EEDC 5(4730) P3

DRAFT TANZANIA STANDARD

(Draft for Stakeholders' comments only)

Electric cables —Thermosetting insulated, armoured cables for voltages of 600/ 1 000 V and 1 900/ 3 300 V

TANZANIA BUREAU OF STANDARDS

First Edition 2016

0 Foreword

0.1 This draft Tanzania standard is intended mainly to cover the technical requirements and test methods relating to Thermosetting insulated, armoured cable suitable for fixed installation in industrial, commercial and domestic premises.

0.2 In the preparation of this draft Tanzania Standard assistance was derived from BS 5467:1997+A3: 2008 Electric *cables —Thermosetting insulated, armoured cable for voltages of 600/ 1 000 V and 1 900/ 3 300 V* published by the British standard Institution.

0.3 For the purpose of deciding whether a particular requirement of this Tanzania Standard is complied with, the final value observed or calculated expressing the result of a test of analysis shall be rounded off in accordance with the *TZS 4 Rounding off numerical values*. The number of significant places retained in the rounded off value should be the same as that of the specified value.

1 Scope

This Draft Tanzania Standard specifies requirements for construction and describes methods of test for armoured cable with thermosetting insulation of rated voltages 600/1 000 V and 1 900/3 300 V. Cables specified in this standard are intended for use in fixed installations in industrial areas, buildings and similar applications.

The insulation and other components are suitable to permit operation of the cables at a maximum sustained conductor temperature of 90 °C and for a maximum short-circuit conductor temperature of 250 °C.

NOTE 1 Limitation on the temperature of the cables may be imposed in situations where they may be touched.

NOTE 2 Due to the relatively high conductor temperature, there is a risk of drying out the surrounding soil, causing an increase in thermal resistivity, which in turn would lead to the cable temperature rising to a higher value than anticipated. For cable laid directly in the ground, a suitable de-rating factor should be applied or a lower maximum sustained conductor operating temperature assumed to take into account the possible effects of soil drying out.

NOTE 3 In installations which include cable joints and terminations, the performance of these accessories should be taken into account in deciding the maximum operating temperature of the cable

Cables specified in this standard are:

a) 600/1 000 V cables, wire armoured and oversheathed having:
single-core stranded copper conductor;
single-core solid aluminium conductor;
two-three-, four- and five-core stranded copper conductor;
two-three-, and four-core solid aluminium conductor;
multicore auxiliary stranded copper conductor.

b) 1 900/3 300 V cables, wire armoured and oversheathed,
having: single-core stranded copper conductor;
single-core solid aluminium conductor;
three-core stranded copper conductor;
three-core solid aluminium conductor

Annex A gives recommendations for the selection and operation of cables while recommendations for the installation of cables are given in Annex B. Annex C lists the information that should be given with an enquiry or order.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 917:2015, *Electric cables — Voltage levels for spark testing*

IEC 60502-1:2004, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 1: Cables for rated voltages of 1 kV ((Um = 1,2 kV) and 3 kV (Um = 3,6 kV)*

IEC10002-1:1990, *Tensile testing of metallic materials — Part 1: Method of test at ambient temperature.*

IEC10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings on steel wire.*"

TZS 1519:2012/IEC60228:2008, *Conductors of insulated cables.*

IEC60332-1-2:2004, *Tests on electric and optical fibre cables under fire conditions — Part 1-2: Test for vertical flame propagation for a single insulated wire or cable — Procedure for 1kW pre-mixed flame.*

IEC60811-1-1:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-1: General application — Measurement of thickness and overall dimensions — Tests for determining the mechanical properties*

IEC60811-1-2:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-2: General application — Thermal ageing methods.*

IEC60811-1-3:1995, *Insulating and sheathing materials of electric cables — Common test methods — Part 1-3: General application — Methods for determining the density — Water absorption tests — Shrinkage*

TZS 145: 2015/IEC62230:2006, *Electric cables — Spark-test method.*

IEC 60050-461, *International Electrotechnical Vocabulary — Part 461: Electric cables*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.

3.1 rated voltage U_0
the nominal power-frequency voltage between conductor(s) and armour or earth for which the cable is suitable

3.2 rated voltage U
the nominal power-frequency voltage between phase conductors for which the cable is suitable

3.3 maximum voltage U_m
the maximum sustained power-frequency voltage between phase conductors for which the cable is suitable

3.4 nominal value
the value by which a quantity is designated and which is often used in tables

NOTE In this standard, nominal values usually give rise to values to be checked by measurements taking into account specified tolerances.

3.5 approximate value
a value which is only indicative

NOTE In this standard, values described as approximate do not constitute requirements to be checked by measurement.

3.6 type tests (symbol T)
tests made before supplying, on a general commercial basis, a type of cable covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application

NOTE These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the cable materials or design or manufacturing process which might change the performance characteristics.

3.7 sample tests (symbol S)
tests made on samples of completed cable, or components taken from a completed cable, adequate to verify that the finished product meets the design specifications

3.8 routine tests (symbol R)
tests made on all production lengths to demonstrate their integrity

3.9 tests after installation
tests intended to demonstrate the integrity of the cable and its accessories as installed

4 Voltage designation

The cables shall be designated by the rated voltages U_0 and U, expressed in the form U0/U. The rated voltages recognized for the purposes of this standard are 600/1 000 V and 1 900/3 300 V. The maximum designated voltages (Um) for the purposes of this standard for 600/1 000 V and 1 900/3 300 V cables are recognized as 1 200 V and 3 600 V respectively.

NOTE Guidance on the selection of cables of appropriate voltage designations for particular systems is given in A.

5 Conductors

The conductors shall be either annealed copper or solid aluminium, as given in Table 4 to Table 18 inclusive, and shall conform to the requirements detailed in Table 2 and to IEC60228.

Where the manufacturer deems it necessary to use tinned copper conductors, they shall conform to the requirements of IEC60228 for metal coated conductors

The conductors shall be circular, circular sectoral or shaped solid (class 1), or circular, circular compacted or shaped stranded (class 2), as specified in Table 4 to Table 18 inclusive.

6 Insulation

6.1 General

The insulation shall be either cross-linked polyethylene (XLPE) or ethylene propylene rubber (EPR) conforming to IEC 60502-1 respectively. The insulation shall be applied by the extrusion process and cross-linked to form a compact and homogeneous layer.

The insulation may be applied in a single layer, or in a number of cohesive layers. Where more than one layer is used, the complete insulation shall be tested as though it were a single layer.

NOTE Insulation applied in more than one layer does not conform to the definition of "Double insulation" given, for instance, in TZS 311.

Where necessary to meet the compatibility requirements specified in 18.2, the manufacturer shall apply a protective barrier between the conductor and the insulation and/or over the insulation. This barrier shall not be included as part of the insulation thickness.

6.2 Thickness of insulation

The thickness of insulation, when determined by taking the average of a number of measurements in accordance with Annex D, shall be not less than the value given in Table 4 to Table 18, as appropriate, and the smallest of the measured values shall not fall below the value given in Table 4 to Table 18, as appropriate, by more than (10 % + 0.1 mm).

6.3 Spark testing of insulation

When tested in accordance with the a.c. or d.c. test methods specified in IEC62230 and using the test voltages specified in TZS 917, there shall be no breakdown of the insulation.

7 Identification of cores

7.1 General

The cores of all cables shall be identified either by colour or by numbers. Numbers shall be marked sequentially starting with the number 1. Colour coding shall be in accordance with the following sequence

Number of cores Identification	**Identification**
Single-core	Brown or blue
Two-core	Brown, blue
Three-core	Brown, black, grey
Four-core	Blue, brown, black, grey
Five-core	Green-and-yellow, blue, brown, black, grey

NOTE Depending on their intended use, the cables might be subject to the core colour requirements specified in **TZS 311** or other standards, or in statutory requirements

The colour shall be applied either throughout the insulation or on its external surface. Where surface colouring is applied, the surface colour shall be of essentially the same material as the underlying material and shall be applied as part of the extrusion process. The surface colour shall not be separable from the underlying material.

Numbers on each core shall be printed in a colour contrasting with that of the insulation.
The height of the individual number shall be not less than 1.5 mm.
The spacing shall be such that each number is repeated at intervals not greater than 70 mm. Conformity shall be checked by visual examination and measurement

7.2 Bi-colour combination

On the core marked with the bi-colour combination green-and-yellow, the distribution of the colours shall be such that for every 15 mm length of core, one of these colours shall cover at least 30 % and at most 70 % of the surface of the core, while the other colour covers the remainder of the surface.

NOTE 1 In cases of dispute and where appropriate to the method of colour marking of the insulation, a suitable test for checking conformity is given in IEC50396:2005,