



# SLOVENSKI STANDARD

## SIST EN 16084:2011

01-oktober-2011

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### Hladilni sistemi in toplotne črpalke - Ocena tesnosti sestavnih delov in spojev

Refrigerating systems and heat pumps - Qualification of tightness of components and joints

Kälteanlagen und Wärmepumpen - Qualifizierung der Dichtheit der Bauteile und Verbindungen

Systèmes de réfrigération et pompes à chaleur - Qualification de l'étanchéité des composants et joints

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#### **ICS:**

27.080	Toplotne črpalke	Heat pumps
27.200	Hladilna tehnologija	Refrigerating technology

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EUROPEAN STANDARD

**EN 16084**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2011

ICS 27.080; 27.200

English Version

## Refrigerating systems and heat pumps - Qualification of tightness of components and joints

Systèmes de réfrigération et pompes à chaleur -  
Qualification de l'étanchéité des composants et des joints

Kälteanlagen und Wärmepumpen - Qualifizierung der  
Dichtheit der Bauteile und Verbindungen

This European Standard was approved by CEN on 20 February 2011.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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## Foreword

This document (EN 16084:2011) 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of an identical text or by endorsement, at the latest by October 2011, and conflicting national standards shall be withdrawn at the latest by October 2011.

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, Croatia, 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 the United Kingdom.

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**EN 16084:2011 (E)****1 Scope**

This European Standard is intended to describe the qualification procedure for type approval of the tightness of hermetically sealed and closed components, joints and parts used in refrigerating systems and heat pumps as described in EN 378. The sealed and closed components, joints and parts concerned are, in particular, fittings, bursting discs, flanged or fitted assemblies. The tightness of flexible piping made from non-metallic materials is dealt with in EN 1736. Metal flexible piping are covered by this standard.

The requirements contained in this document are applicable to joints of maximum DN 50 and components of internal volume of maximum 5 l and maximum weight of 50 kg.

This document is intended to characterise their tightness stresses met during their operations, following the fitting procedure specified by the manufacturer, and to specify the minimal list of necessary information to be provided by the supplier of a component to the person in charge of carrying out this procedure.

It specifies the level of tightness of the component, as a whole, and its assembly as specified by its manufacturer.

It applies to the hermetically sealed and closed components, joints and parts used in the refrigerating installations, including those with seals, whatever their material and their design are.

This European Standard specifies additional requirements for mechanical joints that can be recognised as hermetically sealed joints.

**2 Normative references**

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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.

[SIST EN 16084:2011](https://standards.iteh.ai/catalog/standards/sist/99c43265-6570-42d2-ac1b-42380667515/sist-en-16084-2011)

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

EN 1330-8:1998, *Non-destructive testing — Terminology — Part 8: Terms used in leak tightness testing*

EN 1593, *Non-destructive testing — Leak testing — Bubble emission techniques*

EN 1736, *Refrigerating systems and heat pumps — Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes — Requirements, design and installation*

EN 12284, *Refrigerating systems and heat pumps — Valves — Requirements, testing and marking*

EN 12693, *Refrigerating systems and heat pumps — Safety and environmental requirements — Positive displacement refrigerant compressors*

EN 13134, *Brazing — Procedure approval*

EN 13185:2001, *Non-destructive testing — Leak testing — Tracer gas method*

EN 60068-2-6, *Environmental testing — Part 2-6: Tests — Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007)*

EN 60068-2-64, *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance (IEC 60068-2-64:2008)*

EN 60335-2-34, *Household and similar electrical appliances — Safety — Part 2-34: Particular requirements for motor-compressors (IEC 60335-2-34:2002)*

EN ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:2010)*

ISO 1817, *Rubber, vulcanized — Determination of the effect of liquids*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1330-8:1998 and EN 378-1:2008 and the following apply.

#### 3.1

##### mass flow rate

$Q_m$

value of the leak mass flow rate at any point of the component

NOTE The mass flow rate is expressed in grams (g) per year.

#### 3.2

##### volume flow rate

$Q$

value of the leak volume flow rate at any point of the component

NOTE The volume flow rate is expressed in pascal cubic metres per second ( $\text{Pa}\cdot\text{m}^3/\text{s}$ ).

#### 3.3

##### hermetically sealed system

system in which all refrigerant containing parts are made tight by welding, brazing or a similar permanent connection which may include capped valves and capped service ports that allow proper repair or disposal and which have a tested tightness control level of less than 3 g per year under a pressure of at least a quarter of the maximum allowable pressure

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NOTE Sealed systems as defined in EN 378-1:2008 equal hermetically sealed systems.

#### 3.4

##### product family

group of products that have the same function, same technology, and same material for each functional part and sealing materials

#### 3.5

##### permanent joints

means joints which cannot be disconnected except by destructive methods

[Adapted from the Pressure Equipment Directive 97/23/EC]

#### 3.6

##### reusable joint

joint made without replacing the sealing material in general procedure

NOTE In some cases the tube is used as sealing material (e.g. flared joint).

#### 3.7

##### same base material

material belonging to the same group as follows:

- steel group;
- aluminium and aluminium alloy group; or
- copper group

NOTE Subgroups of these material groups are considered to be same base materials (refer to EN 14276-2).

## EN 16084:2011 (E)

## 4 Symbols

Symbols used in this standard are given in Table 1.

Table 1 — Symbols

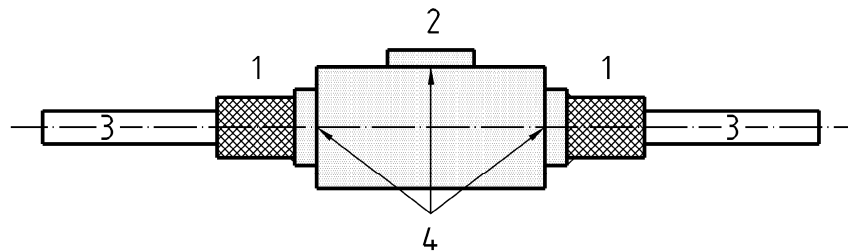
Symbol	Denomination	Unit
$DK_{rel}$	Percentage deviation of the minimum and maximum torque from the average of the minimum and maximum torque, $(K_{max} - K_{min})/(K_{min} + K_{max})$	
$f$	Frequency of vibrations	Hz
$K_{ave}$	Average torques of the respective joint standard	Nm
$K_{max}$	Required maximum torques of the respective joint standard, if specified. Otherwise, the maximum torque values supplied by the manufacturer.	Nm
$K_{min}$	Required minimum torques of the respective joint standard, if specified. Otherwise, the minimum torque values supplied by the manufacturer.	Nm
$L$	Length of tube	mm
$n$	Number of cycles in temperature and in pressure (method 1)	
$n_1$	Number of cycles in temperature and in pressure (method 2)	
$n_2$	Number of cycles in pressure	
$n_3$	Number of cycles in vibration	
$n_{total}$	Total number of cycles in temperature and in pressure	
$N$	Number of samples	
$P$	Tightness test pressure	bar
$P_{max}$	Maximal pressure of cycle	bar
$P_{min}$	Minimal pressure of cycle	bar
$PS$	Maximal allowable pressure	bar
$P_{set}$	Nominal set pressure of the device	bar
$Q$	Volume flow rate	$\text{Pa} \cdot \text{m}^3/\text{s}$
$Q_m$	Mass flow rate	g/yr
$s$	Vibration displacement (peak to peak value)	mm
$T_{max}$	Maximal temperature of cycle	$^{\circ}\text{C}$
$T_{min}$	Minimal temperature of cycle	$^{\circ}\text{C}$



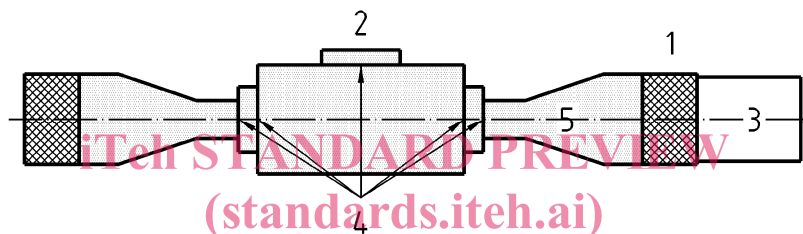
## 5 Test requirements

The required tests to be applied to component bodies and joint used in refrigerating systems and heat pumps are given in Table 2 and in Table 3.

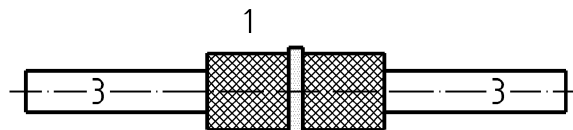
The following figures show in Figure 1 the principle of a component and a joint and their corresponding requirements in Table 2 or Table 3.



a) According to Table 2



b) According to Table 2  
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c) According to Table 3

### Key

- 1 joint
- 2 component body
- 3 pipe
- 4 component body joint
- 5 extension pipe

**Figure 1 — Principle: component body-joint**

All component types and joints types shall be tested.

When a component may be connected with different types of joints, one of these joints shall be tested with the component according to Table 2. The other possible types of joints shall be tested independently according to Table 3.

Table 2 — Requirements for component bodies

Components (including valves):	Requirements							
	Tightness test 7.4	PTV- test (pressure- temperature -vibration) 7.6	Operation simulation 7.7	Freezing test 7.8	Chemical compatibility with materials 7.11	Vacuum test 7.10	Additional test for hermetically sealed	
							Pressure test 7.9	Fatigue test 7.12
Component bodies having only permanent body joints: brazing and welding Identical base materials	YES	NO	NO	NO	NO	NO	NO	NO
Components having permanent body joints: brazing and welding Different base materials	YES	YES <sup>a</sup>	NO	NO	NO	NO	NO	NO
Component bodies having other permanent body joints: e.g. glue, permanent compression fittings, expansion joints	YES	YES	NO	YES if operating temperature below 0 °C	YES if non metallic parts	YES	YES	YES
Component bodies with non permanent body joints	YES	YES	YES if any external stems, shaft seals or removable or replaceable parts	YES if operating temperature below 0 °C	YES if non metallic parts	YES	Not applicable	Not applicable

<sup>a</sup> PTV tests are not required if destructive and non destructive tests of EN 13134 are carried out.

Table 2 (continued)

Components (including valves):	Requirements							
	Tightness test 7.4	PTV- test (pressure- temperature -vibration) 7.6	Operation simulation 7.7	Freezing test 7.8	Chemical compatibility with materials 7.11	Vacuum test 7.10	Additional test for hermetically sealed	
							Pressure test 7.9	Fatigue test 7.12
Capped valves and capped service ports for hermetically sealed systems	YES	YES	YES	YES if operating temperature below 0 °C	YES if non metallic parts	YES	YES	YES
Safety valves	YES	YES	NO	NO	YES if non metallic parts	Not applicable	Not applicable	Not applicable
Flexible piping	Test according to EN 1736							
By exception compressors that comply with the requirements of EN 12693 or EN 60335-2-34 only need to be subjected to the following test:								
<ul style="list-style-type: none"> <li>— joints connecting to other parts of the refrigerating systems;</li> <li>— chemical compatibility test for all gaskets (sight glass, etc.).</li> </ul>								
NOTE Other qualifications for this chemical compatibility done according to other standards are equivalent.								

Table 3 — Requirements for the joining of components

Joints and parts	Requirements							
	Tightness test 7.4	PTV- test (pressure- temperature -vibration) 7.6	Operation simulation 7.7	Freezing test 7.8	Chemical compatibility with materials 7.11	Vacuum test 7.10	Additional test for hermetically sealed	
							Pressure test 7.9	Fatigue test 7.12
Permanent piping joints: brazing and welding Identical base materials	YES	NO	NO	NO	NO	NO	NO	NO
Permanent piping joints: brazing and welding Different base materials	YES	YES	NO	NO	NO	NO	NO	NO
Other permanent piping joints: e.g. glue, permanent compression fittings, expansion joints	YES	YES	NO	YES	YES	YES	YES	YES
Non permanent piping joints	YES	YES	YES	YES	YES, if sealing material	YES	Not applicable	Not applicable
Gaskets and sealing	NO	NO	NO	NO	YES	NO	Not applicable	Not applicable

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## 6 Requirements for hermetically sealed systems

Hermetically sealed systems shall be constructed with components which have their tightness control level qualified as A1 or A2 as per Table 4 or Table 5. These components and joints shall be submitted to the relevant tests as specified in Tables 2 and 3.

## 7 Test procedures

### 7.1 General

The components, joints and part shall pass the tightness test before the other tests are executed. The different tests are shown in Figure 2.

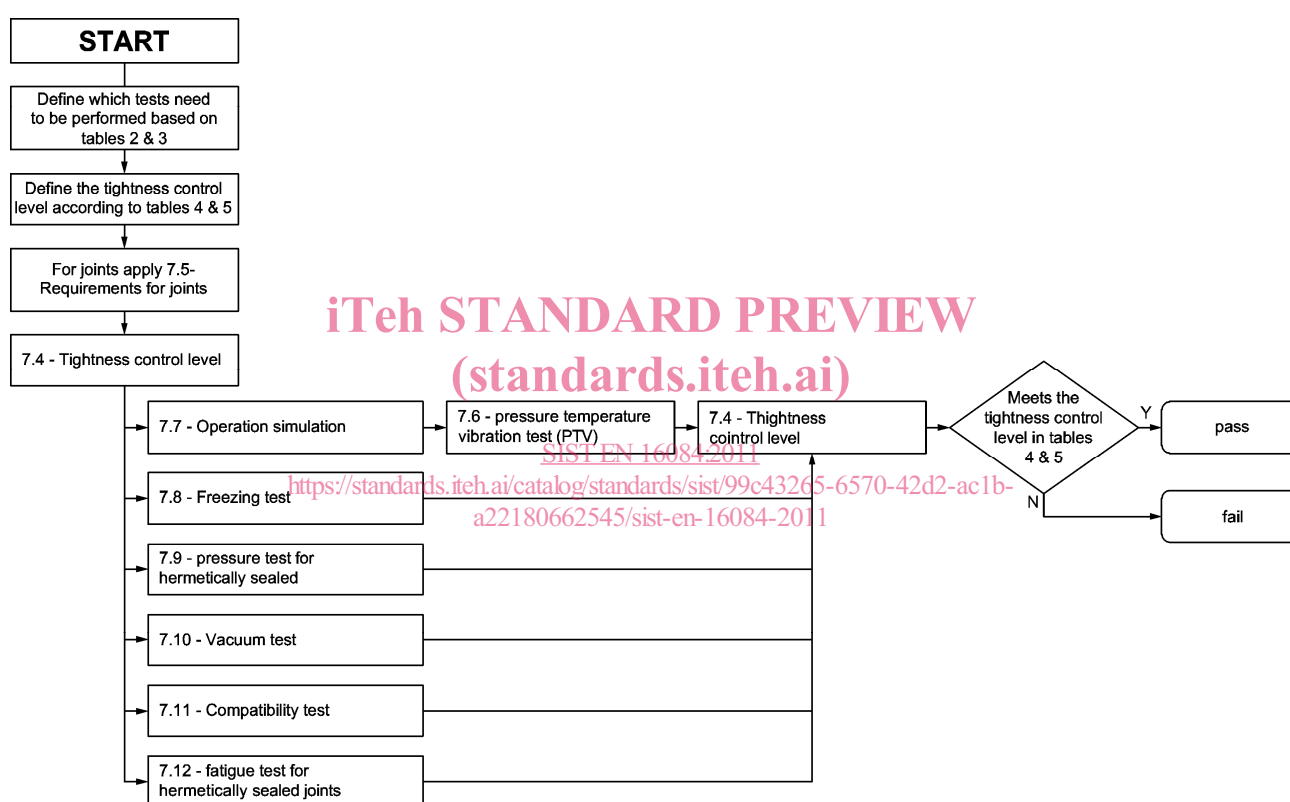


Figure 2 — Test procedure

### 7.2 Sampling

The largest, the smallest and any random samples in between of the product family shall be submitted to the test as required in Table 2 or Table 3. The samples used for pressure-temperature vibration test (7.6) and for operation simulation (7.7) shall be the same. For each of the other tests (7.8, 7.9, 7.10, 7.11, 7.12), different samples may be used.

### 7.3 Test temperature

Test temperature (ambient and gas) shall be 15 °C to 35 °C, unless otherwise specified as the test conditions.