APPENDIX 1



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# SPECIFICATIONS FOR

# LOW VOLTAGE RING TYPE MEASURING CURRENT TRANSFORMERS

| Issued by: Chief Engineer, Installations Management | Authorized by: Manager, Energy Management |
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| Signed: | Signed: |
| Date: 2017-10-19 | Date: 2017-10-19 |

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### 0.1 Circulation List

| Copy No. | Copy Holder |
|---|---|
| 1 | GM, SUPPLY CHAIN |
| 2 | MANAGER, STANDARDS DEVELOPMENT |

### 0.1 Amendment Record

| *No.* | *Date (YYYY-MM-DD)* | *Description of Change* |
|---|---|---|
| *1* | *2016-07-30* | *Amendments on clauses- 4.1.2* |
| | | *Inclusions - Altitude* |
| | | |
| | | |

## FOREWORD

This standard specification lays down requirement for Low voltage ring type measuring current transformers.

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 Low voltage ring type measuring current transformers 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 applies to newly manufactured Low voltage ring type measuring current transformers.

## 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.

**IEC 61869-2 2012:** Additional requirements for current transformers and all the standards referred to in this standard.

## 3 DEFINITIONS

The definitions given in the above reference standard apply.

- LV: Low voltage
- CT: Current transformer

## 4 REQUIREMENTS

### 4.1 Operating conditions

**4.1.1** The current transformers shall comply fully with the service conditions for indoor current transformers as per the IEC 61869-2 standard.

**4.1.2** The current transformers shall be suitable for continuous indoor operation in tropical areas with the following atmospheric conditions:

Humidity: High at Coast, up to 95 % and lower inland, up to 50%; Altitude of up to 2,600m above sea level.

Temperature: Average ambient of +30°C with a minimum of -1°C and a maximum of +40°C, temperature category –5/40;

**4.1.3** The current transformers shall be used for connection of equipment for industrial and commercial loads under tropical climate conditions. The system earthing shall be earthed neutral.

### 4.2 Design and construction

#### 4.2.1 Dimensions

**4.2.1.1** Measuring current transformers shall be of bar primary type, having a hollow diameter of not less than 55mm with an external diameter of not more than 110mm for Current Transformer of 100/5A, 200/5A, 300/5A and 500/5A ratios.

**4.2.1.2** For Current ratios of above 500/5A and up to 2000/5A shall have hollow diameters of not less than 120mm with external diameter of not more than 170mm.

#### 4.2.2 Sealing

**4.2.1.3** The current transformer terminals for all types of ratios shall have facility for sealing.

#### 4.2.3 Rated insulation levels

4.2.3.1 The rated insulation level of a primary winding shall be based on its highest voltage for equipment $U_m$.

4.2.3.2 For current transformer without primary winding and without primary insulation of its own, the value Um = 0,72 kV is assumed.

**4.2.4** For windings having Um = 0,72 kV or 1,2 kV, the rated insulation level is determined by the rated power- frequency withstand voltage, according to the IEC 61869 -2 Standard.

#### 4.2.5 Insulation requirements for secondary windings

The rated power frequency-withstand voltage for secondary winding insulation shall be not less than 3 kV (r.m.s.).

### 4.3 Ratings

#### 4.3.1 Standard values of rated secondary current

The rated secondary current for these current transformers shall be 5 A while the primary values shall be 100A, 200A, 300A, 500A, 1000A, 1500A, and 2000 A.

#### 4.3.2 The standard accuracy class

The accuracy class for these current transformers shall be class 0.2s.

#### 4.3.3 Limits of current error and phase displacement

The limits of current error and phase displacement for measuring current transformers of class 0.2s shall be as detailed in clause 5.6 and Table 200.1 of the IEC 61869-2 standard.

### 4.3.4 Rated continuous thermal current

Unless otherwise specified, the rated continuous thermal current shall be the rated primary current.

### 4.3.5 Rated output power

The value of rated output shall be ≥10VA

### 4.3.6 Rated short-time thermal current ($I_{th}$)

A rated short-time thermal current shall be assigned to the transformer and shall comply with the type test specified in clause 7.1 of the standard.

### 4.3.7 Rated dynamic rating ($I_{dyn}$)

The value of the rated dynamic current *( $I_{dyn}$ )* shall normally be 2.5 times the rated short-time thermal current *($I_{th}$)* and it shall be indicated on the rating plate when it is different from this value.

### 4.3.8 Extended current rating

Current Transformers of accuracy class 0.2s may be marked with extended current rating in compliance with the Standard.

**Requirements of clause 4.3.3 to 4.3.4 shall form part of the type test approval to be issued by an International or the National (of country of manufacture) Current Transformer certifying body.**

### 4.4 Tests

The tests specified in this standard are classified as type tests, routine tests, and special tests.

#### 4.4.1 Type tests

Type tests shall be done on each transformer so as to comply with clause 7.2 of the IEC 61869-2 Standard.

#### 4.4.2 Routine tests

Routine tests shall be done on each transformer so as to comply with clause 7.3 of the IEC 61869-2 Standard.

**Requirements of clause 4.4.1 and 4.4.2 shall form part of the type test approval to be issued by an International or the National (of country of manufacture) current transformer certifying body.**

### 4.5 Instructions and markings

#### 4.5.1 Terminal markings

##### 4.5.1.1 General

The terminal markings shall identify:

a) The primary and secondary windings;

b) The winding sections, if any;

c) The relative polarities of windings and winding sections;

d) The intermediate tapings if any.

#### 4.5.1.2 Method of marking

4.5.1.2.1 The terminals shall be marked clearly and indelible, either on their surface or in their immediate vicinity.

4.5.1.2.2 The marking shall consist of letters followed, or preceded where necessary, by numbers. The letters shall be in block capitals.

#### 4.5.1.3 Markings to be used

The markings of current transformers shall be as indicated in Table 200.6 of the IEC 61869-2 Standard.

### 4.5.2 Rating plate markings

All current transformers shall carry at least the following markings:

a) the manufacturer's name or other mark by which he may be readily identified;

b) a serial number and type designation

c) the rated primary and secondary current, i.e.:

Kn = Ipn / Isn A (e.g. Kn = 200 / 5 A)

d) the rated frequency (e.g. 50 Hz);

e) the rated output and the corresponding accuracy class, together with additional information specified in later parts of these recommendations;

f) the highest voltage for equipment;

g) the rated insulation level;

Note-The two items f) and g) may be combined into one marking (e.g. 0.72/3 kV)

h) the accuracy class and instrument security factor following the indication of the corresponding rated output (e.g. 15 VA Class 0,5 FS 10 );

i) Current transformers having an extended current rating shall have this rating indicated immediately following the class designation (e.g. 15 VA Class 0.5 ext. 150 %);

j) **"THE PROPERTY OF K.P. & L. CO. LTD."**

All information shall be marked in an indelible manner on the current transformer itself or on a rating plate securely attached to the transformer.

In addition, other information shall be marked whenever space is available as per IEC 61869-2 Standard.

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

(a) Drawing giving all the relevant dimensions;

(b) Wiring diagrams;

(c) Description leaflets of current transformers;

**4.5.4** Copies of type approval certificate(s) with test and calibration results of the current transformers being offered (see clauses 4.2.3, 4.2.4, 4.4.1 & 4.4.2) obtained from an international or the national CT certification body shall be provided. **If type approval certificate(s) is (are) from accredited CT certification laboratories (and not national or international body), then it (they) shall be accompanied with copies of certificates of accreditation from the national or an international certification body**.

**4.5.5** **The Tenderer shall complete clearly, all the clauses in both columns of the schedule in Appendix B**. 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.**

**4.5.6** The tenderer shall submit with the tender, **a sample of each type of current transformer** being tendered.

**4.5.7** The manufacturer shall provide proof of conformance to **ISO 9001(2015)** standard. Where proof of conformance to **ISO 9001:2015** standard shall be provided, the certificate shall be valid at the time of tender submission.

**4.5.8** The manufacturer shall provide a list of at **least three previous utilities outside the country of manufacture** to which the current transformer being offered has been supplied including addresses and contact person(s) of the utilities.

**4.5.9** The tenderer shall give proof that the number of current transformers sold to **utilities outside the country of manufacture** over a period of last **5 years** shall not be less than **5,000 CTs.** The

addresses and contact person(s) shall be provided with the tender to facilitate confirmation of this information by the procuring entity.

## 5.0 INFORMATION AND WARRANTY *(In case of tender award)*

5.1 Drawings and technical details shall be submitted to Kenya Power for approval before manufacture of the current transformers commences. Kenya Power undertakes to submit their comments or approval for the drawings within three weeks of receiving the draft copies.

5.2 Operation manuals shall be submitted in 3 copies. Description leaflets (brochures) shall be submitted in copies of 10 for each current transformer type.

5.3 The current transformers 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 current transformers shall be replaced at the supplier's cost.**

5.4 KPLC engineers will inspect CT-manufacturing facilities intending to supply current transformers to the company for the first time at no extra cost, excepting the cost of the engineers' transportation to the nearest major airport. Such inspection shall not in any way prejudice the purchaser's rights and privileges.

5.5 **Samples**

The tenderer shall submit one sample for each CT ratio type together with the tender documents. The submitted CT samples shall be subjected to accuracy tests at Kenya Power's Meter Central Laboratory to verify the requirements of IEC 61869-2 clause 7 and to verify responsiveness to other clauses of this specification. Sample CTs shall not be returned to the tenderers.

5.6 The current transformers shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.

5.7 The current transformers shall be packed in suitable groups and/or batches with consecutive serial numbers.

5.8 Where test and/or calibration certificates/reports are issued by a laboratory other than the **International/National 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, fax and telephone numbers of the national/international testing/calibration laboratories and current transformer certification bodies to facilitate confirmation of the submitted test reports & certificates.

## APPENDIX A: GUARANTEED TECHNICAL PARTICULARS

| Clause Number | Kenya Power Requirements | Bidder's offer | Reference Page to support the offer. |
|---|---|---|---|
| **4.1** | **Operating Conditions** | | |
| 4.1.1 | Shall comply fully with the service conditions for indoor current transformers as per the IEC 61869-2 | | |
| 4.1.2 | The current transformers shall be suitable for continuous indoor operation in tropical areas with the following atmospheric conditions:<br>Humidity: High at Coast, up to 95 % and lower inland, up to 50%;<br>Temperature: Average ambient of +30°C with a minimum of -1°C and a maximum of +40°C, temperature category –5/40; | | |
| 4.1.3 | The current transformers shall be used for connection of equipment for industrial and commercial loads under tropical climate conditions. The system earthing shall be earthed neutral. | | |
| **4.2** | Design & Construction | | |
| **4.2.1** | Dimensions | | |

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| 4.2.1.1 | Measuring current transformers of current shall be of bar primary type, having a hollow diameter of not less than 55mm with an external diameter of not more than 110mm for 100/5A, 200/5A, 300/5A and 500/5A ratios. | | |
| 4.2.1.2 | For Current ratios of above 500A and up to 2000/5A shall have hollow diameters of not less than 120mm with external diameter of not more than 170mm | | |
| **4.2.2** | **Sealing** | | |
| **4.2.2.1** | Sealing: The current transformer terminals for all types shall have facility for sealing. | | |
| **4.2.3.1** | Rated Insulation Levels The rated insulation level of a primary winding shall be based on its highest voltage for equipment Um | | |
| 4.2.3.2 | For current transformer without primary winding and without primary insulation of its own, the value Um = 0.72kV is assumed | | |
| 4.2. 3.3: | For winding having Um=0,72Kv or 1,2 Kv, the rated insulation level is determined by the rated power frequency-withstand voltage ,according to table 3 of IEC 61869-2 Standard. | | |
| **4.2.4** | Insulation requirements for secondary windings<br>The rated power frequency –withstand voltage for secondary winding insulation shall be not less than 3Kv(r.m.s) | | |
| **4.3** | Ratings | | |
| 4.3.1 | Standard values of rated secondary current. The rated secondary current for these current transformer shall be 5A while the primary values shall be, 100A, 200A, 300A, 500A, 1000A, 1500A and 2000A current | | |
| 4.3.2 | The accuracy class for these current transformers shall be class 0.2s | | |

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| 4.3.3 | Limits of current error and phase displacement for measuring current transformers of class 0.2s shall be as detailed in clause 5.6 and Table 200.1 of the IEC 61869-2 Standard | | |
| 4.3.4 | Unless otherwise specified, the rated continuous thermal current shall be the rated primary current. | | |
| 4.3.5 | The value of rated output shall be ≥10VA | | |
| 4.3.6 | A rated short time thermal current shall be assigned to the transformer and shall comply with the type test specified in clause 7.1 of the standard | | |
| 4.3.7 | The value of the rated dynamic current (Idyn)shall normally be 2.5times the rated short-time thermal current (Ith) and it shall be indicated on the plate when it is different from this value. | | |
| 4.3.8 | Current Transformers of accuracy class 0.2s may be marked with extended current rating in compliance with the Standard | | |
| | **Requirements of clause 4.33 to 4.3.4 shall form part of the type test approval to be issued by an international or the National (of country of manufacture) Current Transformer certifying body.** | | |

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| **4.4** | **Tests:** The tests specified in this standard are classified as types ,routine tests, and special tests | | |
| **4.4.1** | **Type tests:** The tests shall be done on each transformer so as to comply with clause 7.2 of IEC 61869 -2 Standard | | |
| **4.4.2** | **Routine tests:** Routine tests shall be done on each transformer so as to comply with clause 7.3 of IEC 61869-2 Standard. | | |
| | **Requirements of clause 4.4.1 and 4.4.2 shall form part of the type approval to be issued by an International or National (of country of manufacture) current transformer certifying body.** | | |
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| **4.5** | **Instructions and markings** | | |
| 4.5.1 | **Terminal Markings** | | |
| | The terminal markings shall identify | | |
| (a) | Primary and secondary windings | | |
| (b) | Winding sections if any | | |
| (c) | Relative Polarities of winding sections | | |
| (d) | The relative polarities of windings and winding sections | | |
| (e) | Intermediate tappings, if any | | |
| 4.5.1.2 | **Method of Marking** | | |
| (a) | The terminal shall be marked clearly and indelibly, either on their surface or in their immediate vicinity. | | |
| (b) | Markings shall consist of letters followed by numbers with letters in block capitals | | |
| 4.5.1.3 | **The marking to be used.** The Markings of current transformer shall be indicated as in table 200.6 of the IEC 61869-2 Standard | | |
| 4.5.2 | **Rating plate markings** All current transformers shall carry at least the following: | | |
| a) | the manufacturers name or other mark by which he may be readily identified | | |
| b) | Serial number or a type designation, preferably both | | |
| c) | the rated primary & secondary current i.e. Kn=Ipn/IsnA(e.g. Kn=100/5A | | |
| d) | the rated frequency(e.g. 50Hz) | | |
| e) | the rated output and corresponding accuracy class, together with additional information specified in later parts of these recommendations. | | |
| f) | the highest voltage for equipment | | |
| g) | the rated insulation level. Note-The two items f) and g) may be combined into one marking (e.g0,72/3Kv) | | |

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| h) | the accuracy class and instrument security factor following of the corresponding rated output (e.g. 15VA Class 0.5FS10) | | |
| i) | current transformer having an extended current rating shall have this indicated immediately following the class designation (e.g. 15VA Class 0.5 ext,150%) if applicable | | |
| | THE PROPERTY OF K.P. CO. LTD. All information shall be marked in an indelible manner on the current transformer itself or on a rating plate securely attached to the transformer. In additional, other information shall be marked whenever space is available as per IEC 61869-2 Standard. | | |
| 4.5.3<br>(a)<br>(b)<br>(c ) | In addition, the following drawings and information shall be required with the tender:<br>Drawing giving all the relevant dimensions;<br>Wiring diagrams;<br>Description leaflets of current transformers | | |
| 4.5.4 | Copies of type approval certificate(s) with test and calibration results of the current transformers being offered (see clauses 4.2.3,4.2.4,4.4.1 &4.4.2) obtained from an international or the national or the national CT certificate body shall be provided. **If type approval certificate(s) is (are) from accredited CT certificate laboratories (and not national or international body),then it (they) shall be accompanied with copies of certificates of accreditation from the national or an international certificate body** | | |

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| 4.5.5 | The Tenderer shall complete Cleary; all the clauses in both columns of the schedule in Appendix B. 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. Insertion such as "noted", "agreed" etc. Shall be considered non-responsive where a specific response is called for. | | |
| 4.5.6 | The tenderer shall summit with the tender, a sample of each type of current transformer being tendered. | | |
| 4.5.7 | The manufacturer shall provide proof of conformance to ISO 9001(2015) standard. Where proof of conformance to ISO 900:2000 standard shall be provided, the certificate shall be valid at the time of tender submissions. | | |
| 4.5.8 | The manufacturer shall provide a list of at least three previous utilities outside the country of manufacture to which the current transformer being offered has been supplied including addresses and contact person(s) of the utilities. | | |
| 4.5.9 | The tenderer shall give proof that the number of current transformers sold to utilities outside the country of manufacture over a period of at least 5years shall not be less than 5000 CTs. The addresses and contact persons shall be provided with the **tender** to facilitate confirmation of this information by the procuring entity. | | |
| 5.0 | Information and warranty. | | |
| 5.1 | Drawings and technical details shall be submitted to Kenya Power for approval before manufacture of the current transformers commences. Kenya Power undertakes to submit their comments or approval for the drawings within three weeks of receiving the draft copies. | | |

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| 5.2 | Operation manuals shall be submitted in 3 copies. Description leaflets (brochures) shall be submitted in copies of 10 for each current transformer type. | | |
| 5.3 | The current transformers 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 current transformers shall be replaced at the supplier's cost**. | | |
| 5.4 | KPLC engineers will inspect CT-manufacturing facilities intending to supply current transformers to the company for the first time at no extra cost, excepting the cost of the engineers' transportation to the nearest major airport. Such inspection shall not in any way prejudice the purchaser's rights and privileges. | | |
| 5.5 | **Samples**<br>The tenderer shall submit one sample for each CT ratio type together with the tender documents. The submitted CT samples shall be subjected to accuracy tests at Kenya Power's Meter Central Laboratory to verify the requirements of IEC 61869-1 clause 7 and to verify responsiveness to other clauses of this specification. Sample CTs shall not be returned to the tenderers. | | |
| 5.6 | The current transformers shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling | | |
| 5.7 | The current transformers shall be packed in suitable groups and/or batches with consecutive serial numbers. | | |
| 5.8 | Where test and/or calibration certificates/reports are issued by a laboratory other than the **International/National Certification Authority**, a copy of accreditation certificate shall be attached together with the tender documents. | | |

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

**NB:** - This schedule does not in any way substitute for detailed information required elsewhere in the specification.

**Manufacturer's Declaration: I .....on behalf of.....**

Declare that the above specifications matrix conforms to a typical tender item **type.....** as clearly marked in the attached technical brochures & drawings, and being offered for this tender.

**Signature.....**

**Date.....Stamp/Seal.....**