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Medical electrical equipment — Clinical performance evaluation of clinical thermometers

Appareils électromédicaux — Évaluation de la performance clinique des thermomètres médicaux

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Foreword

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This document was prepared by Technical Committee ISO/TC 121, *Anaesthetic and respiratory equipment*, Subcommittee SC 3, *Respiratory devices and related equipment used for patient care*, and Technical Committee IEC/TC 62, *Medical equipment, software, and systems*, Subcommittee SC 62D, *Particular medical equipment, software, and systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 205, *Non-active medical devices*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

Determining body temperature is an important *procedure* that is clinically used to assess the status of *patients* as well as blood pressure, SpO_2 and pulse rate. This document is intended to provide the necessary requirements for the *clinical investigation* to ensure that the *essential performance* of these *clinical thermometer* is at an adequate level.

In this document, the following print types are used.

— Requirements and definitions: roman type.

— Terms defined in Clause 3 of this document or as noted: italic type.

— Informative material appearing outside of tables, such as notes, examples and references: in smaller type. Normative text of tables is also in a smaller type.

In this document, the following verbal forms are used:

— “shall” indicates a requirement;

— “should” indicates a recommendation;

— “may” indicates a permission;

— “can” is used to describe a possibility or capability; and

— “must” is used to indicate an external constraint.

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Medical electrical equipment — Clinical performance evaluation of clinical thermometers

1 Scope

This document specifies the requirements and methods for the *clinical investigation* of *medical electrical (ME) equipment* used to measure the body temperature in *indirect measurement mode*.

This document covers both intermittently and continuously measuring *clinical thermometers*.

NOTE 1 This document does not apply to *clinical thermometers* measuring the body temperature in *direct measurement mode*.

NOTE 2 For *clinical thermometers* in *direct measurement mode* determining the technical accuracy in accordance with ISO 80601-2-56:—[1)] is considered sufficient.

This document is applicable to *clinical thermometers* with claimed measurement time shorter than 60 seconds (for methods such as oral or rectal measurement), or shorter than 5 minutes (for methods such as axillary measurement), and which are treated as *predictive type thermometers* and fall under the scope of this document.

This document specifies additional disclosure requirements.

This document does not apply to the *clinical investigation* of a screening thermographs for human febrile temperature screening whose *laboratory accuracy* requirements are described in IEC 80601-2-59.

This document does not apply to pulmonary artery catheter for the determination of cardiac output by thermodilution.

NOTE 3 ISO 80601-2-56:—[1)] does include pulmonary artery catheter for the determination of cardiac output by thermodilution.

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.

ISO 14155:2026, *Clinical investigation of medical devices for human subjects — Good clinical practice*

Bibliography

[1] ISO 14155:2026, *Clinical investigation of medical devices for human subjects — Good clinical practice*

[2] ISO 14971:2019, *Medical devices — Application of risk management to medical devices*

[3] ISO 20417:2026, *Medical devices — Information to be supplied by the manufacturer*

[4] ISO 80601-2-56:—[2)], *Medical electrical equipment — Part 2-56: Particular requirements for basic safety and essential performance of clinical thermometers for body temperature measurement*

[5] IEC 60601-1:2005+AMD1:2012+AMD2:2020, *Medical electrical equipment — Part 1: General requirements for basic safety and essential performance +Amendment 1:2012 +Amendment 2:2020*

[6] IEC 80601-2-59:2017+AMD1:2023, *Medical electrical equipment — Part 2-59: Particular requirements for the basic safety and essential performance of screening thermographs for human febrile temperature screening*

[7] ASTM E1965-98, *Standard Specification for Infrared Thermometers for Intermittent Determination of Patient Temperature*

[8] JCGM 100:2008, *Evaluation of measurement data — Guide to the expression of uncertainty in measurement (GUM 1995 with minor corrections)*

[9] Wang, Q., et al., Infrared Thermography for Measuring Elevated Body Temperature: Clinical Accuracy, Calibration, and Evaluation. *Sensors*, 2022. 22(1), 215

[10] Sullivan. Stacey J. L. et al. Clinical evaluation of non-contact infrared thermometers. *Scientific Reports* [online]. 2021, vol. 11, article no. 22079. Available at: https://www.nature.com/articles/s41598-021-99300-1

[11] Allegaert, Karel, Casteels, Kristl, Van Gorp, Ilse and Bogaert, Gilberte. Tympanic, infrared skin, and temporal artery scan thermometers compared with rectal measurement in children: a real-life assessment. *Current Therapeutic Research – Clinical and Experimental* [online]. 2014, vol. 76, pp. 34–38. Available at: https://doi.org/10.1016/j.curtheres.2013.11.005

[12] Khan, Shahrukh et al. Comparative accuracy testing of non-contact infrared thermometers and temporal artery thermometers in an adult hospital setting. *American Journal of Infection Control* [online]. 2020, vol. 49, no. 5, pp. 597–602. Available at: https://doi.org/10.1016/j.ajic.2020.09.012

[13] Machin, Graham, Lu, Xiaofeng, Martin, Maria-Jose, Pusnik, Igor and WANG, Li. Improving body temperature measurement on a global basis. *AIP Conference Proceedings* [online]. 2024, vol. 3230, art. no. 130004. Available at: https://doi.org/10.1063/5.0234179

[14] Grodyinskz, E and Sund Levander, M, editors. *Understanding fever and body temperature: a cross-disciplinary approach to clinical practice.* Switzerland: Palgrave Macmillan, 2020.

2) Third edition under preparation. Stage at the time of balloting: ISO/DIS 80601-2-56:2025.

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