



Performance requirements for line voltage thermostats used with individual room electric space heating devices



Legal Notice for Standards

Canadian Standards Association (operating as “CSA Group”) develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document’s fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party’s intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document’s compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group’s and/or others’ intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA Group reserves all intellectual property rights in this document.

Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



Standards Update Service

CSA C828:19

October 2019

Title: *Performance requirements for line voltage thermostats used with individual room electric space heating devices*

To register for e-mail notification about any updates to this publication

- go to store.csagroup.org
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **2427528**.

If you require assistance, please e-mail techsupport@csagroup.org or call 416-747-2233.

Visit CSA Group's policy on privacy at www.csagroup.org/legal to find out how we protect your personal information.

Canadian Standards Association (operating as “CSA Group”), under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users — including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

Individuals, companies, and associations across Canada indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work and supporting CSA Group’s objectives through sustaining memberships. The more than 7000 committee volunteers and the 2000 sustaining memberships together form CSA Group’s total membership from which its Directors are chosen. Sustaining memberships represent a major source of income for CSA Group’s standards development activities.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in eight countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to
CSA Group
178 Rexdale Boulevard
Toronto, Ontario, M9W 1R3
Canada



A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

Standards Council of Canada
600-55 Metcalfe Street
Ottawa, Ontario, K1P 6L5
Canada



Standards Council of Canada
Conseil canadien des normes

Cette Norme Nationale du Canada est disponible en versions française et anglaise.

Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users to judge its suitability for their particular purpose.

®A trademark of the Canadian Standards Association, operating as “CSA Group”

National Standard of Canada

CSA C828:19

***Performance requirements for line
voltage thermostats used with
individual room electric space
heating devices***



*®A trademark of the Canadian Standards Association,
operating as "CSA Group"*



*Published in October 2019 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3*

*To purchase standards and related publications, visit our Online Store at store.csagroup.org
or call toll-free 1-800-463-6727 or 416-747-4044.*

*ICS 97.100.10
ISBN 978-1-4883-2442-0*

*© 2019 Canadian Standards Association
All rights reserved. No part of this publication may be reproduced in any form whatsoever
without the prior permission of the publisher.*

Contents

Technical Committee on Residential Equipment	2
Subcommittee on Performance of Thermostats	4
Preface	6
1 Scope	7
1.1 General	7
1.2 Thermostats not covered by this Standard	7
1.3 Thermal regulation and power grid issues	7
1.4 Terminology	7
1.5 Units of measurement	8
2 Reference publications	8
3 Definitions	8
4 General requirements	9
4.1 Performance	9
4.2 Safety	10
4.3 Thermal regulation	10
4.3.1 General	10
4.3.2 Test conditions	10
4.3.3 Wall-mounted line-voltage thermostats	10
4.3.4 Built-in thermostats	10
4.3.5 Two-component thermostats	10
4.4 Performance requirements	11
4.4.1 Droop	11
4.4.2 Differential	11
4.4.3 Control point precision	11
4.4.4 Standard error	11
5 Thermal regulation test requirements	11
5.1 Test set-up	11
5.2 Test procedure	13
5.3 Data analysis	13

Annex A (informative) — Details of sampling plan	20
Annex B (normative) — Standard error (STEYX)	22
Annex C (informative) — Electromagnetic compatibility and other grid impacts	23

Technical Committee on Residential Equipment

G. R. Hamer	BC Hydro, Burnaby, British Columbia, Canada <i>Category: User Interest/Regulatory Authority</i>	<i>Chair</i>
J. K. Hodge	Toronto, Ontario, Canada <i>Category: General Interest</i>	<i>Vice-Chair</i>
C. Buchanan	Natural Resources Canada, Ottawa, Ontario, Canada	<i>Non-voting</i>
G. Butt	Emerson Electric Canada Limited, Richmond Hill, Ontario, Canada <i>Category: Producer Interest</i>	
A. Carrier	Hydro-Québec, Montréal, Québec, Canada <i>Category: User Interest/Regulatory Authority</i>	
G. Chopra	Electro Federation Canada, Toronto, Ontario, Canada	<i>Non-voting</i>
K. N. Delves	Natural Resources Canada, Ottawa, Ontario, Canada	<i>Non-voting</i>
S. Grubbe	Calgary, Alberta, Canada <i>Category: General Interest</i>	
G. D. Henriques	Henriques Consulting, Richmond, British Columbia, Canada	<i>Non-voting</i>
P. Hikspoors	Giant Factories Inc., Montréal, Québec, Canada	<i>Non-voting</i>
R. Kelly	Efficiency Nova Scotia Corporation, Dartmouth, Nova Scotia, Canada	<i>Non-voting</i>
A. Kelly	Canadian Electricity Association (CEA), Ottawa, Ontario, Canada	<i>Non-voting</i>

S. Krsikapa	Ontario Ministry of Energy, Toronto, Ontario, Canada <i>Category: User Interest/Regulatory Authority</i>	
T. K. Lau	BC Hydro, Vancouver, British Columbia, Canada	<i>Non-voting</i>
C. Lesage	Giant Factories Inc., Montréal-Est, Québec, Canada <i>Category: Producer Interest</i>	
C. Li	Hydro One Networks Inc., Toronto, Ontario, Canada	<i>Non-voting</i>
G. Lundy	IBM Canada Ltd., Markham, Ontario, Canada <i>Category: Producer Interest</i>	
E. Milakowski	Ontario Ministry of Energy, Toronto, Ontario, Canada	<i>Non-voting</i>
R. Mortazavi	Natural Resources Canada, Ottawa, Ontario, Canada	<i>Non-voting</i>
A. Orumwense	Natural Resources Canada, Ottawa, Ontario, Canada <i>Category: User Interest/Regulatory Authority</i>	
R. J. Singlehurst	Natural Resources Canada, Ottawa, Ontario, Canada	<i>Non-voting</i>
H. Tse	Independent Electricity System Operator (IESO), Toronto, Ontario, Canada	<i>Non-voting</i>
M. B. Williams	Association of Home Appliance Manufacturers (AHAM), Washington, District of Columbia, USA <i>Category: Producer Interest</i>	
J. Cheema	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

Subcommittee on Performance of Thermostats

C. Le Bel	Laboratoire des technologies de l'énergie (LTE), Shawinigan, Québec, Canada	<i>Chair</i>
D. Baldewicz	ICF, Greenwich, New York, USA	
J. Bylinski	Stelpro Design Inc., St-Bruno, Québec, Canada	
G. Chopra	Electro Federation Canada, Toronto, Ontario, Canada	
Y. Cupidon	Convectair NMT Inc., Sainte-Therese, Québec, Canada	
J. Dukes	Dimplex North America Limited, Cambridge, Ontario, Canada	
P. M. Eastling	Honeywell Inc., Golden Valley, Minnesota, USA	
E. Fernando	Brampton, Ontario, Canada	
M. Fournier	Hydro-Québec, Shawinigan, Québec, Canada	
J. Geissberger	Casa Connected Appliances Ltd., St-Mathieu-De-Beloeil, Québec, Canada	
G. R. Hamer	BC Hydro, Burnaby, British Columbia, Canada	
J. P. Hervieux	Ouellet Canada Inc., Ville de L'Islet, Québec, Canada	
J. K. Hodge	Toronto, Ontario, Canada	

M. Kassabian	Ontario Ministry of Energy, Toronto, Ontario, Canada	
S. Mayer	Sinope Technologies, St-Jean-Sur-Richelieu, Québec, Canada	
R. Mortazavi	Natural Resources Canada, Ottawa, Ontario, Canada	
J. Murru	CSA Group, Toronto, Ontario, Canada	
A. Rascon	Resideo, Chihuahua, Chihuahua, Mexico	
M. Robichaud	Ouellet Canada, L'Islet, Québec, Canada	
C. M. Yip	SOUPRO Limited, Markham, Ontario, Canada	
J. Cheema	CSA Group, Toronto, Ontario, Canada	<i>Project Manager</i>

Preface

This is the fourth edition of CSA C828, *Performance requirements for line voltage thermostats used with individual room electric space heating devices*. It supersedes the previous editions published in 2013, 2006, and 1999.

This Standard deals with the thermal regulation of line voltage thermostats used with individual room electric space heating devices and also contains an informative annex that covers some power grid issues.

The requirements specified in this Standard are intended to facilitate energy conservation while informative Annex C aims to prevent disturbances such thermostats could create on the power grid.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Performance of Thermostats, under the jurisdiction of the Technical Committee on Residential Equipment and the Strategic Steering Committee on Performance, Energy Efficiency, and Renewables, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Notes:

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include “Request for interpretation” in the subject line:*
 - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
 - b) *provide an explanation of circumstances surrounding the actual field condition; and*
 - c) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at standardsactivities.csa.ca.
- 5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include “Proposal for change” in the subject line:*
 - a) *Standard designation (number);*
 - b) *relevant clause, table, and/or figure number;*
 - c) *wording of the proposed change; and*
 - d) *rationale for the change.*

CSA C828:19

Performance requirements for line voltage thermostats used with individual room electric space heating devices

1 Scope

1.1 General

This Standard specifies performance requirements for thermostats (120 to 240 V) intended for switching of a controlled resistive heating load.

The models covered by this Standard are as follows:

- a) wall-mounted thermostats used with baseboards, panel convectors, or radiant floors;
- b) built-in thermostats (1000 W up to 1500 W) used in baseboards or panel convectors; and
- c) two-component thermostats.

1.2 Thermostats not covered by this Standard

Thermostats used exclusively or built-in in the following units are excluded:

- a) fan-forced heaters;
- b) kick space;
- c) fireplaces;
- d) thermal storage heaters;
- e) electric baseboards and convectors incorporating both convection and radiant heating elements;
- f) portable heaters; and
- g) central heating units under the control of a single thermostat.

1.3 Thermal regulation and power grid issues

The mandatory part of this Standard specifies performance requirements covering thermal regulation. The thermal regulation requirements are based on testing in a dual-climate test chamber. Informative Annex C outlines

- a) proposed limits on the level of some types of emissions that might be generated by thermostats; and
- b) grid impacts that thermostats may help alleviate.

1.4 Terminology

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the Standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.