

**WATER SUPPLIES DEPARTMENT**  
**STANDARD SPECIFICATION E-78-03**  
**TURBIDITY MEASURING INSTRUMENTS**

1. **DESIGN**

The turbidity measuring instrument shall be used to measure the concentration of suspended particles in water. Light scattering principle according to ISO 7027 shall be employed for turbidity measurement.

The turbidity measuring instrument shall be microprocessor-based consisting of a continuous process nephelometer in which a single wavelength light beam shall be emitted from a light source for passing through the water sample with measurement to be made on the amount of light scattered 90 degrees by the suspended particles.

Measurement unit shall be Nephelometric Turbidity Units (NTU). For sludge effluent measurement, the instrument shall also support the measurement unit of percentage dry weight of solid content.

Measurement range shall normally be 0-100 NTU, unless otherwise specified. Measurement resolution shall be 0.01 NTU (for measurements at or below 10 NTU) and 0.1 NTU (for measurements above 10 NTU). Measurement accuracy shall be  $\pm 5\%$  of reading.

The system response time for a 90% step change shall be less than 90 seconds at the design sample flow rate.

The instrument shall be designed to avoid erroneous readings caused by stray light, air bubbles, coarse particles and electromagnetic interference. A local on-hold function shall be equipped for the instrument to prevent generating any spike or abnormal signal during maintenance.

If the sensor is not integrated inside the transmitter, at least 15m sheathed control cable shall be provided for connecting the sensor to the transmitter.

The instrument shall be capable of being calibrated by means of standard solutions or a secondary standard device placed in the light path.

2. **CONSTRUCTION**

(a) **Turbidity Sensor**

The d.c. power for the turbidity sensor shall be supplied by the turbidity transmitter.

The enclosure of the turbidity sensor shall be fabricated from chemical resistant materials i.e. stainless steel/titanium or other approved and equivalent material

compatible with the sample water. Electronic components and wiring terminals shall be installed in an isolated compartment sealed off from the wetted parts of the sensor.

The turbidity sensor shall have a built-in mechanical wiper or ultrasonic cleaner for automatic cleaning. The cleaning time and frequency shall be adjustable and programmable at the turbidity transmitter. For turbidity sensors using technology of non-contact measurement in free-fall open sample stream, automatic cleaning is not necessary.

Flow-through type sensor shall have at least IP65 enclosure to IEC 60529 suitable for wall mounting by stainless steel brackets. Integrated or separate bubble trap shall be provided with the sensor to eliminate any incoming gas bubbles before the sample water enters the measuring chamber to enhance measurement accuracy. A drain cock shall be provided at the bottom of the sensor.

Dip type sensor shall have at least IP68 enclosure to IEC 60529. Stainless steel mounting accessories shall be provided for installation.

(b) Turbidity Transmitter

The turbidity transmitter shall have at least IP54 enclosure to IEC 60529 and shall be fabricated from aluminum with epoxy / polyester coating, glass reinforced plastic, polycarbonate, or other approved and equivalent high-strength engineering plastics. The transmitter shall be suitable for wall mounting and operation at 220V 50Hz a.c. supply. Stainless steel mounting brackets shall be provided for installation.

The turbidity transmitter shall have a 4-20 mA d.c. analogue output capable of driving a 500 ohm load for remote indication and recording. The turbidity transmitter shall also provided digital communication format such as Modbus/Profibus or HART protocol etc. subject to the market availability and application environment.

The turbidity transmitter shall have at least an integrated 4-digit backlit LCD indicator for instant display of measurement. At least two signal limit alarms adjustable from 0% to 100% of the whole measurement range and one equipment failure alarm shall be provided. Apart from local indication, the transmitter shall incorporate for each alarm a pair of volt-free relay output contacts rated of at least 2A 220V a.c. or transmitting alarm signals via digital communication format for remote annunciation.

Dedicated keys shall be provided at the turbidity transmitter to allow for configuration, calibration, interrogation and access to all built-in functions of the turbidity measuring instrument.

- End of this Specification -