

JOHANNESBURG WATER (SOC) Ltd.
BULK WASTEWATER

PARTICULAR SPECIFICATION
VOLUME 10 : pH MEASUREMENT



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DOCUMENT CONTROL SHEET

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RECORD OF REVISIONS

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INDEX

10	pH MEASUREMENT	4
10.1	Scope	4
10.2	Abbreviations.....	4
10.3	Standards	4
10.4	General Requirements	4
10.5	Surge Protection.....	6
10.6	pH Measurement – Controller/Transmitter.....	6
10.7	pH Measurement – Electrode	7
10.8	Spares	7
10.9	Data Sheets.....	7

10 pH MEASUREMENT

10.1 Scope

10.1.1 This specification covers the supply and installation of pH Meters, complete with sensors, transmitters, indicators, panels, etc. used for process monitoring and control applications at Johannesburg Water wastewater sites.

10.2 Abbreviations

10.2.1 In this specification the following abbreviations will apply :-

BS	: British Standards
PLC	: Programmable Logic Controller
I/O	: Input/Output
CPU	: Central Processing Unit
UPS	: Uninterruptible Power Supply
MCC	: Motor Control Centre
MCB	: Miniature Circuit Breaker
SPD	: Surge Protection Device
FJB	: Field Junction Box
SSO	: Switched Socket Outlet
SPDT	: Single Pole Double Throw (refers to relay or switch contact arrangements).
LCD	: Liquid Crystal Display
LED	: Light Emitting Diode
O&M	: Operating And Maintenance

10.3 Standards

10.3.1 The supply and installation of all pH meters and associated cabling, panels and any other equipment shall be subject to the latest amendments and editions of the following standard specifications:-

SANS 10142-1	: National Standards for the wiring of premises.
SANS 1091:2004	: National Colour Standard.
SANS 1274-2005	: Coatings applied by the powder-coating process.
BS 381C:1980	: Paint colour chart.

10.4 General Requirements

10.4.1 This specification must be read in conjunction with the following specifications:-

- 10.4.1.1 PLC Panels Specification (Volume 3 of the Automation And Control Standards).
- 10.4.1.2 Clean Power And Surge Protection Specification (Volume 5 of the Automation And Control Standards).
- 10.4.1.3 Cabling Specification (Volume 6 of the Automation And Control Standards).
- 10.4.1.4 Field Junction Boxes And Panels (Volume 19 of the Automation And Control Standards).
- 10.4.1.5 Labelling (Volume 25 of the Automation And Control Standards).
- 10.4.2 Where cables are exposed to physical damage (including damage from rodents) armoured cables must be used or un-armoured cables must be run in steel conduit.
- 10.4.3 All power supply cables to instruments must have a black outer sheath, while all control cables (such as digital and analogue signals to PLC's) must have an orange outer sheath as specified in the Cabling Specification (Volume 6 of the Automation And Control Standards).
- 10.4.4 FJB's and as far as practically possible all instrument sensors and transmitters, must be mounted such that all equipment, wiring, numbers, terminations, etc. are readily accessible and can be viewed clearly. No equipment may be mounted such that it becomes a hazard or dangerous to view or gain access to such equipment.
- 10.4.5 Where sensors and/or transmitters cannot be mounted where they are readily accessible, the installation must be done in such a way that the sensor or transmitter can easily be moved to a safe and convenient position for testing, maintenance, replacement, etc. (e.g. by using hinged brackets, telescopic brackets, etc.).
- 10.4.6 FJB's must be mounted against a wall or structure or on a sturdy pedestal such that the top of the FJB enclosure is no higher than 1.8 m from the floor and easily accessible from the front.
- 10.4.7 All instrument installations must be done in accordance with the manufacturer's requirements and recommendations for proper operation. It is the tenderer's responsibility to ensure that he/she is familiar with both the requirements of the manufacturer as well as the installation requirements, in terms of location, site conditions, materials, equipment or substances to be measured (e.g. hot liquids, acids, abrasive material, etc.) and to ensure that if there are potential problems, they can be pointed out and rectified before orders for equipment are placed.
- 10.4.8 Costs incurred for alterations required to ensure proper operation of instruments, after orders have been placed, will be for the tenderer's account. For example, if instruments have been ordered and it is found there is insufficient space to install the instrument, or the instrument is not flooded with liquid all the time as it is required for proper operation, or the instrument transmitter is sometimes flooded in its installed position, or the sensing head is sometimes outside the medium it is supposed to measure, or the instrument linings are damaged by abrasive liquids, or the sensor is does not have a suitable range of measurement, etc. alterations or replacements required to rectify such problems will be for the tenderer's account if the Engineer finds that the tenderer was negligent in his/her assessment of the installation.
- 10.4.9 Each instrument must be equipped with a circuit breaker connected to the power

supply of the instrument, to enable local isolation in case of repairs or replacement.

- 10.4.10 The supplier of the instrument must be present for the installation, testing and commissioning of the instrument on site. Due allowance must be made for this in the tender sum.
- 10.4.11 The tenderer must supply a complete and detailed set of documentation for the installation, connections, terminations, power supply, technical details, setting up, calibration (if applicable), testing, etc. of the instrument for inclusion in a final O&M manual.
- 10.4.12 Completed data sheets are required as part of the returnable documents of each tender. Failure to complete these data sheets, supplied at the end of this specification, will lead to disqualification of the tender.

10.5 Surge Protection

- 10.5.1 Each instrument and its associated equipment must be suitably protected against surges from induced voltages, switching of equipment, lightning strikes, etc. as detailed in the Clean Power And Surge Protection Specification (Volume 5 of the Automation And Control Standards).
- 10.5.2 The power supply to the instrument must be equipped with suitable surge protection, both at the instrument and at the source of the power supply (i.e. at the distribution board, MCC, PLC panel, etc.), as detailed in the Clean Power And Surge Protection Specification (Volume 5 of the Automation And Control Standards).
- 10.5.3 Both the digital and analogue signals between the instrument and other remote devices (such as the PLC), must be equipped with suitable surge protection, both at the instrument and at the remote device as detailed in the Clean Power And Surge Protection Specification (Volume 5 of the Automation And Control Standards).

10.6 pH Measurement – Controller/Transmitter

- 10.6.1 All pH measurement must be done by using an electrolytic principle to measure hydrogen ions, which is converted into a pH value.
- 10.6.2 All instrument transmitter enclosures must have at least an IP 65 or higher rating.
- 10.6.3 The instrument must be equipped with an isolated, active, 4 – 20mA output which will be connected to a maximum 500 ohm load. This output must be user-programmable for pH. As an option the instrument must be equipped with a second isolated, active, 4 – 20mA output which will be connected to a maximum 500 ohm load. This output must be for temperature.
- 10.6.4 The instrument must be equipped with at least three SPDT relays, rated for at least 230V AC, 2A. Two relays for preset pH outputs and one relay for alarm status (i.e. transmitter failure, out of range measurement, etc.). The preset outputs must be user-programmable for various pH values.
- 10.6.5 The transmitter must be suitable for use with a 230V AC, 50/60 Hz power supply.
- 10.6.6 The transmitter must have an accuracy of at least 0.05% of the full pH range.
- 10.6.7 The transmitter must have a resolution of at least 1% of full scale.

- 10.6.8 The transmitter must have an LCD or LED display showing instantaneous pH and relay status.

10.7 pH Measurement – Electrode

- 10.7.1 The range of the sensor must be from 2 to 14 pH and must be suitable for the application (see items 10.4.7 and 10.4.8 of this specification).
- 10.7.2 The sensor must be suitable for an operating and measurement temperature range of 0°C to +50°C.
- 10.7.3 The sensor must be equipped with automatic temperature compensation.
- 10.7.4 The sensor must have a protection rating of at least IP 67 or higher.
- 10.7.5 Brackets used for the mounting of the sensor must be made of at least 3CR12 grade stainless steel if the sensor is not used within a flow cell.
- 10.7.6 The sensor must be supplied, complete with a cleaning unit (air or water), equipped with a user-programmable cleaning cycle if the sensor is not used within a flow cell.

10.8 Spares

- 10.8.1 The tenderer will be required to provide a recommended spares list for three years maintenance. This item must be completed so that spares may be ordered as part of the capital contract. Tenderers ignoring this condition may be disqualified.

10.9 Data Sheets

- 10.9.1 All data sheets in the attached Appendix 1 must be completed.

APPENDIX 1

DATA SHEET – pH METER

DESCRIPTION	DATA
Make/Manufacturer	
Type/Model	
Power Supply (Voltage)	
Analogue Output Type & Programmable (Y/N)?	
Digital Output Quantity, Type & Rating (E.g. 3 x SPDT, 230V AC, 5A) & Programmable (Y/N)?	
Controller/Transmitter Enclosure Rating	
Accuracy	
Resolution	
Display Data & Type (E.g. instantaneous pH & relay status LCD)	
Transducer/Sensor pH range	
Transducer/Sensor temperature measuring range	
Transducer/Sensor temperature operating range	
Transducer/Sensor temperature compensation (Y/N)?	
Transducer/Sensor enclosure rating	
Transducer/Sensor cleaning system type & programmable (Y/N)?	
Local agent (Y/N)?	
Local agent contact details.	
Guarantee period	