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TECHNICAL REPORT

colour inside

Printed electronics – Part 250: Material technologies required in printed electronics for wearable smart devices

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PRINTED ELECTRONICS –

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FOREWORD

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IEC TR 62899-250, which is a Technical Report, has been prepared by IEC technical committee 119: Printed electronics.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
119/104/DTR	119/123/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62899 series, published under the general title *Printed electronics*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Recently, along with a variety of other expanding electronic technology applications, one in particular has gained a lot of attention from different angles. It is referred to as "wearable electronics". As the name of this new application implies, unlike other electronic technologies, these are to be attached or applied directly to the human body, such as traditional eyewear. Due to the particular characteristics of the human body, such as flexibility, this new technology requires a variety of new and unique capabilities, which other electronics applications do not need.

In order to realise such applications, electronic technologies are evolving in many areas. One area of special interest in electronic technology is a new process for producing devices themselves, called "printed electronics". Unlike conventional production processes called "subtractive processes", which use subtracting techniques to produce functional devices, printed electronics (PE) use an additive process using additional techniques by putting functional materials onto base materials.

Since these electronic technologies are new and rapidly evolving, there are no established means for their evaluation. This Technical Report intends to resolve this situation from certain angles and give some guidance for future standardization work in wearable electronics.

PRINTED ELECTRONICS –

Part 250: Material technologies required in printed electronics for wearable smart devices

1 Scope

This part of IEC 62899, which is a Technical Report (TR), explores a new technological field to establish standardization activities in TC 119 (Printed electronics) in particular, and to contribute to the development and market expansion of wearable smart device (WSD) technology.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

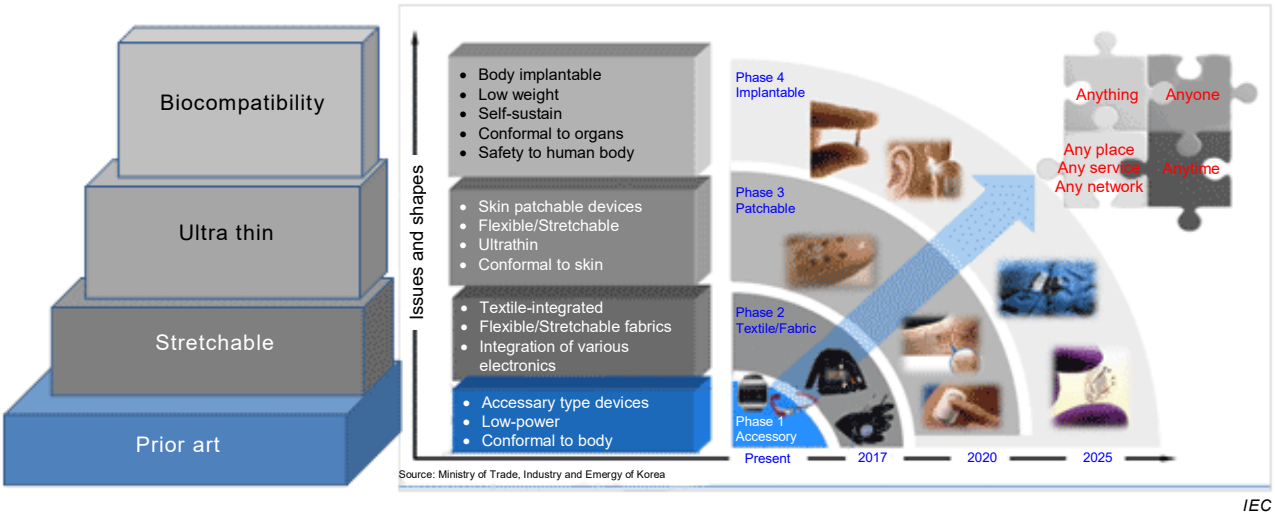
4 What are WSDs?

Wearable smart devices are a newly evolving electronic application field where standards for conventional electronic devices may not be smoothly applicable. In this new field, electronic devices are applied or attached directly to the human body like eyewear, contrarily to conventional electronic devices, such as TV sets, that are most likely to be used away from the body. Due to the particular characteristics of the human body, these new devices are required to have new physical characteristics, such as flexibility and salt resistance (anti-sweat). In order to address those demands, the electronics industry has come up with new processes to produce those new devices.

5 WSDs

5.1 General

Figure 1 shows an overview of WSDs, including categorization and examples. This graphic introduces categories based upon characteristics, such as ‘prior art’, ‘stretchable’, ‘ultra-thin’ and ‘biocompatibility’, and some examples in each category. Technologies and challenges for those examples are discussed in Subclauses 5.2 to 5.5.



Source: http://iecetech.org/issue/2015-01/What-s-up

Figure 1 – WSD technologies and market

5.2 Accessory type devices

Accessory type devices are designed to be a good fit for the shapes of the human body. The major functions of these devices are to acquire vital data and/or movement of the body, and to transfer data to other devices and/or networks without human interaction, unlike cell phones or portable music players, which require human interaction. For example, the following WSDs are already commercialized:

– bracelets, watches and wristbands;
– eyewear and headmounted devices;
– earphones;
– finger rings, necklaces and the like.

In order to realize these devices, adaptation of the following characteristics is required:

– a small footprint,
– lightness,
– lower power,
– mechanical flexibilities to follow body movement, and
– if needed, display functions with higher resolution and/or mechanical flexibilities.

Obviously and most importantly, in addition to fulfilling these electrical or mechanical needs, additional safety requirements and regulations need to be developed, since WSDs will operate in close contact with the human body.

5.3 Textile integrated type

Textile integrated type WSDs combine integrated biomedical signal acquisition functions with communication functions attached to clothing such as sportswear or underwear. This type of WSD needs complementary technologies compatible with the electronic components and textile products that make up the clothes. Specifically, highly flexible and stretchable wiring technologies are required. Furthermore, electronic components need to withstand stresses similar to those general clothing is subjected to, such as stresses which occur during washing and drying.