

JOINT CANADA - US
NATIONAL
STANDARD

*CAN/ANSI/AHRI 540-2015, Performance Rating of
Positive Displacement Refrigerant Compressors
and Compressor Units*



we make life better®



Standards Council of Canada
Conseil canadien des normes



Established timeline for review: A revision is scheduled to be released within five years of the publication date.

National Standard of Canada

A National Standard of Canada is a standard developed by an SCC-accredited Standards Development Organization (SDO), and approved by the Standards Council of Canada (SCC), in accordance with SCCs: Requirements and Guidance-Accreditation for Standards Development Organizations, and Requirements for Guidance-Approval of National Standards of Canada Designation. More information on National Standard requirements can be found at www.scc.ca. An SCC-approved standard reflects the consensus of a number of experts whose collective interests provide, to the greatest practicable extent, a balance of representation of affected stakeholders. National Standards of Canada are intended to make a significant and timely contribution to the Canadian interest.

SCC is a Crown corporation within the portfolio of Industry Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leans 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. Users should always obtain the latest edition of a National Standard of Canada from the standards development organization responsible for its publication, as these documents are subject to periodic review.

The responsibility for approving standards as NSCs rests with:

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

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

It is the responsibility of the user to judge the suitability of this National Standard of Canada for his/her purpose.

International Classification for Standards (ICS) number: 23.140

AHRI Contact Information:

2111 Wilson Blvd. Suite 500
Arlington, Virginia 22201
Phone: 703-524-8800
Fax: 703-562-1942
Email: dabbate@ahrinet.org

This standard was approved as a Joint Canada - United States National Standard by the Standards Council of Canada.

To purchase the standard please contact Daniel Abbate at dabbate@ahrinet.org.

<u>Technical Committee for AHRI Standard 540</u>	
Participant	Interest Category Classification
Ronald Beaulne Bitzer Canada	Producer
Vince Zolli National Refrigeration and A/C Canada Corp.	Producer
Matthew B. Williams Association of Home Appliance Manufacturers	General Interest
Duane P. Brown American Petroleum Institute	General Interest

IMPORTANT

SAFETY RECOMMENDATIONS

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

Notes:

This standard supersedes AHRI Standard 540-2004.

This standard was approved by ANSI on: 3/20/2016.

This standard is suitable for third party certification.

It is the responsibility of the user to select its preferred units of measure.

Foreword

The following are significant changes made in this update:

- 1) Move away from standard ratings and work primarily with published ratings
 - a. Ratings from coefficients are primary source
 - b. Old tables of standard rating conditions would be included in appendix for reference
 - c. Manufacturers can continue to publish information at specific points of interest
- 2) Different uncertainties for different parts of the Application Envelope
 - a. High Temperature
 - b. Medium Temperature
 - c. Low Temperature
- 3) More specific information to help with the development of ratings and the verification of the ratings
 - a. Adding statistical aspect to uncertainties
 - b. Incorporation of more specific information on uncertainty
- 4) Specific guidelines for initial estimates of performance at different superheat values

TABLE OF CONTENTS

SECTION		PAGE
Section 1.	Purpose.....	1
Section 2.	Scope.....	1
Section 3.	Definitions.....	1
Section 4.	Test Requirements.....	3
Section 5.	Rating Requirements.....	3
Section 6.	Minimum Data Requirements for Published Ratings.....	7
Section 7.	Operating Requirements	8
Section 8.	Marking and Nameplate Data	8
Section 9.	Conformance Conditions	8

TABLES

Table 1 (I-P).	Reference Rating Conditions	4
Table 2 (I-P).	Application Envelope for the Rating Uncertainties	4
Table 1 (SI).	Reference Rating Conditions	5
Table 2 (SI).	Application Envelope for the Rating Uncertainties	6
Table 3.	Rating Uncertainty Limits for the Verification of Published Ratings	6

FIGURES

Figure 1 (I-P).	Application Envelope for the Rating Uncertainties, with Reference Rating Conditions Shown (Table 1 (I-P))	5
Figure 1 (SI).	Application Envelope for the Rating Uncertainties, with Reference Rating Conditions Shown (Table 1 (SI))	6

APPENDICES

Appendix A.	References - Normative	9
Appendix B.	References - Informative.....	10
Appendix C.	Method to Handle Zeotropic Mixtures - Informative.....	11

Appendix D.	Superheat Correction - Informative.....	15
Appendix E.	Historical Rating Conditions - Informative.....	16
Appendix F.	Verification of Published Ratings for Batches of Equipment - Informative	18

FIGURES FOR APPENDICES

Figure C1.	Cycle Process for Single Component Refrigerants and Azeotropic Mixtures	11
Figure C2.	Cycle Process for Zeotropic Refrigerant Mixtures.....	12
Figure C3.	Definitions of Subcooling and Superheating	13

TABLES FOR APPENDICES

Table E1.	Historical Rating Conditions for Compressors Used in Commercial Refrigeration Applications (Based on 95°F, 35°C Ambient Temperature Surrounding the Compressor)	16
Table E2.	Historical Rating Conditions for Compressors Used In Air Conditioners and Heat Pumps (Based on 95°F, 35°C Ambient Temperature Surrounding the Compressor)	17
Table F1.	Rating Uncertainty Limits for the Verification of Published Ratings of Batches of Equipment	19
Table F2.	Total Standard Deviations Associated with the Rating Uncertainty Limits for the Verification of Published Ratings of Batches of Equipment.....	19
Table F3.	Acceptance Criteria for the Verification of Published Ratings Using a Sample Size of 1	19
Table F4.	Acceptance Criteria for the Verification of Published Ratings Using a Sample Size of 3.....	20

PERFORMANCE RATING OF POSITIVE DISPLACEMENT REFRIGERANT COMPRESSORS AND COMPRESSOR UNITS

Section 1. Purpose

1.1 Purpose. The purpose of this standard is to establish, for Compressors: definitions, test requirements, rating requirements, minimum data requirements for Published Ratings, operating requirements, marking and nameplate data, and conformance conditions.

1.1.1 *Intent.* This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors and users. The standard defines the minimum amount of information, in a standard form to enable the evaluation and comparison of different Compressors for use in a particular application.

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to positive displacement refrigerant Compressors operating in subcritical applications at a fixed displacement. This standard also applies to the presentation of performance data for Compressors for air-cooled, evaporative-cooled or water-cooled air-conditioning, heat pump and refrigeration applications. The manufacturer is solely responsible for the determination of values to be used in published product information. This standard stipulates the minimum amount of information to be provided and suggests a method to be used to verify the accuracy of that information.

2.2 *Exclusions.*

2.2.1 This standard does not apply to Compressors employing ammonia, as covered in ANSI/AHRI Standard 510 or carbon dioxide in subcritical and transcritical applications, as covered in ANSI/AHRI Standard 570 (I-P) and ANSI/AHRI Standard 571 (SI).

2.2.2 This standard does not apply to modulated refrigerant mass flow Compressors or Compressors utilizing vapor injection for the purpose of subcooling to gain capacity.

2.2.3 This standard does not apply to Compressors intended for use in:

2.2.3.1 Household refrigerators and freezers

2.2.3.2 Automotive air-conditioners

2.2.3.3 Dehumidifiers

2.2.3.4 Industrial products other than heating and cooling

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Terminology* website (<https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>) unless otherwise defined in this section.