INTERNATIONAL STANDARD

**ISO 13971**

First edition
2012-09-01

# Refrigeration systems and heat pumps — Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes — Requirements and classification

*Systèmes de réfrigération et pompes à chaleur — Éléments flexibles de tuyauterie, isolateurs de vibration, joints de dilatation et tubes non métalliques — Exigences et classification*



Reference number
ISO 13971:2012(E)



ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13971 was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning,* Subcommittee SC 1, *Safety and environmental requirements for refrigerating systems*.

## Introduction

Flexible pipe elements are used to eliminate impermissible stresses from refrigerating circuits and absorb pipe expansion or relative movements of components.

Flexible pipe elements are often the weakest part of a refrigerating system and the part most likely to suffer from fatigue or stress corrosion cracking.

# Refrigeration systems and heat pumps — Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes — Requirements and classification

## 1 Scope

This International standard describes requirements, design and installation of flexible pipe elements (e.g., metallic flexible pipe, metallic flexible tube, vibration isolator, expansion joint) and non-metallic tube used in the refrigerant circuits of refrigerating systems and heat pumps.

It also describes the requirements to qualify the tightness and permeability of non-metallic tubes (e.g., plastic) used in evaporating and/or condensing sides of refrigerating systems and heat pumps.

This International standard does not apply to flexible pipes that are only occasionally stressed beyond the elastic limit (e.g., during repair work), or to joints that are free to rotate or hinge.

## 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.



ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals*

ISO 5149-2, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

ISO 6605:2002, *Hydraulic fluid power — Hoses and hose assemblies — Test methods*



## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**expansion joint**
tubular pipe element shaped in such a way that it provides limited movement to accommodate thermal expansion without reaching its elastic limit

**3.2**
**flexible pipe element**
pipe or tube of non-permanent shape linking two parts that are moveable with respect to each other

See Figure 1.

NOTE 1 This generic term includes all types, as defined in 3.1, 3.3 to 3.5, and 3.8 to 3.11.

NOTE 2 Flexible pipe elements may include a plastic barrier in the construction, either as a liner on the inner surface or as a sandwich in the pipe wall. The main purpose of such a barrier is to reduce the permeation of refrigerant gas.

NOTE 3 This type of pipe is flexible by virtue of the shape into which the tube is bent (e. g., coiled capillary tube).

**3.3**
**flexible pipe element, fixed installed**
element used to minimize assembly difficulty by accommodating slight misalignments or relative movement between components of the refrigerating system

**3.4**
**flexible pipe element, for intermittent movement**
element moving intermittently to take up relative movement between components of the refrigerating system

**3.5**
**flexible pipe element, for significant movement**
element moving regularly through significant distance to allow the operation of refrigerating equipment

EXAMPLE Plate freezers.

**3.6**
**maximum allowable pressure**
$P_S$
maximum pressure for which the equipment is designed, as specified by the manufacturer

**3.7**
**maximum/minimum allowable temperature**
$T_S$
maximum/minimum temperature for which the equipment is designed, as specified by the manufacturer

**3.8**
**metallic flexible pipe**
readily flexible, small bore pipe, that is capable of movement within its elastic limit during operation of the refrigerating system or within reasonable plastic deformation range during installation or maintenance

**3.9**
**metallic flexible tube**
tubular flexible element designed to bend within defined limits and containing a corrugated metal bellows, the corrugations of which may be annular or spiral



See Figure 1.

NOTE 1 Metallic flexible tubes can be reinforced by metallic braiding covered either by rubber or plastic but the whole element should be designed so that, when bent within pre-determined limits, it is not stressed beyond the elastic limit.



NOTE 2 This type of pipe is flexible by virtue of its design and construction, e. g. bellows.

**3.10**
**non-metallic flexible tube**
tubular flexible element designed to bend within defined limits

See Figure 1.

NOTE 1 Non-metallic flexible tubes can have smooth bore or corrugated bore and be reinforced to withstand pressure, vacuum or external impact.

NOTE 2 This type of pipe is flexible by virtue of its material (e. g., elastomer).

NOTE 3 Non-metallic flexible tube is intended to include all pipes made of plastic or rubber, mono-layer or multi-layer, reinforced or non-reinforced.

**3.11**
**vibration isolator**
short, flexible tube usually of metallic construction, that is intended to reduce the effects of vibration from the compressor to other parts of the refrigerating system or vice versa