

Redline version  
compares Second edition to  
First edition



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## Cardiovascular implants — Cardiac valve prostheses —

### Part 1: General requirements

*Implants cardiovasculaires — Prothèses valvulaires —*

*Partie 1: Exigences générales*

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# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Abbreviations</b> .....	<b>17</b>
<b>5 Fundamental requirements</b> .....	<b>18</b>
<b>6 Device description</b> .....	<b>19</b>
6.1 General.....	19
<del>6.1</del> 6.2 Intended use.....	19
<del>6.2</del> 6.3 Design inputs.....	19
<del>6.2.1</del> Operational specifications.....	19
<del>6.2.2</del> Performance specifications.....	19
<del>6.2.3</del> 6.3.1 <del>Implant procedure</del> Operational specifications.....	19
6.3.2 Performance specifications.....	21
6.3.3 Implant procedure.....	21
<del>6.2.4</del> 6.3.4 Packaging, labelling, and sterilization.....	21
<del>6.3</del> 6.4 Design outputs.....	21
<del>6.4</del> 6.5 Design transfer (manufacturing verification/validation).....	22
<del>6.5</del> 6.6 Risk management.....	22
<b>7 Design verification testing and analysis/design and validation</b> .....	<b>23</b>
7.1 General requirements.....	23
7.2 <i>In vitro</i> assessment.....	23
7.2.1 General.....	23
7.2.2 Test conditions, sample selection and reporting requirements.....	23
7.2.3 Material property assessment.....	25
7.2.4 Hydrodynamic performance assessment.....	26
7.2.5 Structural performance assessment.....	26
7.2.6 Design- or procedure-specific testing.....	27
7.2.7 Device MRI compatibility.....	27
7.2.8 Simulated use.....	28
7.2.9 Human factors/usability assessment.....	28
7.2.10 Implant thrombogenic and haemolytic potential assessment.....	28
7.3 Preclinical <i>in vivo</i> evaluation.....	28
7.4 Clinical investigations.....	29
<b>Annex A (informative) Rationale for the provisions of this part of ISO 5840-1</b> .....	<b>30</b>
<b>Annex B (normative) Packaging</b> .....	<b>33</b>
<b>Annex C (normative) Product labels, instructions for use, and training</b> .....	<b>34</b>
<b>Annex D (normative) Sterilization</b> .....	<b>38</b>
<b>Annex E (informative normative) <i>In vitro</i> test guidelines for paediatric devices</b> .....	<b>39</b>
<del>Annex F (informative) Statistical procedures when using <i>in vitro</i> performance criteria</del> .....	<del>44</del>
<del>Annex G (informative) Examples and definitions of some physical and material properties of heart valve systems</del> .....	<del>45</del>
<del>Annex H (informative) Examples of standards applicable to testing of materials and components of heart valve systems</del> .....	<del>55</del>
<del>Annex I (informative) Raw and post-conditioning mechanical properties for support structure materials</del> .....	<del>61</del>

<b>Annex F</b> (informative) <b>Corrosion assessment</b> .....	<b>63</b>
<b>Annex G</b> (informative) <b>Echocardiographic protocol</b> .....	<b>66</b>
<b>Annex H</b> (informative) <b>Assessment of implant thrombogenic and haemolytic potential</b> .....	<b>70</b>
<b>Annex I</b> (informative) <b>Guidelines for hydrodynamic performance characterization by steady flow testing</b> .....	<b>81</b>
<b>Annex J</b> (normative) <b>Durability testing</b> .....	<b>88</b>
<b>Annex K</b> (informative) <b>Fatigue assessment</b> .....	<b>96</b>
<b>Annex L</b> (normative) <b>Clinical investigation endpoints for heart valve replacement devices</b> .....	<b>101</b>
<b>Bibliography</b> .....	<b>104</b>

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## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL, see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 150, *Implants for surgery*, Subcommittee SC 2, *Cardiovascular implants and extracorporeal systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 285, *Non-active surgical implants*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first second edition of ISO 5840-1, together with ISO 5840-2 and cancels and replaces the first edition (ISO 5840-1:2015, cancels and replaces ISO 5840:2005), which has been technically revised.

The main changes compared to the previous edition are as follows: the engineering and clinical requirements in the ISO 5840 series have been updated to current specifications and integrated and harmonized across all parts.

A list of all parts in the ISO 5840 series consists of the following parts, under the general title can be found on the *Cardiovascular implants – Cardiac valve prostheses* ISO website.

- ~~Part 1. General requirements~~
- ~~Part 2. Surgically implanted heart valve substitutes~~
- ~~Part 3. Heart valve substitutes implanted by transcatheter techniques~~

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

There is, as yet, no heart valve substitute which can be regarded as ideal.

The ISO 5840 series has been prepared by a group well aware of the issues associated with heart valve substitutes and their development. In several areas, the provisions of the ISO 5840 series deliberately have not been specified to encourage development and innovation. It does specify the types of tests, provides guidance for test methods, and/or requirements for test apparatus and test apparatuses and requires documentation of test methods and results. The areas with which the ISO 5840 series are concerned are those which will ensure that associated risks to the patient and other users of the device have been adequately mitigated, facilitate quality assurance, aid the clinician in choosing a heart valve substitute, and ensure that the device will be presented at the operating table in a convenient form. Emphasis has been placed on specifying types of *in vitro* testing, preclinical *in vivo* and clinical evaluations, reporting of all *in vitro*, preclinical *in vivo*, and clinical evaluations, and the labelling and packaging of the device. Such a process involving *in vitro*, preclinical *in vivo*, and clinical evaluations is intended to clarify the required procedures prior to market release and to enable prompt identification and management of any subsequent problems.

With regard to *in vitro* testing and reporting, apart from basic material testing for mechanical, physical, chemical, and biocompatibility characteristics, the ISO 5840 series also covers important hydrodynamic and durability characteristics of heart valve substitutes and systems required for their implantation. The ISO 5840 series does not specify exact test methods for hydrodynamic and durability testing, but it offers guidelines for the test apparatus.

The ISO 5840 series is incomplete in several areas. It is intended to be revised, updated, and/or amended as knowledge and techniques in heart valve substitute technology improve.

This document is used in conjunction with ISO 5840-2 and ISO 5840-3.

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# Cardiovascular implants — Cardiac valve prostheses —

## Part 1: General requirements

### 1 Scope

This ~~part of ISO 5840~~ document is applicable to heart valve substitutes intended for ~~human~~ implantation and provides general requirements. Subsequent parts of the ISO 5840 series provide specific requirements.

This ~~part of ISO 5840~~ document is applicable to ~~both~~ newly developed and modified heart valve substitutes and to the ~~accessories~~ accessory devices, packaging, and labelling required for their implantation and for determining the appropriate size of the heart valve substitute to be implanted.

This ~~part of~~ ISO 5840-1 outlines an approach for ~~qualifying~~ verifying/validating the design and manufacture of a heart valve substitute through risk management. The selection of appropriate qualification tests and methods are derived from the risk assessment. The tests can include those to assess the physical, chemical, biological, and mechanical properties of heart valve substitutes and of their materials and components. The tests can also include those for preclinical *in vivo* evaluation and clinical evaluation of the finished heart valve substitute.

This ~~part of~~ ISO 5840-1 defines operational conditions for heart valve substitutes.

This ~~part of~~ ISO 5840-1 ~~excludes homografts~~ furthermore defines terms that are also applicable to ISO 5840-2 and ISO 5840-3.

ISO 5840-1 does not provide requirements specific to homografts, tissue engineered heart valves (e.g. valves intended to regenerate *in vivo*), and heart valve substitutes designed for implantation in circulatory support devices. Some of the provisions of ISO 5840-1 can be applied to valves made from human tissue that is rendered non-viable.

NOTE A rationale for the provisions of this ~~part of~~ ISO 5840-1 is given in Annex A.

### 2 Normative references

The following documents, ~~in whole or in part, are normatively referenced in this document and are indispensable for its application~~ are referred to in the text in such a way that some or all of their content constitutes requirements 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 5840-2, *Cardiovascular implants — Cardiac valve prostheses — Part 2: Surgically implanted heart valve substitutes*

ISO 5840-3, *Cardiovascular implants — Cardiac valve prostheses — Part 3: Heart valve substitutes implanted by transcatheter techniques*

ISO 10993-1, *Biological evaluation of medical devices — Part 1: Evaluation and testing within a risk management process*

ISO 11135, *Sterilization of health-care products — Ethylene oxide — Requirements for the development, validation and routine control of a sterilization process for medical devices*

ISO 11137 (all parts), *Sterilization of health care products — Radiation*