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Title: Draft BS ISO 17646 Rapid detection of moisture content in fresh meat - Low-field NMR method.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 17646

Rapid detection of moisture content in fresh meat — Low-field NMR method

ICS: 67.120.10

ISO/TC 34/SC 6

Secretariat: **SAC**

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2024-09-02

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2024-11-25

This document is circulated as received from the committee secretariat.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 6, *Meat, poultry, fish, eggs and their products*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Rapid detection of moisture content in fresh meat — Low-field NMR method

1 Scope

This document specifies the technical requirements for rapid determination of moisture of fresh meat based on low-field nuclear magnetic resonance (LF-NMR) technology.

The test method specified in this document is applicable to the rapid detection of moisture in fresh meat, water-injected meat or thawed meat.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1

paramagnetic

magnetic effect produced when the direction of magnetization is the same as the direction of the external magnetic field

3.2

transverse relaxation time (T_2)

time constant when the transverse magnetization vector decreases to 37 % of the maximum value that characterizes the speed of signal attenuation

Note 1 to entry: Relaxation process is the process of the spinning hydrogen nucleus in the static magnetic field returning from the excited state to the equilibrium state. The time required for the relaxation process is called the relaxation time.

Note 2 to entry: Transverse relaxation time is also named as spin-spin relaxation time.

3.3

free induction decay (FID)

NMR signal received resulting from using a single 90° radio frequency pulse to activate the sample

3.4

CPMG

pulse sequence involves applying multiple 180° radio frequency pulses after applying a 90° radio frequency pulse

Note 1 to entry: Each 180° radio frequency pulse applied will delay the signal attenuation caused by uneven magnetic field, and data that is not affected by magnetic field uniformity can be sampled at the echo peak of the signal.

3.5**sampling bandwidth (SW)**

frequency range of the NMR signal received by the receiver coil when the signal is collected

3.6**regulate first data (RFD)**

control parameter for the starting time of NMR signal acquisition

3.7**pre-amp regulate gain (PRG)**

parameter is used to show that the NMR signal from the receiver coil is pre-amplified to levels in a low-noise pre-amplifier

3.8**regulate analog gain 1 (RG1)**

parameter is used to show that the NMR signal is further amplified to levels in a pre-amplifier following the pre-amplification

3.9**regulate digital gain 1 (DRG1)**

parameter is used to show that the NMR signal is amplified to levels after converted to digital signals for averaging and computer processing

3.10**moisture distribution**

state of moisture in meat is shown by transverse relaxation time of nuclear magnetic resonance, including bound water, immobilized water and free water

3.11**bound water (T_{2b})**

water in meat that is closely bound to the polar groups of protein by hydrogen bonds

Note 1 to entry: The transverse relaxation time of bound water is shorter than that of immobilized water and free water.

3.12**immobilized water (T_{21})**

water in meat that cannot move freely, being fixed by intracellular colloidal particles or macromolecules or existing in the space of macromolecular structure

Note 1 to entry: The transverse relaxation time of immobilized water is between that of bound water and free water.

3.13**free water (T_{23})**

water in meat that moves freely in and out of cells and is maintained by capillary force

Note 1 to entry: The transverse relaxation time of free water is more than that of immobilized water and bound water.

4 Principle

The meat system contains atomic nuclei (1 H protons) with fixed magnetic moments, which can absorb radio frequency energy and generate NMR signals of the water hydrogen when stimulated by radio frequency pulses of specific frequencies under a constant magnetic field. When a meat sample is put in a uniform static magnetic field, specific nuclear magnetic pulse sequence is used to motivate the 1 H protons of moisture in the meat sample. After the sample absorb the excitation energy, nuclear magnetic resonance (NMR) signal is produced, which is proportional to the water mass of samples. Transverse relaxation process occurs and the moisture content of meat samples is obtained by the curve of linear relationship between the moisture mass and the received signal amplitude. In addition, the water-injected meat or thawed meat can be identified by the signals of immobilized water and free water.