



**PRODUCT STANDARD FOR:
IP TEST MACHINE - SPRAY
WATER TESTER**

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IP PROTECTION CHAMBER - SPECIFICATION

APPROVAL RECORD

Description	NAME	DESIGNATION	SIGNATURE	DATE
	Eng. Margaret Kanini	Chief Engineer, DSM & Metering solutions		20/02/17
Checked by	Eng. Rosemary Oduor	Manager, Energy Management		21/2/17
Approved by	Eng. Peter Mwachigi	Ag. General Manager, Customer Service		23/2/17



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A Document of the Kenya Power & Lighting Co. Ltd

February 2017



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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Standards Manager
Electronic copy (pdf) on KPLC server currently: http://172.16.1.40/dms/browse.php?ffFolderId=23	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue	2017-02-09	New Issue	S. Nguli M. Kanini	Dr. Eng. Peter Kimemia



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FOREWORD

This standard specification lays down requirement spray water tester. The specification is intended for procurement of equipment and does not include provision of contract.

INTRODUCTION

This specification was prepared to establish and promote uniform requirements for spray water testing equipment to be used at Kenya Power and Lighting Company Ltd. The specification lays down the minimum requirements for equipment acceptable for evaluation.

1. SCOPE

This specification is for newly manufactured spray water testers for use in IP Tests in 50Hz networks

2. REFERENCES

The following documents were referred to during the preparation of this specification; in case of conflict, the requirements of this specification take precedence.

- 2.1 Enclosure protection IEC 60034-5, edition 4.1, 2006: Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification Motor Vibration.
- 2.2 IEC 60529/ 2001-02: Degrees of protection provided by enclosures (IP Code).
- 2.3 IEC 60598-1/2008-01: Luminaires –Part 1: General requirements and tests.
- 2.4 IEC 60947-1/1999-02: Low voltage switchgear and control gear – Part 1: General rules

3. TERMS AND DEFINITIONS

The definitions given in IEC 60034-5/ 2006, IEC 60529/ 2001-02, IEC 60598-1/ 2008-01 and IEC 60947-1/ 1999-02 apply.

4. REQUIREMENTS

4.1 Operating conditions requirements

- 4.1.1 The spray water tester shall be suitable for operation in tropical climate where temperatures may vary from -1°C to +60°C.
- 4.1.2 The spray water tester shall be suitable for operation in average annual relative humidity reaching 90% and altitude of up to 2,200m.
- 4.1.3 The spray water tester shall be used for IP Tests of energy meters and metering accessories under tropical climate conditions.

4.2 Design and construction

4.2.1 Test chamber

- 4.2.1.1 The test chamber shall be capable of performing IPX2, IPX3 and IPX4 tests.
- 4.2.1.2 The test chamber shall house a spray test system and a drip box test system.
- 4.2.1.3 The external dimensions of the test chamber shall not exceed 2000mm x 2400mm x 2400mm (H x L x W).
- 4.2.1.4 The internal dimensions of the test chamber shall not exceed 1500mm x 1500mm x 1500mm (H x L x W).
- 4.2.1.5 It shall be made of a steel frame and steel panels. The inside of the chamber shall be made of stainless steel.
- 4.2.1.6 It shall be powder coated on the outside to protect it against weather elements.
- 4.2.1.7 The test chamber doorway shall be at least 700mm x 700mm.
- 4.2.1.8 The doorway shall have a silicone rubber sealing strip that can withstand high and low temperatures. The sealing shall prevent water from leaking out of the test chamber to the floor during tests.
- 4.2.1.9 The test chamber shall have at least two glass inspection windows, one located at the door and the other on one of the sides to allow observation of samples under test.
- 4.2.1.10 The test chamber windows shall be equipped with internal wipers to clear the observation windows during tests.
- 4.2.1.11 It shall have an illumination lamp that can be switched on to allow better viewing of the samples under test in poor lighting.
- 4.2.1.12 It shall be equipped with casters (with provisions for fixing them on the floor) to enable the equipment be moved about to pave way for cleaning the floor where it shall be housed.

4.2.2 Drip box (vertical rain drop) tester

- 4.2.2.1 The drip box shall meet all requirements of IPX1 and IPX2 test systems.
- 4.2.2.2 The drip box shall be mounted inside the ceiling of the test chamber.
- 4.2.2.3 The drip area shall be of square or rectangular design and shall not exceed 1100mm x 1100mm.
- 4.2.2.4 The dripping holes diameter shall be 0.4mm.
- 4.2.2.5 The spacing between dripping holes shall not exceed 30mm.
- 4.2.2.6 The tester shall have the option of automatic and manual operation.
- 4.2.2.7 For automatic operation, the tester shall be provided with standard test options so that the equipment operators can select the desired test items and initiate automatic tests.

- 4.2.2.8 The rainfall capacity shall be configurable by the equipment operators and can be selected from 0 – 3mm/ minute.
- 4.2.2.9 The test time shall also be configurable by the equipment operators.
- 4.2.2.10 The spray water tester should be capable of logging the details of tests (Test type, rainfall capacity, water pressure and test duration) and equipment serial number.
- 4.2.2.11 The logged data shall be easily exported to a laptop computer via a Bluetooth or USB/ serial port.

4.2.3 Spray swing pipe tester

- 4.2.3.1 The spray swing pipe tester shall meet all requirements of IPX3 and IPX4 test systems.
- 4.2.3.2 The spray swing pipe shall be made of stainless steel with a minimum radius of 550mm and a maximum radius of 650mm.
- 4.2.3.3 The spray swing pipe shall be easy to mount and the center of the spray swing pipe shall always be in the center of the chamber.
- 4.2.3.4 The spray swing pipe shall have closures at the extreme ends for rinsing the pipe.
- 4.2.3.5 The spray swing pipe nozzles shall be made of brass with spray holes diameter of 0.4mm.
- 4.2.3.6 The swing angle shall be (2 x 60°) for IPX2 tests; (2 x 120°) for IPX3 tests; and (2 x 175°) for IPX4 tests.
- 4.2.3.7 The tester shall have the option of automatic and manual operation.
- 4.2.3.8 For automatic operation, the tester shall be provided with standard test options so that the equipment operators can select the desired test items and initiate automatic tests.
- 4.2.3.9 The rainfall capacity will be configurable from 0-10litres/ minute.
- 4.2.3.10 The water pressure shall be configurable from 0-100kN/m².
- 4.2.3.11 The test time shall also be configurable by the equipment operators.
- 4.2.3.12 The spray water tester should be capable of logging the details of tests (Test type, rainfall capacity, water pressure and test duration) and equipment serial number.

4.2.4 Turn table & tiltable test bed

- 4.2.4.1 The turn table shall be of circular design.
- 4.2.4.2 The turn table diameter shall be of a minimum radius of 650mm and a maximum of 750mm.
- 4.2.4.3 The rotating speed of the turn table shall be 1rpm.
- 4.2.4.4 The turn table shall be able to switch over from rotating mode to oscillating mode, with reversal of the direction of rotation at 350°.



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- 4.2.4.5 The test bed shall be made of stainless steel and easily fitted on the turn table.
- 4.2.4.6 The test bed shall have a load carrying capacity limit of over 40kgs.
- 4.2.4.7 The test bed shall be tiltable by +/- 30° to allow for IPX2 tests.
- 4.2.4.8 The test bed shall be of either circular or square shape support grid. For a circular shape the minimum diameter shall be 200mm and the maximum diameter shall be

300mm. For square shape, the minimum length shall be 200mm and the maximum length shall be 300mm.

4.2.5 Water supply & control system

- 4.2.5.1 The water supply & control system will be used to supply water for IPX2, IPX3 and IPX4 of the test chamber.
- 4.2.5.2 The system shall be equipped with a water tank with a capacity of a minimum of 90litres and a maximum of 110litres. The tank shall be an integral part of the equipment.
- 4.2.5.3 The system shall have an inlet for water and outlet to drain out water from the water tank.
- 4.2.5.4 The system shall have a filtration system to prevent clogging of nozzles and drip holes with dirt particles contained in the water.
- 4.2.5.5 The system shall incorporate a water recirculation system to conserve water during tests.
- 4.2.5.6 The system shall supply water at a constant flow rate and at a constant pressure.
- 4.2.5.7 Water system shall have an adjustable governor for water pressure and a digital pressure gauge to monitor it.
- 4.2.5.8 Water system shall have an adjustable governor for water flow rate and a digital flow meter to monitor it.

4.2.6 Air compressor

- 4.2.6.1 The air compressor is to be used to blow air through nozzles to prevent clogging them with dirt particles during tests.
- 4.2.6.2 The capacity of the air reservoir shall be of a minimum capacity of 25litres and a maximum capacity of 35litres.
- 4.2.6.3 The maximum pressure of the air compressor shall be approximately 7 Bars.
- 4.2.6.4 The air compressor power rating shall be approximately 700W.
- 4.2.6.5 The air compressor shall be operated from mains with reference values of: 3 x 240/415V and at 50 Hz.

4.3 Instructions and Marking

- 4.3.1 The following information shall be marked legibly and indelibly in the nameplate of the spray water tester.
 - a) Name or trade mark of the manufacturer;
 - b) Country of origin;
 - c) Type/model;
 - d) Equipment serial number;



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- e) Barcode comprising of equipment serial no;
- f) The inscription "Property of K.P. & L. Co Ltd."
- g) Standard(s) to which the equipment complies, and
- h) Year of manufacture.

4.3.2 All markings to be written in English and with at least 10mm figure height.

4.3.3 The spray water tester shall be indelibly marked with connections diagrams for power connections to the mains.

4.3.4 In addition, the following drawings and information shall be required with the tender:

- a) Spray water tester drawing giving all the relevant dimensions;
- b) Wiring diagrams;
- c) Description leaflet including details of configuring different IP Tests;
- d) Operational manuals.

4.3.5 The Tenderer shall complete clearly, all the clauses in both columns of the schedule in Appendix A. This shall form the basis of evaluation of the submitted tender. Failure to complete this appendix shall render the tender non-responsive. The tenderers shall indicate the details of their offer where it is different from these requirements. Where the requirement is the same, they shall indicate what is offered. Insertions such as "noted", "agreed" etc. shall be considered as non-responsive where a specific response is called for.

4.3.6 The tenderer shall submit with the tender, product manual and operating manual(s).

4.3.7 The manufacturer shall provide proof of conformance to the following International standards:

- a) ISO 9001(2008) standard
- b) ISO 14001(2004) standard
- c) ISO 17025(2005) standard

4.3.8 The manufacturer shall provide a list of at least three previous customers to which the spray water tester being offered has been supplied (Commendation letters from the customers shall be attached to support this requirement).

5. INFORMATION AND WARRANTY (IN CASE OF TENDER AWARD)

5.1 Drawings and technical details shall be submitted to KPLC for approval before manufacture of the spray water tester commences. KPLC undertakes to submit their comments or approval for the drawings within three weeks of receiving the draft copies.

5.2 Product manual and operation manuals shall be submitted.

5.3 The spray water tester shall have a warranty against any defects, which may develop due to faulty material, calibration, transportation or workmanship for a period of eighteen months from the date of delivery. All defective parts due manufacturer's defect shall be replaced at the supplier's cost.

5.4 KPLC shall meet the full costs of two Engineers for equipment inspection and acceptance testing except the cost of transportation within the country the equipment is being manufactured.

5.5 After delivery of spray water tester to KPLC, the manufacturer shall conduct training for at least 3 days for twenty people in Nairobi, Kenya. The training shall cover and not be limited to:

- a) Equipment features;
- b) Equipment metrology;
- c) Equipment installation;
- d) Equipment software;
- e) Equipment configuration and data downloading and saving, etc.

5.6 The manufacturer shall meet the cost of the training described in clause (5.5).

5.7 The spray water tester shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.

5.8 Where test and/or calibration certificates/reports are issued by a laboratory other than the International/National Meter Certification Authority, a copy of accreditation certificate shall be attached together with the tender documents.

5.9 The manufacturer shall provide current e-mail addresses, and telephone numbers of the national/international testing/calibration laboratories and meter certification bodies to facilitate confirmation of the submitted test reports & certificates.

APPENDIX A: Guaranteed technical particulars for the IP test machine, spray water tester

CLAUSE	KENYA POWER REQUIREMENT	MANUFACTURER'S COMPLIANCE/ RE-MARKS	REFERENCE PAGE IN THE SUBMITTED DOCUMENTS
4.1	Operating conditions requirements		
4.1.1	The spray water tester shall be suitable for operation in tropical climate where temperatures may vary from -1°C to +60°C.		
4.1.2	The spray water tester shall be suitable for operation in average annual relative humidity reaching 90% and altitude of up to 2,200m.		
4.1.3	The spray water tester shall be used for IP Tests of energy meters and metering accessories under tropical climate conditions.		
4.2	Design and construction		
4.2.1	Test chamber		
4.2.1.1	The test chamber shall be capable of performing IPX2, IPX3 and IPX4 tests.		
4.2.1.2	The test chamber shall house a spray test system and a drip box test system.		
4.2.1.3	The external dimensions of the test chamber shall not exceed 2000mm x 2400mm x 2400mm (H x L x W).		
4.2.1.4	The internal dimensions of the test chamber shall not exceed 1500mm x 1500mm x 1500mm (H x L x W).		
4.2.1.5	It shall be made of a steel frame and steel panels. The inside of the chamber shall be made of stainless steel.		
2.1.6	It shall be powder coated on the outside to protect it against weather elements.		
4.2.1.7	The test chamber doorway shall be at least 700mm x 700mm.		
4.2.1.8	The doorway shall have a silicone rubber sealing strip that can withstand high and low temperatures. The sealing shall prevent water from leaking out of the test chamber to the floor during tests.		
4.2.1.9	The test chamber shall have at least two glass inspection windows, one located at the door and the other on one of the sides to allow observation of samples under test.		
4.2.1.10	The test chamber windows shall be equipped with internal wipers to clear the observation windows during tests.		
4.2.1.11	It shall have an illumination lamp that can be switched on to allow better viewing of the samples under test in poor lighting.		



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4.2.1.12	It shall be equipped with casters (with provisions for fixing them on the floor) to enable the equipment be moved about to pave way for cleaning the floor where it shall be housed.		
4.2.2	Drip box (vertical rain drop) tester		
4.2.2.1	The drip box shall meet all requirements of IPX1 and IPX2 test systems.		
4.2.2.2	The drip box shall be mounted inside the ceiling of the test chamber.		
4.2.2.3	The drip area shall be of square or rectangular design and shall not exceed 1100mm x 1100mm.		
4.2.2.4	The dripping holes diameter shall be 0.4mm.		
4.2.2.5	The spacing between dripping holes shall not exceed 30mm.		
4.2.2.6	The tester shall have the option of automatic and manual operation.		
4.2.2.7	For automatic operation, the tester shall be provided with standard test options so that the equipment operators can select the desired test items and initiate automatic tests.		
4.2.2.8	The rainfall capacity shall be configurable by the equipment operators and can be selected from 0 – 3mm/ minute.		
4.2.2.9	The test time shall also be configurable by the equipment operators.		
4.2.2.10	The spray water tester should be capable of logging the details of tests (Test type, rainfall capacity, water pressure and test duration) and equipment serial number.		
4.2.2.11	The logged data shall be easily exported to a laptop computer via a Bluetooth or USB/ serial port.		
4.2.3	Spray swing pipe tester		
4.2.3.1	The spray swing pipe tester shall meet all requirements of IPX3 and IPX4 test systems.		
4.2.3.2	The spray swing pipe shall be made of stainless steel with a minimum radius of 550mm and a maximum radius of 650mm.		
4.2.3.3	The spray swing pipe shall be easy to mount and the center of the spray swing pipe shall always be in the center of the chamber.		



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4.2.3.4	The spray swing pipe shall have closures at the extreme ends for rinsing the pipe.		
4.2.3.5	The spray swing pipe nozzles shall be made of brass with spray holes diameter of 0.4mm.		
4.2.3.6	The swing angle shall be (2 x 60°) for IPX2 tests; (2 x 120°) for IPX3 tests; and (2 x 175°) for IPX4 tests.		
4.2.3.7	The tester shall have the option of automatic and manual operation.		
4.2.3.8	For automatic operation, the tester shall be provided with standard test options so that the equipment operators can select the desired test items and initiate automatic tests.		
4.2.3.9	The rainfall capacity will be configurable from 0-10litres/ minute.		
4.2.3.10	The water pressure shall be configurable from 0-100kN/m2.		
4.2.3.11	The test time shall also be configurable by the equipment operators.		
4.2.3.12	The spray water tester should be capable of logging the details of tests (Test type, rainfall capacity, water pressure and test duration) and equipment serial number.		
4.2.4	Turn table & tiltable test bed		
4.2.4.1	The turn table shall be of circular design.		
4.2.4.2	The turn table diameter shall be of a minimum radius of 650mm and a maximum of 750mm.		
4.2.4.3	The rotating speed of the turn table shall be 1rpm.		
4.2.4.4	The turn table shall be able to switch over from rotating mode to oscillating mode, with reversal of the direction of rotation at 350°.		
4.2.4.5	The test bed shall be made of stainless steel and easily fitted on the turn table.		
4.2.4.6	The test bed shall have a load carrying capacity limit of over 40kgs.		
4.2.4.7	The test bed shall be tiltable by +/- 30° to allow for IPX2 tests.		



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4.2.4.8	The test bed shall be of either circular or square shape support grid. For a circular shape the minimum diameter shall be 200mm and the maximum diameter shall be 300mm. For square shape, the minimum length shall be 200mm and the maximum length shall be 300mm.		
4.2.5	Water supply & control system		
4.2.5.1	The water supply & control system will be used to supply water for IPX2, IPX3 and IPX4 of the test chamber.		
4.2.5.2	The system shall be equipped with a water tank with a capacity of a minimum of 90litres and a maximum of 110litres. The tank shall be an integral part of the equipment and shall be housed under the test chamber.		
4.2.5.3	The system shall have an inlet for water and outlet to drain out water from the water tank.		
4.2.5.4	The system shall have a filtration system to prevent clogging of nozzles and drip holes with dirt particles contained in the water.		
4.2.5.5	The system shall incorporate a water recirculation system to conserve water during tests.		
4.2.5.6	The system shall supply water at a constant flow rate and at a constant pressure		
4.2.5.7	Water system shall have an adjustable governor for water pressure and a digital pressure gauge to monitor it.		
4.2.5.8	Water system shall have an adjustable governor for water flow rate and a digital flow meter to monitor it.		
4.2.6	Air compressor		
4.2.6.1	The air compressor is to be used to blow air through nozzles to prevent clogging them with dirt particles during tests.		
4.2.6.2	The capacity of the air reservoir shall be of a minimum capacity of 25litres and a maximum capacity of 35litres.		
4.2.6.3	The maximum pressure of the air compressor shall be approximately 7 Bars.		
4.2.6.4	The air compressor power rating shall be approximately 700W.		



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4.2.6.5	The air compressor shall be operated from mains with reference values of: 3 x 240/ 415V and at 50 Hz.		
4.3	Instructions and Marking		
4.3.1	The following information shall be marked legibly and indelibly in the nameplate of the spray water tester.		
a)	Name or trade mark of the manufacturer;		
b)	Country of origin;		
c)	Type/model;		
d)	Equipment serial number;		
e)	Barcode comprising of equipment serial no;		
f)	The inscription "Property of K.P. & L. Co Ltd."		
g)	Standard(s) to which the equipment complies, and		
h)	Year of manufacture.		
	All markings to be written in English and with at least 10mm figure height.		
4.3.2	The spray water tester shall be indelibly marked with connections diagrams for power connections to the mains.		
4.3.3	In addition, the following drawings and information shall be required with the tender:		
a)	Spray water tester drawing giving all the relevant dimensions;		
b)	Wiring diagrams;		
c)	Description leaflet including details of configuring different IP Tests;		
d)	Operational manuals.		
4.3.4	The Tenderer shall complete clearly, all the clauses in both columns of the schedule in Appendix A. This shall form the basis of evaluation of the submitted tender. Failure to complete this appendix shall render the tender non-responsive. The tenderers shall indicate the details of their offer where it is different from these requirements. Where the requirement is the same, they shall indicate what is offered. Insertions such as "noted", "agreed" etc. shall be considered as non-responsive where a specific response is called for.		
4.3.5	The tenderer shall submit with the tender, product manual and operating manual(s).		



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4.3.6	The manufacturer shall provide proof of conformance to the following International standards:		
a)	ISO 9001(2008) standard		
b)	ISO 14001(2004) standard		
c)	ISO 17025(2005) standard		
4.3.7	The manufacturer shall provide a list of at least three previous customers to which the spray water tester being offered has been supplied (Commendation letters from the customers shall be attached to support this requirement).		
5	Information and warranty (In case of tender award)		
5.1	Drawings and technical details shall be submitted to KPLC for approval before manufacture of the spray water tester commences. KPLC undertakes to submit their comments or approval for the drawings within three weeks of receiving the draft copies.		
5.2	Product manual and operation manuals shall be submitted.		
5.3	The spray water tester shall have a warranty against any defects, which may develop due to faulty material, calibration, transportation or workmanship for a period of eighteen months from the date of delivery. All defective parts due manufacturer's defect shall be replaced at the supplier's cost.		
5.4	KPLC shall meet the full costs of two Engineers for equipment inspection and acceptance testing except the cost of transportation within the country the equipment is being manufactured.		
5.5	After delivery of spray water tester to KPLC, the manufacturer shall conduct training for at least 3 days for twenty people in Nairobi, Kenya. The training shall cover and not be limited to:		
a)	Equipment features;		
b)	Equipment metrology;		
c)	Equipment installation;		
d)	Equipment software;		
e)	Equipment configuration and data downloading and saving, etc.		
5.6	The manufacturer shall meet the cost of the training described in clause (5.5).		



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5.7	The spray water tester shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.		
5.8	Where test and/or calibration certificates/reports are issued by a laboratory other than the International/National Meter Certification Authority, a copy of accreditation certificate shall be attached together with the tender documents.		
5.9	The manufacturer shall provide current e-mail addresses, and telephone numbers of the national/international testing/calibration laboratories and meter certification bodies to facilitate confirmation of the submitted test reports & certificates.		

