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(IEC 60335-2-34:2021, MOD)

STANDARD FOR SAFETY

Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors

UL Standard for Safety for Household and Similar Electrical Appliances – Safety – Part 2-34: Particular requirements for motor-compressors, UL 60335-2-34

Seventh Edition, Dated March 31, 2025

Summary of Topics

This new edition of ANSI/UL 60335-2-34 dated March 31, 2025 is an adoption of IEC 60335-2-34, Edition 6 issued by the IEC March 2021. Please note that the National Difference document incorporates all the U.S. national differences.

The requirements are substantially in accordance with Proposal(s) on this subject dated May 26, 2023, October 27, 2023, May 10, 2024, August 2, 2024, and October 11, 2024.

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March 31, 2025

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Preface

This is the harmonized CSA Group and ULSE standard for Household and Similar Electrical Appliances – Safety – Part 2-34: Particular Requirements for Motor-Compressors. It is the third edition of CSA C22.2 No. 60335-2-34, and the seventh edition of UL 60335-2-34. This edition of CSA C22.2 No. 60335-2-34 supersedes the previous edition published November 3, 2017. This edition of UL 60335-2-34 supersedes the previous edition(s) published on November 3, 2017.

This harmonized standard is based on IEC Publication 60335-2-34: sixth edition, Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors, issued March 2021. IEC Publication 60035-2-34 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and ULSE Inc. The efforts and support of the Technical Harmonization Subcommittee on Air-Conditioning and Refrigeration (THSC 61D WG15) of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA) are gratefully acknowledged.

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

This standard was reviewed by the CSA Subcommittee on Household Appliances for Refrigeration, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety and has been formally approved by the CSA Technical Committee. This Standard was also reviewed and approved by UL's Standards Technical Panel for Motor-Compressors, STP 60335-2-34. 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.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: 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.

CSA C22.2 No. 60335-2-34 is to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1. The requirements for motor-compressors are contained in this Part 2 Standard and CAN/CSA-C22.2 No. 60335-1. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 60335-1. Where a particular subclause of CAN/CSA-C22.2 No. 60335-1 is not mentioned in CSA C22.2 No. 60335-2-34, the CAN/CSA-C22.2 No. 60335-1 subclause applies.

ULSE Standard 60335-2-34 is to be used in conjunction with the sixth edition of UL 60335-1. The requirements for motor-compressors are contained in this Part 2 Standard and UL 60335-1. Requirements of this Part 2 Standard, where stated, amend the requirements of UL 60335-1. Where a particular subclause of UL 60335-1 is not mentioned in UL 60335-2-34, the UL 60335-1 subclause applies.

Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and ULSE.

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All national differences from the IEC text are included in the CSA Group and ULSE versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for Differences From IEC

Differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to reflect the intent more accurately.

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NATIONAL DIFFERENCES

In the CSA Group and ULSE publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 60335-2-34, Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors, copyright 2021, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

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Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

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Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-34: Particular requirements for motor-compressors

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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This part of IEC 60335 has been prepared by subcommittee 61C: Safety of refrigeration appliances for household and commercial use, of IEC Technical Committee 61: Safety of household and similar electrical appliances.

This sixth edition cancels and replaces the fifth edition published in 2012, Amendment 1:2015 and Amendment 2:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- it aligns the text with IEC 60335-1, Ed 5.2;
- application categories and tests have been extended ([3.1.102](#), Annex [AA](#));
- use of a motorette for winding wire compatibility tests introduced ([3.8.102](#), Annex [BB](#));

- height of the triangle, symbol ISO 7010 W021 has been introduced ([7.14](#));
- some notes are converted to normative text ([1](#), [15.3](#), [22.21](#), [23.8](#), [29.3.4](#), [Figure AA.1](#));
- note in Subclause [6.101](#) becomes normative in Clause [11](#);
- optional pressure endurance test introduced ([18.101](#), Annex [EE](#));
- compatibility test for insulation inside the housing clarified ([22.9](#));
- clarification of clearances inside the housing for motor-compressors suitable for use at altitudes exceeding 2 000 m ([29.1](#));
- normative references and associated text have been updated ([24.101](#), Annex [DD](#));
- breaking strength of tie cord after temperature heating cycle has been updated (Annex [CC](#)).
- The text of this International Standard is based on the following documents:

Draft	Report on Voting
61C/873/FDIS	61C/874/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts of the IEC 60335 series, under the general title *Household and similar electrical appliances – Safety*, can be found on the IEC website.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for motor-compressors.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below.

- [7.1](#): The locked-rotor current marking is required for some MOTOR-COMPRESSORS (USA).
- [22.7](#): Different test pressures are used (Japan, USA).

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

No Text on This Page

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

If testing of the MOTOR-COMPRESSOR includes testing in accordance with Annex [AA](#), temperatures of the MOTOR-COMPRESSOR windings, HOUSING and other parts related to the MOTOR-COMPRESSOR, such as terminals, internal wiring and insulating materials, are not measured when the complete appliance in which the MOTOR-COMPRESSOR is used is tested.

These requirements apply to sealed (hermetic and semi-hermetic type) MOTOR-COMPRESSORS with their associated starting, cooling capacity control and protection systems, tested separately under the most severe conditions of the refrigerating system operation which, within reasonable limits, could occur in the applications for which they are used.

In particular, the construction detail inspection and locked-rotor testing may be done separately on the MOTOR-COMPRESSOR, thereby eliminating the need for inspection and testing when the MOTOR-COMPRESSOR is applied to many different appliances and factory-built assemblies.

Operational tests may also be conducted on the MOTOR-COMPRESSOR separately in certain circumstances. The specification for this type testing is provided in Annex [AA](#). However, the tests of the existing standards

relevant to the given kind of application, such as IEC 60335-2-24 and IEC 60335-2-40, may need to be conducted on the final application and used as the final determination of acceptability.

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of sealed (hermetic and semi-hermetic type) MOTOR-COMPRESSORS, their protection and control systems, if any, which are intended for use in equipment for household and similar purposes and which conform with the standards applicable to such equipment. It applies to MOTOR-COMPRESSORS tested separately, under the most severe conditions that may be expected to occur in normal use, their RATED VOLTAGE being not more than 250 V for single-phase MOTOR-COMPRESSORS and 600 V for other MOTOR-COMPRESSORS.

This standard also covers

- multi-speed MOTOR-COMPRESSORS, that are MOTOR-COMPRESSORS, the speed of which can be set to different values;
- variable capacity MOTOR-COMPRESSORS that are MOTOR-COMPRESSORS where the capacity of the compressor is controlled at fixed speeds.

NOTE 101 Examples of equipment which contain MOTOR-COMPRESSORS are

- tumble dryers (IEC 60335-2-11);
- refrigerating appliances, ice-cream appliances and ice-makers (IEC 60335-2-24);
- electrical heat pumps, air-conditioners and dehumidifiers (IEC 60335-2-40);
- commercial dispensing appliances and vending machines (IEC 60335-2-75);
- commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or compressor (IEC 60335-2-89);
- electrical equipment for measurement, control, and laboratory use (IEC 61010-2-011);
- professional ice-cream makers (IEC 60335-2-118);
- refrigerating systems and heat pumps (ISO 5149-2).

This standard does not supersede the requirements of standards relevant to the particular appliance in which the MOTOR-COMPRESSOR is used. However, if the MOTOR-COMPRESSOR type used complies with this standard, the tests for the MOTOR-COMPRESSOR specified in the particular appliance standard may not need to be made in the particular appliance or assembly. If the MOTOR-COMPRESSOR CONTROL SYSTEM is associated with the particular appliance control system, additional tests could be necessary on the final appliance.

So far as is practical, this standard deals with the common hazards presented by MOTOR-COMPRESSORS used in appliances which are encountered by all persons in and around the home. However, it does not in general take into account

- the use of appliances by young children or infirm persons without supervision;
- playing with the appliances by young children.

NOTE 102 Attention is drawn to the fact that

– for MOTOR-COMPRESSORS intended to be used in appliances in vehicles or on board ships, additional requirements could be necessary;

– in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

This standard does not apply to

– MOTOR-COMPRESSORS designed exclusively for industrial purposes;

– MOTOR-COMPRESSORS used in appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

NOTE 103 If MOTOR-COMPRESSORS for refrigerant R-744 used in appliances with a TRANSCRITICAL REFRIGERATION SYSTEM are equipped with PRESSURE RELIEF DEVICES, compliance with the requirements for these devices is checked during the tests on the final appliance.

1DV DR Modification by replacing Clause 1 of the Part 2 with the following:

This International Standard deals with the safety of sealed (hermetic and semi-hermetic type) MOTOR-COMPRESSORS, their protection and control systems, if any, which are intended for use in equipment for household and similar purposes and which conform with the standards applicable to such equipment. It applies to MOTOR-COMPRESSORS tested separately, under the most severe conditions that may be expected to occur in normal use, their rated voltage being not more than 15 000 V, single or multi-phase and direct current (DC). MOTOR-COMPRESSORS covered by this standard are intended for use in accordance with:

– CSA C22.1, Canadian Electrical Code, Part I, in Canada;

– NFPA 70, National Electrical Code (NEC), in the United States.

This standard is unique in that it applies to MOTOR-COMPRESSORS which are components used within an end-use appliance having its own safety certification standard. Thus, this standard does not distinguish whether a specific MOTOR-COMPRESSOR is intended for use in household, commercial or industrial applications. MOTOR-COMPRESSOR usage is defined by the end-use standard.

MOTOR-COMPRESSORS with a rated voltage from 600 to 15 000 V shall use [Annex 101.DVI](#) together with other relevant requirements in this standard.

This standard also covers

– multi-speed MOTOR-COMPRESSORS, that are MOTOR-COMPRESSORS, the speed of which can be set to different values;

– variable capacity MOTOR-COMPRESSORS, that are MOTOR-COMPRESSORS where the capacity of the compressor is controlled at fixed speeds;

– MOTOR-COMPRESSORS used in an appliance not intended for normal household use but which nevertheless can be a source of danger to the public. These appliances are intended to be used by lay people in shops, in light industry, farms, and similar applications.

NOTE 101 Examples of equipment which contain MOTOR-COMPRESSORS are,

- tumble dryers (IEC 60335-2-11);
- refrigerating appliances, ice-cream appliances, and ice-makers (CSA C22.2 No. 60335-2-24/ UL 60335-2-24);
- electrical heat pumps, air-conditioners, and dehumidifiers (CSA C22.2 No. 60335-2-40/ UL 60335-2-40);
- commercial dispensing appliances, and vending machines (IEC 60335-2-75);
- commercial refrigerating appliances and ice makers with an incorporated or remote refrigerant unit or compressor (CSA C22.2 No. 60335-2-89 / UL 60335-2-89).
- electrical equipment for measurement, control, and laboratory use (CSA C22.2 No. 61010-2-011 / UL 61010-2-011);
- professional ice-cream makers (IEC 60335-2-118);
- refrigerating systems and heat pumps (ISO 5149-2).

This standard does not supersede the requirements of standards relevant to the particular appliance in which the MOTOR-COMPRESSOR is used. However, if the MOTOR-COMPRESSOR type used complies with this standard, the tests for the MOTOR-COMPRESSOR specified in the particular appliance standard may not need to be made in the particular appliance or assembly. If the MOTOR-COMPRESSOR CONTROL SYSTEM is associated with the particular appliance control system, additional tests could be necessary on the final appliance.

So far as is practical, this standard deals with the common hazards presented by MOTOR-COMPRESSORS used in appliances which are encountered by all persons in and around the home. However, it does not in general take into account

- the use of appliances by young children or infirm persons without supervision;
- playing with the appliances by young children.

NOTE 102 Attention is drawn to the fact that.

- for MOTOR-COMPRESSORS intended to be used in appliances in vehicles or on board ships, additional requirements could be necessary;
- in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

This standard does not apply to

- MOTOR-COMPRESSORS used in appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

NOTE 103 If MOTOR-COMPRESSORS for refrigerant R-744 used in appliances with a TRANSCRITICAL REFRIGERATION SYSTEM are equipped with PRESSURE RELIEF devices, compliance with the requirements for these devices is checked during the tests on the final appliance.

2 Normative references

This clause of Part 1 is applicable, except as follows.

Addition:

IEC 60079-1:2014, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-15:2017, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60851-4:2016, *Winding wires – Test methods – Part 4: Chemical properties*

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*

IEC 60851-5:2008/AMD1:2011

IEC 60851-5:2008/AMD2:2019¹

¹ There exists a consolidated edition 4.2:2019 that includes Edition 4 and its Amendment 1 and Amendment 2.

ISO 817:2014, *Refrigerants – Designation and safety classification*

ISO 817:2014/AMD1:2017

ISO 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

2DV DC Modification by adding the following to Clause 2 of the Part 2:

Unless otherwise specified, any international standard within this standard shall be replaced by a reference to the equivalent adopted Canadian and United States standard. The requirements of these Canadian and United States adopted Standards shall take precedence over International Standards on which they are based.

**CSA C22.1,
Canadian Electrical Code, Part I**

**CSA C22.2 No. 0,
General requirements – Canadian Electrical Code, Part II**

**CSA C22.2 No. 0.8,
Safety functions incorporating electronic technology**

**CSA C22.2 No. 0.17,
Evaluation of properties of polymeric materials**

**CSA C22.2 No. 274,
Adjustable speed drives**

**CSA C22.2 No. 253,
Medium-voltage AC contactors, controllers, and control centers**

**CAN/CSA-C22.2 No. 60335-1,
Household and similar electrical appliances – Part 1: General requirements**

**CSA C22.2 No. 60335-2-24,
Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances, and ice-makers**

CSA C22.2 No. 60335-2-40,
Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners, and dehumidifiers

CSA C22.2 No. 60335-2-89,
Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances, and ice-makers with an incorporated or remote refrigerant unit or motor-compressor

CSA E60730-1,
Automatic electrical controls – Part 1: General requirements

UL 347,
Safety Standard for Medium-Voltage AC Contactors, Controllers and Control Centers

UL 60335-1,
Safety Standard for Household and Similar Electrical Appliances, Part 1: General Requirements

UL 60335-2-24,
Safety Standard for Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

UL 60335-2-40,
Safety Standard for Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

UL 60335-2-89,
Safety Standard for Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor

ASHRAE 34,
Designation and Safety Classification of Refrigerants

ASME Boiler and Pressure Vessel Code,
Section VIII

ASTM A90/A90M,
Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

IEC 60068-2-52,
Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)

IEC 60112,
Method for the determination of the proof and the comparative tracking indices of solid insulating materials

IEC 60216-4-1,
Electrical insulating materials – Thermal endurance properties – Part 4-1: Ageing ovens – Single-chamber ovens

IEC 60695-11-20,
Fire hazard testing – Part 11-20: Test flames – 500 W flame test methods

ISO 4892-2,
Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps

NFPA 70,
National Electrical Code (NEC)

3 Terms and definitions

This clause of Part 1 is applicable, except as follows.

3.1 Definitions relating to physical characteristics

3.1.101

DESIGN PRESSURE

gauge pressure that has been assigned to a TRANSCRITICAL REFRIGERATION SYSTEM

Note 1 to entry: It is specified for the high-pressure side of a refrigeration system.

3.1.102

application category

back pressure relative to the evaporation temperature range over which the motor-compressor operates

Note 1 to entry: For the purpose of this standard, the following classifications of APPLICATION CATEGORIES are made relative to the maximum evaporation temperature:

- very low back pressure (VLBP): denotes a maximum evaporation temperature of $-25\text{ }^{\circ}\text{C}$;
- low back pressure (LBP): denotes a maximum evaporation temperature of $-15\text{ }^{\circ}\text{C}$;
- medium back pressure (MBP): denotes a maximum evaporation temperature of $0\text{ }^{\circ}\text{C}$;
- high back pressure (HBP): denotes a maximum evaporation temperature of $+15\text{ }^{\circ}\text{C}$;
- very high back pressure (VHBP): denotes a maximum evaporation temperature of $+30\text{ }^{\circ}\text{C}$;
- subcritical R-744 back pressure (SC R-744BP): denotes a maximum evaporation temperature of $-15\text{ }^{\circ}\text{C}$;

3.1.102DV D1 Modification by replacing Clause 3.1.102 in the Part 2 with the following:

application category

back pressure relative to the evaporation temperature range over which the MOTOR-COMPRESSOR operates

NOTE 1: For the purpose of this standard, the following classifications of APPLICATION CATEGORIES are made relative to the maximum evaporation temperature:

- very low back pressure (VLBP): denotes a maximum evaporation temperature of $-25\text{ }^{\circ}\text{C}$;
- low back pressure (LBP): denotes a maximum evaporation temperature of $-15\text{ }^{\circ}\text{C}$;
- medium back pressure (MBP): denotes a maximum evaporation temperature of $0\text{ }^{\circ}\text{C}$;
- high back pressure (HBP): denotes a maximum evaporation temperature of $+15\text{ }^{\circ}\text{C}$;
- very high back pressure (VHBP): denotes a maximum evaporation temperature of $+30\text{ }^{\circ}\text{C}$;

- subcritical R-744 back pressure (SC R-744BP): denotes a maximum evaporation temperature of -15 °C;
- transcritical low back pressure TC R744 LBP denotes a maximum evaporation temperature of -15 °C;
- transcritical medium back pressure TC R744 MBP, denotes a maximum evaporation temperature of 0 °C;
- transcritical high back pressure TC R744HBP, denotes a maximum evaporation temperature of +15 °C.

NOTE 2: Conditions in [Table AA.1](#) of Annex [AA](#) or [Table 101.DVM.1](#) of Annex [101.DVM](#) are identified using the selected back pressure acronyms above, together with a numerical designation that represents different conditions for each back pressure.

3.4.2DV D1 Modification by replacing Clause 3.4.2DV in the Part 1 with the following:

SAFETY EXTRA-LOW VOLTAGE: Voltage between any accessible part and earth, not exceeding 30 V AC (RMS), 42,4 V AC (peak) or 60 V DC (ripple free) under normal and single-fault condition, which is provided by an independent source (such as safety isolating transformers, motor generators, and batteries) or, if obtained from higher voltage, is obtained by a safety isolating transformer or a converter with separate windings providing equivalent insulation.

NOTE: NFPA 70 Article 725 (NEC) class 2 meets this requirement.

3.5 Definitions relating to types of appliances

3.5.101

MOTOR-COMPRESSOR

appliance consisting of the mechanical mechanism of the compressor and the motor, both of which are enclosed in the same sealed housing, with no external shaft seals, and with the motor operating in a refrigerant atmosphere with or without oil.

Note 1 to entry: The HOUSING may be permanently sealed, such as by welding or brazing (HERMETIC MOTOR-COMPRESSOR), or may be sealed by gasketed joints (SEMI-HERMETIC MOTOR-COMPRESSOR). A terminal box, a terminal box cover, and other electrical components or an electronic control system may be included.

Note 2 to entry: Hereafter, the term MOTOR-COMPRESSOR will be used to designate either a HERMETIC MOTOR-COMPRESSOR or SEMI-HERMETIC MOTOR-COMPRESSOR.

3.5.102

TWO-STAGE MOTOR-COMPRESSOR

MOTOR-COMPRESSOR comprising two compressors and one motor in a single housing

3.6 Definitions relating to parts of an appliance

3.6.101

HOUSING

sealed enclosure for the MOTOR-COMPRESSOR, which contains the compressor mechanism and the motor, and which is subjected to refrigerant pressures

3.6.102

STARTING RELAY

electrically operated control device intended for integration or incorporation into a MOTOR-COMPRESSOR and used within the **motor-compressor** circuit to control the starting of single-phase MOTOR-COMPRESSOR

3.7 Definitions relating to safety components

3.7.101

THERMAL MOTOR-PROTECTOR

automatic control, built-in or fitted on a MOTOR-COMPRESSOR that is specifically intended to protect the MOTOR-COMPRESSOR against over-heating due to running overload and failure to start

Note 1 to entry: This control carries MOTOR-COMPRESSOR current and is sensitive to one or both of the following:

- MOTOR-COMPRESSOR temperature;
- MOTOR-COMPRESSOR current.

Note 2 to entry: The control is capable of being reset (either manually or automatically) when its temperature falls to the reset value.

3.7.101DV D1 Modification by replacing the 1st line of 3.7.101 with the following:

Thermal-mechanical motor-protector, thermostatic (bi or tri-metal) metal

Note throughout the remaining standard the phrase “Thermal-Motor protector” denotes these types of devices.

3.7.102

MOTOR-COMPRESSOR PROTECTION SYSTEM

THERMAL MOTOR PROTECTOR and associated components, if any, or PROTECTIVE ELECTRONIC CIRCUIT fully or partly separate or integrated into the MOTOR-COMPRESSOR CONTROL SYSTEM and which is specifically intended to protect the motor-compressor against over-heating due to running overload or failure to start

Note 1 to entry: The control carries MOTOR-COMPRESSOR current and is sensitive to one or both of the following:

- MOTOR-COMPRESSOR temperature;
- MOTOR-COMPRESSOR current.

3.7.103

MOTOR-COMPRESSOR CONTROL SYSTEM

system comprising one or more electrical or ELECTRONIC COMPONENTS, or ELECTRONIC CIRCUITS that provides at least one of the following:

- MOTOR-COMPRESSOR starting control functions;
- MOTOR-COMPRESSOR cooling capacity control functions

3.7.104

PRESSURE RELIEF DEVICE

pressure sensing device, intended to reduce pressure automatically when pressures within the refrigeration system exceed the preset pressure of the device

Note 1 to entry: This device has no provisions for setting by the end user.

3.7.104DV D1 Modification of Clause 3.7.104 of the Part 2 by adding the following note:

Note 2DV: A BYPASS VALVE (internal pressure relief) is not a PRESSURE RELIEF DEVICE.

3.8 Definitions relating to miscellaneous matters

3.8.101

TRANSCRITICAL REFRIGERATION SYSTEM

refrigeration system where the pressure in the high pressure side is above the pressure where the vapour and liquid states of the refrigerant can coexist in thermodynamic equilibrium

3.8.102

MOTORETTE

insulation system model made to embody all of the elements of a random wound insulation system

3.8.102DV D1 Modification by replacing Clause 3.8.102 of the Part 2 with the following:

MOTORETTE

insulation system model made to embody all of the elements of a random wound insulation system as typically shown in and [Figure BB.2](#) or [Figure 101.DVO.1](#) and [Figure 101.DVO.3](#)

3.8.103DV D1 Addition of the following definitions to Clause 3 of the Part 2 as follows:

3.8.103DV.1

PRIMARY SINGLE PHASING

occurs when one of the three incoming lines to the primary of the transformer supplying the MOTOR-COMPRESSOR supplies no voltage to the transformer

3.8.103DV.2

MAXIMUM CONTINUOUS CURRENT (MCC)

maximum amount of current that is allowed to flow to the MOTOR-COMPRESSOR MOTOR by the MOTOR-COMPRESSOR PROTECTION SYSTEM

3.8.103DV.3

BYPASS VALVE

device that relieves high side pressure into the low side at a predetermined pressure differential

Note: A BYPASS VALVE (Internal pressure relief) is not a PRESSURE RELIEF DEVICE.

3.8.103DV.4

FORM WOUND MOTOR

motor using insulated rectangular shaped conductors that are wrapped with additional electrical insulation over the entire coil prior to insertion and are precisely positioned and formed into coils

3.8.103DV.5

RANDOM WOUND MOTOR

motor using insulated round conductors in which the winding turns occupy random positions in a slot

3.8.103DV.6

MAXIMUM RATED CURRENT (MRC)

current resulting when a MOTOR-COMPRESSOR and ELECTRONIC CIRCUIT are operated under any conditions such as maximum speed/maximum load, maximum speed/minimum load, minimum speed/minimum load, minimum speed/maximum load, including locked-rotor such that current to the MOTOR-COMPRESSOR and ELECTRONIC CIRCUIT is at a maximum

The MRC is the current at the input of the ELECTRONIC CIRCUIT controlling device.

3.8.103DV.7

FORMETTE

special test model used for the evaluation of the electrical insulation systems for form-wound windings

3.8.103DV.8

BARG

pressure, in units of bars, above or below atmospheric pressure

The "g" at the end of the word indicates that the measurement is not absolute pressure, which is sometimes indicated by "bara".

3.8.103DV.9

MAXIMUM ALLOWABLE PRESSURE (PS)

maximum pressure as designed by the manufacturer is generally the maximum pressure for which the equipment is designed, as specified by the manufacturer

Note: The maximum allowable pressure is equal to the design pressure of the MOTOR-COMPRESSOR.

3.8.103DV.10

COILETTE

insulation system model embodying all of the elements of a random wound insulation system and resembling a partially assembled motor but not consistent in construction as typically shown in [Figure 101.DVO.2](#) and [Figure 101.DVO.4](#)

3.8.103DV.11

INCORPORATED OR ASSOCIATED

phrase denoting that a motor-compressor is provided with a component which is installed on, with, or as part of the motor-compressor assembly

This phrase also includes any components that are specified within instructions or other similar motor-compressor technical information. For example, this would include an electronic (operating or protective) circuit that is installed on, with, or as part of a motor-compressor assembly, and also include any electronic (operating or protective) circuit that might be specified within the motor-compressor manufacturer's technical literature.

3.8.103DV.12

ADJUSTABLE SPEED DRIVE (ASD)

a component of an adjustable speed power drive system that controls the flow of energy from the mains to the motor

Adjustable speed drives sit between the electrical supply and the motor. Power from the electrical supply goes into a drive which regulates the power that is fed to the motor's adjustable speed electric drive systems. These systems include the power conversion, drive control, and motor(s).

Note: An ADJUSTABLE SPEED DRIVE is another name for an inverter drive.

4 General requirement

This clause of Part 1 is applicable.

4DV.101 DR Modification of Clause 4 of the Part 2 by replacing it with the following (Canada only):

This clause of Part 1 is applicable except as follows.

CSA C22.2 No. 0 shall form a part of and be read in conjunction with this Standard as far as the requirements apply, except that, where this Standard contains requirements that are at variance with those of CSA C22.2 No. 0, the requirements of this Standard shall take precedence.

5 General conditions for the tests

This clause of Part 1 is applicable, except as follows.

5.2 Addition:

At least one additional sample is required for the tests of Clause [19](#), however further samples may also be provided or are needed.

For the test of [22.7](#), two samples of the housing are required.

5.6 Addition:

Variable speed MOTOR-COMPRESSORS shall run at maximum speed.

5.6DV D1 Modification by replacing Clause 5.6 of the Part 2 with the following:

A motor-compressor provided with an electronic or PROTECTIVE ELECTRONIC CIRCUIT shall be operated at the maximum load condition as specified in Annex [AA](#) or Clause [101.DVM.2.1](#).

5.7 Replacement:

Tests are carried out in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

5.8.1DV D2 Modification by adding the following to the end of the first paragraph of Clause 5.8.1 of the Part 1:

MOTOR-COMPRESSORS for DC only are tested with DC.

5.8.2 Addition:

MOTOR-COMPRESSORS with SELF-RESETTING MOTOR-COMPRESSOR PROTECTION SYSTEMS, and designed for more than one RATED VOLTAGE, are subjected to the tests of [19.101](#) and [19.103](#) at the highest voltage.

5.10 Addition:

For the tests of Clause [19](#), the additional sample or samples shall be identical in all respects to the test sample, charged with oil, if necessary, and vapour refrigerant. The sample has to be provided with the MOTOR-COMPRESSOR PROTECTION SYSTEM, STARTING RELAY, start capacitor, run capacitor and control

system, if any, as specified by the manufacturer, except that the rotor shall have been locked by the manufacturer.

The manufacturer or responsible agent shall provide the following information for each type of MOTOR-COMPRESSOR submitted for the tests:

- type (synthetic or cellulosic) of winding insulation;
- refrigerant identification:
 - a) for a single component refrigerant, by at least one of the following:
 - chemical name;
 - chemical formula;
 - refrigerant number;
 - b) for a blended refrigerant, at least one of the following:
 - chemical name and nominal proportion of each of the components;
 - chemical formula and nominal proportion of each of the components;
 - refrigerant number and nominal proportion of each of the components;
 - refrigerant number of the refrigerant blend;
- types and quantity of oil to be used if the test samples which use oil are not already charged;
- APPLICATION CATEGORY or application categories for MOTOR-COMPRESSORS classified as being tested with Annex [AA](#);
- whether a SUPPLY CORD can be connected directly to terminals on the MOTOR-COMPRESSOR;
- for MOTOR-COMPRESSORS intended for appliances with a TRANSCRITICAL REFRIGERATION SYSTEM, the test pressure for the high pressure side if higher than the minimum test pressure.

5.10DV.1 D1 Modification by replacing the first sentence in the first paragraph of Clause 5.10 of the Part 2 with the following:

For the tests of Clause [19](#), the additional sample(s) shall be identical in all respects to the test sample. If necessary, the sample(s) shall be charged with oil and refrigerant.

5.10DV.2 D1 Modification by replacing the fourth dashed item in Clause 5.10 of the Part 2 with the following:

- APPLICATION CATEGORY or APPLICATION CATEGORIES for motor-compressors classified as being tested with either Annex [AA](#) or Annex [101.DVM](#);

5.11 Replacement:

For MOTOR-COMPRESSORS which can be used in appliances where the SUPPLY CORD is connected directly to terminals on the MOTOR-COMPRESSOR, the test sample shall be provided with a SUPPLY CORD.

NOTE 101 Any additional samples required for testing need not be provided with a SUPPLY CORD.

5.101 *MOTOR-COMPRESSORS, including those with crank-case heaters, are tested as MOTOR-OPERATED APPLIANCES.*

5.102 *With regard to [6.104](#), PROTECTIVE DEVICES other than the declared device under test shall be disabled during the tests of Annex [AA](#) and Clause [19](#). If multiple PROTECTIVE DEVICES are declared, each shall be tested independently.*

5.102DV D2 Modification by replacing Clause 5.102 of the Part 2 with the following:

With regard to [6.104](#), PROTECTIVE DEVICES other than the declared device under test shall be disabled during the tests of either Annex [AA](#) or Annex [101.DVM](#), and Clause [19](#). If multiple PROTECTIVE DEVICES are declared, each shall be tested independently.

5.103 *For cascade systems comprising two or more MOTOR-COMPRESSOR circuits, each MOTOR-COMPRESSOR circuit is tested separately in the end product. IEC 60335-2-34 is not applicable for the system but each MOTOR-COMPRESSOR can be tested according to this standard.*

5.104DV D2 Add the following Clause to the Part 2:

For motor-compressors intended to operate in more than one operating condition, the most severe load condition as defined in Annex [AA.3](#) or Clause [101.DVM.2.1](#) shall be selected and shall cover all other conditions the motor-compressor is intended to operate in.

NOTE To reduce repetitive testing, a testing plan can be conducted using a matrix format which will cover small, medium, and large models across multiple application categories, voltages, and frequencies and refrigerants.

5.105DV D2 Add the following to the Part 2:

MOTOR-COMPRESSORS having RATED VOLTAGE exceeding 600 V up to 15 000 V shall comply with Annex [Annex 101.DVI](#). Other relevant requirements within this Standard shall also be applied.

NOTE The requirements related to motor overload protective devices, thermal protective devices, electric strength, as well as clearances, creepage distances, and solid insulation for MOTOR-COMPRESSORS rated over 600 to 15 000 V, are in [Annex 101.DVI](#) rather than Clauses [13](#), [16](#), and [29](#). Requirements related to the internal wiring located inside the MOTOR-COMPRESSOR HOUSING are in Annexes [BB](#) and [CC](#), Annex [101.DVN](#), or Annex [101.DVO](#).

6 Classification

This clause of Part 1 is applicable, except as follows.

6.2DV D1 Modification by replacing Clause 6.2 of the part 1 with the following:

Ingress protection testing is determined by the applicable end item standard.

6.101 *MOTOR-COMPRESSORS without an incorporated or associated ELECTRONIC CIRCUIT are classified as being tested with Annex [AA](#) or without Annex [AA](#).*

MOTOR-COMPRESSORS with an incorporated or associated ELECTRONIC CIRCUIT are classified as being tested with Annex [AA](#).

MOTOR-COMPRESSORS can be classified as being tested with Annex [AA](#) only if the MOTOR-COMPRESSOR in combination with the MOTOR-COMPRESSOR PROTECTION SYSTEM or MOTOR-COMPRESSOR CONTROL SYSTEM, if any, can be configured to operate so as to deliver maximum cooling capacity, independently of any input sensors that are only provided as part of the final application.

6.101DV D1 Modification by replacing Clause 6.101 of the Part 2 with the following:

MOTOR-COMPRESSORS are classified as being tested with either Annex [AA](#) or Annex [101.DVM](#) or without either Annex [AA](#) or Annex [101.DVM](#).

MOTOR-COMPRESSORS can be classified as being tested with Annex [AA](#) or Annex [101.DVM](#) only if the MOTOR-COMPRESSORS in combination with the motor-compressor protection system or motor-compressor control system, if any, can be configured to operate at the maximum load condition, independently of any input sensors that are only provided as part of the final application.

NOTE 1 Annex [AA](#) is used for MOTOR COMPRESSORS tested using the maximum load according to [Table AA.1](#). The conditions specified in Clause [101.DVM.3.1](#) are used for MOTOR COMPRESSORS classified in accordance with Annex [101.DVM](#).

6.102 MOTOR-COMPRESSORS are classified as being

- intended for direct connection of the appliance SUPPLY CORD to the MOTOR-COMPRESSOR terminals, or
- not intended for direct connection of the appliance SUPPLY CORD to the MOTOR-COMPRESSOR terminals.

NOTE 1 MOTOR-COMPRESSORS can in both cases be delivered with or without the external components necessary for connection of the SUPPLY CORD.

NOTE 2 MOTOR-COMPRESSORS intended for direct connection of the appliance SUPPLY CORD to their terminals can also be used without the SUPPLY CORD being connected directly to their terminals.

NOTE 3 If the MOTOR-COMPRESSOR is used without the relevant components or with components different from those specified by the manufacturer, additional testing in accordance with the appropriate appliance standard can be necessary.

Compliance is checked by inspection and by the relevant tests.

6.103 MOTOR-COMPRESSORS are classified as being protected by PROTECTIVE ELECTRONIC CIRCUITS or not being protected by PROTECTIVE ELECTRONIC CIRCUITS.

This does not preclude the PROTECTIVE ELECTRONIC CIRCUITS being provided in the end product, in which case many of the tests of this standard shall be conducted on the end product.

Compliance is checked by inspection and by the relevant tests.

6.103DV D1 Modification by replacing Clause 6.103 of the Part 2 with the following:

MOTOR-COMPRESSORS are classified as being protected by a MOTOR-COMPRESSOR PROTECTION SYSTEM or not being protected by a MOTOR-COMPRESSOR PROTECTION SYSTEM.

This does not preclude the MOTOR-COMPRESSOR PROTECTION SYSTEM from being provided in the end product, in which case many of the tests of this standard shall be conducted on the end product.

Compliance is checked by

- inspection if the MOTOR-COMPRESSOR PROTECTION SYSTEM is not INCORPORATED OR ASSOCIATED as a part of the MOTOR-COMPRESSOR; or
- the relevant tests of the MOTOR-COMPRESSOR PROTECTION SYSTEM if the MOTOR-COMPRESSOR PROTECTION SYSTEM is INCORPORATED OR ASSOCIATED with the MOTOR COMPRESSORS.

6.104 The MOTOR-COMPRESSOR manufacturer shall declare the means of motor protection, THERMAL MOTOR PROTECTOR, impedance protection, PROTECTIVE ELECTRONIC CIRCUIT, or a combination of the above.

Compliance is checked by inspection and by the relevant tests.

6.105 MOTOR-COMPRESSORS using refrigerant R744 shall be classified as used in a TRANSCRITICAL REFRIGERATION SYSTEM or in a subcritical REFRIGERATION SYSTEM.

Compliance is checked by inspection and by the relevant tests.

6.106DV D1 Add the following clause to the Part 2:

MOTOR COMPRESSORS are classified as protected by overvoltage category II unless otherwise declared.

7 Marking and instructions

This clause of Part 1 is applicable, except as follows.

7.1 Modification:

The RATED POWER INPUT or RATED CURRENT need not be marked.

Addition:

MOTOR-COMPRESSORS suitable for use with a flammable refrigerant shall be marked with Warning sign ISO 7010 W021 (2011-05).

7.1DV D1 Modification by deleting the “Addition” in Clause 7.1 of the Part 2.

7.1ADV.1 DR Modification of Clause 7.1 in the Part 1 to replace the second dashed item with the following:

- symbol for nature of supply including number of phases, unless for single-phase operation;

7.1ADV.2 DR Modification of Clause 7.1 in the Part 1 to add the following after the eighth dashed item:

- motor-compressor locked rotor amperage (LRA) rating(s) for a MOTOR-COMPRESSOR in which protection is other than that provided by either a PROTECTIVE ELECTRONIC CIRCUIT or an ADJUSTABLE SPEED DRIVE having a PROTECTIVE ELECTRONIC CIRCUIT. If motor winding switching or alternate motor wiring options cause or allow different LRA, the highest resulting LRA shall be marked;
- MAXIMUM RATED CURRENT (MRC) for MOTOR-COMPRESSORS intended to be controlled or protected by a PROTECTIVE ELECTRONIC CIRCUIT or an ADJUSTABLE SPEED DRIVE having a protective electronic circuit. This MRC shall be the maximum current value as measured during Clause [AA.3](#) or Clause [101.DVM.4](#) testing; or if the Clause [AA.3](#) or Clause [101.DVM.4](#) testing is not conducted, the MRC shall be the current rating of the motor-compressor controlling device if a PROTECTIVE ELECTRONIC CIRCUIT or ELECTRONIC CIRCUIT is part of the controlling device.

Note 1: Marking the LRA rating(s) is appropriate for an electronically controlled MOTOR-COMPRESSOR in which the electronic control is not relied upon (e.g. bypassed or removed from circuit) for compliance with the test of Clause [19.101DV.1](#).

Note 2: The MAXIMUM CONTINUOUS CURRENT (MCC) determined in Annex [101.DVH](#) or Clause [101.DVM.4](#) is not required to be marked.

Note 3: MOTOR-COMPRESSORS employing a thermal protection component, or device, or electronic protection utilizing a thermal protection component(s) are not required to mark the MRC if the thermal protection component or device is relied upon for compliance with this standard since they are considered thermally protected systems.

7.1ADV.3 DR Add Clauses 7.1ADV.3.1 and 7.1ADV.3.2 to Clause 7.1ADV.3 of the Part 2:

7.1ADV.3.1 If the motor compressor is thermally protected, it shall be marked with:

- "Thermally Protected" if a THERMAL PROTECTOR is provided or is specified by the MOTOR-COMPRESSOR manufacturer; or
- "Thermally Protected System" if a protective system with all sensing elements and motor-current-interrupting means is provided or specified by the MOTOR-COMPRESSOR manufacturer.

7.1ADV.3.2 If Clause [22.7DV.2](#) is used, the MAXIMUM ALLOWABLE PRESSURE (PS) shall be marked as follows on the MOTOR-COMPRESSOR nameplate:

- For a MOTOR-COMPRESSOR HOUSING that is only exposed to high side pressure of the MOTOR-COMPRESSOR, the high side MAXIMUM ALLOWABLE PRESSURE shall be marked.
- For a MOTOR-COMPRESSOR HOUSING that is only exposed to low side pressure of the MOTOR-COMPRESSOR, the low side MAXIMUM ALLOWABLE PRESSURE shall be marked.
- For a MOTOR-COMPRESSOR HOUSING that can be exposed to both high side pressure and the low side pressure of the motor-compressor both the high side MAXIMUM ALLOWABLE PRESSURE and the low side MAXIMUM ALLOWABLE PRESSURE shall be marked.

7.5 Not applicable.