NSAI Standards

Standard Recommendation
S.R. CEN ISO/TS 16491:2012

Guidelines for the evaluation of uncertainty of measurement in air conditioner and heat pump cooling and heating capacity tests (ISO/TR 16491:2012)

S.R. CEN ISO/TS 16491:2012

Incorporating amendments/corrigenda/National Annexes issued since publication:

S.R. CEN ISO/TS
16491:2012/LC:2012-12

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces:

This document is based on:
CEN ISO/TS 16491:2012

Published:
4 January, 2013

This document was published
under the authority of the NSAI
and comes into effect on:
4 January, 2013

ICS number:
23.120
27.080

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie

W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

S.R. CEN ISO/TS 16491:2012

Correction Notice

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Reference: **CEN ISO/TS 16491:2012**

Title: Guidelines for the evaluation of uncertainty of measurement in air conditioner and heat pump cooling and heating capacity tests (ISO/TS 16491:2012)

Work Item: 00113058

Brussels, 2012-12-12

With reference to the above, please include the following minor editorial correction(s) in the document related to:

the following language version(s) :
- ☐ English
- ☐ French
- ☐ German

for the following procedure :
- ☐ PQ/UQ
- ☐ Enquiry
- ☐ 2nd Enquiry
- ☐ Parallel Enquiry (☐ ISO/ ☐ CEN Lead)
- ☐ 2nd Parallel Enquiry (☐ ISO/ ☐ CEN Lead)
- ☐ Formal Vote
- ☐ 2nd Formal Vote
- ☐ Parallel Formal Vote (☐ ISO/ ☐ CEN Lead)
- ☐ 2nd Parallel Formal Vote (☐ ISO/ ☐ CEN Lead)
- ☐ UAP
- ☐ TC Approval
- ☐ 2nd TC Approval
- ☐ Publication
- ☒ Parallel Publication (☒ ISO/ ☐ CEN Lead)

KAC

It has been brought to our attention that this document, issued on 2012-12-05 (CEN Standards Publications Weekly Output Reference 2012/12/I) requires modification.

The deliverable has changed from a TR to a TS.

Please find enclosed the updated *English and French* versions.

We apologise for any inconvenience this may cause.

Avenue Marnix, 17 • B-1000 Bruxelles
Tel : +32 2 550 08 11 • Fax : +32 2 550 08 19

This page is intentionally left BLANK.

S.R. CEN ISO/TS 16491:2012

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN ISO/TS 16491

December 2012

ICS 23.120; 27.080

English Version

Guidelines for the evaluation of uncertainty of measurement in air conditioner and heat pump cooling and heating capacity tests (ISO/TS 16491:2012)

Lignes directrices pour l'évaluation de l'incertitude de mesure lors des essais de puissance frigorifique et calorifique des climatiseurs et des pompes à chaleur (ISO/TS 16491:2012)

Leitlinien für die Beurteilung der Messunsicherheit bei der Prüfung der Kühl- und Heizleistung von Klimaanlagen und Wärmepumpen (ISO/TS 16491:2012)

This Technical Specification (CEN/TS) was approved by CEN on 20 November 2012 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN ISO/TS 16491:2012: E

Contents

Page

Foreword **3**

Foreword

This document (CEN ISO/TS 16491:2012) has been prepared by Technical Committee ISO/TC 86 "Refrigeration and air-conditioning" in collaboration with Technical Committee CEN/TC 113 “Heat pumps and air conditioning units” the secretariat of which is held by AENOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO/TS 16491:2012 has been approved by CEN as a CEN ISO/TS 16491:2012 without any modification.

This page is intentionally left BLANK.

S.R. CEN ISO/TS 16491:2012

TECHNICAL SPECIFICATION

ISO/TS 16491

First edition
2012-12-01

Guidelines for the evaluation of uncertainty of measurement in air conditioner and heat pump cooling and heating capacity tests

Lignes directrices pour l'évaluation de l'incertitude de mesure lors des essais de puissance frigorifique et calorifique des climatiseurs et des pompes à chaleur

Reference number
ISO/TS 16491:2012(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword iv

Introduction v

1 Scope 1

2 Normative references 1

3 Terms and definitions 1

4 Symbols 3

5 Method of calculation 4
5.1 Calibration 4
5.2 Correction 4
5.3 (Instrumental) drift 4
5.4 Stability 4
5.5 Uncertainty due to the lack of homogeneity 4

6 Explanatory notes useful in laboratory application 4
6.1 Uncertainty 4
6.2 Confidence level 4
6.3 Evaluation of errors 5
6.4 Steps in evaluation of uncertainty in measurements 5
6.5 Uncertainty of measurements 5

7 Evaluation of uncertainty — Calorimeter room method 7
7.1 Cooling capacity test 8
7.2 Heating capacity test 11

8 Evaluation of uncertainty — Air enthalpy method 14
8.1 Cooling capacity test 15
8.2 Heating capacity test 16
8.3 Uncertainty of measurement on the air volume flow rate 18

Annex A (normative) **Uncertainty budget sheets** 19

Annex B (informative) **Determination of indirect contribution to uncertainty,** $U(C_i)$ 27

Bibliography 28

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 16491 was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 6, *Air-cooled air conditioners and air-to-air heat pumps*.

Introduction

This Technical Specification is intended to be a practical guide to assist laboratory personnel in evaluating the uncertainties in the measurement of the cooling and heating capacities of air conditioners and heat pumps. It contains a brief introduction to the theoretical basis for the calculations, and contains examples of uncertainty budget sheets that can be used as a basis for the determination of the uncertainty of measurement.

Guidelines for the evaluation of uncertainty of measurement in air conditioner and heat pump cooling and heating capacity tests

1 Scope

This Technical Specification gives guidance on the practical applications of the principles of performance measurement of air-cooled air-conditioners and air-to-air heat pumps as described in ISO 5151, ISO 13253, and ISO 15042.

2 Normative references

The following referenced documents are indispensable for the application 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/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement* (GUM:1995)

ISO 3534-1, *Statistics — Vocabulary and symbols — Part 1: General statistical terms and terms used in probability*

ISO 5151, *Non-ducted air conditioners and heat pumps — Testing and rating for performance*

ISO 13253, *Ducted air-conditioners and air-to-air heat pumps — Testing and rating for performance*

ISO 15042, *Multiple split-system air-conditioners and air-to-air heat pumps — Testing and rating for performance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 99, ISO/IEC Guide 98-3, ISO 3534-1, ISO 5151, ISO 13253 and ISO 15042 apply.

NOTE The definitions of terms 3.1, 3.2, 3.3, 3.4 and 3.5 are taken from ISO/IEC Guide 99:2007, 2.39, 4.14, 2.53, 4.21 and 4.19, respectively, and they are repeated here for easy reference.

3.1
calibration
operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication

[SOURCE: ISO/IEC Guide 99:2007, 2.39]