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Semiconductor devices –
Part 19-2: Smart sensors – Indication of specifications of sensors and power supplies to drive smart sensors for low power operation

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Part 19-2: Smart sensors – Indication of specifications of sensors and power supplies to drive smart sensors for low power operation

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DTS	Report on voting
47E/693/DTS	47E/742/RVDTS

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

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 60747 series, published under the general title *Semiconductor devices*, can be found on the IEC website.

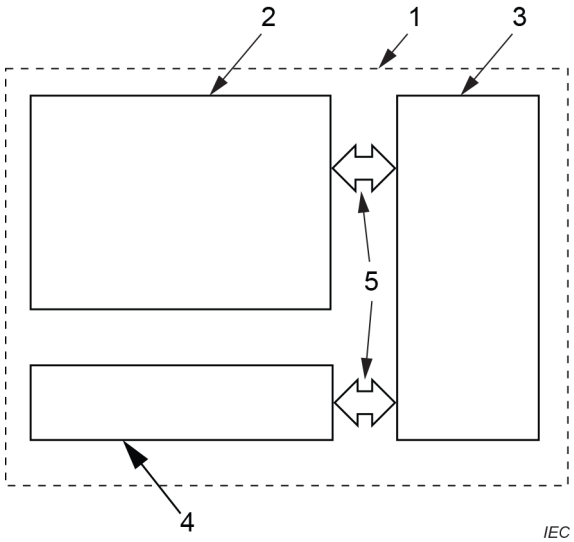
The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,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

INTRODUCTION

The development of smart sensors which integrate analogue-to-digital conversion and digital processing of the captured sensor signal(s) is in progress. A smart sensing unit, which comprises a smart sensor; a terminal module, to control the smart sensor and perform wireless communication; and a power supply for the smart sensor and the terminal module, can send the output data of the smart sensor wirelessly to the outside. Here, the power supply may be a plug-in power supply, a battery, an energy harvester, or their combination. A smart sensing network where a large number of smart sensing units are located in manufacturing factories, offices, and stores has been examined. With this network, environmental monitoring, sensing operational situations of manufacturing equipment and sensing other various events contribute to the realization of the following outcomes by analysing the collected sensing data. Namely, energy saving, improvement in factory productivity such as operation rate, shortening of production lead time, preventive equipment maintenance, and product quality improvement can be achieved.

However, as to the three components of the smart sensing unit, namely, smart sensor, terminal module, and power supply, standardization regarding control schemes to connect the components mutually and regarding indication of specifications of the components has not been sufficiently established yet. This issue leads to the present situation, where the development of each component in the smart sensing unit has not proceeded efficiently. (Figure 1 shows the block diagram of the components in the smart sensing unit and Figure 2 shows an example of the detailed block diagram of the smart sensing unit.)



Key:

1 smart sensing unit

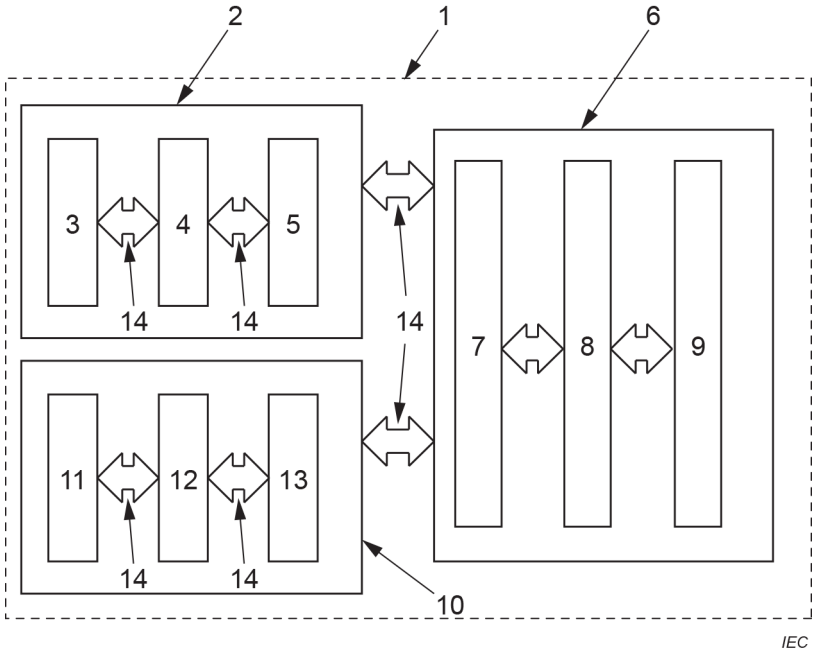
2 smart sensor

3 terminal module

4 power supply

5 electrical connections

Figure 1 – Block diagram of components in a smart sensing unit



Key:

1	smart sensing unit	8	data processing circuit
2	smart sensor	9	wireless communication circuit
3	sensor element	10	autonomous power supply module
4	analogue-to-digital converting circuit	11	power generation element
5	digital processing circuit	12	power storage element
6	terminal module	13	power management circuit
7	smart sensor control unit	14	electrical connections

Figure 2 – Example of detailed block diagram of a smart sensing unit

The IEC 60747-19 series aims to address this issue. The IEC 60747-19 series comprises two parts and its structure is currently conceived as follows:

Part 19-1 – Control scheme of smart sensors

Part 19-2 – Indication of specifications of sensors and power supplies to drive smart sensors for low power operation

Part 19-1 specifies a control scheme of the smart sensor from the terminal module in the smart sensing unit. Generally, the manufacturers of sensors have incorporated into the sensors various parameters and conditions for sensing operations to fulfil various requests and needs of the users. Therefore, it has been quite difficult for the users to understand how to set the parameters and conditions adequately and master the use of sensors. This issue has been a considerable obstacle in designing the smart sensing unit and smart sensing system. The main objective of IEC 60747 Part 19-1 is to solve this obstacle for future expansion of the smart sensors and smart sensing network systems.

This document aims to provide a guideline to indicate information that is required when the smart sensing unit is newly designed. When the smart sensing unit is newly designed especially using an autonomous power supply, the designers have to appropriately arrange selection of the components of the unit and their usage conditions to satisfy that power capability of the power supply successfully exceeds total power budget to be consumed in the unit as a whole. First, information about the detailed power consumption characteristics of the smart sensors is indispensable for this achievement. Namely, information about time-variation power consumption characteristics which is not necessarily described in the datasheet of sensors is essential when intermittent sensing operations are often adopted and a careful lower power design including time-variation characteristics to allow adoption of an autonomous power supply is needed in IoT (Internet of Things) applications. Therefore, this document discusses an indication of smart sensors' time-variation power consumption characteristics. Second, information about total power capability of the power supply to drive the unit and the smart sensor(s) is essential. This power supply as a module comprises (a) primary battery(ies), and(or) (a) secondary battery (ies), and (or) (an) energy harvester(s), or their combinations. To accomplish proper configuration, the information of specifications of power supply is needed. Thus this document also discusses indication of specification of power supply. With the establishments of the appropriate indication, the three components of the smart sensing unit can be easily selected and combined from the point-of-view of a low-power design, when the smart sensing unit is newly designed and the overall design of the smart sensing unit itself can be facilitated. If the telecommunication between smart sensor unit and autonomous power supply unit is done well, the both units work optimally.

Regading smart sensors, many kinds of operation modes are equipped with the availability of various functions by digital processing. When developing these smart sensors, a careful and precise power consumption design including time-variation characteristics and depending on each operation mode become essential. Therefore, the guideline specified in this document is essential for developing low-power smart sensors and their related devices.

Because the corresponding market has been evolving, and the requirements of the specifications of the components can be slightly changed during this process, guidelines are reported in this document as a Technical Specification (TS) to design the smart sensing unit and its components.

SEMICONDUCTOR DEVICES –

Part 19-2: Smart sensors – Indication of specifications of sensors and power supplies to drive smart sensors for low power operation

1 Scope

This part of IEC 60747 provides a guideline of indication of specifications of a low-power sensor being a device or a module allowing autonomous power supply operation, which contributes to the low-power design of a smart sensing unit. Here, the smart sensing unit comprises a smart sensor, a terminal module, and a power supply, which can send output data of the smart sensor to the outside. This part also provides a guideline of indication of specifications of the power supply to drive the smart sensor(s) in the smart sensing unit. Based on these, the three components of the smart sensing unit can be easily selected and combined from the point-of-view of newly designed, low-power, smart sensing units.

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.

There are no normative references in this document.