SLOVENSKI STANDARD
SIST EN 12263:2000

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Hladilni sistemi in toplotne črpalke - Varnostne stikalne naprave za omejevanja tlaka - Zahteve in preskusi

Refrigerating systems and heat pumps - Safety switching devices for limiting the pressure - Requirements and tests

Kälteanlagen und Wärmepumpen - Sicherheitsschalteinrichtungen zur Druckbegrenzung - Anforderungen und Prüfungen

Systemes de réfrigération et pompes à chaleur - Dispositifs-interrupteurs de sécurité limitant la pression - Exigences et essais

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ICS:

27.080	Toplotne črpalke	Heat pumps
27.200	Hladilna tehnologija	Refrigerating technology

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English version

Refrigerating systems and heat pumps - Safety switching devices for limiting the pressure - Requirements and tests

Systèmes de réfrigération et pompes à chaleur - Dispositifs-interrupteurs de sécurité limitant la pression - Exigences et essais

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This European Standard was approved by CEN on 4 March 1998.

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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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Directive 97/23/EC.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

1.1 This European standard establishes the requirements and tests applied to safety switching devices for limiting the pressure – here after called devices – to ensure that the maximum or minimum pressure, which is caused by a pressure generator in refrigerating systems and/or heat pumps, is maintained within the limits of the refrigerating system and/or heat pump. These devices are of special construction equipped with mechanically operated output contacts.

NOTE: Devices may be wired directly into the control circuit of the compressor or may be connected through a relay or microprocessor/computer.

Transducers/analogue devices are not covered by this standard.

If more stringent specifications for special applications are necessary, these should be agreed between the customer and the manufacturer of the devices.

1.2 Different safety and control functions can be combined in one device.

1.3 This standard does not apply to devices used for control purposes.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 60529
Degrees of protection provided by enclosures (IP code) (IEC 529 : 1989)

EN 60730-1 : 1995
Automatic electrical controls for household and similar use – Part 1: General requirements (IEC 730-1 : 1993, modified)

EN 60730-2-6 : 1995
Automatic electrical controls for household and similar use – Part 2: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements (IEC 730-2-6 : 1991, modified)

EN 60947-5-1 : 1991
Low-voltage switchgear and controlgear – Part 5: Control circuit devices and switching elements – Section 1: Electromechanical control circuit devices (IEC 947-5-1 : 1990)

EN 60068-2-6
Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal) (IEC 68-2-6 : 1995 + corrigendum 1995)

3 Definitions

For the purposes of this European standard the following definitions apply:

NOTE: Symbols and equivalent terms are specified in annex A.

3.1 safety switching device for limiting pressure: Pressure actuated device that is designed to stop the operation of the pressure generator.

NOTE: These devices can be designed to limit the high pressure (H) or to limit the low pressure (L) to one predetermined value during abnormal operating conditions.

3.1.1 pressure limiter: Device which automatically resets.

NOTE 1: It is called PSH for high pressure protection and PSL for low pressure protection (see annex A).

NOTE 2: The devices automatically cut out when a set pressure limit is exceeded and they automatically cut in again.

3.1.2 pressure cut out: Device which is manually reset without the aid of a tool.

NOTE 1: It is called PZH for high pressure protection and PZL for low pressure protection (see annex A).

NOTE 2: The devices automatically cut out the pressure when a set pressure limit is exceeded and are manually reset without the aid of a tool.

3.1.3 safety pressure cut out: Device which is manually reset only with the aid of a tool.

NOTE 1: It is called PZHH for high pressure protection and PZLL for low pressure protection (see annex A).

NOTE 2: The devices automatically cut out when a set pressure limit is exceeded and are manually reset only with the aid of a tool.

3.2 cut out pressure: Pressure at which the contacts in the control circuit open to stop the pressure generator.

NOTE: This will occur with a rising pressure for high pressure protection and a falling pressure for low pressure protection.

3.3 cut in pressure: Pressure at which the contacts in the control circuit close to start the pressure generator.

NOTE: This will occur with a falling pressure for high pressure protection and a rising pressure for low pressure protection as well as by manual reset.

3.4 setting range: Pressure range within which the cut out pressure can be set.

3.5 upper switching pressure: Pressure at which the device switches during pressure rise (cut out or cut in).

3.6 lower switching pressure: Pressure at which the device switches during pressure fall (cut out or cut in).

3.7 differential: Pressure difference between the upper and lower switching pressure.

NOTE: For devices with manual reset the lower or upper switching pressure will be that at which the device is capable of being reset.

3.8 drift: Permanent alterations which can occur when a device has been tested under the conditions specified in this standard.

3.9 deviation: Temporary alterations which disappear when the device is no longer subjected to the test conditions.

3.10 maximum declared pressure, p_{max}: Pressure declared by the manufacturer of the component or device to which it may be subjected without reducing its performance.

3.11 allowable temperature range: Range between the maximum and minimum ambient temperature within which the performance of the device is not reduced.

4 Requirements and tests

4.1 General requirements and test conditions

Devices shall be so designed and constructed that in normal use they function so as to cause no danger to persons and surroundings, even in the event of any foreseeable misuse which may occur during operation.

Unless otherwise specified all tests shall be carried out at an ambient temperature of 20 °C to 25 °C. For accuracy of measurement the pressure applied to the device shall not change at a rate of more than 10 bar/min.

Three samples of each type shall undergo and pass all the described tests.

However, only two are used for the burst test and the third for the test of fail-safe function of the measuring element.

4.2 Mechanical requirements

4.2.1 Design and endurance

The materials used in the construction of the devices shall be able to withstand the thermal, mechanical and chemical stresses occurring in the range of application for which the devices are provided. Corrosive effects, in particular, shall not affect the function of the devices.

The design of the device shall ensure a snap action characteristic of the contact system.

Devices with automatic reset shall have a mechanical life of at least 5 000 switching operations.

Devices with manual reset shall withstand at least 500 reset operations.

In addition the devices shall withstand at least 50 000 pressure cycles without switching.

4.2.2 Devices with manual reset

The manual reset shall be designed trip-free according to 2.3.15 of EN 60730-1 : 1995. The reset mechanism shall be independent of other setting mechanisms.

4.3 Electrical requirements

4.3.1 Safety

For electrical safety the following clauses of EN 60730-2-6 : 1995 are applicable and the manufacturer shall declare compliance thereto:

- clause 8: Touch protection against electric shock;
- clause 9: Provision for protective earthing;
- clause 12: Moisture and dust resistance;

- clause 13: Electrical strength and insulation resistance;
- clause 14: Heating;
- clause 17.2: Electrical conditions for the tests;
- clause 19: Threaded parts and connections;
- clause 20: Creepage distances, clearances and distances through insulation;
- clause 21: Resistance to heat, fire and tracking.

4.3.2 Fuse protection

The required fuse protection against short circuit shall be indicated by the manufacturer in accordonce with 8.3.4. of EN 60947-5-1 : 1991.

4.4 Setting, range and accuracy

4.4.1 Set point adjustment

The cut out pressure shall be shown on the device either by marking of fixed setting or by a scale indication on adjustable devices.

On adjustable devices setting changes shall only be possible by means of a tool.

It shall be possible to protect the devices against alteration of settings by unauthorized persons.

4.4.2 Setting range

High pressure devices shall be protected against excessive set point adjustment above the maximum set point range. This protection shall not allow a cut out pressure higher than the maximum range value + 15 % or + 3 bar, whichever is the greater.

4.4.3 Accuracy of setting

The accurate setting of the upper and lower switching pressures shall be established by means of a suitable pressure gauge because the setting scales are showing only approximate values.

Devices with fixed factory setting for high pressure protection shall have a cut out pressure kept within a deviation of 0 bar to - 0,25 bar or 0 % to - 8 % of the specified settings, whichever is the greater.

Devices with fixed factory setting for low pressure protection shall have a cut out pressure kept within a deviation of 0 bar to + 0,25 bar or 0 % to + 8 % of the specified settings, whichever is the greater.

4.5 Tests: pressure overload, ambient temperature, mechanical endurance

4.5.1 Preparation

Adjustable devices shall be set to mid range and mid differential.

Devices with fixed settings shall be supplied having mid range and mid differential setting.

A reference value for upper and lower switching pressures is to be measured and shall be applied in the tests required by the following clauses of 4.5.

4.5.2 Drift and deviation of cut out

Drift and deviation of cut out from the reference value shall not exceed the following:

– for devices for high pressure protection:
reference value + 0,25 bar or + 5 %, whichever is the greater;

– for devices for low pressure protection:
reference value - 0,25 bar or - 5 %, whichever is the greater.

Drift in the safe direction shall not exceed twice the above mentioned tolerances.

4.5.3 Pressure overload

The devices are exposed to - 0,95 bar or lower (vacuum) for 1 min.

50 pressure variations between 0 bar and 1,1 times the maximum declared pressure are then applied and the cut out pressure drift is determined by comparison with the reference value.

4.5.4 Ambient temperature

The devices are subjected to a temperature of - 20 °C ± 1 K until they have reached this temperature.

Subsequently the devices are subjected to + 55 °C ± 1 K until they have reached this temperature.

At both temperatures the cut out deviation is determined by comparison with the reference value.

4.5.5 Mechanical endurance

a) Pressure limiters are subjected to 5 000 switching operations with the following pressure variation:

1) upper pressure level: reference value + 10 %;
2) lower pressure level: reference value - 10 %.

b) Pressure cut outs and safety pressure cut outs are subjected to 500 reset operations with the following pressure variation:

– devices for high pressure protection:
1) upper pressure level: reference value + 10 %;
2) lower pressure level: reset mechanism is initiated when the pressure is 10 % below the pressure at which reset is possible.

– devices for low pressure protection:
1) lower pressure level: reference value - 10 %;
2) upper pressure level: reset mechanism is initiated when the pressure is 10 % above the pressure at which reset is possible.

c) The devices are subjected to 50 000 pressure cycles at 1 000 cycles /h as follows:

– devices for high pressure protection:
1) value for upper pressure level: 1 bar below the upper reference value;
2) value for lower pressure level: 4 bar below the value for upper pressure level.

– devices for low pressure protection:
1) value for lower pressure level: 0,5 bar above the lower reference value;
2) value for upper pressure level: 2 bar above the value for lower pressure level.

On completing these tests the cut out drift is determined by comparison with the reference value.