

ILNAS

Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 12693:2008

Refrigerating systems and heat pumps - Safety and environmental requirements - Positive displacement refrigerant compressors

Kälteanlagen und Wärmepumpen -
Sicherheitstechnische und
umweltrelevante Anforderungen -
Verdrängerverdichter für Kältemittel

Systèmes de réfrigération et pompes à
chaleur - Exigences de sécurité et
d'environnement - Compresseurs
volumétriques pour fluides frigorigènes

05/2008



National Foreword

This European Standard EN 12693:2008 was adopted as Luxembourgish Standard ILNAS-EN 12693:2008.

Every interested party, which is member of an organization based in Luxembourg, can participate for FREE in the development of Luxembourgish (ILNAS), European (CEN, CENELEC) and International (ISO, IEC) standards:

- Participate in the design of standards
- Foresee future developments
- Participate in technical committee meetings

<https://portail-qualite.public.lu/fr/normes-normalisation/participer-normalisation.html>

THIS PUBLICATION IS COPYRIGHT PROTECTED

Nothing from this publication may be reproduced or utilized in any form or by any mean - electronic, mechanical, photocopying or any other data carries without prior permission!

ICS 23.140; 27.080

English Version

**Refrigerating systems and heat pumps - Safety and
environmental requirements - Positive displacement refrigerant
compressors**

Systèmes de réfrigération et pompes à chaleur - Exigences
de sécurité et d'environnement - Compresseurs
volumétriques pour fluides frigorigènes

Kälteanlagen und Wärmepumpen - Sicherheitstechnische
und umweltrelevante Anforderungen - Verdrängerverdichter
für Kältemittel

This European Standard was approved by CEN on 25 April 2008.

CEN members are bound to comply with the CEN/GENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	3
Introduction	4
1 Scope	4
2 Normative references	5
3 Terms and definitions	7
3.6 Symbols	8
4 List of significant hazards	10
5 Safety requirements and/or protective measures	12
5.1 General.....	12
5.2 Protection of moving parts	12
5.3 Safety to prevent loss of stability	12
5.4 Safety during handling.....	12
5.5 Safety to prevent rupture or bursting.....	12
5.6 Electrical safety.....	14
5.7 Measures to reduce emissions of substances	16
6 Verification of safety requirements and/or protective measures	16
6.1 General.....	16
6.2 Type test	17
6.3 Individual test.....	19
7 Marking, graphical symbols, written warnings.....	20
7.1 General.....	20
7.2 Marking	21
7.3 Graphical symbols, written warnings and information.....	22
8 Documentation and information for the user	22
8.1 General.....	22
8.2 Instruction handbook	22
Annex A (informative) Basic design criteria for refrigerant compressors	24
Annex B (normative) Procedure for the design of a refrigerant compressor	25
Annex C (normative) Materials	28
Annex D (normative) Determination of the allowable pressure at the maximum operating temperature	30
Annex E (normative) Determination of the allowable pressure at minimum operating temperature (requirements to avoid brittle fracture)	31
Annex F (informative) Compilation of material characteristics of often used materials	37
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC	61
Annex ZB (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	62
Bibliography	63

Foreword

This document (EN 12693:2008) has been prepared by Technical Committee CEN/TC 182 "Refrigerating systems, safety and environmental requirements", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by November 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives 98/37/EC and 2006/42/EC.

For relationship with EU Directive(s) see informative Annexes ZA and ZB, which are an integral part of this document.

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 implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This standard is a type C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This standard applies to positive displacement refrigerant compressors for stationary and mobile refrigerating systems and heat pumps defined in 3.1, hereafter called compressors.

It applies for compressors used in commercial and industrial appliances and with electrical energy supply including integral motors, up to 1 000 VAC and 1 500 VDC.

It applies to open drive, semi hermetic and hermetic motor compressors, which contain a positive compression function.

This standard is not applicable to:

- compressors used in household appliance for which EN 60335-2-34 applies;
- compressors using water or air as refrigerant.

This standard does not deal with requirements for vibration and noise.

NOTE 1 Compressors for automotive comfort air conditioning systems can be developed according e.g. SAE J 639.

NOTE 2 Noise emission depends on the complete installation of the built-in compressors and the corresponding operating conditions.

For semi-hermetic and open drive compressors which include moving parts and for which the external envelope is primarily designed for mechanical loads, thermal loads (to limit the possible deformation due to temperature), stiffness of the structure (external mechanical loads and weight of the equipment), taking into account established safe industrial practice, it is considered that pressure is not a significant design factor.

Attached parts covering other functions e.g. oil separators, oil coolers, suction accumulators shall comply to EN 14276-1 or EN 13445-6 (cast iron) or EN 13445-8 (aluminium) or showing compliance to the relevant European requirements. This applies also to shells for hermetic compressors either welded or with any kind of permanent joint.

Requirements for compressors used in explosive atmospheres are not covered by this standard.

NOTE 3 For further guidance see EN 13463-1.

This standard deals with all significant hazards, hazardous situations and events relevant to compressors, when they are used as intended and under conditions for misuse which are reasonably foreseeable by the manufacturer (see Clause 4).

This standard specifies safety requirements for the design, construction, manufacture and testing, documentation and marking of compressors, including integral accessories, e.g. shut-off valve, if necessary.

The requirements in this standard take account of the intended use, as defined in 3.12 of EN ISO 12100-1:2003.

This standard relates to the compressor itself which is to be incorporated in a refrigerating system.

This standard is not applicable to compressors as defined in the scope which are manufactured before the date of publication as EN.

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.

EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 294, *Safety of machinery — Safety distance to prevent danger zones being reached by the upper limbs*

EN 378-1:2008, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2:2008, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 378-3, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 3: Installation site and personal protection*

EN 378-4, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery*

EN 837-1, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 837-3, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimensions, metrology, requirements and testing*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 1050, *Safety of Machinery — Principles for risk assessment*

EN 1515 (all parts), *Flanges and their joints — Bolting*

EN 1561, *Founding — Grey cast irons*

EN 1563, *Founding — Spheroidal graphite cast irons*

EN 1779, *Non-destructive testing — Leak testing — Criteria for method and technique selection*

EN 10045-1, *Metallic materials — Charpy impact test — Part 1: Test method*

- EN 10204, *Metallic products — Types of inspection documents*
- EN 12178, *Refrigerating systems and heat pumps — Liquid level indicating devices — Requirements, testing and marking*
- EN 12516-2, *Industrial valves — Shell design strength — Part 2: Calculation method for steel valve shells*
- EN 13136:2001, *Refrigerating systems and heat pumps — Pressure relief devices and their associated piping — Methods for calculation*
- EN 13445-2:2002, *Unfired pressure vessels — Part 2: Materials*
- EN 13445-3, *Unfired pressure vessels — Part 3: Design*
- EN 20898 (all parts), *Mechanical properties of fasteners*
- EN 60034-1:2004, *Electrical rotating machinery — Part 1: Rating and performance (IEC 60034-1:2004)*
- EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*
- EN 60335-2-34, *Household and similar electrical appliances — Safety — Part 2-34: Particular requirements for motor-compressors (IEC 60335-2-34:2002)*
- EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*
- EN 60947-4-1, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters (IEC 60947-4-1:2000)*
- EN 60999 (all parts), *Connecting Devices — Electrical copper conductors — Safety requirements for screw-type and screwless-type clamping units*
- EN 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements (IEC 61010-1:2001)*
- EN ISO 898 (all parts), *Mechanical properties of fasteners made of carbon steel and alloy steel*
- EN ISO 4126-2, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices (ISO 4126-2:2003)*
- EN ISO 9606-2, *Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*
- EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*
- EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*
- EN ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules (ISO 15607:2003)*
- EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*
- EN ISO 15614-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 2: Arc welding of aluminium and its alloys (ISO 15614-2:2005)*

CR ISO 15608:2000, *Welding — Guidelines for a metallic material grouping system (ISO/TR 15608:2000)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 378-1:2008, EN ISO 12100-1:2003 and the following apply.

NOTE All pressures are gauge pressures unless otherwise specified.

3.1

positive displacement compressor

compressor in which compression is obtained by changing the internal volume of the compression chamber

3.2

specified maximum allowable pressure, PS

maximum allowable pressure as stated by the compressor manufacturer

3.3

specified maximum allowable standstill pressure, PS_s

maximum allowable value for the equalisation pressure in the compressor as stated by the compressor manufacturer

NOTE 1 This pressure corresponds to different maximum permissible ambient temperatures for different refrigerants (see 6.5.2).

NOTE 2 $PS_s \leq PS$

3.4

compressor overflow device

device specifically intended to protect the compressor against bursting caused by abnormal conditions, e.g. the discharge valve shut. The device relieves from the high pressure/intermediate side of the compressor to a lower pressure side

NOTE The device may be a bursting disc or may be a spring loaded overflow valve. Spring loaded overflow valves can be either back pressure compensating or back pressure dependent type.

3.5

Temperature load cases

3.5.1

min $t_{0\ 100}$

lowest temperature at which component material can be used at a load of up to 100 % of the allowable design stress at 20 °C, taking the safety factors according to Table B.2 into account

3.5.2

min $t_{0\ 75}$

lowest temperature at which component material can be used, at a load of up to 75 % maximum of the allowable design stress at 20 °C, taking the safety factors according to Table B.2 into account

3.5.3

min $t_{0\ 25}$

lowest temperature at which component material can be used, at a load of up to 25 % maximum of the allowable design stress at 20 °C, taking the safety factors according to Table B.2 into account

3.5.4

fasteners

screws, double end studs, reduced shank bolts, studs and nuts with designation system according to EN ISO 898 and EN 20898 or EN 1515 (property classes)