



IEC/TC OR SC: <b>TC 124</b>	SECRETARIAT: <b>Korea</b>	DATE: <b>2019-12</b>
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Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting, or sent to the Central Office promptly after its contents have been agreed by the committee.

**A. STATE TITLE AND SCOPE OF TC**

**Title:**  
**Wearable electronic devices and technologies.**

**Scope:**  
**Standardization in the field of wearable electronic devices and technologies which include patchable materials and devices, implantable materials and devices, ingestible materials and devices, and electronic textile materials and devices.**

**Excluded: Standardization for specific items in the field of the following IEC TCs: TC 47, TC 62, TC 100, TC 108, TC 110, TC 119, SyC AAL and relevant areas of ISO/IEC JTC 1.**

**Background**

The world-wide market trends have led to a growing convergence and new industry including patchable, implantable, and ingestible materials and devices as well as e-textiles into the concept of wearable electronic devices and technologies. New types of standardization and collaboration works are needed to efficiently cope with the rapidly growing new industry. There are several activities inside and outside IEC. However, their activities are considerably partial and limited to cover all of the standardization necessity in the current and future markets. In order to stabilize and accelerate industrialization of wearable electronic devices and technologies, the TC 124 may need strong liaisons and collaborations with other bodies for its future works.

IEC TC 124 has no intention to work on the areas covered by IEC TC 62.

**B. MANAGEMENT STRUCTURE OF THE TC**

Since wearable electronic devices and technologies are still evolving and expanding vigorously, the structure of the TC is preferred to be flexible so as to effectively follow the rapid change but not constrain it. Tentative WG structure should cover the following essential areas: terminology, e-textiles, materials, devices, systems, and their reliabilities, etc.

- WG1 (Terminology)  
To produce terminology definitions for wearable electronic devices and technologies
- WG2 (E-textiles)  
To develop measuring and evaluating methods for textile materials, devices, and systems with electrotechnical functionality
- WG3 (Materials)  
To define specific terms and to determine assessments, requirements, and specifications for materials of wearable electronic devices and packages, all excluding e-textiles  
To analyze the effectiveness of the existing methods specific to the materials of wearable electronic devices and packages, all excluding e-textiles  
To develop measuring and evaluating methods for materials for wearable electronic

devices and packages, all excluding e-textiles

- WG4 (Devices and Systems)

To develop measuring and evaluating methods for devices and packages including implantable, patchable, ingestible, excluding E-textile

To develop standards related with systems, applications, and services, all excluding e-textiles

To develop standards related with power sources, all excluding e-textiles

To develop standards related with interfaces and connectivity, all excluding e-textiles

- AG1 (Advisory Group on Strategy)

To update and manage the scope and the strategic business plan of TC 124

To develop strategy for effective standards development and technical roadmap, including new electrotechnical areas

To organize, coordinate, and manage the work of TC 124

To prepare the WG allocation of contested new work items of TC 124

To prepare an improvement of TC 124 structure

To promote two-way communications between TC 124, liaised TC/SCs and other international standardization organizations to facilitate cooperation and avoid duplication of work

To provide leadership to enable improved cooperation between industry and TC 124

To maintain membership participation

Convenor: Secretary

Members: TC 124 officers, WG convenors, 1 representative expert from each P-member country

### C. BUSINESS ENVIRONMENT

The business environment of wearable electronic devices and technologies is rapidly expanding on a global basis with new emerging markets and applications. Wearable electronic devices and technologies will be used in emerging applications sectors using various technologies that will include semiconductors, displays, sensors, textiles, IoT, etc.

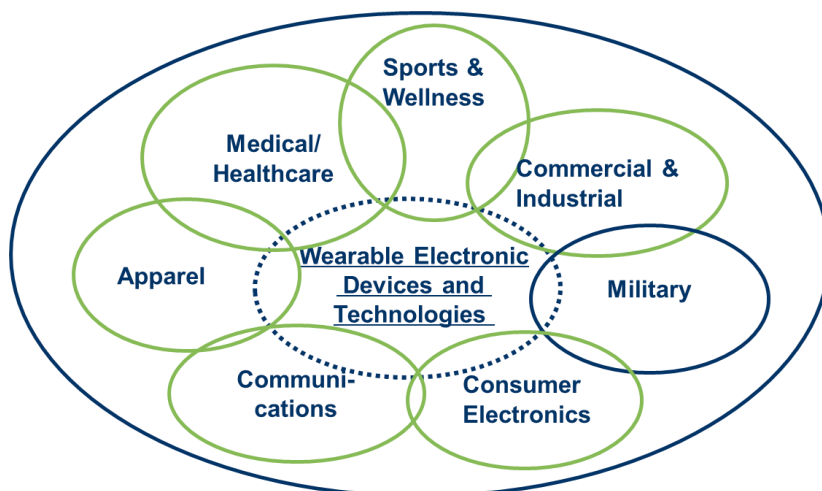
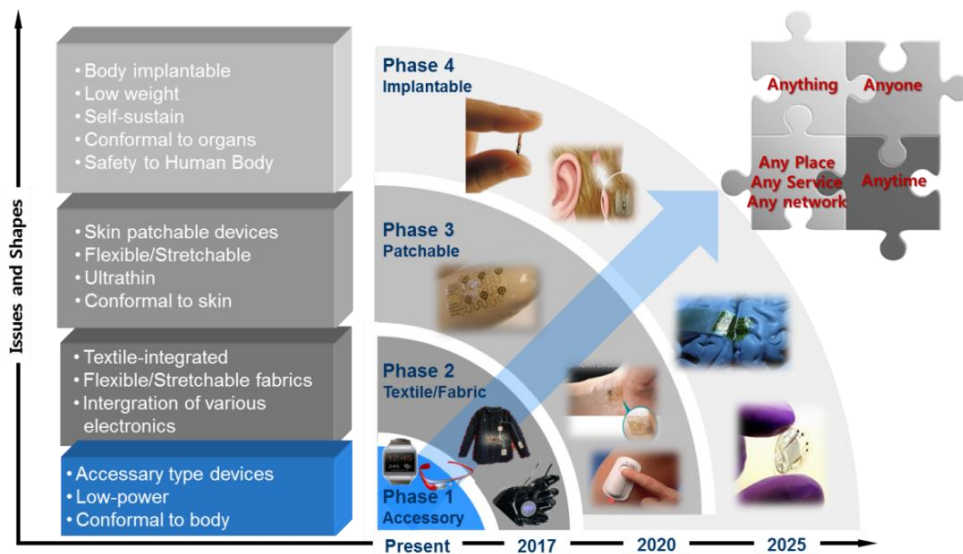


Figure 1 Business areas and applications of wearable electronic devices and technologies

### D. MARKET DEMAND

More than four thousand companies including all major electronics multi-nationals are developing wearable electronic devices and technologies for the global market. The most promising areas of development are medical and infotainment applications followed by industrial, commercial, and military applications. According to the forecast from IDTechEx in 2014, global market value for wearable electronic devices and technologies is projected to exceed 70 billion US dollars by 2024. In the early stage, basic infotainment (not web connected or diagnostic) and passive medical, healthcare, and fitness devices will share the biggest market (around 50% of value). Based on IDTechEx expectation, new types of wearable electronic devices and technologies (patchable or implantable devices with web connection and diagnostic capability) will appear gradually and take

over most of the market (90% of value) by 2024. In addition, the market share of the wearable electronic devices and technologies for industrial fields (commercial and military) will continuously rise, thus, the market value would reach around 10 billion US dollars at the year of 2024.



**Figure 2 The evolution and roadmap of wearable electronic devices and technologies**

Major current and upcoming wearable devices are categorized as accessories, electronic textiles, patchable devices, implantable devices. While wearable electronic devices and technologies are different in their types and shapes, they share common characteristics that they are always stay on, collecting data with the aim to improve how users interact and benefit from their environments.

Such many companies will become primary customers for the international standards which will be developed by TC 124. Related technologies are ready to industrialize and facilitate wearable electronics, there is a common agreement that only international standardization can reduce the cost and effort for the early industrialization and provide effective guidelines towards stabilization and expansion of the market. In particular, standardizations of the relevant materials, devices, systems, adaptability and reliability will be carried out by TC 124. TC 124 will also focus on supporting the strategy and road map reflecting wearable electronic device market demands, which will open the related market and industry.

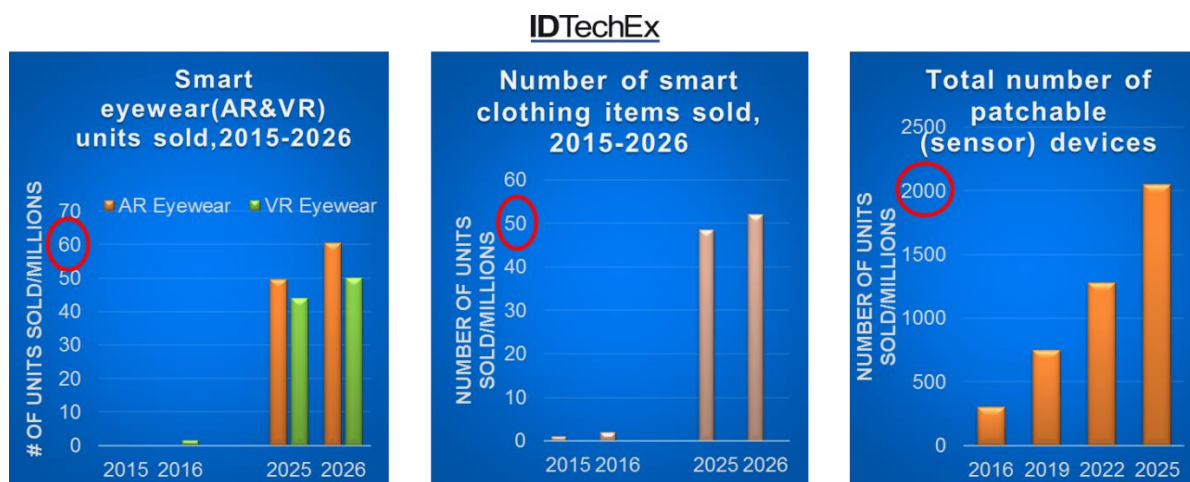
#### E. TRENDS IN TECHNOLOGY AND IN THE MARKET

Trends in wearable electronic devices and technologies require user comfort and adaptability. Miniaturization, form factor transition to flexible wearable electronic devices is under development to alleviate the inconvenience of users while carrying them. For future development, incorporation of wearable electronic devices with clothing and other products, and communication to improve user interface with IoT and outer devices need to be taken into account.



### Figure 3 Trends in wearable electronic devices and technologies

Section D of this document lists medical and infotainment applications as the most promising areas of development. In terms of specific product types it is envisioned that these would consist of smart\* eyewear, smart clothing, patchable devices, and wearable power sources. According to IDTechEx 2016, the total numbers of products in wearable applications are expected to increase rapidly.



**Figure 4 Forecast of smart eyewares, smart clothings, and patchable devices in wearable applications (reproduced from IDTechEX 2016 data)**

Implantable near skin and ingestible devices that are composed of biodegradable and biocompatible materials are at the edge of production. Bio-degradable batteries, dissolvable electronic devices and smart pills that can be implanted under skins and used to kill infections are expected to come in a near future.

\* devices with electronic connectivity and/or embedded computational power

#### F. SYSTEMS APPROACH ASPECTS (REFERENCE - AC/33/2013)

The market size and needs for “Wearable Electronic Devices and Technologies (WEDTs)” with respect to various applications are rapidly growing. For these reasons, there are several activities inside and outside IEC to cope with these needs. However, their activities are considerably partial and limited to cover all of the WEDTs’ standardization necessity in the current and future markets.

Identifying all potential areas that require collaboration and prepare a systematic approach plan (as shown below) that shows how each area of TC 124 needs joint activities or strong liaisons with other TC/SCs and WGs inside and outside IEC.

- Building a support network by establishing liaisons with other TC/SCs or conjunctions with other academic or industrial organizations.
- Considering liaison with following TC/SCs:
  - Inside IEC: TC 21, TC 29, TC 47, TC 62, TC 78, TC 91, TC 100, TC 101, TC 106, TC 108, TC 110, TC 119, SyC AAL, and ISO/IEC JTC 1, ISO/IEC JTC 1/SC 41
  - Outside IEC: ISO/TC 38 (Including smart textiles), ISO/TC 94, ISO/TC 150, ISO/TC 172, ISO/TC 194, ETSI SmartBAN, etc. Also considering Category C liaison with AATCC RA111, Electronically-Integrated Textiles Test Methods, ASTM D13.50, Smart Textiles, and IPC D-70 E-textiles.

#### G. CONFORMITY ASSESSMENT

TC 124 does not currently have any publications used for IEC conformity assessment system.

**H. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES**

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
Produce terminology standards for wearable electronic devices and technologies (WG1)	<p>A standard on terminology for wearable electronic devices and technologies is under development.</p> <ul style="list-style-type: none"> <li>- Terminology (124/58/CD).</li> </ul>	2021
Produce standards for e-textiles (WG2)	<p>Four standards on measurement for conductive yarn and textiles are under development.</p> <ul style="list-style-type: none"> <li>- Measurement methods for basic properties of conductive yarns (124/37/NP).</li> <li>- Measurement methods for basic properties of conductive fabric and insulation materials (124/38/NP).</li> <li>- Snap button connectors for e-textile wears and detachable electronic devices (124/42/CD).</li> <li>- Determination of electrical resistance of conductive textiles under simulated microclimate (124/62/CD).</li> </ul>	2022
	<p>A standard on washability for e-textiles is under development.</p> <ul style="list-style-type: none"> <li>- Measurement methods for basic properties of conductive yarns (124/59/CD).</li> </ul>	2022
Produce standards for test and evaluation methods of materials for wearable electronic devices (WG3)	<p>A standard on test methods for materials for wearable electronic devices is under development.</p> <ul style="list-style-type: none"> <li>- Test method of electrochromic films for wearable equipments (124/50/NP).</li> </ul>	2022
Produce standards for test and evaluation methods of wearable electronic devices and systems (WG4)	<p>Three standards on test methods for wearable electronic devices are under development.</p> <ul style="list-style-type: none"> <li>- Test methods of glove-type motion sensors for measuring finger movements (124/60/CD).</li> <li>- Evaluation method of the stretchable resistive strain sensor (124/57/CD).</li> <li>- Performance Measurement of Fitness Wearables – Step Counting (124/63/NP).</li> </ul> <p>A new standard for skin pressure</p>	2022

	sensors is under discussion.	
	<p>Three standards on safety issues (EMC, low-temperature burns, and other human body safety issues) of wearable electronic devices and technologies are under discussion and one standard is under development.</p> <ul style="list-style-type: none"> <li>- Test methods of on-body wearable electronic devices for measuring skin contact temperature (124/67/CD).</li> </ul>	2022
	<p>A standard for data management for wearable electronic devices and technologies is under discussion.</p> <ul style="list-style-type: none"> <li>- Body area network</li> </ul>	2023

Note: The progress on the actions should be reported in the RSMB.