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Textiles and textile products — Textiles with integrated electronics and ICT — Definitions, categorisation, applications and standardisation needs

National foreword

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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Textiles and textile products - Textiles with integrated electronics and ICT - Definitions, categorisation, applications and standardisation needs

Textiles et produits textiles - Textiles à électronique et TIC intégrées - Définitions, catégorisation, applications et besoins de normalisation

Textilien und textile Erzeugnisse - Textilien mit integrierter Elektronik und ICT - Definitionen, Klassifizierung, Anwendungen und Normungsbedarf

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Contents

Page

European foreword ... **3**

Introduction ... **4**

1 Scope ... **7**

2 Normative references ... **7**

3 Terms and definitions ... **7**

4 Categorization according to integration levels ... **10**
4.1 General ... **10**
4.2 Integration level 1 ... **10**
4.3 Integration level 2 ... **10**
4.4 Integration level 3 ... **10**
4.5 Integration level 4 ... **11**

5 Available standards for testing and evaluating textiles with integrated electronics and ICT ... **11**
5.1 General ... **11**
5.2 Verification of claimed performances ... **12**
5.3 Durability of properties ... **20**
5.4 Wear (during use)/ mechanical stress (check military standard) ... **22**
5.5 Electromagnetic compatibility ... **28**
5.6 Exposure to electromagnetic fields ... **28**
5.7 Explosive atmospheres ... **28**
5.8 Innocuousness ... **29**
5.9 Product information ... **29**
5.10 Environmental aspects ... **29**

6 Risk assessment ... **31**

7 Data privacy/ (personal) data protection ... **32**

8 Examples ... **33**
8.1 Heated garment ... **33**
8.2 Garment with heart rate monitor ... **35**
8.3 Smart workwear, including personal protective equipment (PPE) ... **36**

9 Proposals for future work ... **37**

Bibliography ... **38**

European foreword

This document (CEN/TR 17945:2023) has been prepared by Technical Committee CEN/TC 248 “Textiles and textile products”, the secretariat of which is held by BSI.

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Introduction

This document is intended to be complementary to CEN ISO/TR 23383 “Textiles and textile products - Smart (Intelligent) textiles - Definitions, categorisation, applications and standardization needs”.

In the field of smart textiles with integrated electronics and ICT, different terms are being used which don’t necessarily describe the same types of products. For example, there are the expressions “textile electronics”, “electronic textile”, textronics or “e-textile”, connected textiles, i-textiles (interactive textiles), which are used for anything from combinations of textile and electronics to electronic components made of textile parts. Another example is the expression “wearable electronics”, which is applicable for anything that is wearable, including also non-textile products. And then there is the term “flexible and stretchable” electronics, which is used for novel electronics components, including circuit boards, which can be deformed as compared to the rigid state-of-the art technology (see Figure 1). All of these terms are being commonly used, but not always clearly defined. Also, clear categorizations are missing, which could form the basis for standards developments. The purpose of the new CEN Technical Report is therefore to provide guidance on how to approach standardization in the field of smart textiles with integrated electronics and ICT.

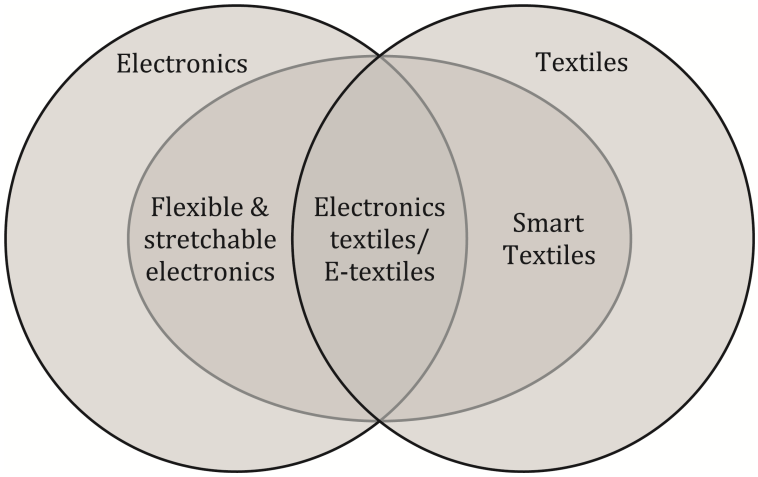


Figure 1 — Relationships between textiles, (flexible) electronics and electronic textiles (e-textiles)

Textiles and electronics are two very different fields of technology, requiring a quite different type of expertise. The terminology used and the approach to developing new technology is often very different. Adding ICT makes this difference even greater. One important purpose of the new CEN Technical Report will therefore be to provide a common basis for experts from Textile and Electronics (and ICT) to understand each other (terminology and way of thinking) in order to be able to develop the technology and products together, see Figure 2.

Important issues also include the testing, characterization and evaluation of textile electronics parts and products. Experience has shown that these products cannot simply be seen as an additive combination of textile and electronics, but due to the novel combination and implementation of materials and design of components, completely new properties emerge which allow new applications.

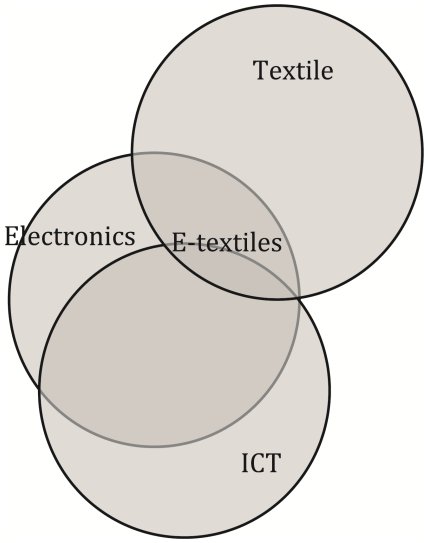


Figure 2 — Positioning of E-textiles (electronic textiles) among the textiles, electronics and ICT (Information and Communication Technology)

As a result, the currently existing standards both in textile and in electronics are not sufficient to describe smart textiles with integrated electronics and ICT.

Factors currently not taken into account for electronics are for example:

— flexibility and stretchability, i.e. a change in dimensions during use;

— washing (combination of water, detergent and mechanical action) vs. immersion in water/ liquids;

— size and weight;

— the human body environment: temperature, perspiration, etc.

Factors currently not taken into account in many textile processes are:

— standardized dimensions for connectors, wires, etc.;

— printed circuit board design;

— batch processes for applying parts are not automated.

The information provided in this document can be of use to

in general:

— stakeholders from textile, electronics and ICT that want to work together on developing cross sectorial products in order to have a basis for understanding each other's sectors.

more specifically:

— manufacturers of textile electronics: to advise them on appropriate product development and testing, on suitable ways to substantiate product claims and on what conformity assessment will be necessary;

— specification writers, as guidance to writing technical specifications and new specific standards for electronic textiles;

— end users, in determining whether a product has indeed been fully assessed and that all information necessary for proper use and care are available;

— conformity assessment bodies, as a guide towards assessing products according to the appropriate standards;

— market surveillance authorities, to help in the assessment of product claims, product safety and fitness for purpose.

Applications

Already for several years, demonstrators and prototypes of textile electronics have been developed, but after the initial hype there was a lot of disappointment that no commercial products where reaching the market. This was partially because of unrealistic design and wrong expectations. This was also due in part to the lack of existing standards, not only towards testing and evaluation but also towards product design. On the other hand, standards development is often only started if commercial products are available or close to market introduction.

Currently, there are several areas of application where stakeholders are increasingly asking for standards development. On the one hand, market introduction is being delayed due to the lack of standards. On the other, products are being introduced but standards are lacking to prove the conformity of the products with national and regional legislation. In some cases, even the legislation is not clear. The following areas have been identified and will be highlighted in this document:

— personal protective clothing and equipment (PPE), intervention;

— medical;

— assisted living, including health care support;

— automotive/ aerospace;

— sports & leisure, including clothing and accessories;

— labels or tags (e.g. RFID) for tracking, theft protection.

For a general classification of technical textiles, based on a market approach, the definitions provided by Techtextil are commonly used[1].

[1] https://techtextil.messefrankfurt.com/frankfurt/en/profile.html

1 Scope

This document provides definitions in the field of electronic textiles (e-textiles) and electronic textile systems, as well as the categorization of different types of electronic textiles and electronic textile systems. It briefly describes the current stage of development of these products and their application potential and gives indications on preferential standardization needs.

This document will also provide guidelines to determine general verification of claimed performance, innocuousness, durability of properties, product information and environmental aspects of textile electronics.

This document is not intended for products which are placed inside or are (permanently) attached to the human body. It also does not specifically address the electronics information communication link between the textile with integrated electronics and external data processing. This document therefore also does not focus on the design of software to be implemented in electronic textiles of textile systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CEN ISO/TR 23383, *Textiles and textile products - Smart (Intelligent) textiles - Definitions, categorisation, applications and standardization needs (ISO/TR 23383)*

EN 16812, *Textiles and textile products - Electrically conductive textiles - Determination of the linear electrical resistance of conductive tracks*

EN IEC 63203-101-1, *Wearable electronic devices and technologies - Part 101-1: Terminology (IEC 63203-101-1)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN ISO/TR 23383, EN 16812 and EN IEC 63203-101-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
electronic textile
e-textile
fibre, yarn, fabric, or textile end product combined with at least one electronic component or device

Note 1 to entry: Electronic devices, components and systems can be made at the levels of fibres, yarns, fabrics and garments.

[SOURCE: EN IEC 63203-101-1:2021, 3.12]

3.2
(electronic) component
(electronic) constituent part of a device which cannot be physically divided into smaller parts without losing its particular function

[SOURCE: Electropedia 151-11-21]