

Navigator 550

Sodium wet-section



Measurement made easy

—
Navigator 550
sodium wet-section

Introduction

This publication provides commissioning instructions for the Navigator 550 sodium wet-section. The wet-section is used in conjunction with the Navigator 540 transmitter.

Note.

Purchase or prepare the correct solutions prior to commissioning:

- to purchase solutions, contact your local ABB representative
- to prepare solutions, refer to Solution preparation (overleaf)

For more information

Further publications are available for free download from:

abb.com/measurement

or by scanning this code:



Search for or click on

Data Sheet DS/ASO550-EN
Navigator 500
Sodium analyzer

Operating Instruction OI/ASO550-EN
Navigator 500
Sodium analyzer

Commissioning Instruction CI/AWT540-EN
Navigator 540
Transmitter

Health & Safety

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 and maintenance of this product must only be conducted by personnel authorized to work on electrical installations and in accordance with relevant local regulations.

Potential safety hazards

Electrical

The Navigator 550 sodium wet-section operates from 24 V DC supplied from the Navigator 540 transmitter. There are no hazardous voltages present.

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.
- Concentrated ammonia solution – this reagent should only be handled under a fume hood. It causes burns and is irritating to the eyes, respiratory system and skin. Wear rubber gloves and eye protection. In warm weather pressure increases in the bulk container of ammonia and the cap must be released with care.
- 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) can be obtained from the Company, together with servicing and spares information.

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.

Safety conventions

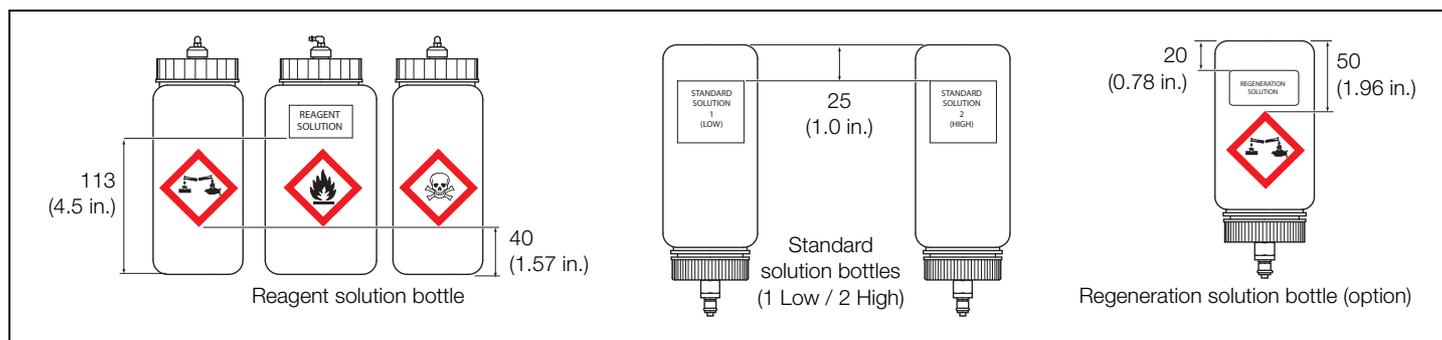
Warning. In this manual, a warning is used to indicate a condition which, if not met, could cause serious personal injury and / or death. Do not proceed beyond a warning until all conditions have been met.

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.

Solution bottle safety and identification label positions

Safety and identification labels must be fixed to the solution bottles using the dimensions / positions shown below.



Symbols

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.

Product recycling and disposal (Europe only)

	<p>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.</p> <p>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.</p>
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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.

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.
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Specification

Mechanical data

Protection

IP54

Dimensions

Height – 480 mm (18.90 in.) – excluding bottle carrier

– 668 mm (26.30 in.) – including bottle carrier

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 (supplied by transmitter)

24 V DC max.

Power consumption

8 W max.

1 Sample requirements

The sampling point should be as near as possible to the wet-section and must provide a thoroughly mixed representative sample.

The sample must conform to the following conditions:

- 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 (6.10 to 24.4 to cu in./min.).
- Sample must not exceed 1.5 bar gauge (21.75 psi).

2 Locating the wet-section

Referring to Fig. 1:

1. Locate the wet-section / transmitter indoors in a clean, dry, well-ventilated, easily-accessible area.
2. Do not locate in rooms containing corrosive gases or vapors – for example, with chlorination equipment or chlorine gas cylinders.
3. Select a location not subject to strong electrical and magnetic fields. If this is not possible (for example, where mobile communications equipment is present), use screened cables within flexible, earthed, metal conduit.

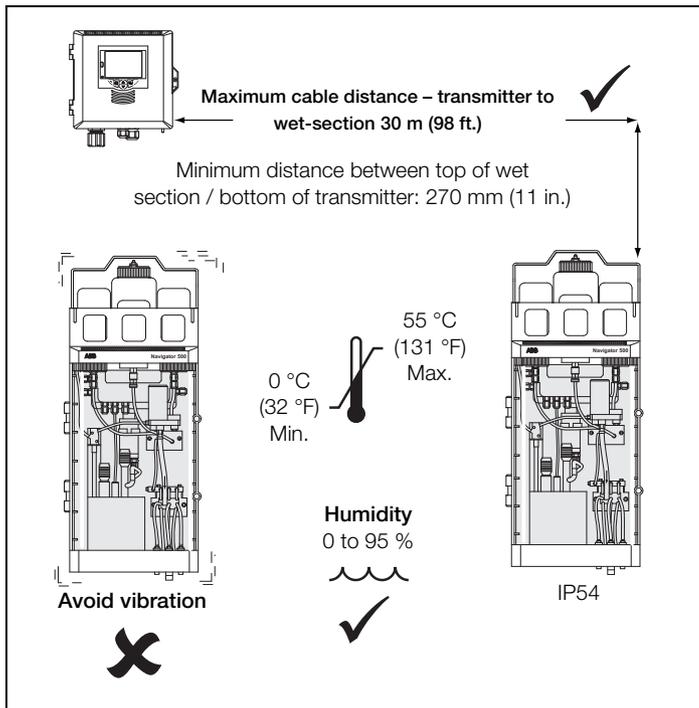


Fig. 1 Locating the wet-section

3 Mounting the wet-section

Refer to Fig. 2 for wet-section dimensions. The wet-section weighs 4.5 kg (10 lb), excluding solutions.

Note.

1. Allow sufficient room for clearance – the enclosure doors can open 180°. If mounting in a confined area, allow sufficient clearance for door opening.
2. When installing, allow a further 60 mm (2.36 in.) min. to remove the bottle carrier assembly or 135 mm (5.31 in.) min. to remove the calibration solution bottle from the carrier.

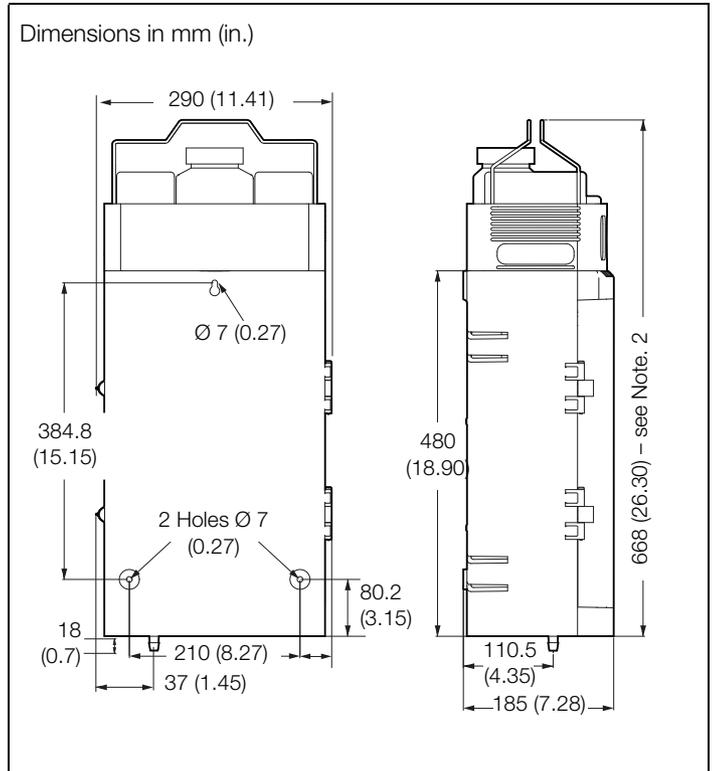


Fig. 2 Sodium wet-section dimensions

Referring to Fig. 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.

Note. Fixing (A) cannot be adjusted once the wet-section is placed over it.

4. Hang the wet-section onto fixing (A), ensuring the wet-section is retained firmly against the wall.
5. Secure the wet-section to the wall using 2 fixings (B).

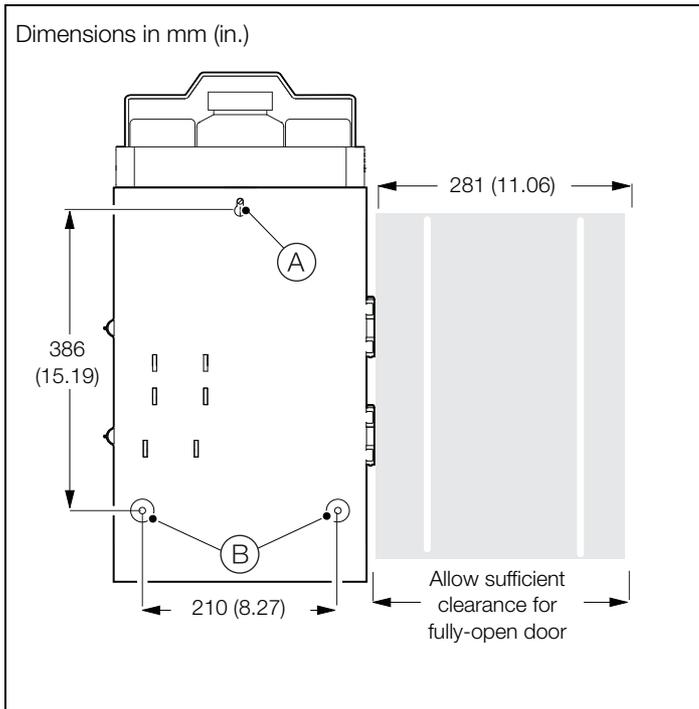


Fig. 3 Mounting the wet-section

4 Connecting the external sample lines and drains

Note.

- Sample inlet tubing is customer-supplied.
- Sample inlet tubing must have sufficient wall thickness to withstand the highest sample pressure. Keep pipe lengths short.
- Keep sample drains as short as possible and vertical to enable the sample to drain freely.
- Where particulate matter is present (for example, magnetite in boiler samples) it is recommended that a 60 micron sample filter is fitted to the sample inlet line.

To make external sample inlet and drain connections:

1. Fit a shut-off valve (not supplied) at each sample inlet.

Referring to Fig. 4:

2. Connect sample inlet tubing as follows:
 - a. For multi-stream wet-sections without flowmeters, connect $\frac{1}{4}$ in. ID (or equivalent) plastic tubing (1 tube per stream) to barbed connectors A.
 - b. For multi-stream wet-sections with flowmeters, connect $\frac{3}{8}$ in. ID (or equivalent) plastic tubing (1 per stream) to spigot on flowmeters B.
 - c. For single-stream wet-sections without flowmeters, connect $\frac{1}{4}$ in. ID (or equivalent) plastic tubing to barbed connector C.
 - d. For single-stream wet-sections with flowmeter, connect $\frac{3}{8}$ in. ID (or equivalent) plastic tubing to spigot on flowmeter D.
3. Ensure the wet-section internal sample stream drain tubing and sample outlet tube is kept as straight as possible and routed through the drain outlets at the base of the wet-section and through the funnel E. (These tubes are factory-fitted but may have moved during transit.)
4. Connect the flowcell drain tubing (customer-supplied $\frac{3}{8}$ in. ID [or equivalent]) to the barbed connector in flowcell F and to the base of the wet-section funnel E.

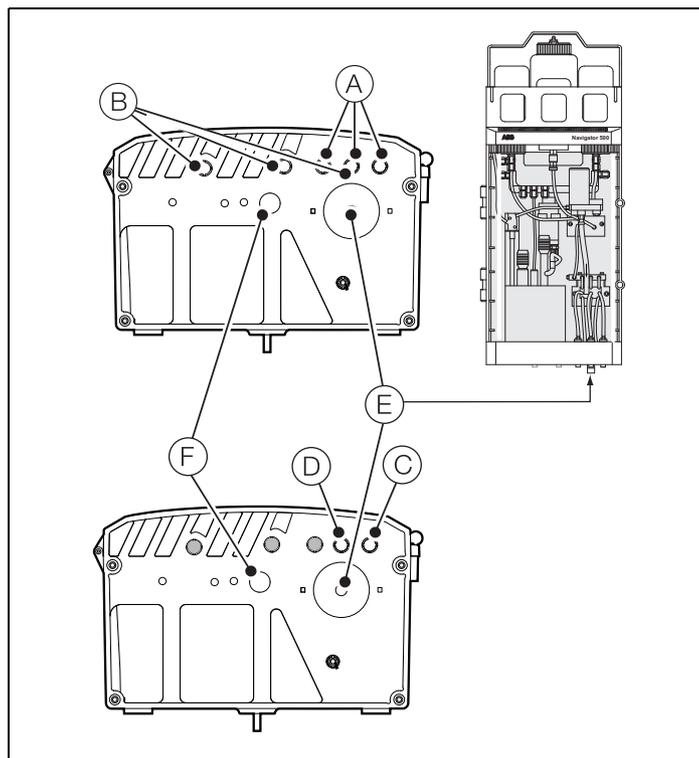


Fig. 4 Connecting the external sample lines and drains

5 Setting up the electrodes and wet-section

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

If multiple wet-sections are being connected to 1 transmitter, an additional setup procedure is required – refer to the sodium Operating instructions (OI/ASO550-EN) for multiple wet-section setup and serial connection details.

Caution.

- Do not attempt to setup the analyzer unless the wet-section and transmitter are fully installed and ready for operation.
- If the analyzer is being commissioned for the first time, calibration and selection / input of certain software parameters is required. The menu structure, general operation and menu descriptions, including Calibration, are detailed in the sodium Operating instructions (OI/ASO550-EN).

Fitting the electrodes

Note. O-rings must be fitted correctly and the inside of the electrode connectors must be dry and completely sealed (moisture reduces the circuit impedance and affects the wet-section performance).

Referring to Fig. 5:

1. Unpack sodium electrode (A) and carefully remove the rubber teat – retain the teat for storage. Unscrew (but do not remove) plastic sleeve (B) and slide sodium electrode (A) fully into plastic sleeve (B).
2. Carefully tighten plastic sleeve (B) (with sodium electrode (A) in place) until electrode bulb (C) passes through O-ring (D).
Position the sodium electrode so that, when the plastic sleeve is tightened against O-ring (D), the electrode bulb is just above the bottom of the flowcell chamber (E).
3. Ensure O-ring (F) is fitted at the top of the sodium electrode.
4. Connect red-sleeved sodium connector (G) to the top of the sodium electrode and tighten.
5. Unpack reference electrode (H) and remove the rubber teat – retain the teat for storage.
6. For wet-sections **without** an optional reservoir, unplug the black rubber filling hole plug (I) (check the reference electrode has sufficient solution – top up if necessary).

For wet-sections with an optional reservoir fitted, connect the reservoir tube (J) to the reference electrode filler tube (K).

7. Remove the supplied O-ring (L) (temporarily secured to the top of the right-hand chamber) and fit it over the reference electrode body.
8. Carefully position the reference electrode centrally in the right-hand chamber (M) so that the ceramic plug (N) is between 5 and 10 mm (0.2 to 0.4 in.) from the bottom of the chamber.
9. Ensure O-ring (O) is fitted at the top of reference electrode.
10. Connect black-sleeved reference electrode connector (P) to the top of reference electrode and tighten.
11. To prevent a build-up of static charge, we recommend a 16/0.2 mm wire (green/yellow outer insulation) is connected between flowcell stud terminal (Q) and the nearest suitable equipotential earth – for example the earth stud terminal on the Navigator 540 transmitter.

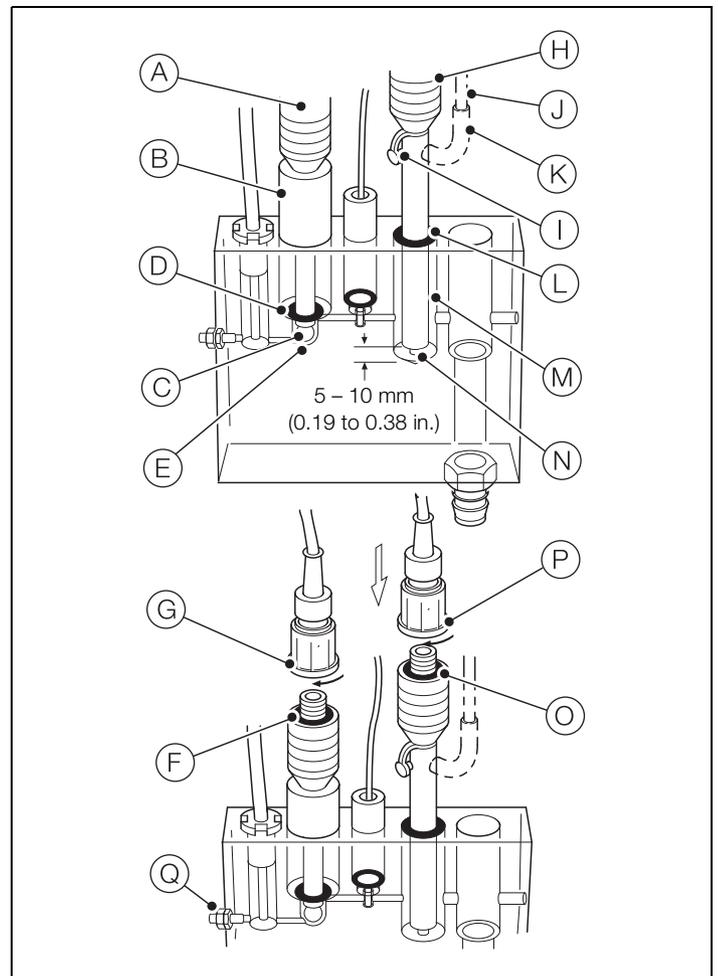


Fig. 5 Fitting the sodium and reference electrodes

6 Connecting the tubing

Note. If reagent and standard solutions have not already been prepared, proceed to *Solution preparation* (below).

1. Fill the bottles with the appropriate reagent solutions – default calibration solution values are 100 ppb sodium and 1000 ppb sodium for the low and high calibration solutions, respectively.

Referring to Fig. 6:

2. Fit the bottles into their correct positions in the bottle carrier.
3. Connect the end of reagent tubing (A) to the luer connector (B) on the reagent bottle.
4. Connect the calibration solution 2 tubing QD coupling plug (C) to the mating connector (D) at the base of the calibration solution 2 bottle.
5. Connect the (optional) regeneration solution tubing QD coupling plug (E) to the mating connector (F) at the base of base of the regeneration solution bottle.
6. Connect the calibration solution 1 tubing QD coupling plug (G) to the mating connector (H) at the base of the calibration solution 1 bottle.

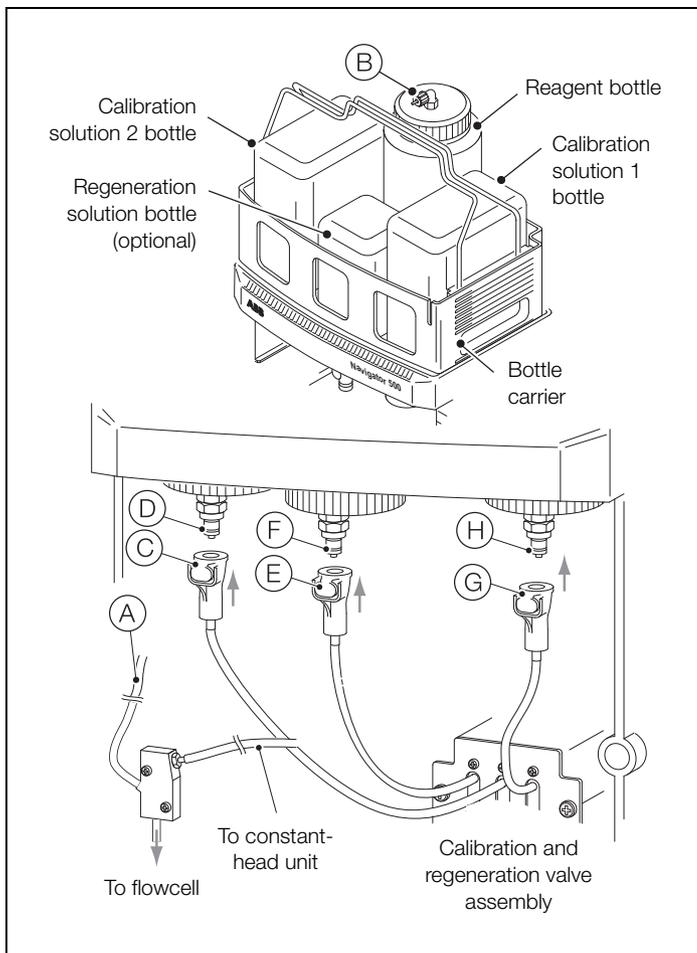


Fig. 6 Reagent, calibration and (optional) regeneration tubing connections

At the wet-section:

7. Open the shut-off valve upstream of the wet-section panel and adjust until sample is overflowing from the overflow pipe of the constant-head unit.

Maximum and minimum flow rates are 400 to 100 ml/mi (24.4 to 6.10 cu in./min.).

8. Ensure sample is passing from the constant-head unit to the flowcell and that the entrainment of reagent is operating – the entrainment should be regular, not intermittent.
9. On multiple wet-section configurations, check / set the DIP switches on the wet-section PCB – refer to the sodium Operating Instructions (OI/ASO550-EN).
10. Wait at least 1 hour then proceed to step (7) to perform a calibration.

7 Calibrating the analyzer

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

Perform a calibration via the *Calibration Level* or *Advanced Level* transmitter menus – refer to the Commissioning instructions (CI/AWT540-EN).

Solution preparation

Warning. Solution bottle labelling

Ensure safety and identification labels are fixed correctly to the solution bottles – refer to the Health & Safety section for label positions.

Regeneration solution

If using automatic electrode regeneration solution, order part number AWRK5000113.

Reagent solutions

Two alternative reagent solutions may be used, depending on the required lower limit of measurement. Concentrated ammonia solution, that provides adjustment of sample pH to a minimum of 10.7 (if fresh 35 % w/v ammonia solution is used) is suitable for measurements of sodium ion to approximately $0.5 \mu\text{g kg}^{-1}$. At concentrations below this, hydrogen ion interference becomes significant and a reagent of di-isopropylamine (DIPA) should be used. This adjusts the sample pH between 11.2 and 11.5 and enables measurements to be made down to $0.1 \mu\text{g kg}^{-1}$.

1. Concentrated ammonia solution – 1 litre (0.22 US gal.).

A 35 % w/v solution (s.g. 0.88) is recommended, but lower concentrations, to a minimum of 30 % w/v (s.g. 0.89), can be used.

2. Di-isopropylamine – 1 liter (0.22 US gal.).

continued ...

Solution preparation (continued)

Standard solutions

The following instructions refer to the preparation of 100 µg l⁻¹ and 1 mg l⁻¹ sodium, STANDARD SOLUTION 1 (LOW) and 2 (HIGH) respectively. Alternative concentrations can be prepared within the measuring range selected by appropriate dilution of the stock solution.

It is not advisable to prepare static sodium solutions of less than 50 µg l⁻¹ because low concentration solutions rapidly become contaminated and change in concentration.

Although the HIGH and LOW standard solutions are typically one decade apart in sodium concentration, any concentration difference can be used if the HIGH solution is at least five times the concentration of the LOW solution. It is necessary to have a significant change in electrode output to achieve an accurate calibration.

For all practical purposes, 'µg l⁻¹' can be considered equal to 'µg kg⁻¹' ('ppb') and 'mg l⁻¹' equal to 'mg kg⁻¹' ('ppm').

To prepare stock solution (1000 mg l⁻¹ sodium ions):

1. Dissolve 2.543 (±0.001) g of analytical reagent grade sodium chloride in approximately 100 ml high purity water. Transfer this solution to a 1 litre volumetric flask and make up to the 1 litre mark with more high purity water to give a stock solution of 1000 mg l⁻¹ sodium ions. Store in a plastic container.
2. Pipette 10 ml of this solution to a 1 litre volumetric flask. Make up to the 1 litre mark with high purity water to give a solution of 10 mg l⁻¹ sodium ions.
3. Pipette 10 ml of the 10 mg l⁻¹ solution into a 1 litre volumetric flask and make up to the 1 litre mark with high purity water to give the LOW standard solution of 100 µg l⁻¹ sodium ions. Transfer this solution to the bottle labelled STANDARD SOLUTION 1 (LOW).
4. Transfer 100 ml of the 10 mg l⁻¹ solution to a 1 litre volumetric flask and make up to the mark with high purity water to give the HIGH standard solution of 1 mg l⁻¹ sodium ions. Transfer this solution to the bottle labelled STANDARD SOLUTION 2 (HIGH).

Note. High purity water = water containing less than 2 µg l⁻¹ sodium ions and a specific conductivity of less than approximately 0.2 µS cm⁻¹.

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