

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION E-78-02
pH MEASURING INSTRUMENT

1. DESIGN

The pH measuring instrument shall be microprocessor based, with the measuring system operating on the principle of electrochemical cell using two withdrawable sealed type electrodes in which one shall be the pH measuring glass electrode and the other the standard reference electrode. The electrode system will generate an electro-motive force which varies with the concentration of hydrogen ions in the sample solution. The pH measuring instrument shall be suitable for calibration using standard buffer solutions.

The electrode system of the pH measuring instrument shall incorporate a device for protecting the reference electrode from contamination. An integrated temperature sensor shall be provided for automatic compensation of solution temperature and continuous temperature monitoring. A local on-hold function shall be equipped for the instrument to prevent generating any spike or abnormal signal during maintenance.

The pH measuring instrument shall meet at least the following design requirements:

(a) Transmitter

Accuracy	: $\pm 0.75\%$ over the measuring range
Sensitivity	: 0.01 pH
System response time	: 10 seconds for a 90% step change in pH
Measuring range	: 0 - 14 pH
	: 0 - 100 °C

(b) Sensor

Sample temperature	: 0 - 50 °C
Sample conductivity at 20 °C	: 25 - 300 uS/cm
Operating pressure	: up to 600 kPa

2. CONSTRUCTION

(a) Transmitter

The enclosure of the transmitter shall have a degree of protection of IP65 to IEC 60529 and shall be fabricated from aluminium with epoxy or 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 transmitter shall have analogue and digital outputs for the measured pH and temperature of the sample solution. The analogue output signals shall be

4-20 mA d.c. capable of driving a 500 ohm load for remote indication and recording. Digital communication format such as Modbus, Profibus or HART protocol etc. shall be provided subject to the market availability and application environment.

The transmitter shall have at least a 4-digit backlit LCD indicator for instant display of the measured pH and temperature values. At least two signal limit alarms adjustable from 0% to 100% of the measuring range and one equipment failure alarm shall be provided. Alarm of the transmitter shall include local alarm indication and volt-free relay output contacts rated of at least 2A 220V a.c. or transmitting alarm signals via digital communication format for remote alarm annunciation.

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

(b) pH Sensor

The d.c. power for the sensor shall be supplied by the transmitter. The sensor shall have an optional integrated pre-amplifier in order to achieve the system requirements mentioned in section 1 of this specification.

The sensor shall have an enclosure fabricated from chemical resistant materials i.e. Ryton/glass or other approved and equivalent material suitable for operation with the sample solution. Electronic components and wiring terminals shall be installed in an isolated compartment sealed off from the wetted parts of the sensor. The electrode head and electrodes shall be removable from the sensor body for maintenance and inspection. 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.

Flow-through type pH sensors shall have at least a degree of protection of IP65 to IEC 60529 and shall be suitable for wall mounting by stainless steel brackets. Dip type pH sensors shall have at least a degree of protection of IP68. Removable guard for protecting the pH measuring electrodes and stainless steel mounting accessories shall be provided for the installation of sensor.

An automatic acid cleaning system in the form of spray head cleaning with about 3% or manufacturer's recommended dilute acid shall be incorporated with the pH sensor to prevent coating or build-up of deposits. Other automatic cleaning systems may be considered provided that the whole pH measuring instrument is designed for treated water application. The cleaning system shall be suitable for prolonged operation without maintenance and shall not affect measurement accuracy. The initiation shall be based on timer or self-diagnostic feedback signal. All accessories required for the automatic cleaning system, such as self-cleaning set, hose pump, injector, spray head, etc., shall be provided.