

DOCUMENT NO: KP1/6C/4/1/TSP/11/007-2



Kenya Power

AUTOMATIC LOAD TRANSFER SWITCH
Part 2: 11KV INDOOR AUTOMATIC LOAD TRANSFER SWITCH —
SPECIFICATION

A Document of the Kenya Power & Lighting Co. Ltd
July 2017



Kenya Power

Kenya Power & Lighting
Co. Ltd

TITLE:
AUTOMATIC LOAD TRANSFER SWITCH
Part 2: 11KV INDOOR AUTOMATIC LOAD
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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Manager, Standards
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?folderId=23)	

REVISION OF KPLC STANDARDS

To keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

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0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 1 Rev 2	2010-04-12	Clause 4.3.1: Changed no. of mechanical operations & making/breaking currents	S.K. Nguli	G.K. Gathige
Issue 2 Rev 0	2017-07-19	i. Editing ii. Changed the title to <i>Automatic Load Transfer Switch - Part 2: 11kv Indoor Automatic Load Transfer Switch — Specification</i> iii. Restated Clause 4.2.1.2 4.3.1	Rotich Benard	Dr. Eng. P. Kimemia

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FOREWORD

This specification has been prepared by the Standards Department in collaboration with Central Construction – Electrical Plant Projects Department, both of Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for 11kV indoor pad-mounted automatic load transfer switch herein called ‘switch’.

The automatic load transfer switches shall be air-insulated and interruption shall be in vacuum.

The equipment shall be complete with all components to realize the intended application. The indoor-mounted automatic load transfer switch, while assembled, shall comprise of 2 switches, control unit(s) plus associated control cables and accessories.

This specification is in this series:

KP1/6C/4/1/TSP/11/007-1: Automatic Load Transfer Switch - Part 1: 11kV and 33kV Pole-Mounted Automatic Load Transfer Switch — Specification

KP1/6C/4/1/TSP/11/007-2: Automatic Load Transfer Switch - Part 2: 11kV Indoor Automatic Load Transfer switch — Specification

KP1/6C/4/1/TSP/11/007-3: Automatic Load Transfer Switch - Part 3: 11kV and 33kV Pole-Mounted Vacuum Switch in SF₆ — Specification

KP1/6C/4/1/TSP/11/007-4: Automatic Load Transfer Switch - Part 4: 11kV Indoor Pad-mounted Automatic Load Transfer switch in SF₆ — Specification

It shall be the responsibility of the manufacturer to ensure adequacy of the design and good engineering practice in the manufacture of the indoor pad mounted automatic load transfer switch for KPLC. The manufacturer shall also submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

The following are members of the team that developed this specification:

Name	Department
Adrian Sagwe	Technical Services
Rotich Benard	Standards

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1. SCOPE

This specification is for 11kV Indoor Automatic Load Transfer Switch together with controls and auxiliary equipment for use on underground distribution network to provide seamless load transfer from one source to an alternative standby source without voltage or frequency transients whenever there is an interruption on the current source of power supply. The specification also covers inspection and test of the equipment

2. REFERENCES (NORMATIVE)

The following standards contain provisions which through reference in this text constitute provisions of this specification. For dated editions, the cited edition shall apply; for undated editions, the latest edition of the referenced document shall apply.

- IEC 62271-100: High-voltage switchgear and controlgear - Part 100: High-voltage alternating-current circuit-breakers.
- IEC 62271-200: High-voltage switchgear and controlgear - Part 200: A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.
- IEC 60051 Direct acting indicating analogue electrical measuring instruments and their accessories.
- IEC 60044-1: Instrument transformers - Part 1: Current transformers.
- IEC 60044-2: Instrument transformers - Part 2: Inductive voltage transformers.
- IEC 60255: Electrical Relays.
- IEC 60529: Degrees of protection provided by enclosures (IP Code).

3. DEFINITIONS AND ABBREVIATION

For this specification, the definitions and abbreviations given in the reference standards shall apply.

4. REQUIREMENTS

4.1. Service conditions

The switches shall be suitable for use indoors in tropical areas and harsh climatic conditions including areas exposed to:

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- a) Altitudes of up to 2200m above sea level
- b) Humidity of up to 95%
- c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,
- d) Pollution: Design pollution level to be taken as “Heavy” (Pollution level III) for inland and “Very Heavy” (Pollution level IV) for coastal applications in accordance with IEC 60815.
- e) *Isokeraunic* levels of up to 180 thunderstorm days per year.

4.2. Materials and Construction

4.2.1. Switch

- 4.2.1.1. The switch shall be suitable for indoor ground-mounting, designed for three phase operation by means of a local and remote control for load transfer from two sources.
- 4.2.1.2. The switching shall take place in vacuum while the insulation medium shall be air. The switch shall be equipped with an operation counter visible from the outside.
- 4.2.1.3. The switch shall have a mechanical status indicator for both the Open and the Closed position.
- 4.2.1.4. The Switch shall be equipped with inbuilt current transformers of appropriate ratio, which will be connected to the control unit so that faults on the load side can be detected and load transfer blocked.
- 4.2.1.5. The Switch shall have current transformers for metering on the load side.
- 4.2.1.6. All current carrying parts shall be made of electrolytic high conductivity material with the contacts silver -plated.
- 4.2.1.7. Manually operated levers to enable manual trip and close of source-side interrupter switches during power outages to be provided.
- 4.2.1.8. The switch to be provided with suitable terminals for connecting cables of up to 300mm² (both aluminium and copper).
- 4.2.1.9. The switch shall be provided with suitable durable surge diverters at point of cable termination. Healthy status of surge diverter shall be monitored via suitable indicator meter. The diverters shall be fitted in such a way that can guarantee easy removal and replacement.
- 4.2.1.10. The cable compartment shall have an anti-vermin guard plate giving protection against rats, rodents, snakes etc.

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4.2.2. Voltage Transformers

- 4.2.2.1. A set of three-phase voltage transformers shall be supplied for monitoring the status of the two sources. The marshalling boxes for the voltage transformers and connection cables to the marshalling box and to the control box shall be provided.
- 4.2.2.2. The secondary voltage of the voltage transformers shall be between 100V and 240V AC. This voltage shall be used for powering the control box and also for electrical operations of the switches.

4.2.3. Control Unit

- 4.2.3.1. The control unit shall be complete with auxiliary equipment suitable for automatic load transfer from one source to alternate standby source whenever there is loss of power on the preferred source.
- 4.2.3.2. The control unit shall be a fully programmable microprocessor/numerical-based unit with the following features on its front face:
- LCD Screen to facilitate manual programming of the control unit and viewing of data such as events, faulty records and measurands.
 - Key Pad:** This shall be used for programming and viewing the control settings, measurands and control logic for the unit.
 - The control unit shall have a suitable means of showing the status of the two sources, i.e. whether they are live or not.
 - If the control has locked out i.e., failed to transfer load because it has detected a fault on the load side, then this should be indicated on the control by a suitable means.
 - The time delay for load transfer from preferred source to alternate source and vice versa and from one to another where none of the sources is preferred shall be programmable from 0 seconds to at least 60 seconds.
- 4.2.3.3. The auto changeover shall be able to “remember” to switch to its previous preferred source of supply in an event where both sources of power supplies are restored after failure. Under voltage trip block in case of loss of both sources of supply is also acceptable.
- 4.2.3.4. Phase sequence indication by means of press button shall be provided and an audible alarm provided in case of wrong rotation. The correct phase sequence shall be R, Y, B.

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- 4.2.3.5. The DC supply provided by batteries shall be such that operations of the auto changeover are possible 8hrs after loss of AC without recharge.
- 4.2.3.6. The unit shall be supplied complete with 7 copies of programming software in a CD ROM.
- 4.2.3.7. It shall be possible to load the software into at least 10 different laptop computers without requirement for additional licenses. Seven (7) sets of hardcover manuals for the software supplied providing detailed instructions for programming and settings shall be provided.
- 4.2.3.8. The control units shall be supplied complete with integral termination kits, control and interconnecting cables.
- 4.2.3.9. The control Unit shall be equipped for supervisory control via SCADA
- 4.2.3.10. Automatic change-over from one source to the other shall occur when: -
- One or all the phases for the source in service is detected to be dead or de-energized and all the phases of the standby source are healthy.
 - Undervoltage or overvoltage is detected on one or more phases of the source in service and all the phases of the standby source are healthy.
- 4.2.3.11. The settings of the overvoltage and undervoltage sensing relay shall be programmable at least $\pm 20\%$ of nominal voltage rating.

4.2.4. Characteristics

- 4.2.4.1. The electrical characteristics of the load transfer switch shall be as shown in Table 1 below:

Table 1: Electrical Characteristics of the Load Transfer Switch

CHARACTERISTICS	11KV SWITCH
Rated system highest voltage and frequency	17.5Kv, 50Hz
Rated Current	630A
Rated power frequency withstand voltage, rms	38kV
Rated lightning impulse withstand voltage, peak	95kV
Minimum breaking /making capacity peak	16/31.5 kA
Minimum number of Mechanical & Full load operations	10,000
Minimum number of operations under fault conditions	100
Rated short-time withstand current	16kA, 3sec
Internal Arc Classification (IAC) in accordance to IEC 62271-200	25kA, 1s
Standard degree of protection	IP4X

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CHARACTERISTICS	11KV SWITCH
Surge diverter rating	I _n : 10kA, U _r : 9kV U _c : 7kv
Current transformers for metering	300/1, 0.5 15VA

4.2.4.2. The insulation for the voltage transformers shall be 38kV and 95kV.

4.2.4.3. Spares required to run equipment for 15 years after installation shall be listed and offered as an option.

5. TEST REQUIREMENTS

The switches shall be tested in accordance with the requirements of IEC 60255, IEC 60529, IEC 60265, IEC 60270, IEC 694, IEC 61000, IEC 60068, ANSI C37. 60, IEC 60298, ISO 1461 and the requirements of this specification.

6. MARKING AND PACKING

6.1. Packing

The switches and associated components shall be packed in a manner as to protect it from any damage in transportation and repeated handling.

6.2. Marking:

6.2.1. Each assembly and package of items associated with the switches shall be suitably marked. A packing and parts list shall be provided

6.2.2. The following information shall be marked indelibly and eligibly and in a permanent manner on each item/ name plate:

- a) Manufacturer's name or Trademark;
- b) Manufacturer's Type Designation;
- c) Specified electrical characteristics;
- d) The wording "**Property of KPLC**"

6.2.3. All marking shall be permanent either by embossing or engraving.

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APPENDICES


APPENDIX A: TESTS AND INSPECTION (NORMATIVE)

- A.1. Type tests, sampling tests and routine tests shall be done in accordance with the requirements of IEC 60255, IEC 60529, IEC 60265, IEC 60270, IEC 694, IEC 61000, IEC 60068, ANSI C37. 60, IEC 60298, ISO 1461 and the requirements of this specification. It shall be the responsibility of the manufacturer to perform or have performed all the tests specified.
- A.2. Copies of previous type test reports by the relevant independent /international or National Testing /Standards Authority of the country of manufacture (or ISO/IEC 17025/ILAC accredited laboratory) shall be submitted with the tender for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.
- A.3. The indoor automatic Load Transfer Switches 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 Load Transfer Switches to be supplied shall be Submitted to KPLC for approval before delivery of goods.
- A.4. On receipt of the equipment, KPLC will inspect them for acceptance at stores and may perform or have tests performed to verify compliance of the equipment with this specification. The supplier shall replace without charge to KPLC, any equipment which upon examination, test or use fail to meet any or all of the requirements in this specification

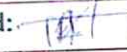
APPENDIX B: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

- B.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the switches' material, workmanship, tests, service capability, etc. will 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 9001:2008/2015
- B.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 or 2015 certificate shall be submitted with the tender for evaluation.
- B.3. The bidder shall indicate the delivery time of the switches, manufacturer's monthly and annual production capacity and experience in the production of the items. A detailed list and

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contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for switches sold in the last five years together with reference letters from four of the customers shall be submitted with the tender for evaluation.

APPENDIX C: TECHNICAL DOCUMENTATION (NORMATIVE)

C.1. The bidder shall submit its tender complete with technical documents 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 **Guaranteed** Technical Particulars (GTPs)- Appendix D - stamped and signed by the manufacturer.
- b) Detailed drawings and technical data of the automatic load transfer switch (all in English Language)
- c) Detailed manuals and drawings of the installation and control unit circuits and components shall accompany the tender (all in English Language)
- d) Wiring diagram for complete set of auto-changeover switch
- e) Details of manufacturing capacity and the manufacturer's experience;
- f) Copies of required test certificates and test reports by a third-party testing laboratory accredited to ISO/IEC 17025;
- g) Sales records for previous five years and reference letters from at least four of the customers;

C.2. The successful bidder (supplier) shall submit two sets of the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Fully filled clause by clause **Guaranteed** Technical Particulars (GTPs) stamped and signed by the manufacturer (**these are not the ones submitted with the tender**);
- b) Detailed drawings and technical data of the automatic load transfer switch (all in English Language)
- c) Detailed manuals and drawings of the installation and control unit circuits and components shall accompany the tender (all in English Language)
- d) Wiring diagram for complete set of auto-changeover switch
- e) Marking and packaging details.

C.3. Three copies of as built drawing on A3 or A4 paper to be supplied prior to shipment of the switches. A wiring diagram for one complete set of load transfer switch shall be provided

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C.4. A set of Three (3) Installation, Testing Configuration Programming, commissioning, operation and maintenance manuals shall be provided with the switches shall be submitted during delivery.

C.5. The unit shall be supplied complete with 7 copies of programing software in a CD ROM

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**APPENDIX D: GUARANTEED TECHNICAL PARTICULARS (GTPs) —
NORMATIVE**

(to be filled, stamped and signed by the Supplier and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of suppliers' capacity and experience; and copies of complete test certificates and test reports for tender evaluation or approval, all in English Language, as per clauses C.1 and C.2)

Tender No.

Bidder's name and Address.....

Description		Bidder's offer
1. Manufacturer's Name & Country of manufacture		State
2. Type/Model Number of Components		State
3. List of components to be supplied (for one installation)		Specify
Clause	Description	Bidders offer*
1.1	Scope	State
2	Applicable Standards	List
4.1	Service conditions	Specify
4.2.1.1	Switch designed for three phase operation by means of a local and remote control	State
4.2.1.2	Switching takes place in vacuum while the insulation medium shall be air	State
4.2.1.3	switch has mechanical status indicator for both the Open and Closed position.	Specify
4.2.1.4	Switch equipped with inbuilt current transformers of appropriate ratio	State
4.2.1.5	Switch has current transformers for metering on the load side	State
4.2.1.6	All current carrying made of electrolytic high conductivity material with contacts silver -plated.	State
4.2.1.7	Manually operated levers to enable manual trip and close are provided	State
4.2.1.8	suitable terminals for connecting cables of up to 300mm ² (both aluminium and copper) are provided	Specify
4.2.1.9	durable surge diverters at point of cable termination are provided	Specify
4.2.1.10	cable compartment has an anti-vermin guard plate	Specify
4.2.2.1	The switches are supplied with a set of three-phase voltage transformers for monitoring the status of the two sources	state
4.2.2.2	secondary voltage range of the voltage transformers	State

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4.2.3.1	Control unit complete with auxiliary equipment suitable for automatic load transfer	Specify	
4.2.3.2	Control unit has a fully programmable microprocessor/numerical-based unit	Specify	
	Control unit front face features	State	
4.2.3.3	Auto changeover able to “remember” to switch to the preferred source of supply when both sources of power supplies are restored after failure.	Specify	
4.2.3.4	Phase sequence (R, Y, B) indication by means of press button provided	State	
4.2.3.5	Duration of the DC supply to sustain auto changeover operation after loss of AC without recharge	State	
4.2.3.6	No. of copies of control unit’s programing software in a CD ROM	State	
4.2.3.7	No. of computers which the software can be loaded the into without requirement for additional licenses	State	
4.2.3.8	Accessories to be supplied the control units	State	
4.2.3.9	Control unit equipped for supervisory control via SCADA	Specify	
4.2.3.10	Scenarios when automatic changeover occur	State	
4.2.3.11	Settings of the overvoltage and undervoltage sensing relay	State	
4.2.4.1	Electrical characteristics of the load transfer switch	Rated system highest voltage and frequency	Specify
		Rated Current	Specify
		Rated power frequency withstand voltage, RMS	Specify
		Rated lightning impulse withstand voltage, peak	Specify
		Minimum breaking /making capacity peak	Specify
		Minimum number of Mechanical & Full load operations	Specify
		Minimum number of operations under fault conditions	Specify
		Rated short-time withstand current	Specify
		Internal Arc Classification (IAC) in accordance to IEC 62271-200	Specify
		Standard degree of protection	Specify
Surge diverter rating	Specify		
	Current transformers for metering	Specify	
4.2.4.2	Insulation for the voltage transformers	Specify	
4.2.4.3	Spares required to run equipment for 15 years after installation	List	
5	Test standards	State	
6.1	Switches and associated components packed in a manner to protect from any damage in transportation and repeated handling.	State	
6.2.1	Each assembly and package of items associated with the switches suitably marked	State	
6.2.2	Information marked indelibly and legibly on each item	List	
A1	Tests to be performed and the standards of tests	State	
A2	copies of previous type test reports by the relevant independent /international testing laboratory submitted	State	

Issued by: Head of Section, Standards
Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2017-07-19

Date: 2017-07-19



Kenya Power

Kenya Power & Lighting
Co. Ltd

TITLE:
AUTOMATIC LOAD TRANSFER SWITCH
Part 2: 11KV INDOOR AUTOMATIC LOAD
TRANSFER SWITCH — SPECIFICATION

Doc. No.	KP1/6C/4/1/TSP/11/007-2
Issue No.	2
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A3	Factory Acceptance Tests to be witnessed by KPLC Engineers at the factory	List
A4	Supplier shall replace without charge to KPLC items that don't meet specification	Specify
B1	QAP and ISO 9001:2008	State
B2	Copies of quality management certifications attached	State
B3	Delivery time, Production capacity & experience of the manufacturer	State
C1	Technical documents to be submitted with tender documents	
	a. Fully-filled clause by clause Guaranteed Technical Particulars (GTPs)- Appendix D - stamped and signed by the manufacturer.	
	b. Detailed drawings and technical data of the automatic load transfer switch (all in English Language)	state
	c. Detailed manuals and drawings of the installation and control unit circuits and components shall accompany the tender (all in English Language)	Specify
	d. Wiring diagram for complete set of auto-changeover switch	State
	e. Details of manufacturing capacity	
	f. Copies of required type test certificates and type test reports by a third-party testing laboratory accredited to ISO/IEC 17025	
	g. Sales records for previous five years and reference letters from at least four of the customers	State
C2	Documents to be submitted for approval before manufacture	
	a) Fully filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer (these are not the ones submitted with the tender);	State
	b) Detailed drawings and technical data of the automatic load transfer switch (all in English Language)	State
	c) Detailed manuals and drawings of the installation and control unit circuits and components shall accompany the tender (all in English Language)	State
	d) Wiring diagram for complete set of auto-changeover switch	
	e) Marking and packaging details	

** Words like 'agreed', 'confirmed', 'As per KPLC specifications', etc. shall not be accepted and shall be considered non-responsive.*

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

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2017-07-19	Date: 2017-07-19