

# ANALITE



NEP9504G Shown

## ANALITE NEP9000 AND NEP9500 SERIES TURBIDITY PROBE USER MANUAL

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# **ANALITE NEP9000 and NEP9500 Series Turbidity Probe User Manual**

## **Introduction**

Thank you for purchasing an ANALITE NEP9000 or NEP9500 series turbidity probe. It will give you years of service if you install and maintain it according to guidelines set out in this Manual.

The ANALITE NEP9000 and NEP9500 series of turbidity probes are an enhanced version of our successful ANALITE 190 and 195 series probes. They offer better performance, more output options and greater ease of deployment yet are available in the same mechanical package (G version).

The ANALITE NEP9000 and NEP9500 series turbidity probes are designed for monitoring and process applications where turbidity levels of up to 3,000NTU may be encountered. Standard ranges are 100NTU, 400NTU and 1,000NTU, but custom ranges are available.

Specifically, the ANALITE NEP9000 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 NEP9500 probes however, with their integral wiper assembly, are designed where bio-fouling or sedimentation buildup is likely. The ANALITE NEP9000 and NEP9500 series of probes with a stainless steel case may be submerged to a depth of 100 meters (approx. 330 feet). The composite case version is rated to 30 meters (approx 100 feet).

The ANALITE NEP9000 and NEP9500 probes use 90° optics and employs infrared light in accordance with ISO7027. 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.

## **Applications**

The applications that the ANALITE NEP9000 and NEP9500 probes are so extensive and too numerous to elaborate on in this document but generally they include:

- 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.

## Specifications

Parameter	NEP9001/9501	NEP9004/9504	NEP9010/9510	NEP90xx/95xx
<b>Measurement</b>				
Technique	ISO7027 - 90°			
Range	100NTU	400NTU	1,000NTU	Custom to 3,000NTU max.
Output Span	±2.5Volts or 4 – 20mA, where -2.5V or 4mA = 0NTU 0 to +1V and 0 to +2.5V outputs are also available. Specify output at time of order.			
Response Time	Approx 1 second to 99%.			
Linearity	1%	1%	3%	5%
Zero Offset, 0 to 40°C	±3mV max.			
Repeatability @ 25°C	±1%	±1%	±2%	±2%
Temperature Coefficient (0 to 40°C)	< ±0.05%/°C			
Calibration compliance using APS AEPA polymer solutions	4 points 0, 10, 40 and 100NTU	4 points 0, 40, 100 and 400NTU	4 points 0, 100, 400, and 1000NTU	3 points min. 0 and 2+ other values.
<b>Physical</b> (Standard Version – see Physical Dimensions)				
Probe Diameter	32mm for 316 stainless steel casing; 34mm for composite casing.			
Probe only Length	181mm without wiper, 188mm with wiper.			
Overall Length	267mm without wiper; 274mm with wiper			
Weight (probe only)	120gms without wiper, 190gms with wiper.			
Cable	5 core + shield. 6mm dia. PUR sheathed.			
Connector	7 pin male waterproof to 100m when mated. Open face pressure of 50m			
Cable Length	Specify at time of order. Cable part number is NEP-CBL.			
<b>Environmental</b>				
Static Depth Rating	100m (stainless steel casing), 30m (composite casing)			
Operating Temp.	-5°C to +40°C			
Storage Temp.	-20°C to +50°C			
<b>Wiper</b>				
Wiper Arrangement NEP9500 series only	Disposable and consumable - Foam Pad on PVC or Acetal arm. Field replaceable. Mounted on central shaft, fixed by hex set screw onto flat of wiper shaft.			
Actuation  NEP9500 series only	<ol style="list-style-type: none"> <li>By external TTL/CMOS active low pulse or momentarily contacting the wiper actuation conductor (pin 5) to 0V (pin 3).</li> <li>Automatic wipe every 2 hours if the wiper actuation conductor (pin 5) is permanently connected to 0V (pin 3) and also when applying normal power to the probe.</li> </ol>			
Actuation Pulse Duration	On NEP9500 series only. >50mSec, <500mSec			
Actuation Pulse Current Sink	On NEP9500 series only. 1mA max.			
Wiping Time	On NEP9500 series only. 8 second nominal. During the wipe the output is held to the output value just prior to the wipe ±1% .			
<b>Power</b>				
Operating Voltage	9.6 - 28V dc			
Current Consumption	15mA maximum when not wiping plus up to 20mA if current output fitted.			
Power Settling Time	< 1 Sec			
Wiping Current	NEP9500 series only. Additional 25mA approx at less than 30m submersion.			

<b>Accessories</b>	
NEP19WIPE	Wiper Kit comprises 4 replacement wipers and hex fastening key for the ANALITE NEP9500 series only. Also used on the ANALITE NEP195, 395 & 495 probes.
NEP390-CA-xx	Shielded multi-core cable assembly including mating connector to suit the standard version. Length xx to be specified at time of probe order.
NEP19SHRD	Stainless protective shroud to suit the NEP9000 and NEP9500 series.
NEP-CBL-xx	Cable only xx meters - specify at time of order. Required for G version.

**Note:** The standard version utilises the water proof connector. The version utilising a fixed and glanded cable includes the “G” suffix after the part number (eg NEP9504G).

## Installation

There are two aspects to consider when preparing to install the ANALITE NEP9000 or NEP9500 series probes in the field.

- 1) Installation of the probe proper into the environment where measurements are to take place.
- 2) Cabling considerations.
- 3) Connection of the probe into the data collection and control system.

### Probe Installation

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 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 static water. Allowances must be made for the effect of flowing water to ensure the static 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 NEP9000 and NEP9500 series probes are made of 316 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 castellations in the probe casing.

To avoid crevice corrosion on the 316 stainless steel casing in salt and acidic water deployments it is strongly recommended that the probe be thoroughly washed in clean water after deployment and prior to storage. Failure due to crevice corrosion is not covered under warranty. A composite cased version is available for corrosive and sea water environments but its pressure rating is limited 30m.

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 ANALITE NEP9000 and NEP9500 series probes are thin wall instrument 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 which can be made of simple PVC piping or stainless steel which ever the situation warrants. A shroud is available for the NEP9000 and NEP9500 as an accessory under the part number NEP19SHRD. Such a shroud not only protects the probe but also assist in maintaining a minimum distance between probe optics and any local obstructions.

### Cabling Considerations

#### Physical

Cable normally supplied with the ANALITE NEP9000 and NEP9500 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.

Never the less, 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 cable as any water penetration through the cable sheath may find its way into the probe proper affecting 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 yet not 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.

## Electrical

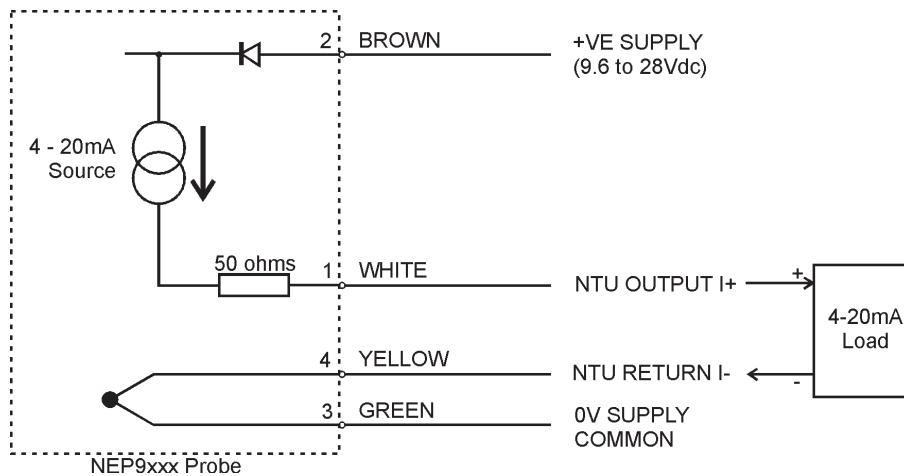
Because long cable lengths are common some electrical factors should be taken into account and these are discussed below.

### Voltage Output Version

ANALITE NEP9000 and NEP9500 probes may have an analogue voltage output with a nominal output impedance of 100 ohms. Conductor resistance is nominally 73 ohms/km or 7.3 ohms for 100 meter probe cable and this may need to be taken into account in some configurations particularly with regards to logger channels that have low input impedance (say less than 10,000 ohms). For particularly long cable runs, the 4 – 20mA current output version is recommended.

### 4 – 20mA Current Output Version

ANALITE NEP9000 and NEP9500 probes may have an analogue 4 – 20mA current output with a maximum load rating of 350ohms, consequently cable loop resistance should be taken into account. The PUR cable normally supplied with the probes has a nominal loop resistance of 14.6 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 the NTU Return conductor to the Supply Common conductor at the end of the cable to reduce the voltage drop along the run.

### 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 NEP9000 and NEP9500 series probes have the stainless steel 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.

## Probe Connection

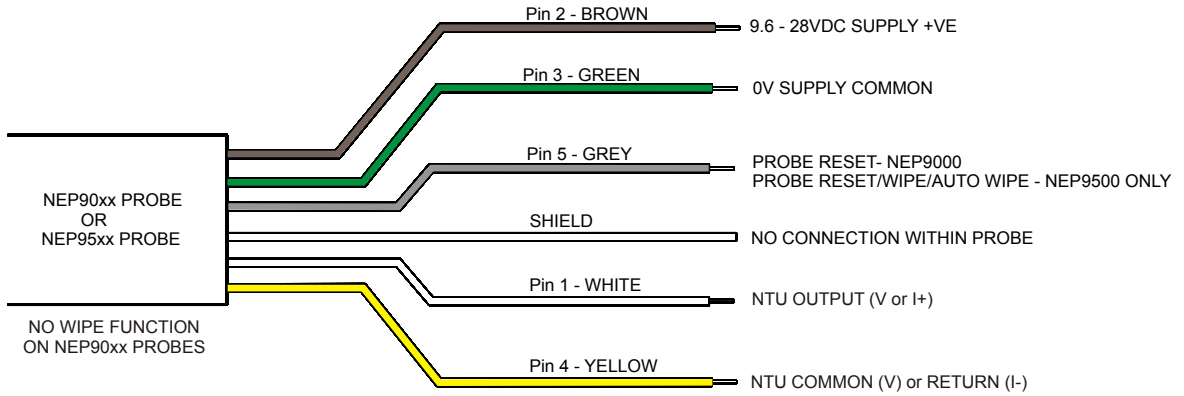
The standard version of the NEP9000 and NEP9500 probes are fitted with a 7 pin male marine connector with an open face pressure rating of 50m. This means that if the probe is accidentally submerged when not connected, or improperly connected to its mating cable assembly, a pressure rating of only 50m is offered. The mating female cable connector is supplied with the specified cable length. When the cable connector is properly mated to the probe the overall pressure rating is 100m.

A fixed and glanded cable version is also available and these versions have the G suffix attached to the part number.

The cable conductor assignment is as shown below:

Note that the Signal Common (yellow) and Supply Common (green) conductors are electrically connected together within the probe. The stainless steel cover is connected only to the cable shield.

The probe is designed to operate with most data loggers, PLC and DAS systems available today. When using the NEP9500 models some form of wiper actuation control may be required depending on the wiping protocol selected. This is discuss later in this manual.



There are two wiping protocols available on the NEP9500 probes:

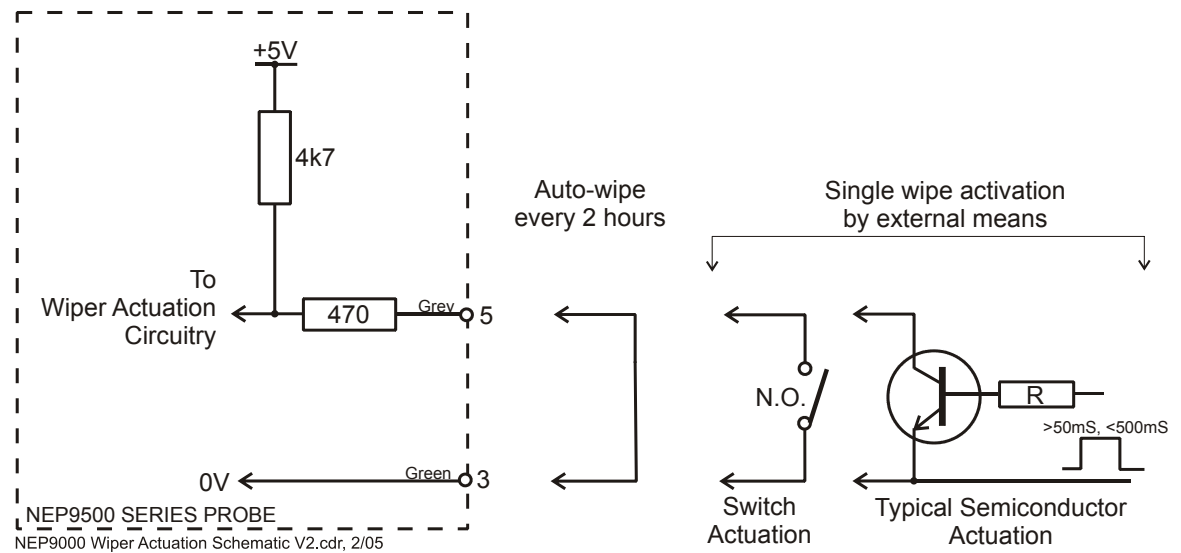
1. A single wipe externally initiated by momentarily resetting the probe.
2. An automatic wipe every two hours by terminating the Reset/Wipe to the Power Common..

1. The wiper on the NEP9500 probes can be actuated by momentarily connecting the Reset/Wipe conductor (5) to the Power Common conductor (3) for longer than 50msec but less than 0.5 second. This has the effect of resetting the probe which then initiates a wipe immediately after the inbuilt microprocessor has properly reset. 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 (approx. 8 seconds after a wipe actuation). Reset/Wipe pulses applied during a wipe action will be ignored. Note that during the wipe period the NTU output will be held at the value measured just prior to the wipe (within 1%).

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

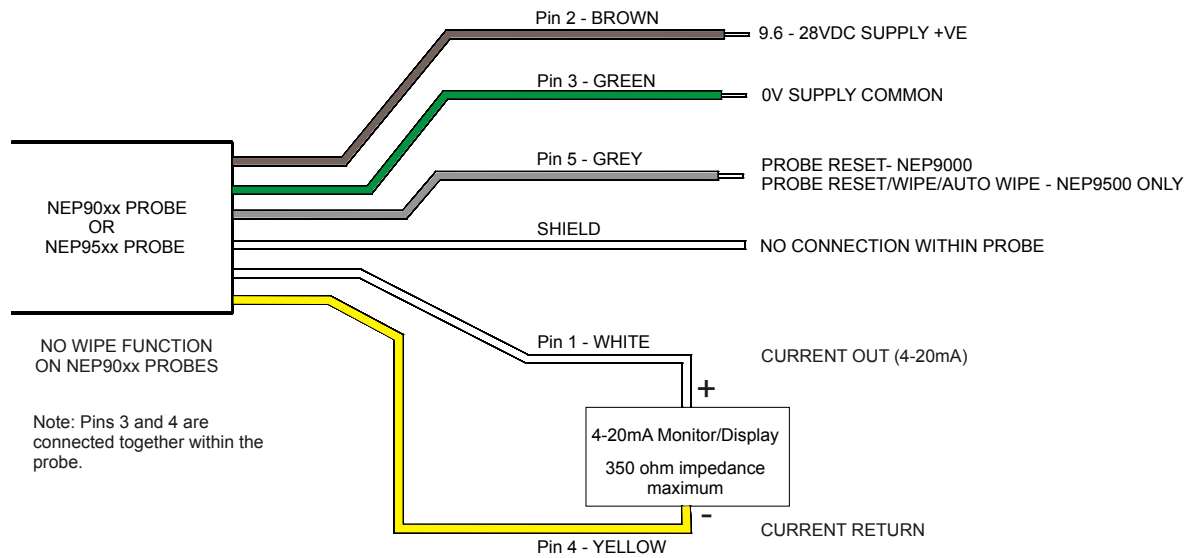
2. Permanently connecting the Reset/Wipe conductor (5) to the Power Common (3) will force an automatic wipe every two hours and when the probe power is applied. Note that during the wipe period the NTU output will be held at the value measured just prior to the wipe (within 1%). Output from the probe during the initial wipe on a power up should be disregarded and data treated as valid, say, about 12 seconds after the power is applied.

The termination arrangement for the 2 hourly auto-wipe is shown schematically below.



### Current Output Arrangement

When a NEP9000 or NEP9500 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 350 ohms to ensure proper operation over the probe's specified power supply range. The connection arrangement for a probe with a current output is shown below.



### Connection to the ANALITE TM5



The NEP9000 and NEP9500 series are readily interfaced to the ANALITE TM5 Indicator/Controller unit the probe output must be either  $\pm 2.5V$  or 4-20mA. The ANALITE TM5 is ideal for industrial control and alarm applications. The ANALITE TM5 allows for the selection of wiping intervals as well as allowing field calibration.

More information on the ANALITE TM5 can be downloaded from the McVan Instruments website at [www.mcvan.com](http://www.mcvan.com).

Normal termination of a NEP9000 or NEP9500 series probe with  $\pm 2.5V$  output to an ANALITE TM5 is as tabled below:

ANALITE NEP9xxx Probe		ANALITE TM5	
Pin	Colour	Term No.	Circuit
1	White	46	NTU Vout Signal
2	Brown	44	+12Vdc Power
3	Green	43	Power Common
4	Yellow	45	NTU Vout Common
5	Grey	47	Clean (Wipe) – NEP95xx only

If the TM5 is fitted with the 4-20mA input option, a NEP9000 or NEP9500 series probe with current output may be terminated as tabled below:

ANALITE NEP9xxx Probe		ANALITE TM5 with 4-20mA option	
Pin	Colour	Term No.	Circuit
1	White	50	NTU I+ Signal
2	Brown	44	+12Vdc Power
3	Green	43	Power Common
4	Yellow	51	NTU I- Signal
5	Grey	47	Clean (Wipe) – NEP95xx only



## Wiper Replacement

This applies to the NEP9500 versions only.

The effectiveness of the wiper in maintaining a clean optical surface will eventually be compromised, the time being dependent on the water under investigation and the number of wiping cycles carried out. We recommend periodic inspection of the wiper pad to determine if the material is deteriorating or is impregnated with material from bio-fouling. Normally the wiper should be replaced every 4 to 6 weeks of deployment. In addition, as a precaution we recommend changing the wiper prior to each deployment.

The wiper is a consumable item and a spare is provided with each NEP9500 series probe along with a hex key to loosen and fasten the wiper set screw. Wiper packs containing four wipers and a hex key are available (Part Number NEP19WIPE) as a standard accessory.

To change the wiper, loosen the set screw in the wiper arm until the wiper assembly can be removed from the wiping shaft. Place a new wiper assembly on the shaft with the set screw aligned squarely with the flat on the wiping shaft. Gently press the wiper arm down until the wiper arm hits the stop on the shaft. The wiper pad should now be compressed to roughly one half its original thickness. Tighten the set screw - do not over tighten.

It is important that the wiper arm does not make contact with the probe face - only the pad should be in contact. A gap of 0.5mm between the wiper arm and the optic face is typical when a new pad has been properly installed.

**NOTE:** It is imperative that the set screw be fastened squarely aligned onto the flat on the shaft otherwise proper operation will be affected.

**CAUTION: Do not over tighten the set screw or manually attempt to rotate the wiper arm once set onto the shaft. Any attempt to manually rotate the wiper may cause gearbox damage and void the warranty.**

## Calibration Confirmation and Turbidity Standards

The ANALITE NEP9000 and NEP9500 probes are factory calibrated using non-toxic neutral-density polymer-based turbidity standards. Solution values up to 1,000NTU as USA EPA certified.

10NTU, 40NTU, 100NTU, 400NTU and 1,000NTU neutral-density polymer-based turbidity standards are available from McVan Instruments and their distributors, or directly from the manufacturer for US customers only. We recommend the use of one of these standards and pure water for a calibration confirmation. The standards should not be diluted, as this will reduce the effect of the anti-fungal agent contained in the standard solutions.



Because a turbidity probe is inherently an optical device, care must be taken during a calibration confirmation to ensure that external optical effects are kept to a minimum. This is best implemented by placing calibration solutions in dark, leak proof bottles with a non-reflective finish such as Nalgene® 2106 bottles in amber. These are available from McVan Instruments with wide necks and a nominal capacity of 1,000ml and carry the part number NEP-BTL. The calibration routine is best done under natural or incandescent lighting (not fluorescent or arc).

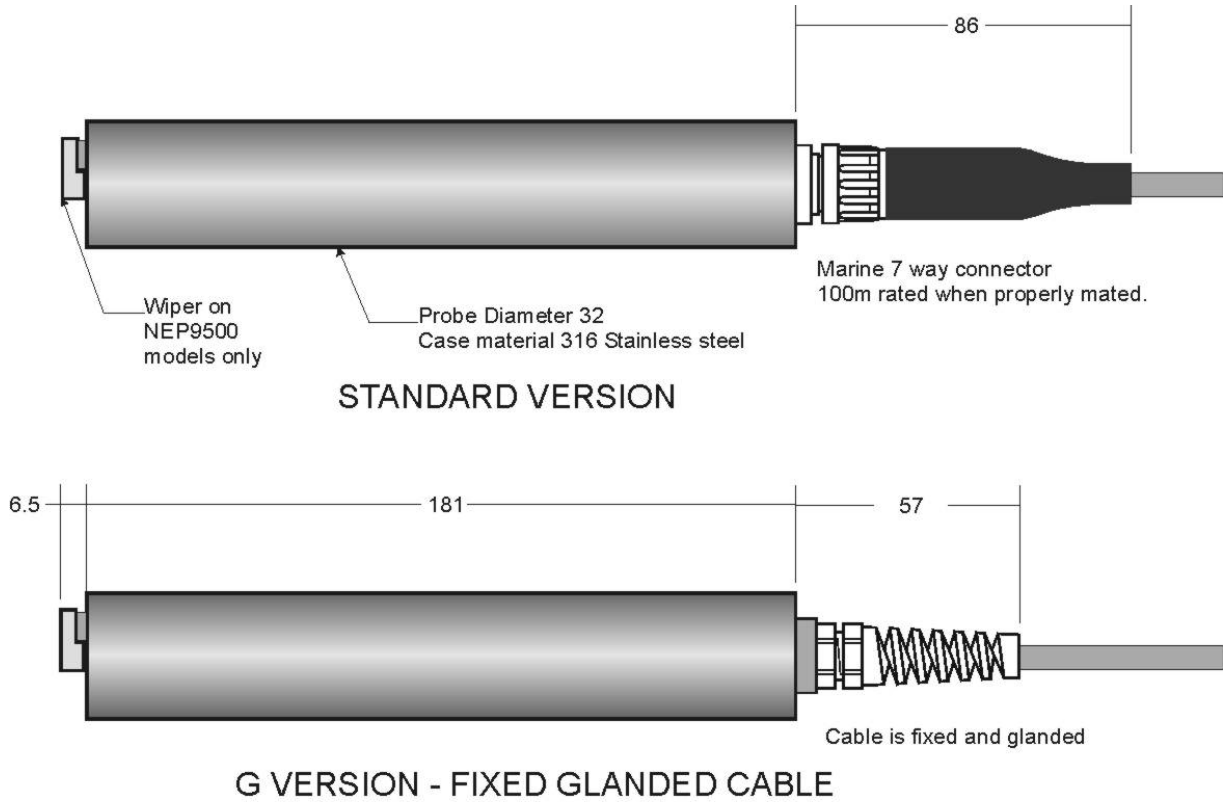
Another critical factor is cleanliness. Any debris or water that makes its way into the calibration solutions will affect its value. It is therefore a good practice to have an ample supply of distilled de-ionized water and a means of properly drying the probe end (clean compressed air is ideal). Wipers should **always** be removed prior to a calibration routine. Probes should be flushed in two containers of distilled water with thorough drying in between and before insertion into a calibration solution. Also where ever possible, a calibration confirmation should commence at a lower value (usually zero) and work up in value to further minimize the effects of cross contamination.

**CAUTION: ALWAYS REMOVE THE WIPER PRIOR TO CALIBRATION.**

When inserting the NEP9000 or NEP9500 probe into a calibration solution ensure that the optic face of the probe is at least 50mm from the base and all sides of the bottle. This is particularly important for low turbidity solutions below 200NTU. Hold the probe a few degrees from the vertical and gently tap it on the bottle rim so as to dislodge any air bubble on the optic face. If the probe is properly placed the measurement value will not vary if the probe is gently moved a few millimeters in any direction.

## Physical Dimensions

NEP9000 and NEP9500 Probes



All dimensions in mm.

## Warranty

The ANALITE NEP9000 and NEP9500 series turbidity probes are warranted against defects in material and workmanship for one year from date of purchase, exclusive of the wiper assembly. The warranty does not cover the wiper arm assembly, corrosion or leakage due to corrosion. Unauthorized service, tampering or abuse will void this warranty. Damage as a result of improper installation will also void this warranty.

Should you require service (under warranty or otherwise) please contact the McVan Instrument distributor from whom you purchased the probe, or our Service Centre. If the probe is being returned for service under warranty please supply proof of purchase.

All support enquiries must include the serial number of the probe – labelled on the casing of the probe.

The shipping address for probe returns is:

McVan Instruments' Service Centre  
58 Geddes Street, Mulgrave  
VIC 3170 AUSTRALIA.  
Tel: (+61-3) 9582-7333, Fax: (+61-3) 9560-1164  
E-mail: [info@mcvan.com](mailto:info@mcvan.com)

## Electrical Conformity

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

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

**Analite NEP9000 and NEP9500 SERIES of turbidity probes and accessories,**

Manufactured by:

**McVan 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 harmonised standards:

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

Signed by:



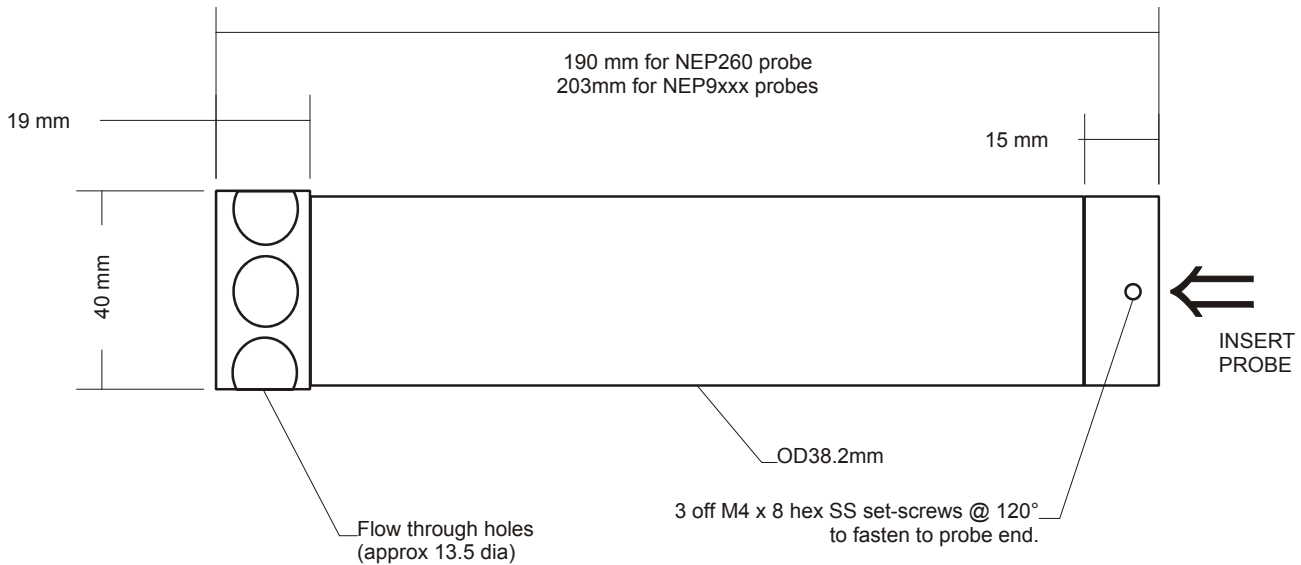
John Van de Vreede – Director

Date of Issue: 1 DECEMBER 2002

Place of Issue: McVan Instruments Pty Ltd  
58 Geddes Street, Mulgrave  
VIC 3170 Australia



## Protection Shroud

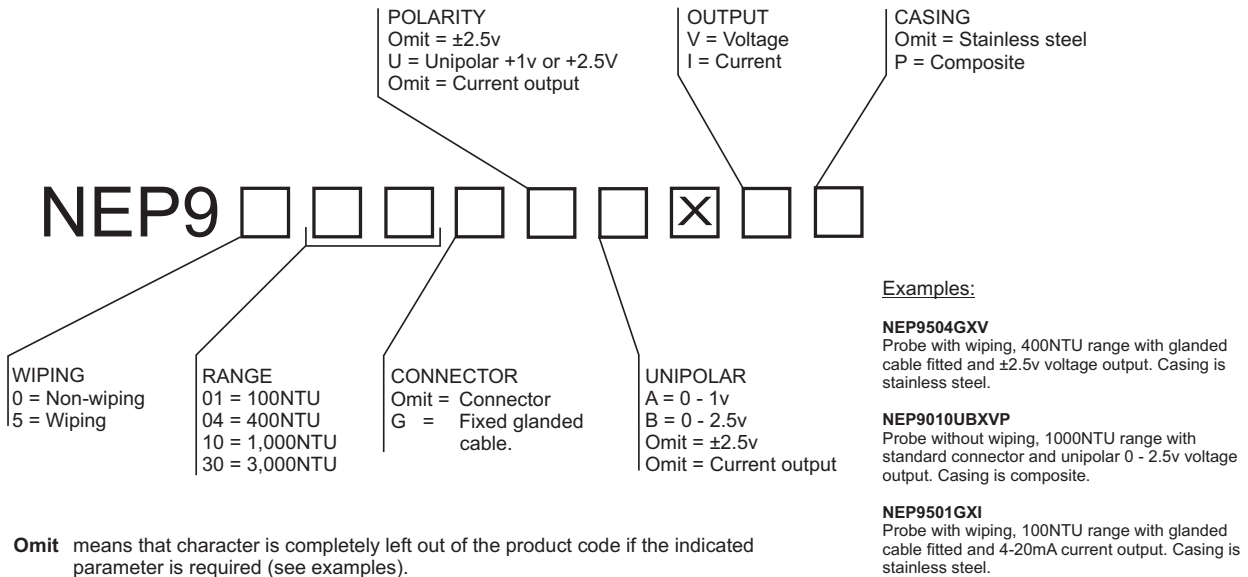


### FITTING

Insert the Analite turbidity probe into the shroud as shown. Ensure end of probe is against internal stop at other end of shroud. Rotate the probe in the shroud so as to give the lowest possible (NTU) output when in clear water. Fasten the M4 screws onto the probe end. (Do not over tighten). Re-zero the instrument with the shroud fitted. Approximate weight of the shroud alone is 400grams

Material: 316 Stainless Steel  
 © 1999 - 2005 McVan Instruments Pty Ltd  
 File: NEP SHROUD for NEP160 and NEP9xxx.cdr

## Product Identification Nomenclature



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