

TITLE:

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**SURVEY AND OPTICAL
INSTRUMENTS**

Part 3: Spirit Level

Doc. No. KP1/3CB/TSP/09/059-3

Issue No. 1

Revision No. 0

Date of Issue 2014-06-18

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0.1 Circulation List

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FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Distribution Division, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for spirit level for use on distribution and sub-transmission power lines. It is intended for use by KPLC in purchasing of the instruments.

1. SCOPE

- 1.1 This specification is for spirit level for use outdoors and indoors on distribution and sub-transmission power lines
- 1.2 The specification also covers inspection and tests of the spirit level as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.
- 1.3 The specification stipulates the minimum requirements for spirit level acceptable for use in the company and it shall be the responsibility of the Suppliers & Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the instruments for KPLC.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply:

- IEC 60529: Degrees of protection provided by enclosures (IP Code)
- ISO 9001: Quality management systems – Requirements
- BS 958: Specification for spirit levels for use in precision engineering

3. TERMS AND DEFINITIONS

For the purpose of this specification the definitions given in the reference standards shall apply.

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4. REQUIREMENTS

4.1. Service Conditions

The spirit level shall be tropicalized, designed and constructed for continuous outdoor operation in tropical areas and harsh climatic conditions including areas exposed to sea spray (along the coast), humidity of up to 95% and average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C.

4.2. Design and Construction

4.2.1. General

The spirit level shall be designed, manufactured and tested in accordance with the provisions of BS 958 standard.,

4.2.2. Construction

4.2.2.1. The filling liquid inside the spirit level shall be so adjusted before sealing so that due to partial filling, a bubble of mixed air and liquid vapour shall be formed inside.

4.2.2.2. The dimension of the glass tube shall be so proportioned and the filling liquid inside the glass tube shall be so adjusted that both ends of the spirit level shall always be read against the scale over a temperature -range of 5 to 45°C and the air-bell shall retain an effective length for accurate measurements up to 70°C

NOTE - To achieve this, it is recommended that alteration in length of a spirit level for a temperature change of one degree centigrade anywhere between 5 to 45% should not exceed one percent.

4.2.2.3. The filling pip of the spirit level while cased in the mount with the plaster of Paris shall not be covered by the plaster, and any plaster adhering to the pip shall be removed.

4.2.2.4. The vial of cylindrical spirit levels shall be processed internally so that, in a longitudinal section formed by a vertical plane through the axis of the vial, the surface in contact with the air-bell is a circular arc.

4.2.2.5. The ends of the glass bodies shall be approximately hemispherical and shall be drawn to thinner sections to facilitate quick sealing after filling. The tips shall be rounded off smoothly leaving no sharp projections.

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4.2.3. Materials

- 4.2.3.1. The glass tube used shall be well annealed, transparent, and free from striae, flaws and other defect and of 1.25 mm to 2.5 mm wall thickness. The composition of the glass shall be such that it is not reacted upon by the filling liquid or colouring material used. Borosilicate or soft soda glass tubes are preferable.
- 4.2.3.2. Ethyl ether, industrial methylated spirit (Grade I), methyl alcohol, acetone, absolute alcohol or any other suitable liquid shall be used. The liquid shall be clear, shall not be discoloured and shall not cloud or noticeably change in fluidity with age or at temperature as low as -40°C. The liquid shall also be chemically inert to the glass tube and the colouring material used. The liquid shall be free of water and impurities and shall not decompose under light and temperature.
- 4.2.3.3. The filling liquid shall not normally be coloured. If specified by the purchaser (KPLC), fluorescent colouring materials, such as eosine for orange colour or fluorescein for intense colour, shall be used.
- 4.2.3.4. Metal rods and plates used in the manufacture of mounts for spirit levels shall be of the best quality and free from defects. Non-magnetic materials shall be used, if specifically desired by the purchaser.
- 4.2.3.5. Perfectly white surgical plaster of Paris shall be used for mounting the spirit levels. PVC or acrylic plastic sheet or similar suitable material optically worked shall be used in the manufacture of the plastic guard. It shall be colourless, transparent and dimensionally stable under tropical conditions.

4.2.4. Graduation

- 4.2.4.1. The top of the spirit levels shall be graduated preferably by etching to assist in bringing the air-bell in the centre of its run, and to indicate the movement of the air-bell for a specified tilt indicated by such spacing where provide.
- 4.2.4.2. On cylindrical spirit levels, two long lines shall be marked such that the spacing between them would indicate the length of the spirit levels at a temperature of 27°C. These lines shall also indicate the position for the air-bell at the centre of its run, showing that the bubble is in a horizontal plane. Scale marking shall be made on all cylindrical spirit levels at 2.5 mm space, commencing from long centring lines and on either side of them, the outer lines being filled in black and the inner lines in red. The

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thickness of the lines shall be 0.25 ± 0.05 mm. The blank space at the centre shall be one-third of the air-bell length at a temperature of 27°C.

4.2.4.3. The two major graduation marks of any scale shall be clearly designated by their increased length and/or their being terminated by dots. They shall be of the same length and shall indicate the graduations, an optical arrangement shall be provided to enable the air-bell to be viewed so that its two ends appear adjacent to each other. When the spirit level is central, the two ends shall appear to rest side by side in the same line.

4.2.5. Sizes

The preferred overall lengths and diameters for cylindrical spirit level shall be as given in Table 1 read with Fig. 1A. The pip should be as small as possible.

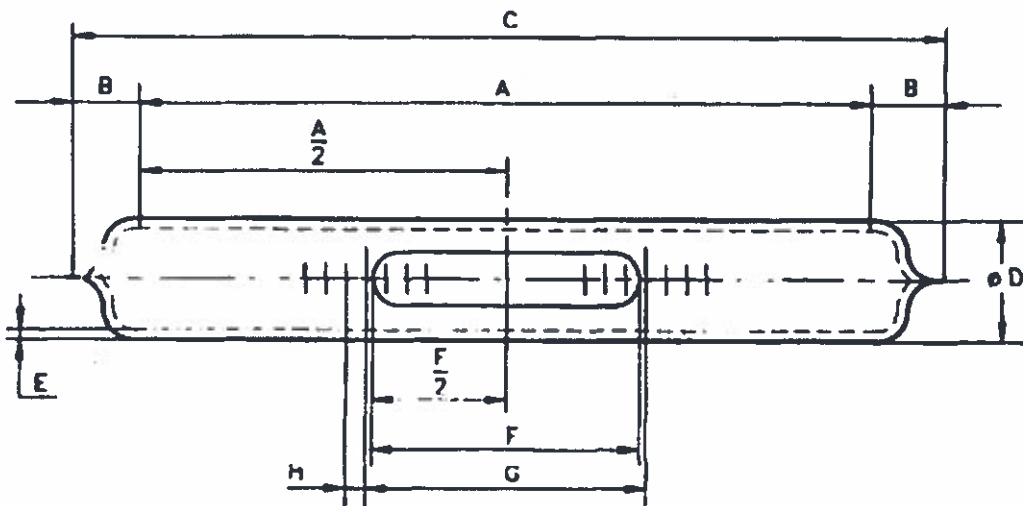


Fig. 5: Cylindrical Spirit Level

Table 1: Dimensions and sizes of cylindrical bubbles

Dimensions	Dimensions of cylindrical spirit			
	All dimensions are in millimetres			
A (min)	200	100	50	25
B (max)	15	10	7	5
C (max)	230	120	64	35
D	17 - 20	13 - 15	10 - 12	5 - 8
E	1.5	1.25	0.75	0.75
F	50 - 70	33 - 50	15 - 22	7 - 10
H	2.5	2.5	2	2

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4.3. Quality Management System

- 4.3.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation of the spirit level fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008.
- 4.3.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.
- 4.3.3. The bidder shall indicate the delivery time of the spirit level, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered.

5.0. TESTS AND INSPECTION

- 5.1. The spirit level shall be inspected and tested in accordance with the requirements of BS 958 and IEC 60529 standards and all the provisions of this specification. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.
- 5.2. Copies of previous Type Tests Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language).
The testes shall include:
 - a) Zero setting
 - b) Sensitivity, and consistency of the bubble
 - c) V-grooved surfaces tests
 - d) Squareness of the level
- 5.3. The spirit level shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and Sample Test Reports for the spirit level to be supplied shall be submitted to KPLC for approval before delivery of the goods. The tests shall include:

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- a) Zero setting
- b) Sensitivity, and consistency of the bubble
- c) Flatness of the base
- d) V-grooved surfaces tests
- e) Squareness of the level
- f) Dimensional checks

5.4. On receipt of the product, KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the spirit level which upon examination, test or use; fail to meet any of the requirements in the specification.

6.0. MARKING AND PACKING

6.1. Marking

- 6.1.1. The glass vial used in the level shall be suitably and legibly marked preferably near the centre with their measured values of sensitivity.
- 6.1.2. The details to be legibly and indelibly marked on the body of the spirit level shall be:
 - a) The name of the manufacturer or his trademark
 - b) The year of manufacture.
 - c) The letters: "Property of KPLC"

6.2. Packing

- 6.2.1. During storage and transit all working surfaces of the level shall be protected against climatic conditions by being covered with a suitable corrosion preventive compound. The level shall then be placed in its protective case. The case shall be wrapped with brown paper and required number of cases shall be suitably packed in a wooden box lined with brown paper using any suitable material for cushioning.
- 6.2.2. An instructional booklet shall be provided by the manufacturer giving specially the precautions to be taken during use.

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7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

- a) Fully filled clause by clause description of the item on offer as per Annex A (Guaranteed Technical Particulars) and signed by the manufacturer;
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
- c) Sales records for the last five years and at least four customer reference letters;
- d) Details of manufacturing capacity and the manufacturer's experience;
- e) Copies of required type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
- f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
- g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Design Drawings with details of spirit level to be manufactured for KPLC.
- c) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008
- d) Detailed test program to be used during factory testing;
- e) Marking details and method to be used in marking the spirit level;
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the spirit level for The Kenya Power & Lighting Company;
- g) Packaging details (including packaging materials).

7.3 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the spirit level to KPLC stores

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ANNEX A: *Guaranteed Technical Particulars (to be filled and signed by the supplier and submitted together with copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of test certificates for tender evaluation)*

Tender No **Bidder's Name & Address**

	Description	Bidder's Offer (indicate full details of the values offered)
1	Name of the manufacturer and country of origin	
	Type Reference Number or Model Number	
2	Applicable Standards	
3	Terms and Definitions	
4	Requirements	
4.1	Service conditions	
4.2	Design and Construction	
	4.2.1 General	
	4.2.2. Construction	
	4.2.2.1 - 4.2.2.5	
	4.3.3. Materials	
	4.3.3.1 - 4.3.3.5	
	4.3.4. Graduation	
	4.3.4.1 - 4.3.4.3	
	4.3.5. Sizes	
4.4	Quality Management System	
	4.4.1 – 4.4.3	
5.0	Tests and Inspection	
	5.1 – 5.6	
6.0	Marking and packing	
	6.1 Packing	
	6.1.1 – 6.1.3	
	6.2 Marking	
7.0	Documentation	
	7.1– 7.3	
8.0	Manufacturer's Guarantee and Warranty	
9.0	List catalogues, brochures, technical data and drawings submitted to support the offer.	
10.0	List customer sales records and customer reference letters submitted to support the offer.	

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11.0	List Test Certificates submitted with tender	
12.0	List test & calibration reports to be submitted to KPLC for approval before shipment	
13.0	List test reports of the spirit level to be submitted to KPLC for approval before shipment	
14.0	Statement of compliance to specification (indicate deviations if any & supporting documents)	
15.0	List Acceptance Tests to be witnessed by KPLC Engineers at the factory	

.....
Manufacturer's Name, Signature, Stamp and Date

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