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**Magnetocalorics –
Terminology;
Text in English**

Magnetokalorik –
Terminologie;
Text Englisch

Magnétocalorique –
Terminologie;
Texte en anglais

There are various procedures for developing a DIN SPEC:
This document has been developed in accordance with the PAS procedure.

Document comprises 20 pages

This document has been developed and adopted by the authors named in the foreword.

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Foreword

This DIN SPEC has been developed according to the PAS procedure. The development of a DIN SPEC according to the PAS procedure is carried out in workshops and does not require the involvement of all stakeholders.

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At present there are no standards covering this topic.

DIN SPECS are not part of the body of German Standards.

A draft of this DIN SPEC has been published.

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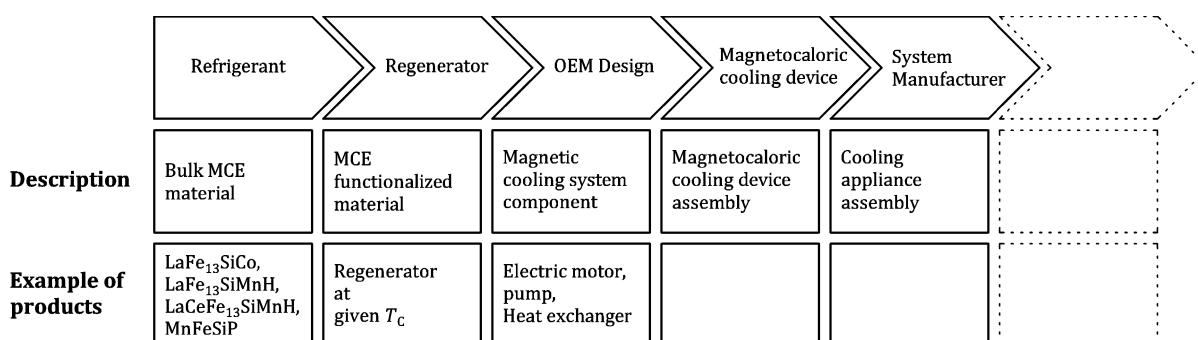
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Introduction

At the end of the 1990s beginning of 2000s the discovery of new magnetocaloric materials with the potential to be low cost by virtue of avoiding expensive or rare elements, led to a significant expansion of materials research in universities and research centres. The possibility to exploit these new materials, coupled with the emergence of the large-scale production of high-performance and low-cost permanent magnets, led to the formation of new companies aiming at creating new technologies that exploit the properties of magnetocalorics. Concurrently, metallurgy and chemical companies started to invest in R&D activities aimed at using their internal industrially scalable processes to mass produce these new materials.

An international community of developers and researchers from both academia and industry has coalesced, with a huge expansion over the last decade of scientific publications and conferences covering the field of magnetocalorics.

Emerging from these developments a magnetic cooling industry value chain is now taking shape. An illustration of such a value chain is shown in Figure 1.



[1] SOURCE: N. Wilson, A. Pastore (Camfridge Ltd.)

Figure 1 — Nascent magnetic cooling industry value chain — courtesy of the authors [1]

This nascent industry can grow faster and stronger if industrial standards are defined and accepted by the different players along the value chain. A unified terminology represents the first step towards the creation of such standards.

1 Scope

This DIN SPEC provides a unified terminology for magnetocalorics. It is aimed at researchers, manufacturers and users.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN EN ISO 80000-1, *Quantities and units — Part 1: General*

DIN EN 80000-6, *Quantities and units — Part 6: Electromagnetism*

3 Terms and symbols

For the purposes of this document, the terms and definitions given in DIN EN ISO 80000-1 and DIN EN 80000-6 and the following apply.

3.1 Terms

3.1.1 Basic terminology

3.1.1.1

magnetocaloric effect

MCE

change in temperature under adiabatic conditions or a change in entropy under isothermal conditions exhibited by a magnetic material when subjected to a change in magnetic field strength

Note 1 to entry: The magnetocaloric effect (MCE) is a function of temperature, pressure and magnetic field strength difference.

3.1.1.2

magnetocaloric material

material which exhibits the magnetocaloric effect

Note 1 to entry: Colloquially, the phrase “metallic refrigerant” has been used instead of magnetocaloric material, having a similar function to gas used in existing compressor based technologies or gas refrigerants. It is strongly encouraged to use the proper term magnetocaloric material.

3.1.1.3

conventional magnetocaloric effect

magnetocaloric effect characterized by an increase in temperature of the magnetocaloric material when subjected to an increase in magnetic field strength

3.1.1.4

inverse magnetocaloric effect

magnetocaloric effect characterized by a decrease in temperature of the magnetocaloric material when it is subjected to an increase in magnetic field strength

Note 1 to entry: Inverse of conventional effect, also known as unconventional magnetocaloric effect.

3.1.1.5

magnetic phase transition

transition from one phase to another where at least one of the phases is magnetically ordered

Note 1 to entry: A magnetocaloric phase transition is a magnetic transition accompanied by a magnetocaloric effect.

[SOURCE: “Definitions of Terms Relating to Phase Transitions in the Solid State” (Clark et al.), IUPAC Recommendations 1994, modified — Note 1 to entry has been added.]