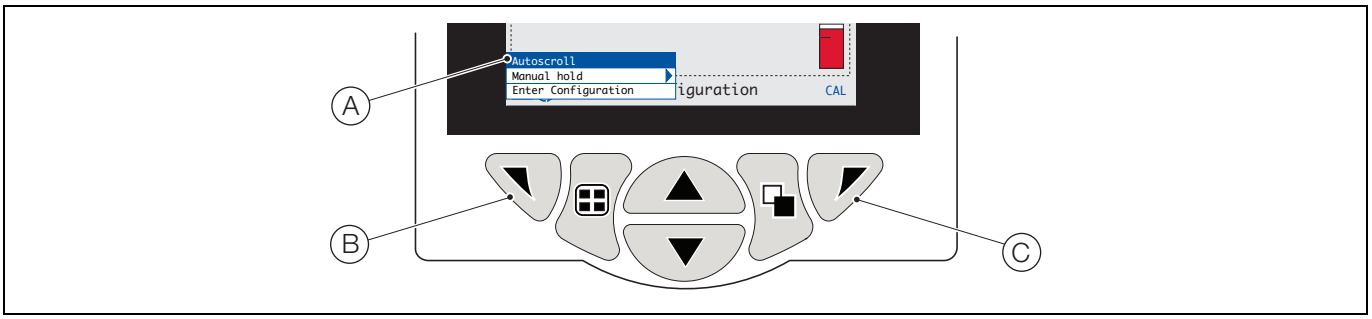


Fig. 6.2 Operator menus

Operator menus comprise:

- *Operator Pages* – displays the *Operator Page* for each available wet-section.
- *Data Views* – displays enabled data views.
- *Logs* – displays enabled *Log* views.
- *Alarm Acknowledge* – acknowledges the active alarm displayed in the *Alarms View*.
- *Manual Hold* – holds (freezes) the current outputs and alarms for the selected wet-section(s).

  Note. Active values are still indicated on the display.

- *Autoscroll* (enabled on *Operator* pages only) – displays *Operator* pages sequentially when multiple wet-sections are fitted.
- *Media Card* – displays the status of the SD Card / USB stick (enabled only media module is fitted).
- *Enter Configuration* – enabled on all pages – enters *Configuration* parameters via the *Access Level* – refer to Section 6.9.2, page 36 for access levels and password security options.

CAL shortcut – to initiate a calibration directly from an *Operator Page*, press the ▷ key (C) (below the *CAL* prompt). This shortcut opens the *Calibrate* page, bypassing the *Configuration* level menus.

6.4 Navigation overview

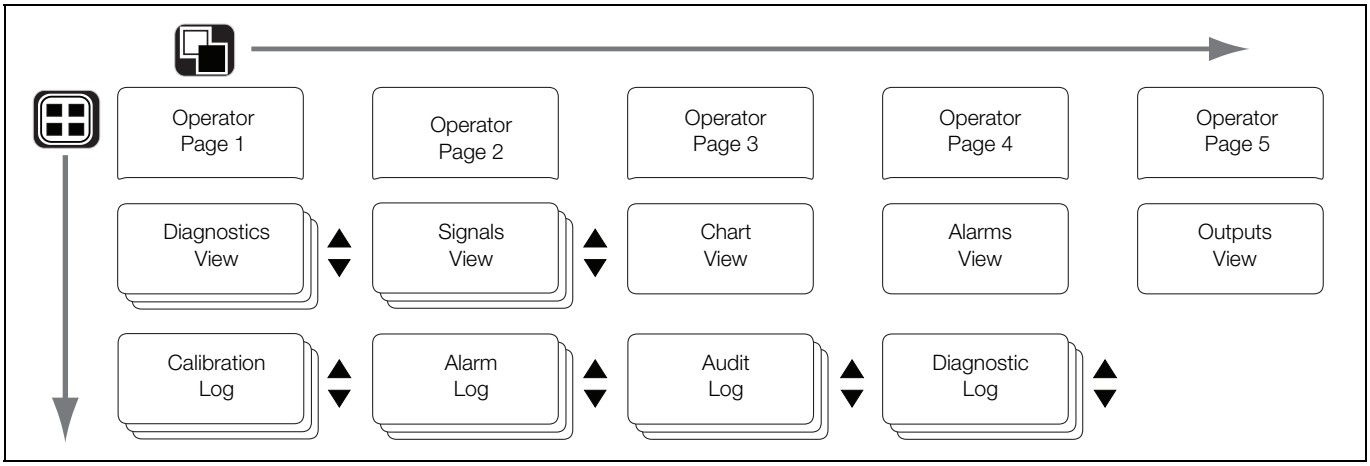


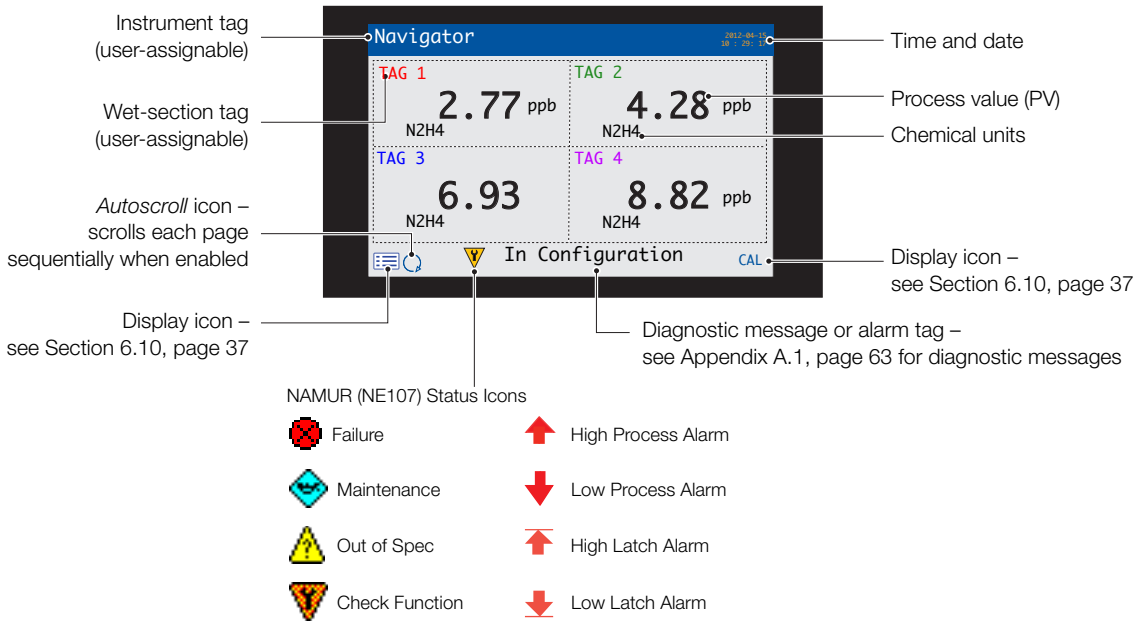
Fig. 6.3 Menu navigation

6.5 Operating mode

In operating mode, values from connected wet-sections are displayed on *Operator Pages*. A maximum of 5 *Operator Pages* can be displayed.

Operator Page 1 (the default page) displays values from all connected wet-sections simultaneously (a maximum of 4 wet-sections can be connected). The remaining *Operator Pages* can be assigned to display values from individual wet-sections (in any wet-section order). To achieve this, each wet-section must be associated with a template in the *Configuration* level / *Display* / *Operator Templates* parameters – see page 44.

In Fig. 6.4, *Operator Page 1* shows that 4 wet-sections are connected.



*The highest priority diagnostic or alarm is displayed. Other active diagnostic / alarm states can be viewed on the *Diagnostics View* – see page 30.

Fig. 6.4 Operator Page 1 (hydrazine multiple wet-section)

Fig. 6.5 shows an overview of *Operator Pages 2 to 5*. Each *Operator Page* displays the process value (PV) and temperature from a single wet-section. Fixed, color-coded, user-assignable tags (one for each fitted wet-section) and color-coded bargraphs aid identification of each wet-section.

The bargraph indicates the PV (minimum and maximum values on the chart are configurable in the *Sensor Setup* level). If the PV is above the maximum specified range of the wet-section, the bargraph flashes to indicate the value is out of range.

When multiple wet-sections are fitted and, if *Autoscroll* is selected from the *Operator Menu* (see Fig. 6.2, page 27), the display scrolls through each available *Operator Page* consecutively.

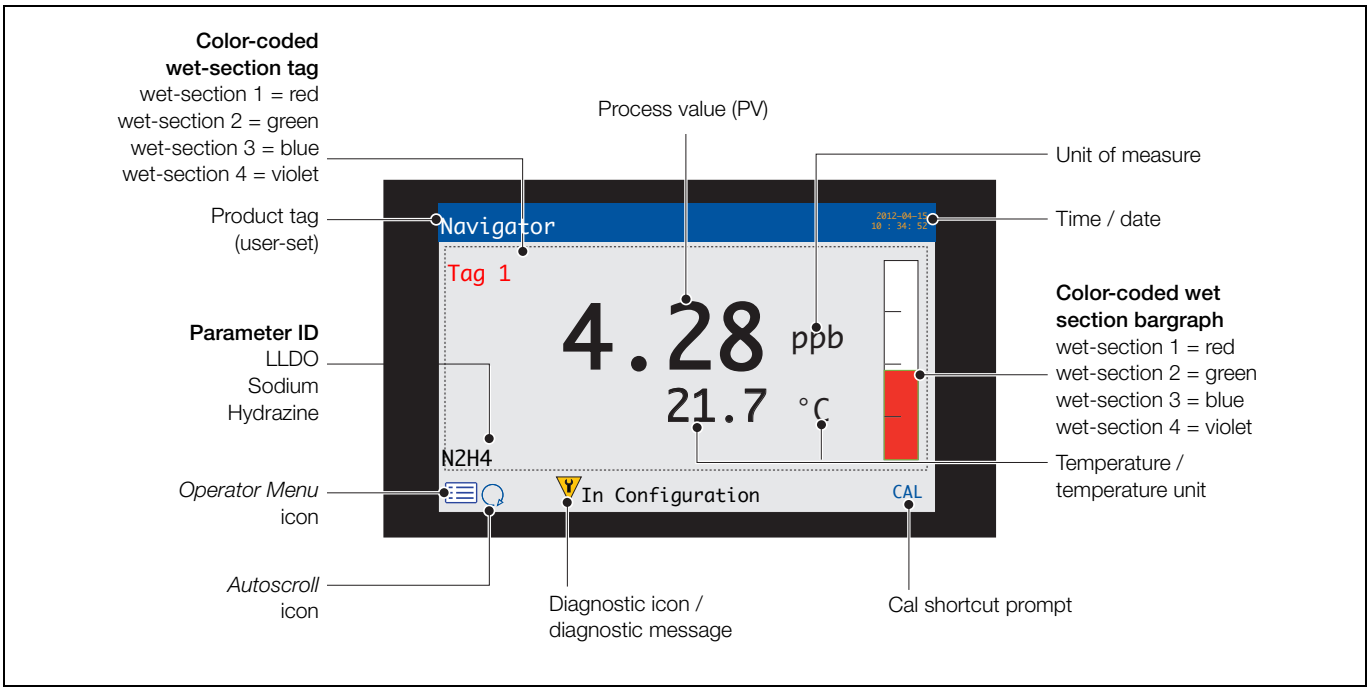


Fig. 6.5 Operator Pages 2 to 5 – overview

6.6 View mode

Pages displayed in *View* mode comprise:

- *Diagnostics View* – displays a list of diagnostic messages identified by priority and message – see Fig. 6.6
- *Alarms View* – displays a list of alarms identified by priority (sequence number), source and status – see Fig. 6.7
- *Outputs View* – displays a list of alarms identified by analog output ID, output value and percentage of output value – see Fig. 6.8
- *Signals View* – display a list of active signals and their values – see Fig. 6.9
- *Chart View* – represents the wet-section readings as a series of color-coded traces – see Fig. 6.10

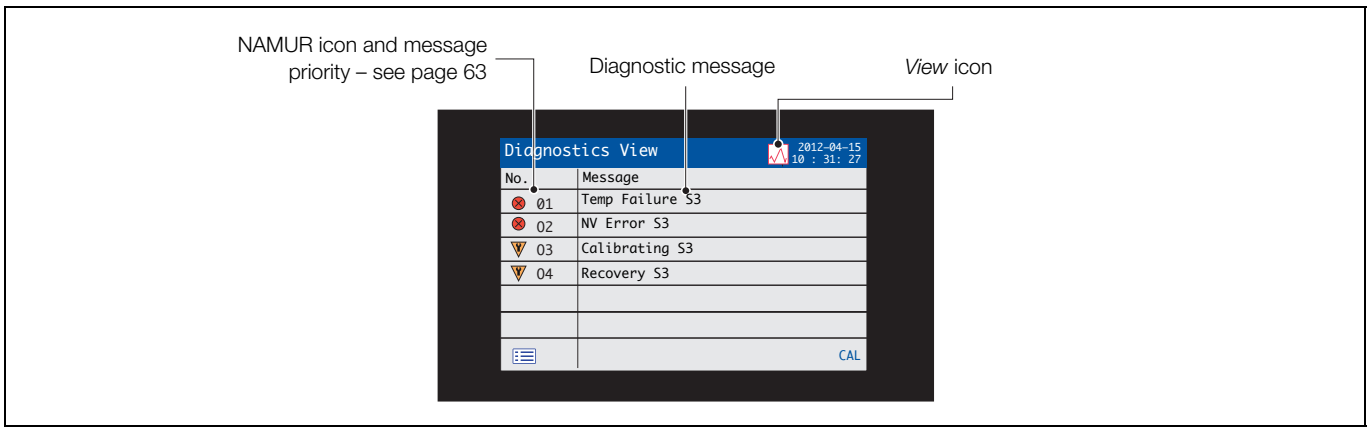


Fig. 6.6 Diagnostics View

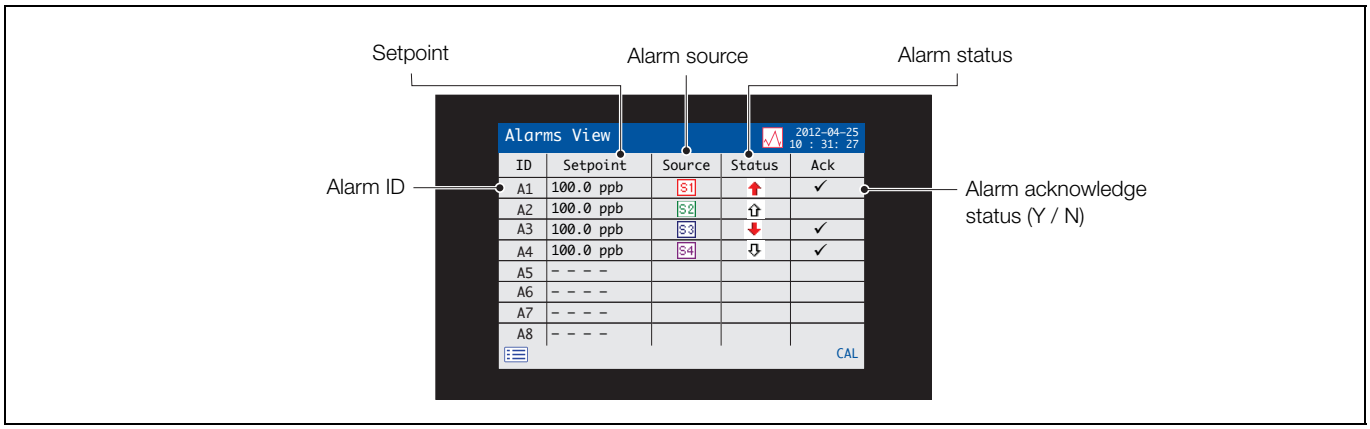


Fig. 6.7 Alarms View

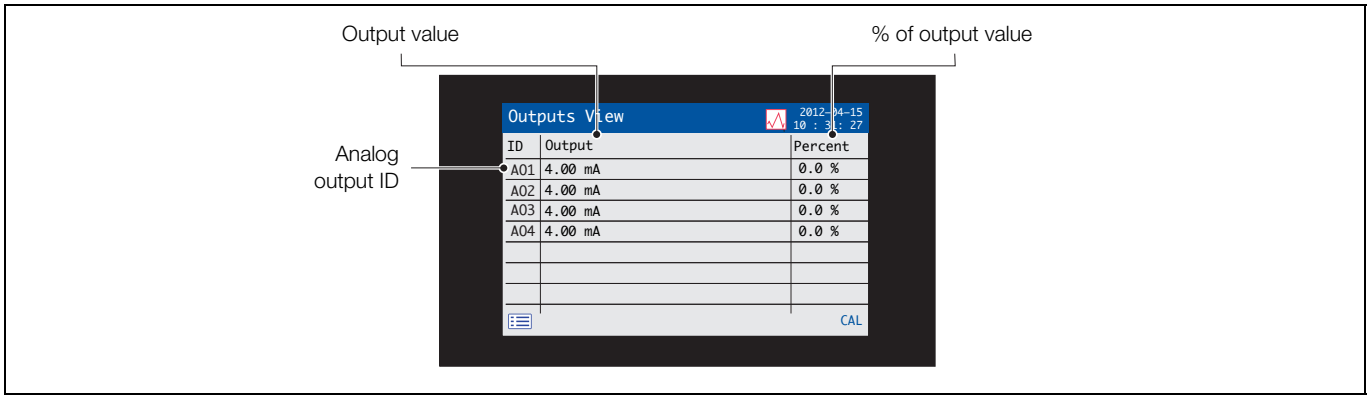


Fig. 6.8 Outputs View

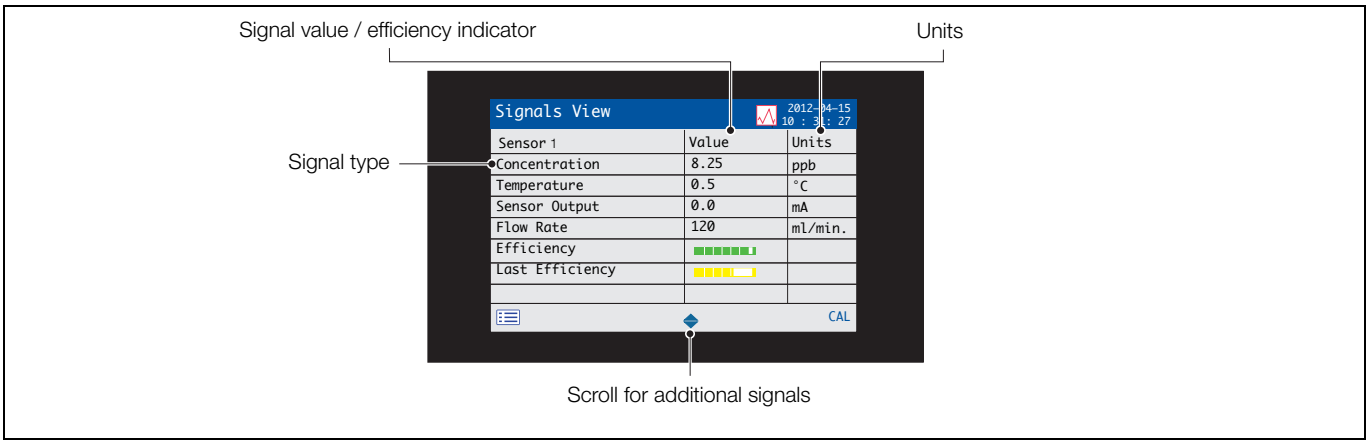


Fig. 6.9 Signals View

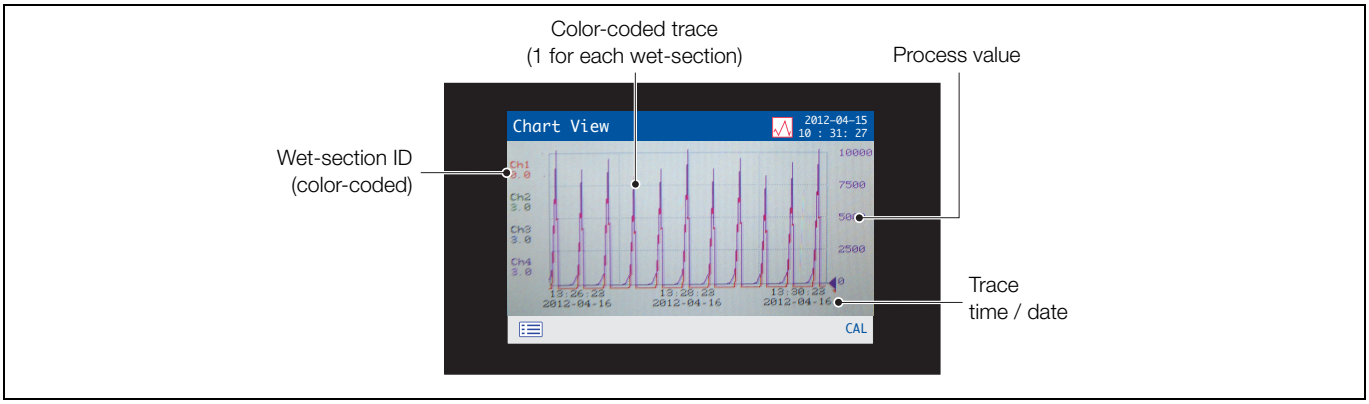


Fig. 6.10 Chart View

6.7 Log mode

Log mode pages display logged information in the sequence it occurred.

Log mode pages comprise:

- *Calibration Log*: a history of calibration routines.
- *Alarm Log*: a history of alarm events.
- *Audit Log*: a history of analyzer activity.
- *Diagnostic Log*: a history of diagnostic events.

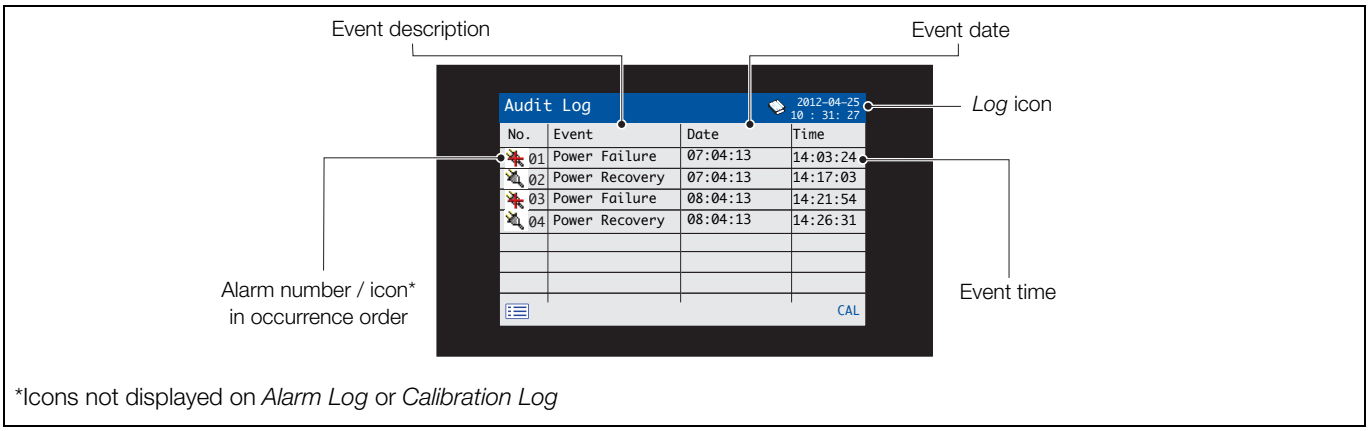


Fig. 6.11 Log page (example of Audit Log shown)

6.7.1 Calibration log entries

Possible calibration log entries along with a description are shown in Table 6.2. The possible *Audit Log* entries along with a description are shown in Table 6.3. The *Diagnostic Log* shows the history of diagnostic messages that have been displayed in the *Diagnostic View*; see Appendix A, page 63 for a list of diagnostic messages.

Log entry	Description
Cal Failed	Calibration procedure failed due to low sensor efficiency or automatically due to sample temperature error.
Cal Aborted	Calibration aborted manually by the user.
Cal Missed	Scheduled calibration missed due to: – user being in *Man. Valve Control* menu. – manual calibration in progress (on same wet-section) – user in *Service* login.
Efficiency	An indication of the sensor efficiency.

Table 6.2 Calibration Log entries

Log entry	Description
Power Failure	Power to the transmitter is lost.
Power Recovery	Transmitter restarted after a power loss.
In Config.	User in *Advanced / Configuration* mode.
Time / Date Changed	User has changed date / time.
Daylight Saving	Time changed due to daylight-saving.

Table 6.3 Audit Log entries

6.8 Logging

Data recorded in the transmitter's internal memory can be archived to a removable Secure Digital (SD) card or USB stick. The transmitter continuously records **all** data to its internal memory and keeps track of which data has been archived.

> **Note.** ABB's DataManager software can be used to store and view data archived from the transmitter.

The amount of time that data remains in the transmitter's internal memory depends on the sample rate – see Table 6.4. Sample data is saved to removable media as comma-separated files.

Configuration files are saved as binary-encoded files. Additional files can also be archived:

- Event log files (these files contain *Audit Log, Alarm Log, Diagnostic Log* and *Calibration Log* data)
- Data log files
- Configuration files

The transmitter's internal memory supports a maximum of 10 *Data Log* and *Event Log* files only and a maximum of 8 *Configuration* files. Durations for continuous recording are shown in Table 6.4 (internal storage).

5 s	10 s	30 s	1 m	5 / 10 / 30 m	1 hr
30 days	60 days	180 days	300 days	300 days	300 days

Table 6.4 Internal (flash) memory storage capacity

A 2 GB SD card / USB stick has sufficient external storage capacity for >5 years data.

6.8.1 SD card / USB stick

> **Caution.** To avoid potential damage or corruption to data recorded on an SD card / USB stick, take care when handling and storing. Do not expose to static electricity, electrical noise or magnetic fields. When handling the SD card / USB stick take care not to touch any exposed metal contacts.

There are two methods of archiving to an SD card / USB stick:

- **An SD card / USB stick is kept in the transmitter**

  Data is archived to the SD card / USB stick automatically at set intervals. Archiving continues until the SD card / USB stick full; archiving then stops. To ensure all required data is archived successfully, the SD card / USB stick should be swapped periodically for an empty one.

  > **Note.** It is not advisable to leave a USB stick in the transmitter permanently.

  It is advisable to back-up critical data stored on an SD card / USB stick regularly. The transmitter's internal memory provides a buffer for the most recent data only so, if data stored on an SD / USB stick card is lost, it can be re-archived.

- **Data is copied to an SD card / USB stick when required**

  When a SD card / USB stick is inserted into the transmitter, the media status can be set to *Online* causing unarchived data to be copied to the media –
  see Section 7, page 39 / *Media Card* menu level.

6.8.2 SD card / USB stick insertion and removal

To access the SD card / USB stick:

1. Ensure the transmitter is offline.
2. Use a large Pozi-drive screwdriver to release the door catch (A).
3. Open the door and insert the SD card / USB stick (B).

   The red LED (C) is lit when the SD card / USB stick is in use by the transmitter.
4. To remove the SD card / USB stick, if the red LED is lit, press button (D) and wait until the LED goes out.
5. Pull the SD card / USB stick out of its socket. The SD card / USB stick can then be inserted into an appropriate card reader / USB port on the PC and the data downloaded.

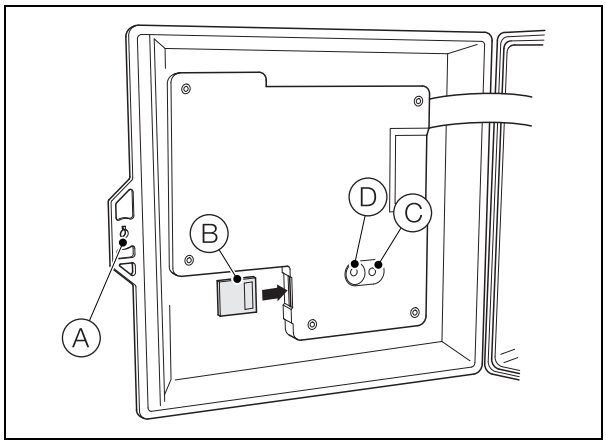


Fig. 6.12 SD card / USB stick insertion and removal

Note. Data stored in the internal memory buffer can still be transferred to the SD card / USB stick when the archive media is placed on-line again (providing it is not off-line so long that the un-archived data in the internal memory is overwritten).

6.8.3 Archive file types

All archive files created by the transmitter (except for configuration files) are assigned filenames automatically. Each type of archived file is assigned a different file extension.

Archive files are created as text format data files.

The file type and extension for **Data** text files is '.DOO'

- <ddmmyy><hhmmss><instrument tag>.DOO

The file type and extension for **Event** log files (containing historical entries from the *Audit, Calibration, Diagnostic* and *Alarm* logs is '.AOO'.

- <ddmmyy><hhmmss><instrument tag>.AOO

Note.

- The 'instrument tag' is set in the *Device Setup* level (see page 42) when the user has access at *Advanced* level – see Section 6.9, page 36.
- The time and date are formatted according to the format set in *Display* / *Date & Time* level. – see page 44.

  The transmitter's internal clock can be configured to adjust automatically at the start and end of *Daylight Saving* periods – see page 44.

Configuration filenames are user-entered. The configuration file type and extension is '.cfg'.

6.8.4 Data files

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

Alternatively, you can carry out detailed graphical analysis of the data on a PC using ABB's DataManager data analysis software.

New data files are created in the following circumstances:

- The transmitter configuration is changed.
- One of the current files exceeds the maximum permissible size (a new file is created at 12:00 a.m. on the following day. Data is logged into the existing file continuously until the new file is created.
- When the daylight saving period starts or ends.
- When working files cannot be found / are corrupted.

The filename is formatted as follows:

- Data logs: <ddmmyy><hhmmss><instrument tag>.DOO

6.8.5 Log files

The Alarm Event, Calibration, Diagnostic and Audit logs are archived into the same file. The filenames are formatted as follows:

- Event logs: <ddmmyy><hhmmss><instrument tag>.AOO

6.8.6 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 2013 filename:

30Mar13AHM550.D00

Summertime starts at 2:00am on 30th March 2013 and the clock changes automatically to 3:00am.

The existing file is closed and a new file is created filename:

30Mar13AHM550~DS.D00

The file '30Mar13AHM550.D00' contains data generated from 00:00:00 to 01:59:59.

The file '30Mar13AHM550~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 2013 filename:

26Oct13AHM550~DS.D00

Summertime ends at 3:00am on 26th October 2013 and the clock changes automatically to 2:00am.

The existing file is closed and a new file is created filename: 26Oct13AHM550.D00

The file '26Oct13AHM550~DS.D00' contains data generated from 00:00:00 to 02:59:59.

The file '26Oct13AHM550.D00' contains data generated from 02:00:00.

Note. Daily files start at 00:00:00.

6.9 Password security and Access Level

Passwords are entered at the *Enter Password* screen accessed via the *Access Level* – see Section 6.9.2, below.

6.9.1 Setting passwords

Passwords can be set to enable secure access at 2 levels: *Calibrate* and *Advanced*. The *Service* level is password protected at the factory and reserved for factory use only.

Passwords can contain up to 6 characters and are set, changed or restored to their default settings at the *Device Setup / Security Setup* parameter – see page 42.

Note. When the transmitter is powered-up for the first time, the *Calibrate* and *Advanced* levels can be accessed without password protection. Protected access to these levels can be allocated as required.

6.9.2 Access Level

The *Access Level* is entered via the *Operator* menu / *Enter Configuration* menu option – see Section 6.3, page 27.

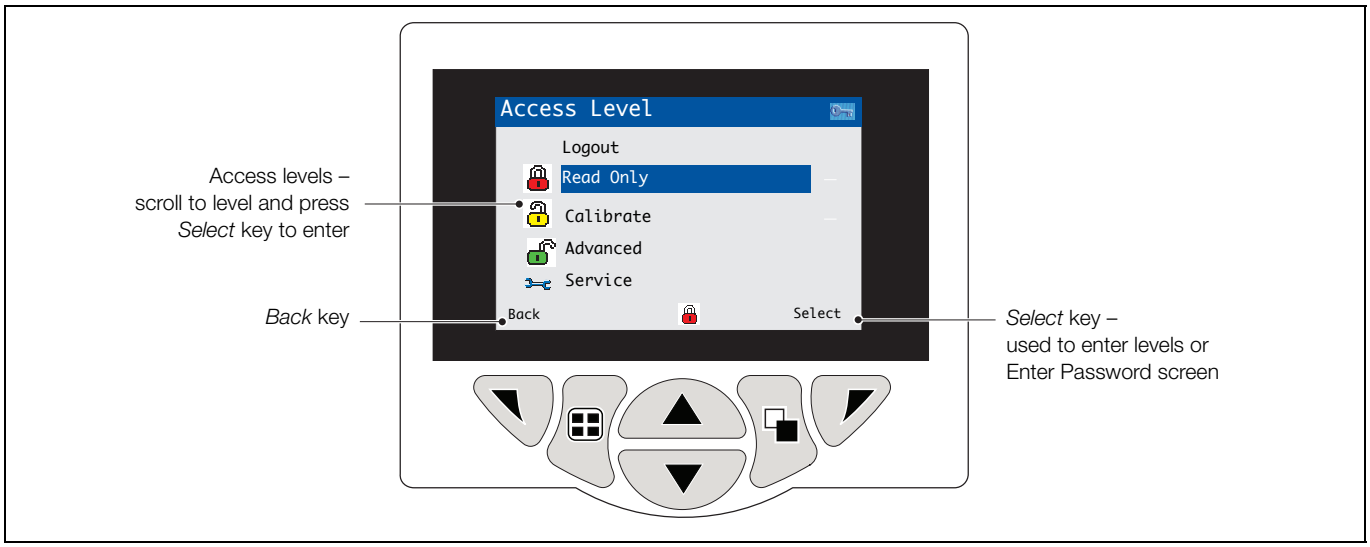


Fig. 6.13 Access Level

Level	Access
Logout	Displayed after *Calibrate* or *Advanced* level are accessed. Logs the user out of current level. If passwords are set, a password must be entered to access these levels again after selecting *Logout*.
Read Only	View all parameters in read-only mode.
Calibrate	Enables access and adjustment of *Calibrate* parameters – refer to Section 5, page 23 for calibration details.
Advanced	Enables configuration access to all parameters.
Service level	Reserved for authorized service technicians only.

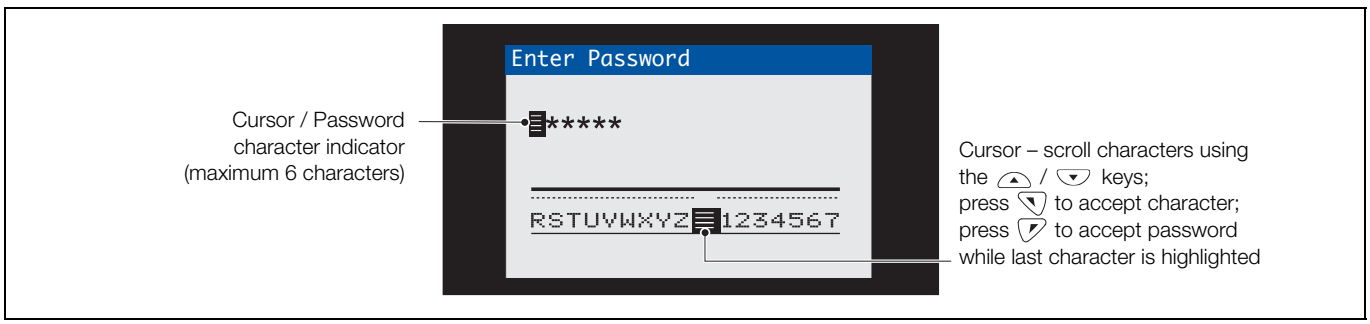


Fig. 6.14 Enter Password screen

6.10 Display icons

6.10.1 Diagnostic icons

Note.

- When a diagnostic condition is detected the associated NAMUR icon plus the highest priority diagnostic message is displayed in the Status Bar when the transmitter is in Operator View mode – refer to Appendix A, page 63 for diagnostic messages.
- If the status bar displays a diagnostic message, press the key to see all diagnostic messages.

NAMUR icons

	*Diagnostic* icon – *Out of Specification*.
	*Diagnostic* icon – *Maintenance Required*.
	*Diagnostic* icon – *Failure*.
	*Diagnostic* icon – *Check Function*.

Alarm, Hold and Calibration icons

	*Alarm* – indicates a user-defined alarm condition (20-character) and flashes intermittently with an associated NAMUR diagnostic icon.
	Hold – indicates that alarms / analog outputs are in a manual hold state.
	Calibrating – indicates that a calibration is in progress.

6.10.2 Title bar icons

	*Log* mode – indicates that one of the *View* pages is currently displayed (*Calibration, Alarm, Audit or Diagnostic*).
	*View* mode – indicates that one of the *View* pages is currently displayed (*Diagnostics, Alarms, Outputs, Signals* or *Chart*).
	Media on-line: 0 to <20 % full.
	Media on-line: 20 to <40 % full.
	Media on-line: 40 to <60 % full.
	Media on-line: 60 to <80 % full.
	Media on-line: 80 to <100 % full.
	Media on-line: full (icon toggles when full).
	Media off-line: 0 to <20 % full.
	Media off-line: 20 to <40 % full.
	Media off-line: 40 to <60 % full.
	Media off-line: 60 to <80 % full.
	Media off-line: 80 to <100 % full.
	Media off-line: not inserted (not logging).
	Media off-line: not inserted, logging active – icon display toggles with *Media off-line: not inserted (not logging) icon*.

6.10.3 Log icons

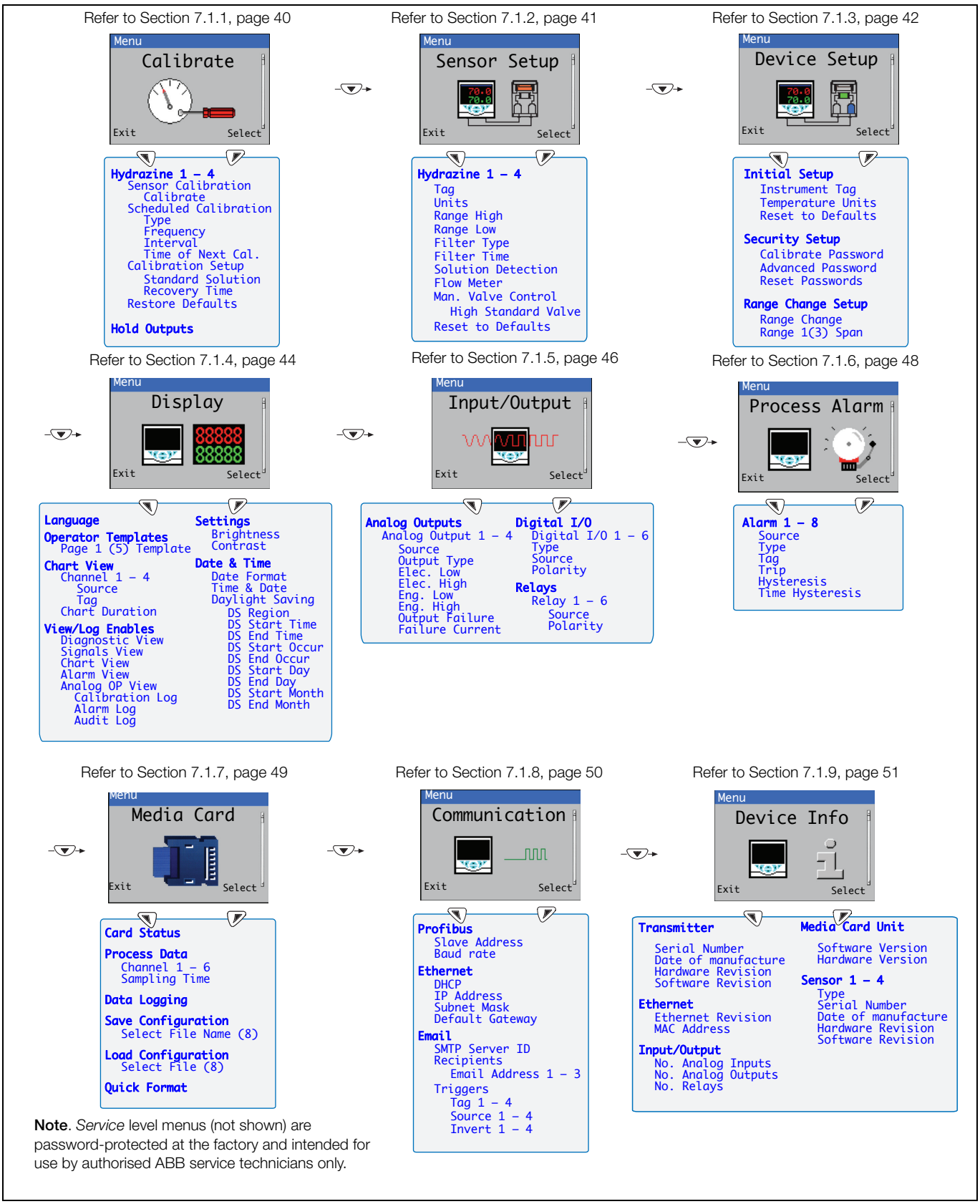
S1 T1	Source: wet-section 1 (red) S1 = sensor for wet-section 1 T1 = temperature for wet-section 1
S2 T2	Source wet-section 2 (green) S2 = sensor for wet-section 2 T2 = temperature for wet-section 2
S3 T3	Source wet-section 3 (blue) S3 = sensor for wet-section 3 T3 = temperature for wet-section 3
S4 T4	Source wet-section 4 (violet) S4 = sensor for wet-section 4 T4 = temperature for wet-section 4
	Power failed / power failed
	Configuration changed
	System Error
	File created / deleted
	Media inserted / removed
	Media on-line / off-line
	Media full
	Date / time or daylight saving start / end changed
	High process alarm active / inactive
	Low process alarm – active / inactive
	High latch alarm – active / inactive
	Low latch alarm – active / inactive
	Alarm acknowledged

6.10.4 Status bar icons

	*Operator* menu – displays the Operator menu when the ◥ key is pressed.
	*Autoscroll* – selected from the Operator menu (displayed when *Autoscroll* enabled). Indicates Operator pages are displayed sequentially. Disabled if 1 Operator page only is configured for display.
CAL	*Calibration* – shortcut access to the Calibration page when the ◤ key is pressed.
	*Enter* – selects the highlighted option from the *Operator* menus when the ◤ key is pressed.
	*Service Level* – indicates that alarms and analog outputs are held.
	*Advanced Level* – indicates that *Advanced Level* parameters are enabled for the current user.
	*Calibrate Level* – indicates that the *Calibration Level* parameters are enabled for the current user.
	*Read Only Level* – indicates that the transmitter is in *Read Only mode.* All parameters are locked and cannot be configured.

7 Menu descriptions

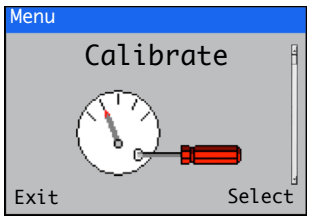
7.1 Menu overview



Note. *Service* level menus (not shown) are password-protected at the factory and intended for use by authorised ABB service technicians only.

Fig. 7.1 Overview of hydrazine menus

7.1.1 Calibrate

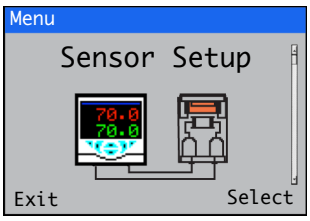


Used to calibrate the wet-section, adjust the *Recovery Time* and to enable / disable the *Hold Outputs* function.

Access to the *Calibrate* menu is permitted via the *Calibrate and Advanced* levels only.

Menu	Comment	Default
Hydrazine 1 – 4	The identity of the hydrazine wet-section being calibrated.	
Sensor Calibration		
Calibrate	Performs a 1-point calibration.	
Scheduled Calibration		
Type		
High Calibration		
Frequency	Selects the scheduled calibration frequency.	
Off		
Daily	Daily interval – *Daily, 2, 3, 4, 5, 6, 7* days.	
Weekly	Weekly interval – *Weekly, 2, 3, 4, 5, 6, 7, 8* weeks.	
Interval	Selects the scheduled calibration interval.	
Time of Next Cal.	Selects the time and date of the next and subsequent scheduled calibrations. Scheduled calibrations are not performed until the date / time set is reached. The date of the next scheduled calibration is updated automatically according to the frequency set. For example, if *Frequency* is *5* days and *Time of Next Cal*. is *12:00:00 2013-01-05*, it is updated automatically to: *12:00:00 2013-01-10*. **Note**. If the scheduled calibration cannot be run, or is not successful, the next scheduled calibration date is updated according to the *Frequency* set and a *Missed Scheduled Cal*. diagnostic message is created. Parameters are not enabled if Frequency is *Off*.	2000.01.01 00:00:00
Calibration Setup		
Standard Solution	Sets the standard solution value between 0 and 1000 ppb.	50 ppb
Recovery Time	Sets the recovery time in minutes (range 5 to 120 minutes).	15 minutes
Restore Defaults	Restores Calibrate parameters to their default values / settings.	
Hold Outputs	Enables / Disables the *Hold Outputs* function. If Enabled then Current Outputs and Alarm functions are held during calibrations and subsequent recovery periods.	Disabled

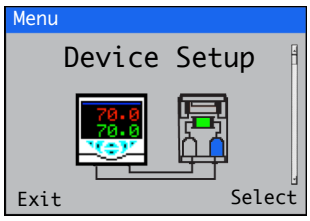
7.1.2 Sensor Setup



Used to set the wet-section tag, measurement units, operational range and filter type, enable / disable the *Flow Meter* (optional) and energize the solenoid valve (via the *Man.l Valve Control* menu).

Menu	Comment	Default
Hydrazine 1 – 4	The identity of the hydrazine wet-section being set up.	
Tag	Sets the (colored) 16-character alphanumeric wet-section tag displayed on *Operator Pages*.	TAG 1
Units	Selects the measurement unit: ppb / µg/l or µg/kg	ppb
Range High	Sets the span value in *Chart* and *Bargraph* views.	1000
Range Low	Sets the zero value in *Chart* and *Bargraph* views.	0
Filter Type	Selects the filter type: *Off / Min / Max / Average / Rolling Point*	Off
Filter Time	Sets the filter (input) time (5 to 100 seconds).	5 seconds
Solution Detection	Enables / disables the solution detection function. Generates a *No Solution* diagnostic if solution is not detected when *Enabled* – see page 64.	Enabled
Flow Meter	Enables / Disables the flow sensor function (active only if the flow sensor option is fitted).	Enabled
Man. Valve Control	The solenoid valve can be energized manually. The current concentration value is shown for reference. When the *Man. Valve Control* parameter is exited, the valve returns to the closed state. **Note**. Press the ⌃ key to open the valve manually, press the ⌄ key to close the valve manually.	
High Standard Valve	Enables the *High Standard Valve* for manual control.	
Reset to Defaults	Resets all parameters to their default values.	Disabled

7.1.3 Device Setup



This level is used to access standard setup parameters.

Menu	Comment	Default
Initial Setup		
`Instrument Tag`	A 16-character alphanumeric device (transmitter) identification tag displayed in the title bar on all *Operator* pages.	Navigator
`Temperature Units`	Selects the temperature units displayed (°C or °F).	°C
`Reset to Defaults`	Restores *Device Setup* parameters to their default settings.	
Security Setup		
`Calibrate Password`	Sets the password to enable access at *Calibrate* level. (Not factory-set).	
`Advanced Password`	Sets the password to enable access at *Advanced* level. (Not factory-set).	
`Reset Passwords`	Clears all passwords.	
Range Change Setup	**Notes**. ■ Displayed only if 1 single-stream wet-section is connected. ■ *Range 3* must always be the largest range, *Range 1* must always be the lowest. ■ Range Changing is disabled automatically when the sensor type is changed.	
`Range Change`	When *Enabled*, *Analogue Output 2*, *Relays 3* and *4* are configured automatically for range changing and are not available via the *Input/Output* sections.	Disabled

`Range 1 Span`
`Range 2 Span`
`Range 3 Span`
	For correct operation, *Range 1 Span* should be the lowest range and *Range 3 Span* should be the highest range.
	When *Enabled* – the following zero and span ranges 1 to 3 are set automatically:
	Range **Zero** **Span**
	1 0 10
	2 0 100
	3 0 1000
	The range spans can be changed to suit end-user's requirements.	

Continued on next page…

…Range Change Setup

Analog output operation

Analogue output 2 is used for the range changing functionality and is scaled depending on the range selected. The mA range is set automatically to 4 to 20 mA.

Analog output 2

Range	Zero	Span
1	0 % of mA range	100 % of mA range
2	0 % of mA range	100 % of mA range
3	0 % of mA range	100 % of mA range

Note. When range changing is enabled, the *Analog Output 2* parameter option in the *Input / Outputs* level is not available – see Section 7.1.5, page 46.

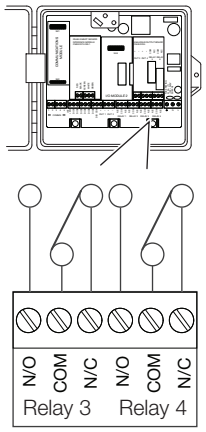
Relay operation

Relays 3 and 4 are used for the range changing functionality.

Connect Relay 3 – N/O to Relay 4 – COM

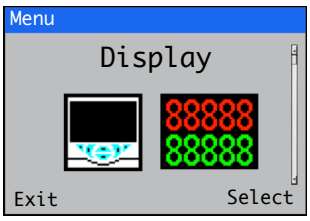
The range selection outputs can be determined as shown in the following table:

Range	Voltage-free contact	
1	Relay 3 – N/C	Relay 3 – COM
2	Relay 4 – N/C	Relay 3 – COM
3	Relay 4 – N/O	Relay 3 – COM



Note. When range changing is enabled, *Relay 3 and 4* parameter options in the *Input / Outputs* level are not available – see Section 7.1.5, page 46.

7.1.4 Display



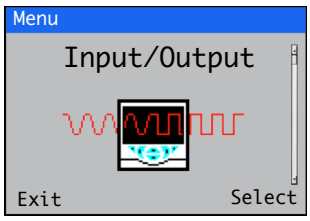
Used to select the display language, setup *Operator* page templates (1 to 5), enable diagnostic, view and log functions, set the device's display brightness / contrast and set the time and date.

Menu	Comment	Default
Language	Selects the display language: *English / German / French / Italian / Spanish*.	English
Operator Templates	Enables a template to be assigned to a wet-section for display purposes – refer to Section 6.5, page 28 for *Operator Template* examples.	Page 1
`Page 1 (to 5) Template`	*Page 1* template cannot be set, this defaults to the number of wet-sections fitted.	
Chart View	The chart can be configured to display the trend for 1, 2, 3 or 4 analog values. The engineering ranges for the process variable values are configured in the *Sensor Setup* menu – see page 41. **Note**. This menu is displayed only when *Chart View* is *Enabled* at the *Operator Functions / Chart View*.	
`Channel 1 (to 4)`		
`Source`	Selects the process variable signal to be displayed on the chart.	
`Tag`	A 3-character, alphanumeric tag used to identify the parameter on the chart.	
`Chart Duration`	Selects the chart duration from 1, 2, 4, 8, 12, 16, 20 and 24 hours.	
View/Log Enables	Enables / disables the following *View and Log* functions: *View* functions: *Diagnostics View / Signals View / Chart View / Alarm View / Analog OP View* – refer to Section 6.6, page 30 for examples of *Operator Pages* in *View* mode. *Log* functions: *Calibration Log / Alarm Log / Audit Log / Diagnostics Log* – refer to Section 6.7, page 31 for examples of *Operator Pages* in *Log* mode.	

Continued on next page…

…Menu	Comment	Default
Settings	Sets the following display parameters.	
Brightness	Increases / decreases the device's brightness settings to suit local environmental conditions.	
Contrast	Increases / decreases the device's contrast settings to suit local environmental conditions.	
Date & Time	Sets / formats the device's date, local time and daylight saving start / end times:	
Date Format	*DD–MM–YYYY / MM–DD–YYYY / YYYY–MM–DD*.	DD-MM-YYYY
Date & Time	Sets the device date and time in the format: (date format set at *Date Format* menu) XX–XX–XXXX / time (fixed format) HR:MINS:SEC.	01.01.2000
Daylight Saving	Sets the daylight saving parameters.	Off
DS Region	Selects the geographical region daylight saving hours are based on: ■ *Off* – daylight saving is disabled. ■ *Europe* – selects standard daylight saving start and end times automatically. ■ *USA* – selects standard daylight saving start and end times automatically. ■ *Custom* – used to set custom daylight saving start and end times manually for regions other than Europe or USA. **Note**. The *DS Start Time / Occur / Day / Month* and *Time* menus (below) are activated only when *Custom* is selected at the *DS Region* menu.	
DS Start Time DS End Time	Sets the daylight saving start time and end time, selected from 1-hour increments.	
DS Start Occur DS End Occur	Selects the day within the month that daylight starts / ends – for example, to set daylight saving to start (or end) on the second Monday of the selected month, select Second.	
DS Start Day DS End Day	Sets the day of the month daylight saving starts / ends. **Note**. The DS Start Occur / DS End Occur parameters must be valid within the month for the selected day.	
DS Start Month DS End Month	Sets the month daylight saving starts / ends.	

7.1.5 Input/Output



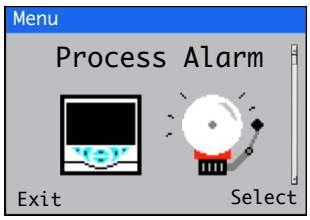
Input/Output level enables configuration of analog outputs, digital inputs and outputs and relays.

Menu	Comment	Default
Analog Outputs	The analog outputs can be configured to retransmit the process variable and temperature values and have a configurable range from 0 to 22 mA.	
Analog Output 1 to 4	*Analog Outputs 3* and *4* are available only if an option board is fitted – see page 18.	
Source	Selects the analog signal to be assigned to the output – see Table 7.1, page 52.	None
Output Type	Selects the output type required: ■ Linear ■ Log 2 Decades ■ Log 3 Decades ■ Log 4 Decades	Linear
Elec Low Elec High	The maximum and minimum engineering range output value (0 to 22 mA range).	4 mA 20 mA
Eng Low Eng High	The maximum and minimum engineering range output value. If the *Output Type* selection is logarithmic the *Eng Low* value is set automatically to 2, 3 or 4 decades below the *Eng High* value.	0 20,000
Output Failure	When enabled, the current output can be driven to a preset value if a *Failure* category diagnostic state occurs for the selected source – see page 63.	Enabled
Failure Current	Sets a preset value the current output is driven to when a *Failure* category diagnostic state is present. – see page 63. **Note**. Active only if *Output Failure* is *Enabled*.	22.0

Continued on next page…

…Menu	Comment	Default
Digital I/O	See page 18 for digital I/O connections.	
Digital I/O 1 to 6	Sets the polarity of the input or output signal	
Type	Sets the *Digital I/O* to operate as an output or an input: *Off* – no action taken. *Output* – the *Digital I/O* operates as an output. *Volt Free* – high input detected when volt-free switch across input is closed. *24 Volt* – digital input low <5 V, high> 11 V (maximum input 30 V).	Off
Source	Selects the digital signal to be assigned to the output – see Table 7.2, page 52.	None
Polarity	Sets the polarity of the output signal. *Inverted* – for an output, if the source is active the output is low. For an input, if a high signal is detected the input is inactive. *Non Inverted* – for an output, if source is active the output is high. For an input, if a low signal is detected the input is inactive.	Non Inverted
Relays		
Relay 1 to 6	*Relays 5* and *6* are available only if an option board is fitted – see page 18.	
Source	Selects the digital signal to be assigned to the relay – see Table 7.3, page 52.	None
Polarity	Sets the polarity of the relay: *Inverted* – if the source is active the relay is energized. *Non Inverted* – if the source is inactive the relay is energized.	Non Inverted

7.1.6 Process Alarm



Used to configure up to 8 independent process alarms.

Menu	Comment	Default
Alarm 1 to 8		
Source	Selects the analog value for the process alarm source.	None
Type	Selects the alarm type from: ■ High Process ■ Low Process ■ High Latch ■ High Latch	High Process
Tag	The alarm *Tag* is displayed as a diagnostic message and appears in the *Diagnostic Status Bar* and on the *Diagnostic View* page at *Operator* level – see page 28.	Alarm <n>
Trip	The alarm trip level in engineering units.	0.0
Hysteresis	The hysteresis trip level in engineering units. Activated at the alarm trip level but deactivated only when the process variable has moved into the safe region by an amount equal to the hysteresis value – see Process alarm examples below.	0.0
Time Hysteresis	If 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 timer is reset.	0

Process alarm examples

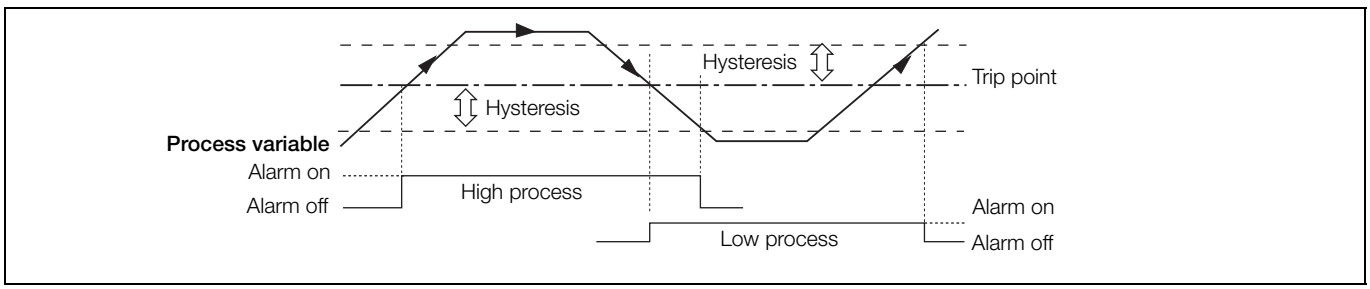


Fig. 7.2 High and low process alarm action

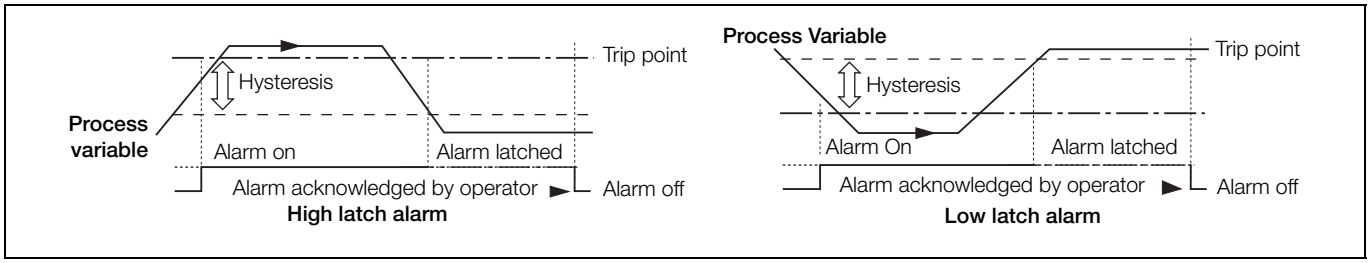
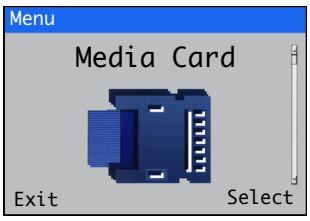


Fig. 7.3 High and low latch alarm action

7.1.7 Media Card

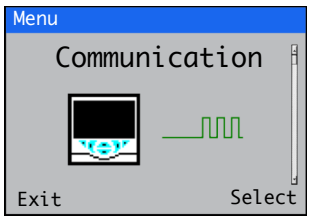


Used to set the card on / off status, select the process data to be logged, enter file configuration selection and save details and to format the media card.

Media Card level menus are enabled only if an optional media card module is fitted.

Menu	Comment	Default
Card Status	Selects card status, *Online / Offline*.	Online
Process Data		
`Channel 1 to 6`	Selects the source to be logged – refer to Section 7.2, page 52 for sources.	
`Sampling Time`	Selects the sampling duration time: 5 / 10 / 30 seconds 1 / 5 / 10 / 30 minutes 1 hour	5 seconds
Data Logging	*Enabled / Disabled* data logging. In *Enable* mode data can be written to internal / external media. In *Disable* mode, data is prevented from being written to internal / external media.	Enabled
Save Configuration		
`Select File Name (8)`	Enables a user-selected filename to be specified for the current configuration to be saved.	
Load Configuration		
`Select File (8)`	Selects the configuration file to be loaded from a list of previously saved files.	
Quick Format	*Disabled / Enabled*. Runs a quick format routine on the SD card / USB stick inserted into the transmitter's card reader.	Disabled

7.1.8 Communication

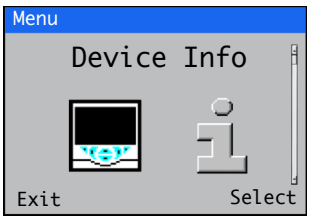


The *Communication* level is enabled only if an optional communications module is fitted.

Ethernet and Email menus are enabled only if a Ethernet communications module is fitted.

Menu	Comment	Default
Profibus		
`Slave Address`	Sets the device-specific slave address for identification on the network.	
`Baud Rate`	A read-only value (range 0 to 12000 K) taken from the PC the network is connected to.	
Ethernet		
`DHCP`	Sets DHCP (Dynamic Host Control Protocol) on / off. Set to *On* if the IP address is to be allocated dynamically by the network. Set to *Off* if the IP address is defined statically.	
`IP Address`	Sets the IP address to be assigned to the wet-section. The IP address is used by the TCP/IP protocol to distinguish between different devices. The address is a 32-bit value expressed with 4 values (0 to 255), each separated by a period (.). **Note**. Configurable only if *DHCP* is disabled.	
`Subnet Mask`	The subnet mask is used to indicate which part of the IP address is used for the network ID and which part is used for the host ID. Set each bit that is part of the network ID as '1's, for example: 255.255.255.0 indicates the first 24 bits are for the network ID.	
`Default Gateway`	Sets the IP address for the Default Gateway (router or switch) used to communicate with other networks. **Note**. This setting is required only if a router (or switch) is used.	000.000.000.000
Email		
`SMTP Server ID`	The IP (Internet Protocol) address of the SMTP (Simple Mail Transport Protocol) server used to distribute emails.	
`Recipients`		
`Email Address 1 – 3`	Enter the email address(es) of the recipient(s).	
`Triggers`		
`Tag 1 – 4`	The trigger description that appears in the subject title.	
`Source 1 – 4`	Up to 4 independently-configurable triggers can be enabled to generate an email when the selected source becomes active (the email can be sent to up to 3 recipients).	
`Invert 1 – 4`	If enabled, an email is generated when the *Source* becomes inactive instead of active.	

7.1.9 Device Info



Displays read-only factory-set details for the transmitter and connected wet-section(s).

Menu	Comment	Default
Transmitter		
Serial Number	The transmitter's serial number.	
Date of Manufacture	The transmitter's date of manufacture.	
Hardware Revision	The transmitter's hardware version number.	
Software Revision	The transmitter's software version number.	
Ethernet	Enabled only when an Ethernet communications module is fitted – see page 18.	
Ethernet Revision	The Ethernet module software version.	
MAC Address	The Ethernet physical address.	
Input/Output		
No. Analog Inputs	The number of analog inputs available.	
No. Analog Outputs	The number of analog outputs available.	
No. Relays	The number of relays available.	
Media Card Unit		
Software Version	The media card unit's software version number.	
Hardware Version	The media card unit's hardware version number.	
Sensor 1 – 4		
Type	The wet-section type(s) connected.	Hydrazine 1 (4)
Serial Number	The serial number.(s) of connected wet-section(s).	
Date of Manufacture	The date of manufacture of connected wet-section(s).	
Hardware Revision	The hardware version number(s) of connected wet-section(s).	
Software Revision	The software version number(s) of connected wet-section(s).	

7.2 Analog sources and digital input / output sources

7.2.1 Analog sources

Source name*	Description
Hydrazine 1 (4)	Measured concentration value for the associated wet-section.
Temperature 1 (4)	Measured temperature value for the associated wet-section.

Table 7.1 Analog sources

7.2.2 Digital output sources

Source name*	Description
Alarm 1 (8) State	Process alarm state (alarm 1 to 8).
S1 (4) Failure	The associated wet-section is in the failed state – see Appendix A, page 63 for possible causes.
S1 (4) Out of Spec.	The associated wet-section is out of specification – see Appendix A, page 63 for possible causes.
S1 (4) Maintenance	The associated wet-section requires maintenance – see Appendix A, page 63 for possible causes.
S1 (4) Function Check	The associated wet-section requires checking – see Appendix A, page 63 for possible causes.
Tx Failure	The transmitter is in the failed state – see Appendix A, page 63 for possible causes.
Tx Out of Spec.	The transmitter is out of specification – see Appendix A, page 63 for possible causes.
Tx Maintenance	The transmitter requires maintenance – see Appendix A, page 63 for possible causes.
Tx Function Check	The transmitter requires checking – see Appendix A, page 63 for possible causes.
S1 (4) Cal in Progress	A calibration is in progress for the associated wet-section.
S1 (4) Cal Failed	The last calibration has failed for the associated wet-section.

Table 7.2 Digital output sources

7.2.3 Digital input sources

Source name*	Description
S1 (4) High Std Cal	Calibration.
S1 (4) Hold	The measured concentration for the associated wet-section can be held via the digital input.

Note. It is recommended that a momentary switch is used to start or abort calibrations and a toggle switch is used for the hold functionality.

To start a calibration – hold the momentary switch for a minimum of two seconds; when the calibration starts release the switch.

To abort a calibration – hold the momentary switch for a minimum of two seconds; when the calibration aborts release the switch.

Table 7.3 Digital input sources

*(4) = maximum number of wet-sections if multiple wet-sections are connected.

8 Maintenance

8.1 Chemical solutions

Warning. Sodium Hydroxide is extremely caustic and must be handled with great care. Wear gloves and eye protection.

The following standard solutions are required to maintain the wet-section in operation. Solutions must be stored in plastic bottles and, where possible, should be freshly made.

Fig. 8.1 identifies solution tanks, filler points and QD couplings.

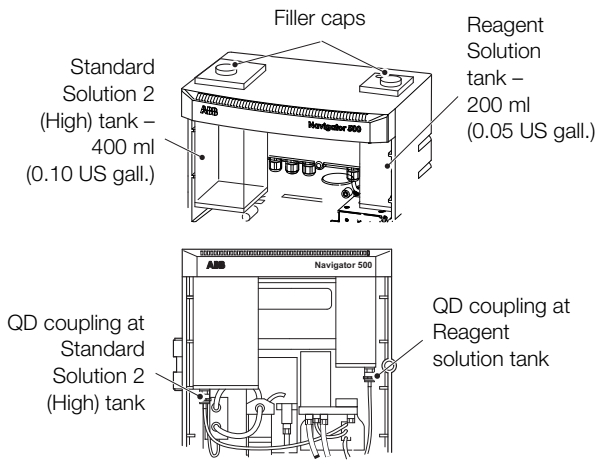


Fig. 8.1 Solution tanks

8.1.1 Reagent Solution – 5M (20% W/V) Sodium Hydroxide

The solution used to fill the reagent container is made up as shown below; consumption is approximately 250 ml in 2 to 4 weeks.

1. Weigh out 2.5 (±0.1) g EDTA and transfer to a 500 ml (16.9 fl oz) measuring flask (a little high purity water can be used to help this transfer).
2. In a separate vessel, weigh out 100 (±1) g sodium hydroxide, NaOH, pellets (analytical reagent grade) and dissolve in approximately 300 ml (10.0 fl oz) high purity water in a plastic container. Allow this solution to cool.
3. Transfer this solution to the measuring flask, shake well to dissolve the EDTA and top up to the mark with more high purity water.

8.1.2 Standard solution

Warning. Hydrazine sulphate is an irritant to skin and eyes. Avoid breathing the dust. Wear gloves, eye protection and a dust mask when handling this substance.

Choose a convenient value for the hydrazine concentration of the standard solution – typically 50 or 80 µg kg^{-1}. Other concentrations can be used if required.

Note. Hydrazine solutions deteriorate with time: replace the stock solution at monthly intervals. Dilute standard solutions must be freshly prepared.

Prepare a stock solution of 1000 mg l^{-1} hydrazine as follows:

1. Weigh out 4.058 (±0.001) g analytical reagent grade hydrazine sulphate (N_2H_4,H_2SO_4) and dissolve in approximately 800 ml (27.0 fl oz) high purity water.
2. Transfer to a 1 l (33.81 fl oz) volumetric flask and top up to the mark with more high purity water.
3. Dilute the stock solution to provide the required standard solution for the particular measuring range (usually 30 or 80 µg kg^{-1}).

8.2 Scheduled servicing

The procedure outlined is a guide to the maintenance requirements of the wet-section. The actual servicing schedule depends on the particular installation and sample conditions.

8.2.1 Weekly

1. Check level of solution in the reagent container. When the level is near the bottom of the container remove the container from wet-section, empty contents, rinse with high purity water and refill with reagent. Clean up any spillages.

   Reagent and calibration solutions are connected to their respective tubes using valved QD couplings.

   Warning. It is imperative that all leaks of potentially aggressive chemical solutions receive attention as soon as possible and all spillages are cleaned up.

2. Perform a calibration as described in Section 5, page 23.

8.2.2 6-monthly

1. Replace the microporous disc in the dosing chamber – see Section 8.2.4.
2. Replace tubing if stained or age hardened – see Section 8.2.5, page 55.

8.2.3 12-monthly

1. Replace all the tubing in the wet-section using the internal re-tubing kit – refer to Section 8.2.5, page 55.
2. Empty both the standard solution and reagent containers and replace the O-rings on each filler cap.

8.2.4 Replacing the microporous disc

Referring to Fig. 8.2:

1. Close the external sample isolation valve to the wet-section.

   > **Warning.** The reagent is extremely caustic and must be handled with great care. Wear gloves and eye protection.

2. Remove the special tool (A) from the holder.
3. Disconnect the QD coupling (B) on the reagent solution container and remove the reagent tube (C) from the membrane clamp (D), located on the top of the reagent dosing chamber (E).
4. Remove the two sample tubes (F) and (G) from the reagent dosing chamber (E).
5. Unscrew the 2 x reagent dosing chamber bracket retaining screws (H) and remove the reagent dosing chamber from the panel.
6. Locate the lugs of the special tool provided in the recesses in the membrane clamp (D) on top of the reagent dosing chamber (E) and unscrew the membrane clamp.

   Remove the O-ring located in the recess of the membrane clamp.
7. Carefully remove the old microporous disc with the end of a screwdriver and dispose of it safely. Rinse the chamber and fit a new (large) O-ring and microporous disc – part number AW503 061 see page 69.
8. Fit the second new (small) O-ring securely into the recess of the membrane clamp and refit the membrane clamp (D) using the special tool.
9. Refit the reagent dosing chamber (E) to the panel and connect the sample inlet tube (G).
10. Hold the reagent tube (C) over a suitably positioned beaker and reconnect the reagent QD coupling (B) to enable the reagent to flow through the tube to displace any air bubbles.
11. Connect the reagent tube (C) to the top of the reagent dosing chamber (E).
12. Establish flow through the new disc by clamping the sample inlet tube (G) and applying suction from a plastic syringe to the reagent dosing chamber outlet (I).
13. Connect the reagent dosing chamber outlet tube (F) to the reagent dosing chamber (E).
14. Allow approximately 1 hour for caustic dosage to be established (the pH of the effluent at the sensor outlet must be at least 10.5).
15. Calibrate as described in Section 5, page 23.

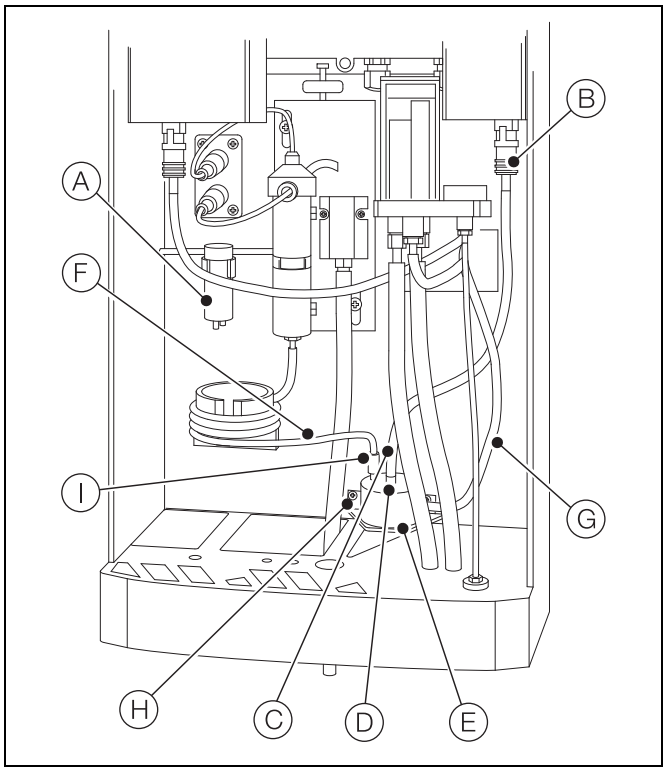


Fig. 8.2 Replacing the microporous disc

8.2.5 Replacing plastic tubing

Warning.

- This wet-section contains caustic and other solutions which must be handled with care. Wear gloves and eye protection.
- Clean up any chemical spillages immediately when performing this procedure.

In time, certain sections of plastic tubing require replacement, due to leakage, blockages or poor condition. It is good practice to replace all plastic tubing every 12 months – re-tubing must be performed using only the correct tubing lengths and part numbers – refer to Appendix C, page 68 for part numbers.

Before re-tubing the wet-section, observe the following notes:

- Tubing from the calibration and reagent containers and between the constant-head unit and solenoid valve must be cut from 1 x 610 mm (24 in.) length of part number 0212186 – refer to Table 8.1, page 56 for the cut lengths for each connection.
- Drain tubing from the constant-head unit (standard and emergency drains) must be cut from 1 x 480 mm (18.9 in.) length of part number 0212189 – refer to Table 8.1, page 56 for cut lengths.
- Do not modify tubing as this could affect critical flow paths within the wet-section.

To replace the plastic tubing:

1. Close the sample isolating inlet valve and allow the wet-section's liquid handling system to drain.
2. Place absorbent tissue at the bottom of the wet-section to soak up any spillages.
3. Note the arrangement of all tubing.

   Referring to Fig. 8.3, page 56:
4. Disconnect the reagent container QD coupling.
5. Cut new tubing (A) in half to make 2 x 240 mm (9.45 in.) lengths and push-fit each length onto the constant head unit drain stubs.

   Feed each length of tubing down through the large holes in the base of the wet-section and into funnel (see Fig. 3.4, page 10, for location details).
6. Fit a 100 mm (4 in.) length of new tubing (B) between the constant head unit outlet and solenoid valve.
7. Fit new tubing (C) to the sensor overflow drain barbed connector and feed to the main drain in the base of the wet-section (see Fig. 3.4, page 10, for location details).
8. Remove the old mixing coil (D) from the base of the hydrazine sensor and from the reagent dosing chamber outlet, unwinding it from the coil former.

   Connect new tubing (D) to the reagent dosing chamber outlet and lead it behind the coil former. Wind on 4 complete turns, ensuring closely spaced and not twisted and locate the tube in the coil former slot. Ensure that new tubing has no kinks or restrictions to flow along its length.

   Connect to the base of the hydrazine sensor.
9. Remove the tube (E) between the reagent dosing chamber and the solenoid valve and replace with new tubing (E).
10. Release the QD coupling from the standard solution container and remove the tube (F) from the solenoid valve.

    Remove the QD coupling from the tube (F).
11. Fit the QD coupling to a 230 mm (9 in.) length of new tubing (F) and fit the new tube to the solenoid valve – leave the QD coupling to the container unconnected until the container has been refilled with standard solution – see Section 8.1.2, page 53).
12. Release the QD coupling from the reagent solution container and remove the tube (G) from the dosing chamber (top).

    Remove the QD coupling from the old tube and retain the coupling.
13. Fit the QD coupling to a 280 mm (11 in.) length of new tubing (G) and fit the new tube to the solenoid valve – leave the QD coupling to the container unconnected until the container has been refilled with reagent – see Section 8.1.1, page 53).
14. Disconnect the sample inlet to constant-head unit tubing (H) and replace with new tubing.
15. Refurbish the hydrazine sensor as required. Follow the procedure in Section 8.4, page 58.
16. Follow the procedures in Section 4.2, page 19, from step 3 onwards.

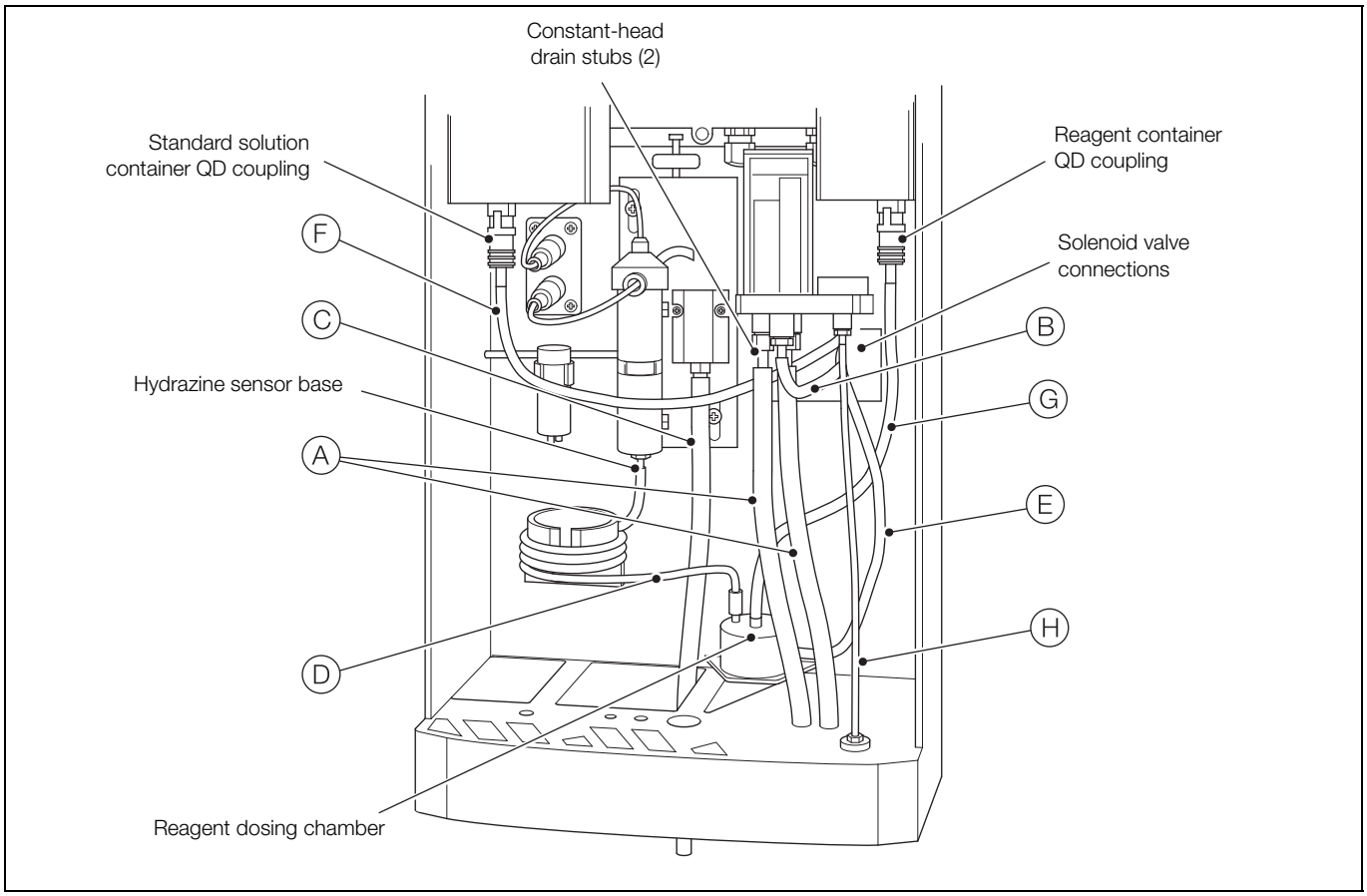


Fig. 8.3 Removing / Replacing tubing in wet-section

Item	Description	Length mm (in.)	Part number	Quantity
(A)	Drain tubing* (cut into 2 equal lengths of 240 mm [9.45 in.]): constant-head unit to drain outlet emergency constant-head unit to drain outlet	2 x 240 (9.45) cut lengths	0212189*	1*
(B)	Constant-head unit to solenoid valve tube**.	100 (3.93)	0212186**	1**
(C)	Drain tube – hydrazine sensor to drain.	1500 (59.0)	0212156	1
(D)	Mixing coil tube.	–	AW503171	1
(E)	Sample inlet tube – solenoid valve to dosing chamber (base).	–	AW503166	1
(F)	Calibration solution tube** – QD coupling to solenoid valve.	230 (9.0)	0212186**	1**
(G)	Reagent tube** – QD coupling to dosing chamber.	280 (11.0)	0212186**	1**
(H)	Sample inlet to constant-head unit tube.	210 (8.27)	0212362	1

Table 8.1 Replacement tubing lengths / part numbers

*Tubing 0212189 (item (A)) is supplied as 1 x 480 mm (18.9 in.) length and must be cut to make 2 x 240 mm (9.45 in.) lengths.

**Tubing 0212186 (items (B), (F), (G)) is supplied as 1 x 610 mm (24.0 in.) length and must be cut to make 3 lengths:

- item (B) – 1 x 100 mm (3.93 in.) cut length
- item (F) – 1 x 230 mm (9.0 in.) cut length
- item (G) – 1 x 280 mm (11.0 in.) cut length

8.3 Shut-down procedure

If the wet-section needs to be shut down for longer than 1 week, perform the following procedure:

1. Turn sample flow off and allow the constant-head unit to drain.
2. Turn the hydrazine sensor plugs (electrical connectors), located on the side of the liquid handling panel, anti-clockwise and disconnect them by pulling them from the sockets.

   Warning. The gel in the hydrazine sensor contains silver oxide and sodium hydroxide. It is caustic and stains skin and clothing. Wear gloves and eye protection.

3. Remove the hydrazine sensor and drain it as detailed in Section 8.4.1, page 58.
4. Replace the (drained) hydrazine sensor in its mounting clip.

   Warning. The reagent is extremely caustic and must be handled with great care. Wear gloves and eye protection.

5. Disconnect the QD coupling on the reagent container (see Fig. 8.3, page 56) and remove the reagent container. Either empty the contents into a storage container or discard, rinse out the container and replace in the wet-section.
6. Clean the porous disc by attaching a piece of tubing to the reagent dosing chamber outlet and place the other end in a beaker of high purity water. Clamp the reagent dosing chamber sample inlet tube – refer to Section 8.2.4, page 54, item (E).
7. Attach a large syringe (for example 50 ml) to the reagent inlet and draw the water through the disc. Repeat this several times. This procedure effectively back-flushes the dosing chamber assembly.
8. Flush the delay / mixing coil with demineralized water.
9. Remove the clamp on the reagent dosing chamber sample inlet tube, reassemble the panel, clean up any spillage and then close the wet-section door.

8.4 Refurbishing the hydrazine sensor assembly

Warning. The reagent used in the wet-section is extremely caustic and must be handled with great care. Gloves, protective clothing and eye protection must be worn throughout this procedure.

Note. Before removing the hydrazine sensor assembly, either:

- close the sample isolating valve upstream of the wet-section and leave the constant-head unit to drain

  or

- pinch off the sample inlet line from the constant-head unit to the hydrazine sensor assembly.

8.4.1 Hydrazine sensor removal

Referring to Fig. 8.4:

1. Disconnect the hydrazine sensor (A) (red) and temperature sensor (B) (blue) electrical connectors.
2. Pull the hydrazine sensor assembly (C) out of its mounting clip (D) on the sub-panel.
3. Holding the sensor over a suitable container, pull the inlet tube off inlet nipple (E) and let the tube and sensor drain into the container.

   Place the end of the inlet tube in the container.

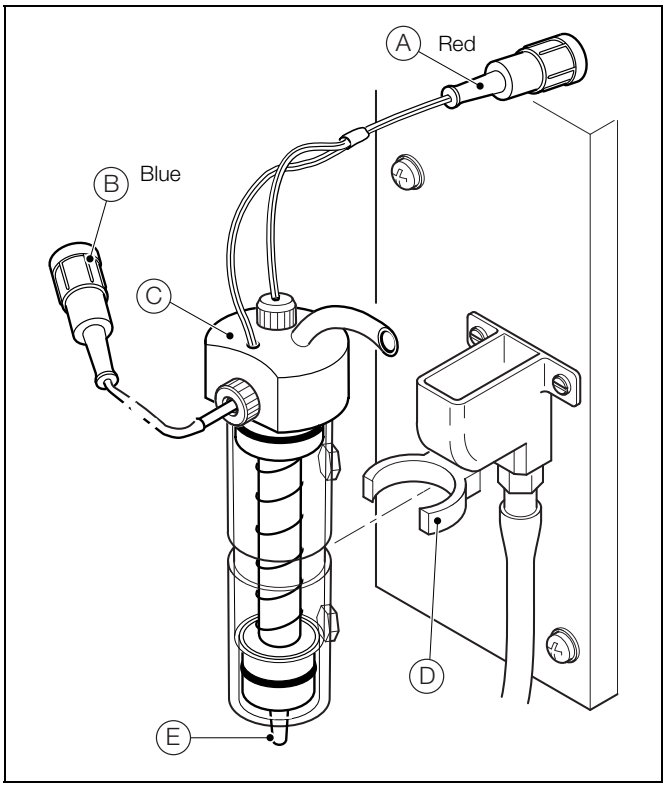


Fig. 8.4 Hydrazine sensor removal

8.4.2 Dismantling and cleaning

Referring to Fig. 8.5:

1. Remove the 2 x 10-32 UNF blanking plugs (A) and (B).
2. Hold outer sleeve (C) and carefully push the sensor assembly up from the inlet nipple (D) end to remove sensor from outer sleeve.

Warning. The gel in the hydrazine sensor assembly contains silver oxide and sodium hydroxide. The gel is caustic and stains skin and clothing. Wear gloves, protective clothing and eye protection.

3. Wash all components thoroughly with high-purity water to remove all traces of gel.
4. Unscrew knurled nut (E) and withdraw sleeve (F) and the platinum electrode, taking care not to damage the electrode or the electrical connection.
5. Insert the brush supplied in the sensor kit into the bore of the ceramic tube, rotate gently and withdraw. Immerse the platinum anode in a test tube containing 50 % nitric acid for a few minutes until clean.

Warning. Nitric acid must be handled with great care. Wear gloves, protective clothing and eye protection.

6. If the silver cathode is tarnished or blackened, dip a cotton wool bud in 50% nitric acid and rub over the wire to restore it to a matt silver finish. Rinse thoroughly with high purity water.
7. Soak the ceramic tube for one hour in 2 % sodium hydroxide solution and rinse with high purity water.

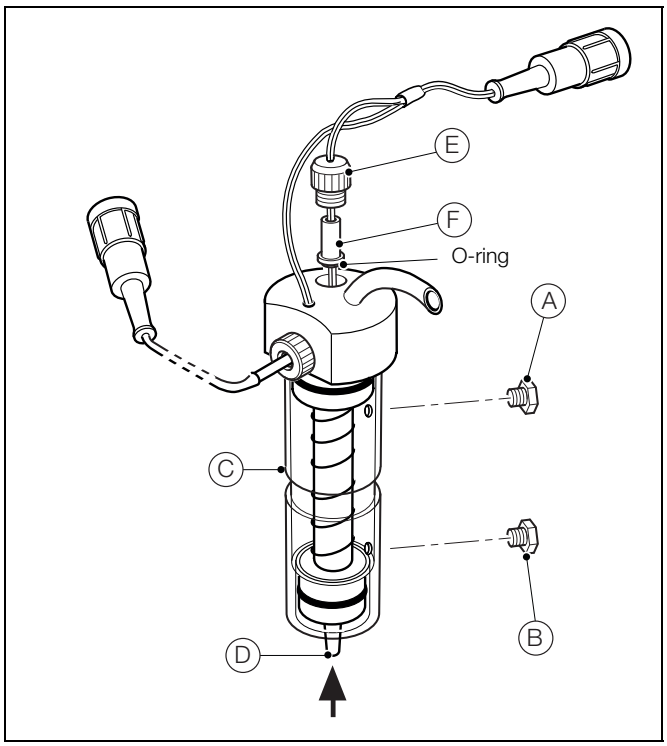


Fig. 8.5 Hydrazine sensor dismantling

8.4.3 Cleaning the platinum anode and sensor ceramic

Warning. Sodium Hydroxide is extremely caustic and must be handled with great care. Wear gloves and eye protection.

1. Switch off sample flow to the wet-section.
2. Refer to Section 8.4.2, page 58, steps 4 to 7.

8.4.4 Reassembly and refitting

Referring to Fig. 8.6:

1. Carefully insert the platinum electrode into the ceramic tube, taking care not to damage the electrode or the electrical connection. Refit sleeve (A) and secure with knurled nut (B).

   Ensure the O-ring is in good condition and located correctly.
2. Carefully slide outer jacket (C) onto the hydrazine sensor assembly.
3. Fill the hydrazine sensor assembly with fresh gel as follows:
   a. Holding the black closure cap tightly in place on the filling syringe, snap the syringe plunger into position and remove the black closure cap.
   b. Slowly inject the filling gel through the lower hole in the outer jacket until it reaches the top hole.
   c. Remove the syringe and replace its closure cap.
   d. Refit lower 10-32 UNF blanking plug (D).
   e. Refit upper 10-32 UNF blanking plug (E).
4. Push the hydrazine sensor assembly into clip (F) on the sub-panel, ensuring outlet tube (G) is positioned directly above drain tundish (H).
5. Reconnect the inlet tube to inlet nipple (J).

Note. Hold the hydrazine sensor firmly at the top so that the centre portion is not pushed out when the tube is connected.

6. Reconnect the hydrazine sensor (K) (red) and temperature sensor (L) (blue) electrical connectors.
7. Fill the reagent and calibration solution containers with their respective solutions.

Warning. The sample is dosed with sodium hydroxide and the concentration, although small at first, increases if any spillage is left to evaporate. Dispose of the outflow safely.

8. Open the sample isolating valve upstream of the wet-section and adjust the sample flow rate until sample is overflowing from the constant-head unit but not from the emergency overflow.
9. Ensure that the sample is flowing through the hydrazine sensor at the correct rate – refer to Section 3.1.1, page 8.
10. Close and lock the wet-section door.
11. Perform a calibration sequence – refer to Section 5, page 23.

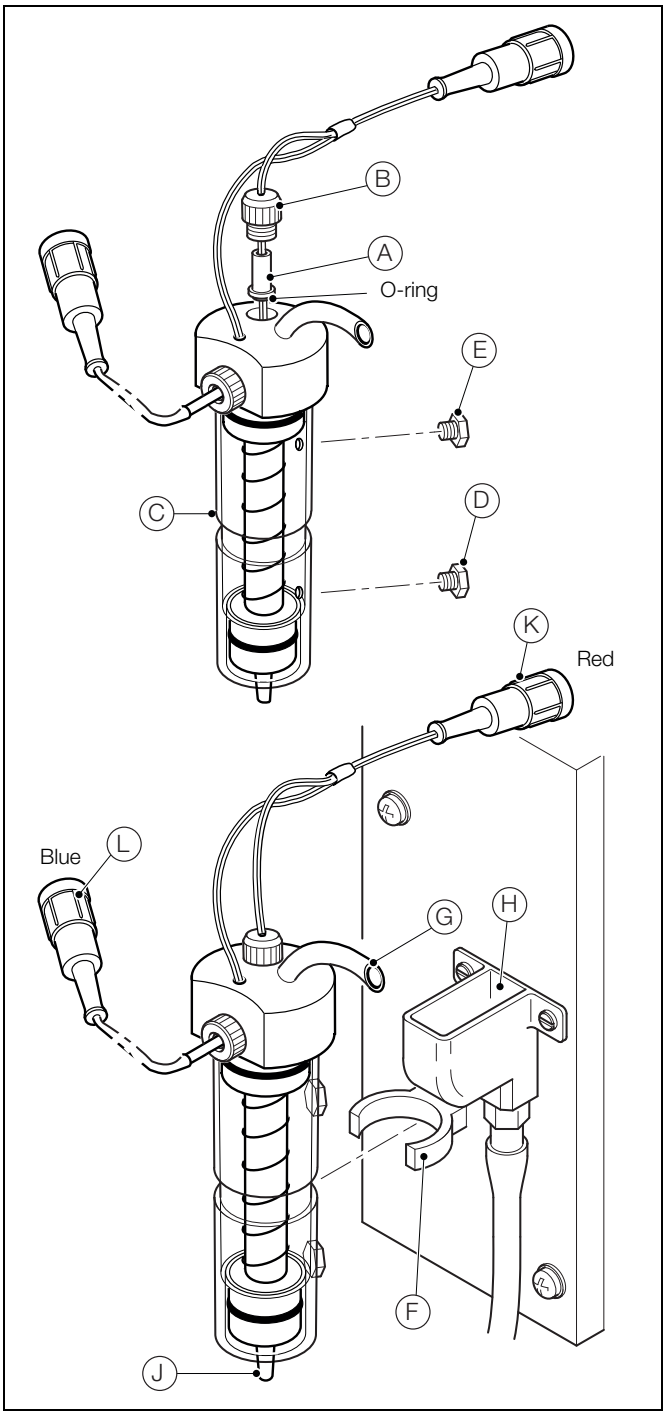


Fig. 8.6 Hydrazine sensor reassembly and fitting

9 Specification – system

Operation

Measuring range
0 to 1000 ppb

Units of measure
ppb, µg/l, µg/kg

Accuracy
±3 % of reading or ±1 ppb, whichever is the greater

Repeatability
±3 % of reading or ±1 ppb, whichever is the greater

Response time
<2 minutes for a 90 % step change

Resolution
0.1 ppb

Temperature compensation
5 to 55 °C (41 to 131 °F) automatic using a Pt1000

AutoCal frequency
Programmable from 1 to 7 days or 1 to 8 weeks

Sample temperature
5 to 55 °C (41 to 131 °F)

Sample pressure
1.5 bar gauge (21.7 psi) maximum

Sample flow rate
100 to 400 ml/min

Sample connections
1/4 flexible tubing to barbed connector

Environmental data

Ambient operating temperature:
0 to 55 ºC (32 to 131 ºF)

Ambient operating humidity:
Up to 95 % RH non-condensing

Storage temperature:
– 20 to 70 °C (–4 to 158 °F) without sensor
0 to + 55 °C (41 to 131 °F) with sensor

Approvals, certification and safety

CE mark

cULus

General safety
EN61010-1
Pollution category 2
Insulation category 2

EMC

Emissions & immunity
Meets requirements of IEC61326 for an industrial environment and domestic emissions

Maintenance

Periodic calibration:
User-defined

DS/AHM550–EN Rev. G

10 Specification – transmitter

Operation

Display

89 mm (3.5 in) color 1/4 VGA TFT, liquid crystal display (LCD) with built-in backlight and brightness / contrast adjustment

Language

English, German, French, Italian, Spanish

Keypad

6 tactile membrane keys:

Group select / left cursor, view select / right cursor, menu key, up, down, enter key

No of inputs

Up to 4 single-stream or 1 multi-stream wet-section.

Mechanical data

Protection

IP66 / NEMA 4X

Dimensions

Height – 194 mm (7.64 in) minimum (excluding glands)

Width – 214 mm (8.42 in) – excluding glands

Depth – 98 mm (3.85 in) door closed – minimum (excluding fixing brackets)

Weight – 1.5 kg (3.3 lb)

Materials of construction

Glass-filled polycarbonate

Security

Password protection

Calibrate and Advanced – user-assigned
Service level access – factory-set

Electrical

Power supply ranges

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

Power consumption

<30W

Terminal connections rating

AWG 26 to 16 (0.14 to 1.5 mm^2)

Analog outputs

2 standard

2 optional

Galvanically isolated from the rest of the circuitry, 500 V for 1 minute. Range-programmable source and range 0 to 22 mA, maximum load 750 Ω @ 20 mA

Relay outputs

4 standard

2 optional

Fully-programmable. Contacts rated at 2A @ 110 / 240 V. Standard relays are changeover. Optional relays are normally closed (N/C).

Digital inputs / outputs

6 standard, user-programmable as input or output

Minimum input pulse duration: 125 ms

Input – volt-free or 24 V DC (conforms to IEC 61131-2)

Output – open-collector, 30 V, 100 mA max.
(conforms to IEC 61131-2)

Connectivity / communications

Ethernet (optional)

TCP/IP, HTTP

Data logging

Storage

Measurement value storage (programmable sample rate)

Audit log*, Alarms log*, Calibration log, Diagnostics log, Configuration changes

Chart view

On local display

Historical review

Of data

Data transfer

Secure digital (SD) card interface / USB stick – Windows-compatible FAT file system, data and log files in Excel and DataManager Pro compatible formats

*Audit Log and Alarm Log data are stored in the same log file.

DS/AHM550-EN Rev. G

11 Specification – wet-section

Mechanical data

Protection

IP54

Dimensions

Height – 480 mm (18.90 in)

Width – 290 mm (11.41 in) – door shut

Depth – 185 mm (7.28 in) door closed – minimum (excluding fixing brackets)

Weight – 4.5 kg (10 lb)

Electrical

Power supply ranges (supplied by transmitter)

24 V DC max.

Power consumption

8 W max.

DS/AHM550–EN Rev. G

Appendix A – Troubleshooting

A.1 Diagnostic messages

The transmitter 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 transmitter are added to the transmitter's *Audit Log*.

The tables below show icon types, diagnostic messages and possible causes / suggested remedial action.

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

Diagnostic Icon	NAMUR Status
	Failure
	Check function
	Out of specification
	Maintenance required

Icon	Diagnostic message	Possible cause and suggested action
	**ADC Failure (S1, S2, S3, S4)**	Wet-section failure (temporary or permanent failure of analog to digital converter for wet-section 1, 2, 3, 4). Cycle power to the transmitter. If problem persists replace electronics inside wet-section, contact local service organization.
	**Excessive Power**	The wet-section is drawing more current than available. The power being drawn from the transmitter exceeds the maximum permitted. Check the wiring to all wet-sections connected for possible wiring problems. Check any digital outputs powered from the +24 V out terminal. Ensure the limits are not exceeded.
	**Int Comms Error**	Communication to wet-section failure Communication to one or all the wet-sections has failed during cyclic reads. Check wiring between transmitter and wet-sections.
	**No Sample (S1, S2, S3, S4)**	No sample available (at wet-section). Check sample flow rates are >50 ml/min.
	**NV Error Comm Bd**	NV error – comms. board (CRC Comms.). Failure of non-volatile memory on communications board or permanent corruption of its data. Cycle power to the transmitter. If problem persists check all configuration parameters and correct any errors. If problem still persists contact local service organization.
	**NV Error Main Bd**	NV error – main board (CRC Comms.). Failure of non-volatile memory on main board or permanent corruption of its data. Cycle power to the transmitter. If problem persists check all configuration parameters and correct any errors. If problem still persists contact local service organization.
	**NV Error Proc Bd**	NV error – processor board (CRC Comms.). Failure of non-volatile memory on processor / display board or permanent corruption of its data. Cycle power to the transmitter. If problem persists check all configuration parameters and correct any errors. If problem still persists contact local service organization
	**NV Error (S1, S2, S3, S4)**	Failure of wet-section (1, 2, 3, 4) non-volatile memory or permanent corruption of its data. Cycle power to the transmitter. If problem persists check all configuration parameters for all wet-sections and correct any errors. If problem still persists contact local service organization.

Table A.1 Diagnostic messages (Sheet 1 of 2)

Icon	Diagnostic message	Possible cause and suggested action
	**NV Error SW Key 1**	NV error – software key 1 (CRC Comms.). Failure of non-volatile memory on software key 1 board or permanent corruption of its data. Cycle power to the device. If problem persists check all configuration parameters and correct any errors. If problem still persists contact local service organization.
	**Temp Failure (S1, S2, S3, S4)**	Temperature sensor failure for wet-section1 (2, 3, 4). The temperature compensator or associated connections are either open-circuit or short-circuit. Check wiring at temperature compensator connections to the PCB.
	**Calibrating (S1, S2, S3, S4)**	Displayed during calibration of wet-section (1, 2, 3, 4), when wet-section is exposed to air. On a multiple wet-section setup, this inhibits the calibration of other wet-sections.
	**In Hold Mode (S1, S2, S3, S4)**	Wet-section (1, 2, 3, 4) in manual hold mode via front panel. Analog outputs and alarms are held. To exit manual hold press the ▽ key, scroll to *Manual Hold* and select the appropriate wet-section(s).
	**Recovery (S1, S2, S3, S4)**	Wet-section(s) performing a recovery stage after calibration or regeneration or after exiting *Man. Valve Control* – see page 41. During the recovery period, outputs and alarms are held if *Hold Outputs* is enabled – see page 40.
	**Simulation On**	The analyzer is operating in *Simulation* mode.
	**Cal. Failed (S1, S2, S3, S4)**	Last wet-section calibration failed. Check the calibration solution – refer to Appendix A.3, page 65.
	**Flow Error (S1, S2, S3, S4)** *Displayed only if flowmeter is fitted*	Sample flow rate is less than 50 ml/min (3.05 cu in./min) Increase the sample flow to the wet-section.
	**Media Card Full**	Memory card is full, no more data can be saved to the card. Replace memory card.
	**Missed Cal. (S1 S2, S3, S4)**	Missed last schedule calibration.
	**PV Range (S1, S2, S3, S4)**	Process value (PV) measured is out of the specified range of the wet-section. 0 to 1000 ppb.
	**Sample Cold (S1, S2, S3, S4)**	Sample solution temperature lower than 5 °C (41 °F). Increase the temperature of the sample.
	**Sample Hot (S1, S2, S3, S4)**	Sample solution temperature higher than 55 °C (131 °F). Reduce the temperature of the sample.
	**No Sample (S1, S2, S3, S4)**	No sample available at wet-section. **Note**. Displayed only if *Solution Detection* is enabled.
	**Media Near Full**	Memory card is more than 90% full. Replace memory card.

Table A.1 Diagnostic messages (Sheet 2 of 2)

A.2 Checking the temperature input

1. Check that the wet-section responds to a temperature input. Disconnect the Pt1000 temperature compensator leads in the wet-section PCB (see Section 3.4.2, page 15) and connect a suitable resistance box to the wet-section PCB inputs.

   Note. Resistance boxes have an inherent residual resistance which may range from a few milliohms up to 1 ohm. This value must be taken into account when simulating input levels, as should the overall tolerance of the resistors within the box.

2. Check that the transmitter displays the correct values as set on the resistance box – see Table A.2. Incorrect readings usually indicate an electrical calibration problem.

Temperature °C (°F)	Resistance Ω
0 (32)	1000.0
10 (50)	1039.0
20 (68)	1077.9
30 (86)	1116.7
40 (104)	1155.4
50 (122)	1194.0
60 (140)	1232.4

Table A.2 Temperature readings for resistance inputs

3. If the readings checked at step 2 are correct, perform a resistance check on the Pt1000 temperature compensator and confirm the values are as shown in Table A.2.
4. If the readings are still incorrect, check the connector block cable connections at the wet-section PCB and their condition.

A.3 Incorrect or erratic flow rate sensor readings

Incorrect or erratic flow rate readings may be due to a blockage in the flowmeter. Stop the flow of sample to the wet-section, remove the flowmeter and back-flush it with water or air. Re-connect the flowmeter, start the sample flow and check the flow reading. If the problem persists a replacement flowmeter may be required – see page 70.

A.4 Simple electronic check

In the unlikely event that a problem is encountered with the wet-section, use a current (µA) source and a resistance box to test the transmitter electrical connections.

To perform a simulated calibration proceed as follows:

1. Access the wet-section PCB as described in Section 3.4.1, page 14.
2. Disconnect the sensor and Pt1000 connections as follows:

   31: Sensor (Red)

   32: Sensor (Blue)

   33: Pt1000 (Black)

   35: Pt1000 (Yellow)
3. Connect the appropriate wires of the current source and resistance box to TB2 as follows:

   current source +ve: 31

   current source –ve: 32

   Resistance box: 33

   Resistance box: 35
4. Set the appropriate resistance value corresponding to the thermistor resistance at the nominal sample temperature, for example:

   20 °C = 1077.9 Ω
5. Select the nominal calibration value to 80 µg kg^{-1}.
6. Set the current source to 15 µA.
7. Initiate a calibration sequence by pressing the CAL button.
8. After 15 minutes the display reads the selected concentration value.
9. Check the wet-section range with different µA values. The relative values are as follows:

µA	µg kg^{-1}
1.875	8.4
3.75	18.7
7.5	39.1
15	80.0
18.75	100.4

Note. When the electronic systems are operating correctly, the displayed concentration value should be within ± 0.2 µg kg^{-1} of the selected value.

A.5 Unscheduled servicing

A.5.1 Wet-section malfunction

Diagnostic messages on the display are used to indicate abnormal wet-section operation – refer to Appendix A.1, page 63.

Some problems may be due to the standard solution or reagent solutions – check flow rates of these solutions. If any doubts exist regarding the integrity of these solutions, replace with freshly-prepared solutions in the early stages of the fault-finding investigations. The accuracy of the wet-section is governed by the condition of all the solutions involved some may have been made incorrectly or have become contaminated.

Check mechanical components involved with the liquid handling regularly for leaks or blockages, as they change the chemical conditions around the electrode.

Ensure the liquid flow paths are free of air bubbles. This can be done by attaching a syringe to the outlet of the hydrazine sensor and pulling sample or standard through the liquid flow path.

A.5.2 Calibration fail alarm

Calibration problems, normally shown as a *Cal. Failed* diagnostic message and alarm, indicate that the output of the sensor is less than 40 % efficient. The problem is likely to be resolved through one or more of the following checks:

1. Check that the red and blue sensor plugs are inserted fully into the red and blue sockets, respectively.
2. Replace the standard solutions as a fresh solution may solve the problem. Check that the solenoid valve is energized (an audible click is produced when the calibration is initiated) and that the standard solution is flowing through the sensor – air bubbles should be visible at the bottom of the standard solution Boyle Mariotte tube – see Fig. A.1.

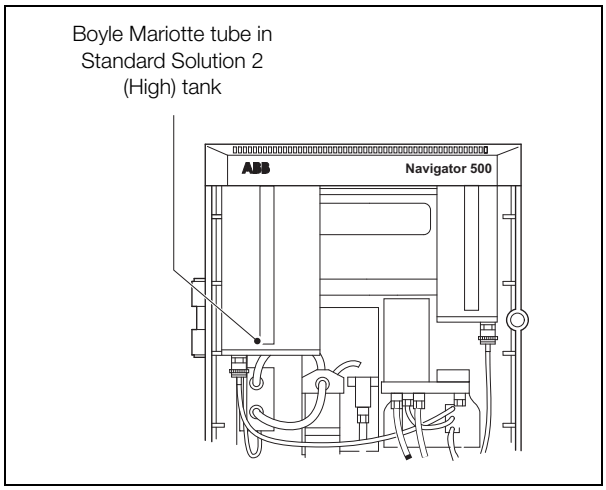


Fig. A.1 Boyle Mariotte tube in standard solution 2 (high) tank

3. Check that the standard solution value entered into the wet-section is correct for the solution used.
4. Check the sodium hydroxide solution dosing by measuring the pH of the sample flowing through the sensor; it must be at least 10.5.
5. Check that the two electrodes are clean. The silver cathode can be cleaned only when the sensor is refurbished. The platinum anode can be cleaned when required – see Section 8.4.2, page 58.
6. Check the condition of the gel in the sensor. In normal operation the life is usually 3 to 6 months. The gel should have even color, even consistency and no signs of separation or drying out. If the gel shows signs of being very liquid and leaks out of the sensor, refurbish the sensor – see Section 8.4, page 58.

   The shelf life of the gel before use can vary, but can be up to 1 year providing that the syringe cap is fitted tightly.
7. Remove any air trapped in the flow paths with a syringe and then check the flow rates of both the standard solution and the sample – see page 20.
8. Check the sample temperature reading on the display against a thermometer reading of the sample.

If there are discrepancies between wet-sections and independent laboratory results, investigate the points in steps 2, 3, 4 and 8.

Electronic problems are unlikely, but the operation of the electronics can be checked using a current source to simulate the output from the sensor. For details of this procedure, refer to Appendix A.4, page 65.

A.5.3 Hydrazine sensor check

Before checking the sensor, ensure the fault condition is not due to incorrect sample and calibration flow rates caused by an air bubble in the sensor or flow line. To remove air, lift the platinum electrode slightly and allow some liquid to escape, carrying any bubbles with it. Alternatively, connect a syringe to the sensor outlet and apply slight suction – refer to Fig. 8.6, page 59.

Appendix B – Multiple wet-section setup

A single Navigator 500 transmitter can monitor up to 4 wet-sections. The wet-sections can be any combination of the three Navigator 500 parameters – sodium, low level dissolved oxygen and hydrazine. Note that the transmitter cannot monitor more than 1 wet-section if the wet-section is a multi-stream sodium.

If an additional wet-section is added to a transmitter, the procedures in sections B.1 and B.2 (below) must be performed.

B.1 Configuring the device address

The unique device address assigned to the wet-section (1 to 4), enables the transmitter to identify the wet-section on the data transmission link. Each wet-section must have its own unique address. The address can be set by SW1 as shown in Table B.1 and Fig. B.1. LEDs D4 and D5 indicate the slave address of the PCB.

Slave address	SW1.1	SW1.2	LED D4	LED D5
1	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	ON
3	ON	OFF	ON	OFF
4	ON	ON	ON	ON

Table B.1 Configuring the device address

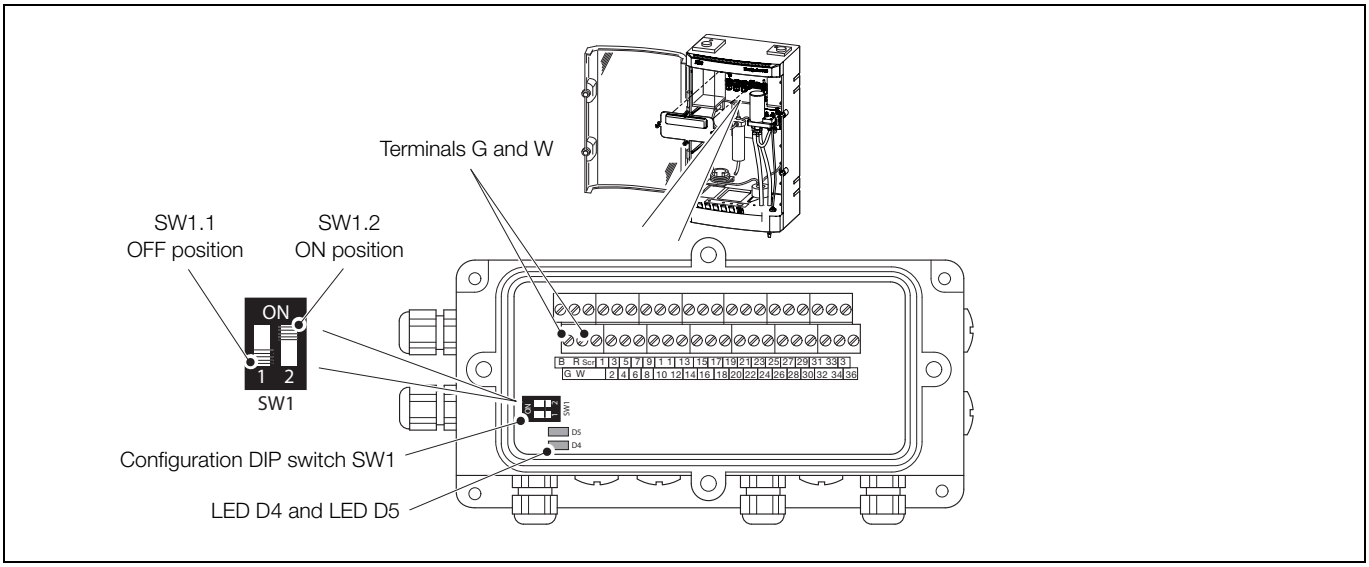


Fig. B.1 Configuration DIP switch SW1 and LED D4 / D5 location

B.2 Serial connections

Each wet-section must be connected in a 'daisy chain' format as shown in Fig. B.2.

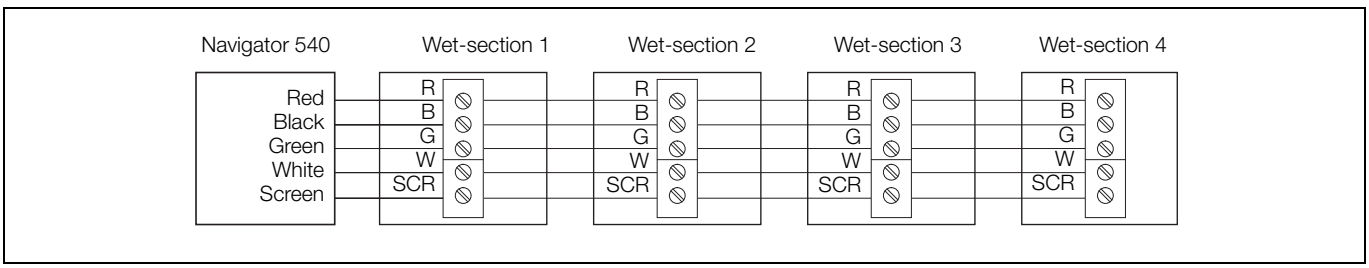


Fig. B.2 Serial connections

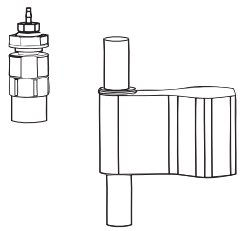
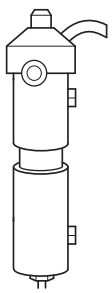
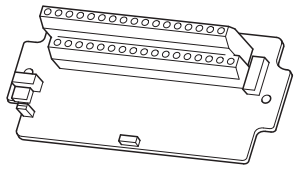
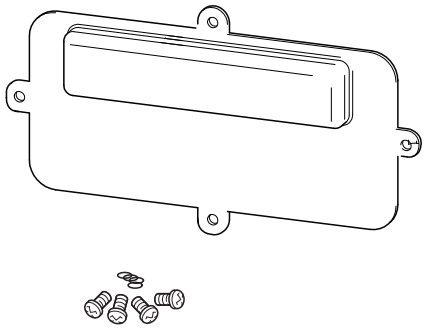
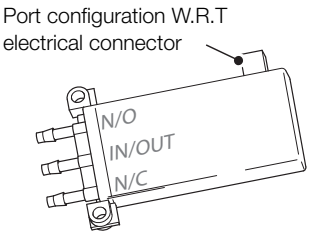
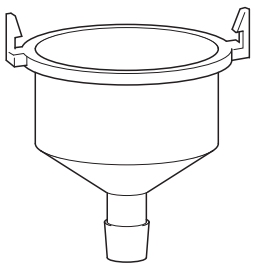
Note. The total cable length between the transmitter and the last wet-section must not exceed 30 m (98 ft.).

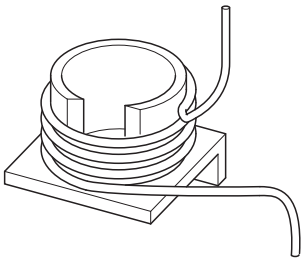
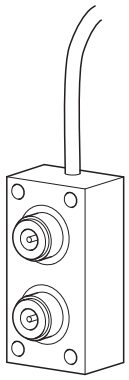
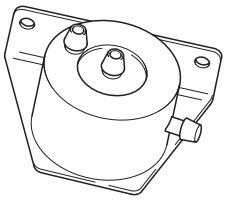
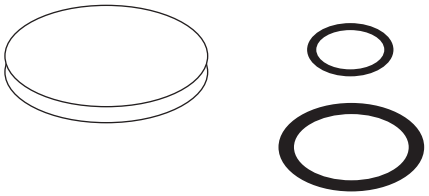
Appendix C – Spare parts

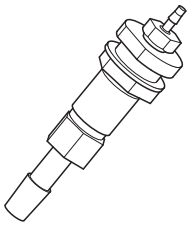
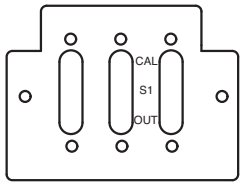
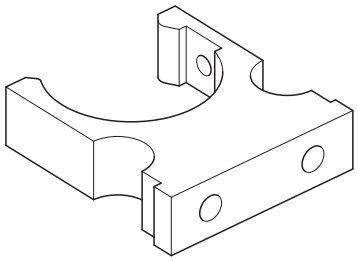
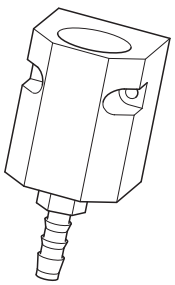
C.1 Navigator 500 hydrazine consumables

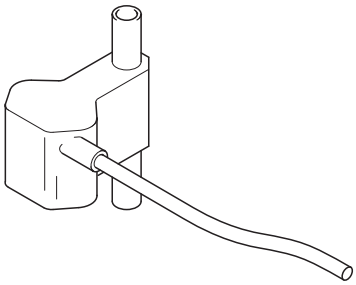
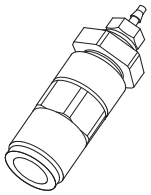
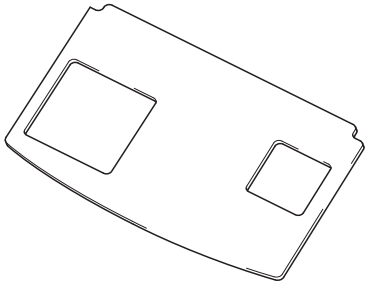
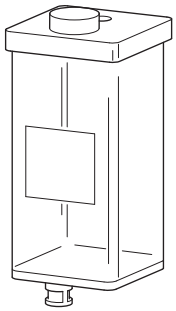
Part No. / Type	Usage / Volume
AWRS5000201 Hydrazine reagent	Provides 4 to 8 weeks of continuous operation. Shelf life 2 years. Also available as a kit (AWRK5000211), see below.
AWRS5000202 Hydrazine standard – 50 ppb hydrazine	Provides 2 calibrations. Shelf life 4 months. Also available as a kit (AWRK5000212), see below.
AWRK5000211 Hydrazine reagent kit	6 x 0.5 liter bottles of hydrazine reagent.
AWRK5000212 Hydrazine standards kit	6 x 1 liter bottles of 50 ppb hydrazine standard.

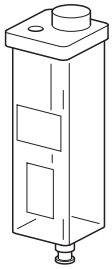
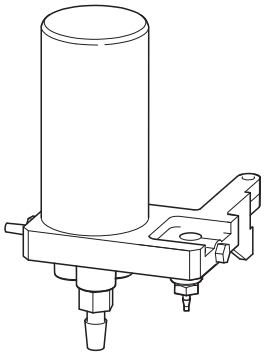
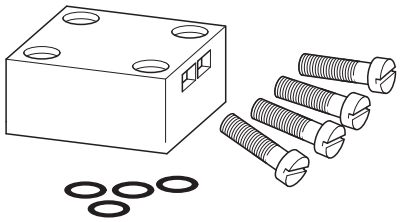
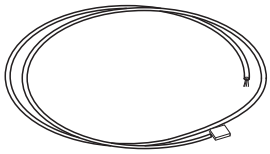
C.2 Navigator 500 hydrazine wet-section

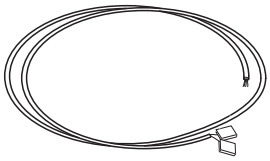
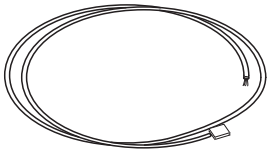
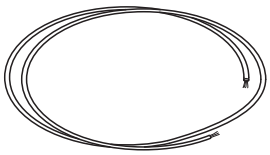
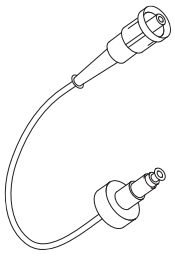
Part No.	Description
AW500 040	Flowmeter upgrade kit 
AW503 040	AHM550 hydrazine sensor assembly 
AW503 050	Hydrazine wet-section PCB 
AW503 051	PCB housing seals 
AW503 052	Terminal cover, O-ring and screws 
AW503 053	Solenoid valve – hydrazine 
AW503 054	Funnel – drain 

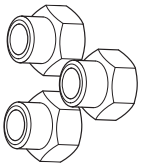
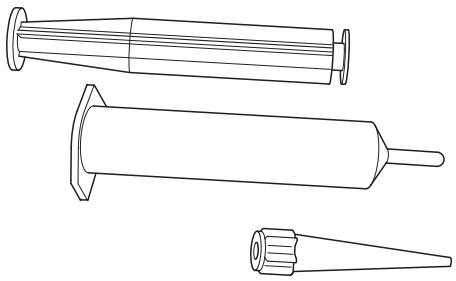
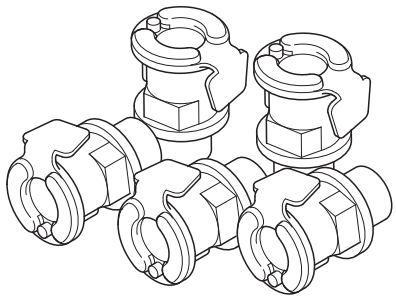
Part No.	Description
AW503 055	Delay coil assembly including tubing and fasteners 
AW503 058	Sensor connector block 
AW503 060	Dosing chamber assembly (including bracket and fasteners) 
AW503 061	Dosing chamber micro-porous disc and O-rings (2 of each O-ring) 

Part No.	Description
AW503 064	Sample adaptor kit 
AW503 065	Valve mounting plate 
AW503 066	Sensor mounting kit (including fasteners) 
AW503 067	Tundish assembly 

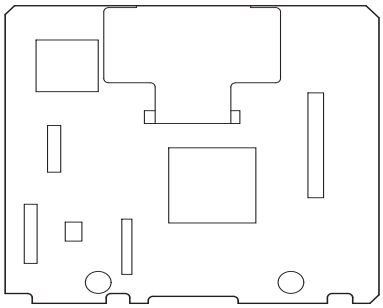
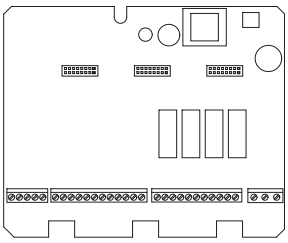
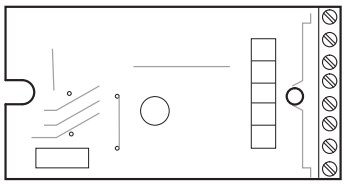
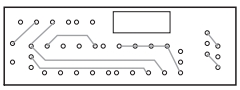
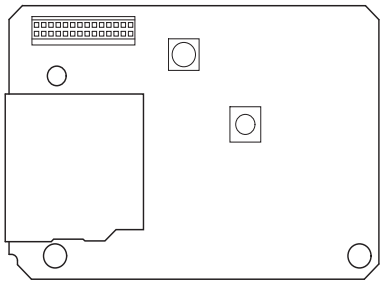
Part No.	Description
AW503 068	Flowmeter – hydrazine 
AW503 069	Flowmeter adaptor kit 
AW503 070	Top cover plate 
AW503 072	Caln tank assembly 

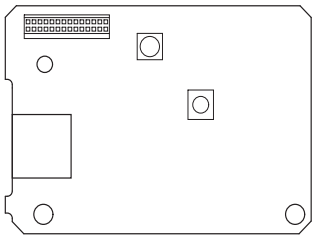
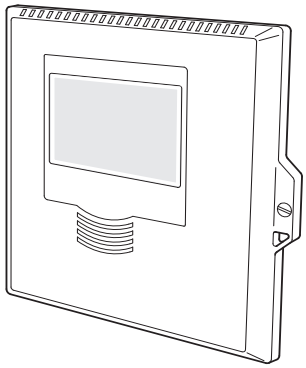
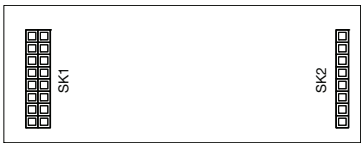
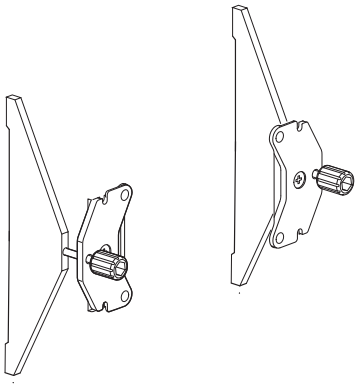
Part No.	Description
AW503 073	Reagent tank assembly 
AW503 075	Constant head assembly, including fittings 
AW503 077	Pressure switch assembly (1.25 in. set point) including O-rings and fasteners 
AW503 080	Cable assembly – hydrazine calibration solenoid valve 

Part No.	Description
AW503 085	Cable assembly – pressure switch 
AW503 086	Cable assembly – flowmeter 
	Modbus cable assembly:
AW503 090	1.5 m (4.9 ft.)
AW503 091	5 m (16.4 ft.)
AW503 092	10 m (32.8 ft.)
AW503 093	20 m (65.6 ft.) 
AW503 302	Pt1000 temperature compensator assembly, including clamp ring 

Part No.	Description
AW503 303	Hydrazine sensor filling plug kit (3 off) 
AW503 062	Tubing kit – required for 12-monthly maintenance (includes tubing supplied in AW503 063) – see Section 8.2.3, page 54.
AW503 063	Calibration and reagent solution tubing (only) kit – required for 12-monthly maintenance, see Section 8.2.3, page 54.
7830061	Sensor recharge kit 
3KXA004214U0000	5 off $^{1}/_{8}$ in BSP socket connectors 

C.3 Navigator 540 transmitter

Part No.	Description
AW500 050	AWT processor board spares kit 
AW500 051	AWT main board spares kit 
AW500 052	AWT sensor input PCB (Digital RS485) 
AW500 053	AWT analogue output PCB (2 current outputs + relays) 
AW500 054	AWT SD media PCB spares kit 

Part No.	Description
AW500 055	AWT USB media PCB spares kit 
AW500 056	Door assembly spares kit 
AW500 058	AWT Profibus DPV1 PCB 
AW500 060	AWT panel-mount kit 

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