Manual

NEP-9500-PLUS series turbidity probe

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Date: 09 March 2020
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Document history

The Observator range is in continuous development and so specifications may be subject to change without prior notice. When in doubt about the accuracy of this document, contact the Observator Group.

Reference documents

Type of document / tool	Product type and name (incl. url)
Datasheet	NEP-9500-PLUS
Manual	NEP-9500-PLUS
Application notes	Pressure calibration
	Shroud installation
	Temperature calibration
	Wiper replacement

Revision history

Date	Amendments	Company, position
2017-10-24	Initial document creation	Observator Australia, Document Controller
2018-04-09	Introduced document control	Observator Australia, Document Controller
2018-06-03	Updated chapter 6	Observator Australia, Document Controller
2019-03-06	Added reference documents	Observator Australia, Document Controller
2019-07-04	Quality review	Observator Australia, Operation Manager
2019-12-13	Replace NEP-9500 images	Observator Australia, Document Controller
2019-12-15	Compress document	Observator Group, Communication Officer
2020-01-30	Updated document format	Observator Australia, Document Controller
2020-03-08	Updated installation section	Observator Australia, Document Controller

Procedure sign-off:

Date	Company, position	Status
2018-04-09	Observator Australia, Document Controller	Finished
2019-12-16	Observator Australia, Managing Director	Approved
2020-03-04	Observator Group, Communication Officer	Approved

Distribution list

Date	Company, position

Summary

Thank you for purchasing an Analite NEP-9500 series turbidity probe. It will give you years of service if you install and maintain it according to the guidelines set out in this manual.

The Analite NEP-9500 series of turbidity probes are an enhanced version of our successful Analite 90 and 95 series probes. They offer better performance; more output options and greater ease of deployment yet are available in the same mechanical package (glanded version).
The Analite NEP-9500 series turbidity probes are designed for monitoring and process applications where turbidity levels of up to 5,000NTU may be encountered. Standard ranges are 0NTU, 10NTU, 400NTU, 1,000NTU, 3,000NTU and 5,000NTU.

Specifically, the Analite NEP-9500 probes are designed for applications that will not allow bio-fouling to build up such as short monitoring deployment or placement in fast and cold running water. The Analite NEP-9500 probes however, with their integral wiper assembly, are designed where bio-fouling or sedimentation build-up is likely. The Analite NEP-9500 series probe, with a stainless-steel case, may be submerged to a depth of fifty meters. The composite case version is rated to two hundred meters.

The Analite NEP-9500 probes use 90° optics and employ infrared light in accordance with ISO-7027. All probes use a unique modulation technique that ensures almost total rejection of ambient light conditions as well as a unique microprocessor controlled differential sample and hold circuit for enhanced performance, particularly at low turbidity levels. one hundred eighty degrees is also available which measures up to 30,000NTU.

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1 Applications

Analite NEP-9500 probes typical use includes applications such as:

1. Monitoring of streams and rivers
2. Monitoring of water storage bodies including stratification studies
3. Intermediate and final effluent treatment monitoring
4. Hydrological run off studies
5. Ground and bore water analysis
6. Drinking water filtration efficiency
7. Industrial process monitoring
8. Sludge and dredge monitoring
9. Sediment load monitoring

Which model is best used is dependent on the application, the measuring environment, the logging equipment and the monitoring period (deployment times) required.

The Analite turbidity probes are not suitable in situations where they may be abraded by large particles such as sand and under these circumstances the reading may become erratic due to the large particles passing the optic sensor. Measuring turbidity under these circumstances will require a stilling well to allow the sand particles to settle away from the optic sensor in the probe tip.

2 Safety

Do not connect anything that is potentially electrical to the metal body of the sensor as it may result in electrical shocks that could harm you or destroy your instruments.

Do not attempt to force the wiper mechanism while operating or you may harm yourself due to the higher torque level.

Please check with your supplier or material specifications before using the sensor in an unknown chemical.

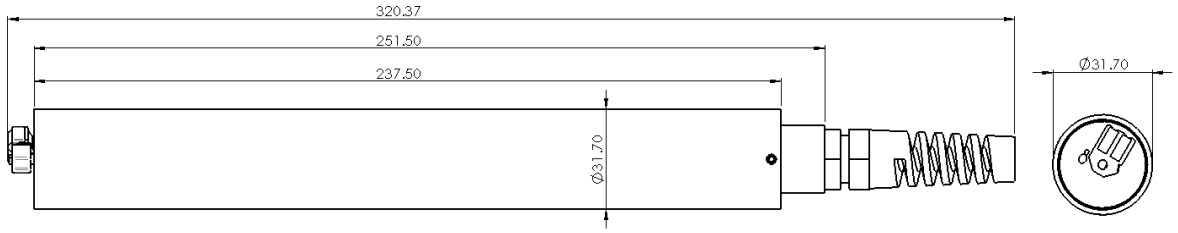
Take appropriate precaution when handling or servicing pre-deployed sensors as you may be exposed to radioactive and hazardous solutions.

After the end of the life of the product, please dispose this product according to your local regulations or return it to the manufacturer.

3 Specification

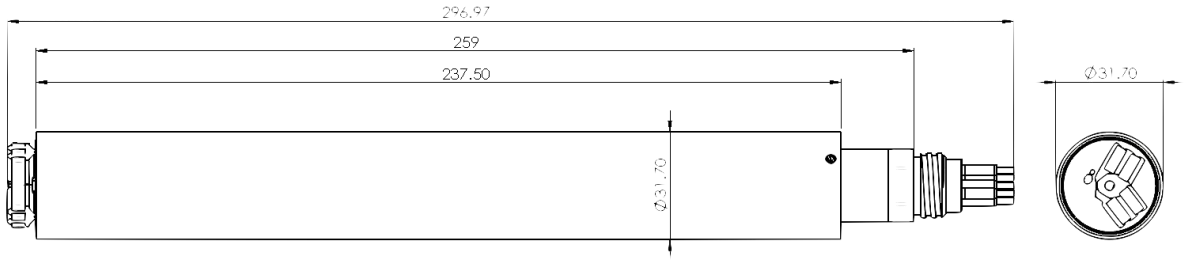
3.1 Glanded cable option (default)

Turbidity sensor dimensions	
Length	320.4mm
Diameter	31.70mm



3.2 SubConn option

Turbidity sensor dimensions	
Length	297mm
Diameter	31.7mm



Measurement	NEP-9500-PLUS
Technique	ISO-7027-90
Range	To customer requirements
Output span	±2.5V or 4 – 20mA, where -2.5V or 4mA = 0NTU 0 to + V and 0 to +2.5V outputs are also available Specify output at time of order
Response time	Approximately 1 second
Linearity	1% Accuracy
Repeatability @ 25°C	± 2% across the board
Temperature coefficient (0 to 40°C)	< ±0.05%/°C

Environmental	
Static depth rating	200m (stainless steel casing), 50m (composite casing)
Operating temp.	-5°C to +40°C
Storage temp.	-20°C to +50°C

Wiper	
Wiper arrangement (NEP-9500 series only)	Disposable and consumable – Foam pad on Polyvinyl Chloride (PVC) or Acetal arm. Field replaceable. Mounted on central shaft, fixed by hex set screw on to the flat part of the wiper shaft.
Actuation (NEP-9500 series only)	1. By external Transistor–Transistor Logic (TTL) / Complementary Metal Oxide Semiconductor (CMOS) active low pulse or momentarily contacting the wiper actuation conductor (pin 5) to 0V (pin 3). 2. Automatic wipe (periodic and power on). Please specify during the order.
Actuation pulse duration	On NEP-9500 series only. >50ms, <500ms.
Actuation pulse current sink	On NEP-9500 series only. 1mA max.
Wiping time	On NEP-9500 series only 8s nominal. During the wipe, the output is held to the output value just prior to the wipe.

Power	
Operating voltage	8-30V Direct Current (DC).
Current consumption	25mA maximum when not wiping plus up to 60mA if current output is fitted.
Power settling time	2s.
Wiping current	NEP-9500 series only. Additional 25mA approx. at less than 10m submersion.

4 Pinout & wiring diagram

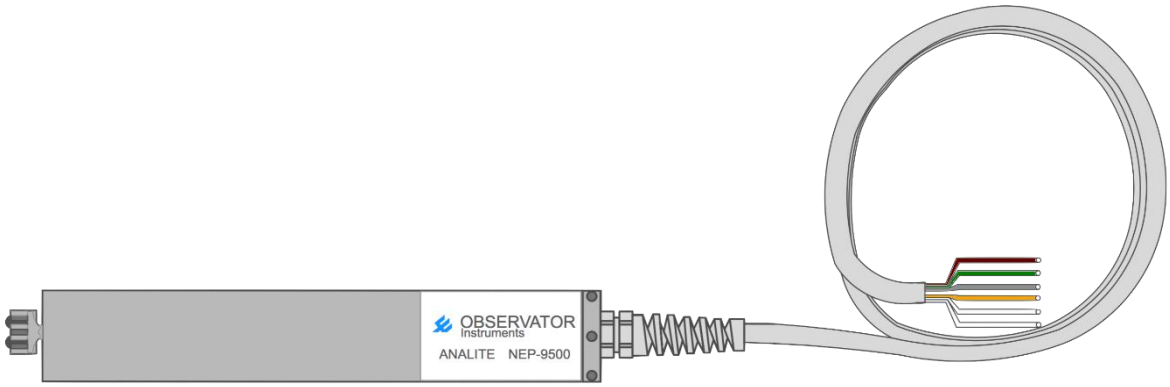
Long cable lengths are common; therefore, some electrical factors should be considered and these are discussed below.

There are two wiping protocols available on the NEP-9500 probes:

1. A single wipe externally initiated by momentarily resetting the probe (please specify during the ordering).
2. A periodic automatic wipe (please specify during the ordering).

4.1 Voltage output version

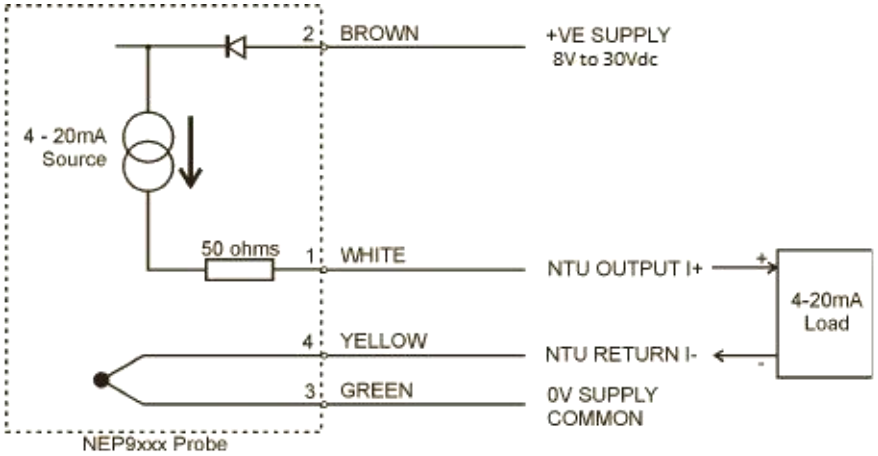
Analite NEP-9500 probes may have an analogue voltage output with a nominal output impedance of 500 ohms. For particularly long cable runs, the 4-20mA current output version is recommended.



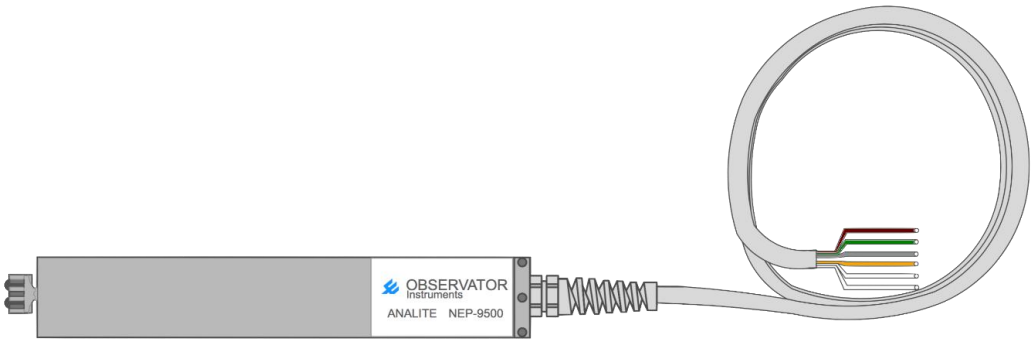
Wire color	Voltage option
Green	Ground (0V common)
Shield	Shield (no connection within probe)
Brown	8 to 30V DC power supply (+Ve)
Grey	Wiper (probe sleep/wipe)
Yellow	NTU voltage common
White	NTU voltage output

4.2 4-20mA current output version

Analite NEP-9500 probes may have an analogue 4-20 current output with a maximum load rating of 200 Ohms, consequently cable loop resistance should be considered. The Polyurethane (PUR) cable normally supplied with the probes has a nominal loop resistance of 4.6 Ohms per 100m. A schematic of the probe and its load is shown below.



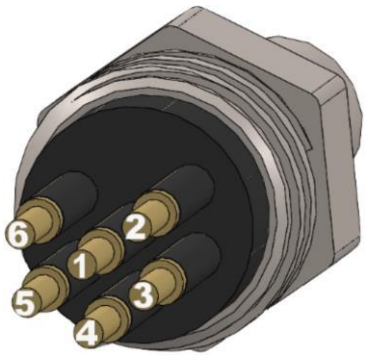
For very long cable runs (>200m), it may be advisable to connect the “NTU return” conductor to the “Supply Common” conductor at the end of the cable to reduce the voltage drop along the run.
When a NEP-9500 series probe is ordered with the 4-20mA current output, the probe is configured as a (high) current source. The load must be less than 270 Ohms to ensure proper operation over the probe’s specified power supply range.



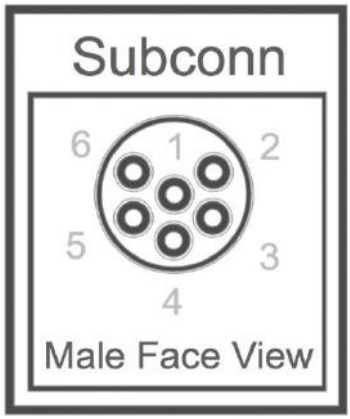
Wire color	Voltage option
Green	Ground (0V common)
Shield	Shield (No connection within probe)
Brown	8 to 30V DC power supply (+Ve)
Grey	Wiper (probe sleep/wipe)
Yellow	NTU voltage common
White	NTU voltage output

4.3 SubConn connection

The standard version of the NEP-9500 probes are glanded cable connectors.
Optional SubConn 6-pin marine connectors are also available.



The pinout configuration of the NEP-9500 is the following:



SubConn pin number	Meaning	Color
#1	Ground	Black
#2	Signal output	White
#3	Power	Red
#4	Shield	Shield
#5	Signal output	Orange
#6	Wiper	Blue

4.4 Surge and lightning considerations

Surge and lightning protection may also have to be considered given that many installations are “in the wild”. It is important to note that the NEP-9500 series probes have the stainless-steel casing terminated only to the cable shield. There is no electrical contact between the casing terminated only to the cable shield. There is no electrical contact between the casing and the probe electronics. The signal ground (4) and power ground (3) are electrically bound together within the probe.

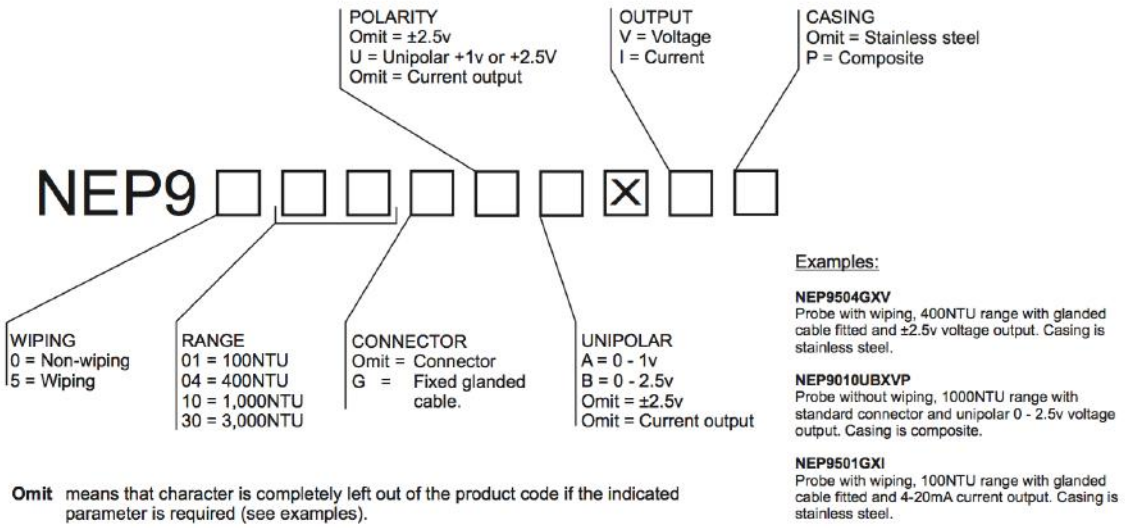
5 What you will find in the box

When the product is delivered, this is what you will receive in the box:

Items found in the box	
NEP-9500 probe **NEP-CBL-XX** Cable length (XX) in meters to be specified at time of order	

Product identification

Each product code can be used to identify each product specification and determine which wiring must be used for the configuration as detailed in the examples below:



6 Accessories

Observator Instruments offers a wide range of accessories for the NEP-9500 range. These products are available from the website:

Accessories	
Case **NEP-CASE**	
Wiper replacement kit **NEP-WIPER-KIT** - comprising of 4 silicon wipers and a hex fastening key	
Shroud NEP-9SHRD - Stainless protective shroud	

7 Installation

There are aspects to consider when preparing to install the Analite NEP-9500 series probes in the field:

1. Installation of the probe properly into the environment where measurements are to take place
2. Physical cabling considerations
3. Electrical cabling considerations

7.1 Installing the probe for the first time

The probe is normally installed with the optics pointing downwards (but not vertical) or in a horizontal alignment. In a simple application the probe is immersed into the water to the desired depth, but within the depth rating of the probe. Please note the depth rating is based on stagnant water. Allowances must be made for the effect of flowing water to ensure the stagnant depth rating is not exceeded. If the probe is to be installed downwards, then it is recommended to install it a few degrees away from the vertical to allow bubbles to escape away from the optic face.

Probes with integrated wiping should be installed such that they can be easily retrieved from time to time to replace the wiper arm assembly. It is important that the optic end of the probe is kept clear of obstruction such as the river bed. The minimum distance between the optic head and any object should be 50mm (2”).

The standard casing of the Analite NEP-9500 series probes is made of 6 stainless steel but the optic face is made of plastic materials and so should be protected from accidental scratching or abrasion. The wiper arm assembly should be replaced periodically to avoid abrasive material build-up in the pad that may eventually abrade the optic face. The optic face is partially protected from damage by the protruding castellation in the probe casing.

To avoid crevice corrosion on the 6 stainless steel casing in salt and acidic water deployments, it is strongly recommended that the probe be thoroughly washed in clean water after usage and prior to storage. Failure to do this will cause crevice corrosion and this is not covered under warranty. A composite cased version is available for corrosive and sea water environments but its pressure rating is limited to 30m.

If the probe is to be installed in a glanded fitting (for insertion into a pipe etc.) then care must be taken to ensure the sealing surface pressures offered by the gland fitting are not excessive so as to not cause distortion of the probe casing and force leakage. The Analite NEP-9500 series probes are thin wall instruments and so glanding pressure must be minimal and spread over the largest possible area. Do not cut or damage the outer sheath of the cable. Water may enter the probe through holes or cuts in the cable sheath. Where damage may occur due to river rocks striking or rolling over the probe body, a protective shroud should be used (plastic or stainless steel, whichever the situation warrants. A shroud is available for the NEP-9500 as an accessory under the part number NEP-9SHRD. Such a shroud not only protects the probe but also assists in maintaining a minimum distance between the probe optics and any local obstructions.

7.2 Physical cabling considerations

The cable supplied with the Analite NEP-9500 series probes is a specially selected PUR sheathed and screened cable selected for strength, chemical resilience and exceptional resistance to cuts, nicks and abrasion. The cable part number is NEP-CBL.

Nevertheless, care should be taken during the installation process of the probe and its cabling to ensure that the cable is not subjected to persistent pulling, snagging abrasion or severe compression.

This is particularly important for the probes with fixed and glanded cables as any water penetration through the cable sheath may find its way into the probe. This will affect the accuracy of the readings and possibly causing irreparable damage.

For probes fitted with connectors, care must be taken to ensure the connectors are properly mated to ensure a seal not yet screwed together too tightly, so as to make their disconnection difficult after a long deployment.

Prior to mating, make sure both the probe and cable connectors are dry in the termination area otherwise erratic operation may occur due to moisture.

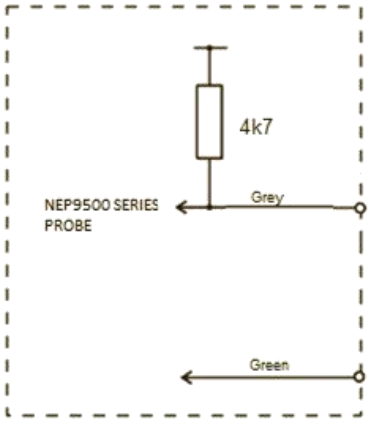
7.3 Miscellaneous

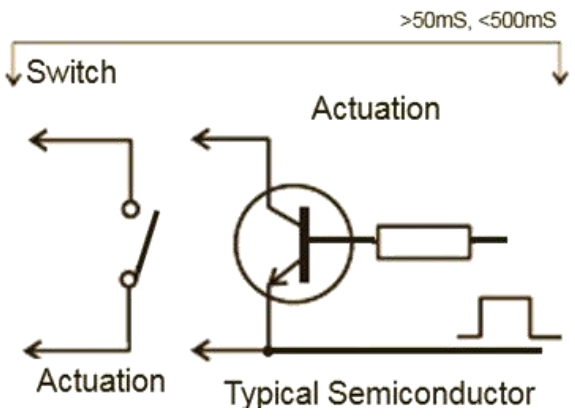
The wiper on the NEP-9500 probes can be actuated by momentarily connecting the wipe conductor (5) to the power common conductor (0) for longer than 50ms.

This protocol can be implemented using a mechanical switch arrangement or open collector (drain) output available on most loggers. For multiple wipes each consecutive wipe must be actuated after the wiper has parked in its rest position (approximately 8s after a wipe actuation). Wipe pulses applied during a wipe action will be ignored.

Note: During the wipe period the NTU output will be held at the value measured just prior to the wipe (within 2%).

The recommended external wiper activation interface arrangements are shown schematically below:



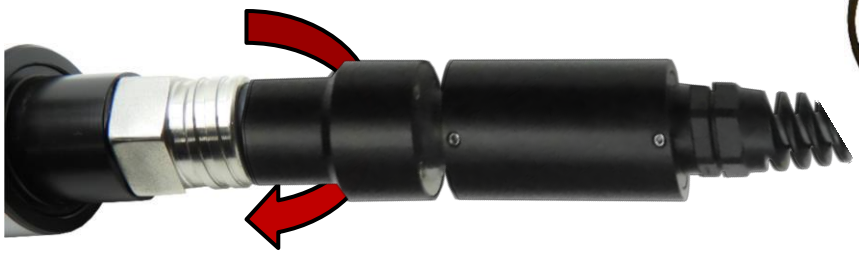


8 Deployment

8.1 Installation

Installation instructions will vary depending on your project requirements. A typical example involves the use of an extension cable for SubConn connector option which can be purchased separately. Connect the SubConn female extension cable to the probe according to the matching pin configuration as shown below:

Make sure the connector is sealed by screwing tight the connector.



Install the probe to the mounting location ready for deployment.

8.2 Deploy the probe

1. Start by considering the environment of operation: always operate wearing appropriate safety equipment in safe operational conditions.

2. The probe is normally installed with the optics pointing downwards (but not vertical) or in a horizontal alignment.

3. In a simple application, the probe is simply immersed into the water to the desired depth, but within the depth rating of the probe. Please note the depth rating is based on stagnant water.

4. Allowances must be made for the effect of flowing water to ensure the stagnant depth rating is not exceeded. If the probe is to be installed downwards then it is recommended to install it a few degrees away from the vertical to allow bubbles to escape away from the optic face.

5. Probes with integrated wiping should be installed such that they can be easily retrieved from time to time to replace the wiper arm assembly.

6. It is important that the optic end of the probe is kept clear of obstruction such as the river/sea bed. The minimum distance between the optic head and any object should be 50mm (2”).

Be Careful: The standard casing of the NEP-9500, as well as the optic face, is made of plastic materials and should be protected from accidental scratching or abrasion. The wiper arm assembly should be replaced periodically to avoid abrasive material build-up in the pad that may eventually abrade the optic face. The optic face is partially protected from damage by the protruding castellation in the probe casing.

If the probe body is to be installed in a glanded fitting (for insertion into a pipe, etc.) then care must be taken to ensure the sealing surface pressures offered by the gland fitting are not excessive so as to not cause distortion of the probe casing and force leakage. The NEP-9500 probes are thin wall instruments and so glanding pressure must be minimal and spread over the largest possible area. Do not cut or damage the outer sheath of the cable. Water may enter the probe through holes or cuts in the cable sheath. Where damage may occur due to river rocks striking or rolling over the probe body, a protective shroud should be used. Such a shroud not only protects the probe but also assists in maintaining a minimum distance between probe optics and any local obstructions.

8.3 Retrieve the probe

Carefully pull the sensor out of the water. Clean the sensor with fresh water and carefully dry the connector (blow air if necessary). Then disconnect the cable from the connector. Store the probe in appropriate conditions.

9 Electrical conformity

EC Declaration of Conformity according to Council Directive 89/336/EEC

We, Observator Instruments Pty. Ltd., declare under our sole responsibility that the product:

Analite NEP-9500 series of turbidity probes and accessories,

Manufactured by:

Observator Instruments Pty. Ltd.

To which this declaration relates, are in conformity with the protection requirements of Council Directives 89/336/EEC on the approximation of the laws relating to electromagnetic compatibility.

This Declaration of Conformity is based upon compliance of the product with the following harmonized standards:

Emissions:	EN50081-1:1992
Immunity:	EN50082-1:1997

Signed by:

Dana Galbraith – Managing Director

Date of Issue:	1 December 2002
Place of Issue:	Observator Instrument Pty. Ltd. 8-10 Keith Campbell Court, PO Box 9039 Scoresby, VIC 3179 AUSTRALIA

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Since 1924 Observator has evolved to be a trend-setting developer and supplier in a wide variety of industries. Originating from the Netherlands, Observator has grown into an internationally oriented company with a worldwide distribution network and offices in Australia, Germany, the Netherlands, Singapore and the United Kingdom.