Magnetic Measurement Scales for Linear and Angular Measurement Systems

Terminology, Technical Representation, Classification, Characterization and Evaluation

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Foreword

Magnetic linear and angular measurement systems have become indispensable in modern automation, drive and automotive engineering. Their core element – the magnetic measurement scale – is, however, developed, manufactured, magnetized and tested by a wide variety of actors along the entire value chain. It is precisely at these interfaces that the lack of a common, unambiguous language becomes apparent time and again.

An important first step towards remedying this situation was DIN SPEC 91411 (Innomag 2022). Practical experience with this specification over recent years has convincingly confirmed the value of a uniform description – but has also revealed that several key terms have been understood and interpreted differently in day-to-day use. This body of experience gave rise to the wish to sharpen existing definitions, to close gaps and to derive the representation rules consistently from physical principles.

The present guideline is the outcome of this further development. It was prepared by a consortium of member companies and institutes of INNOMAG e. V. that brought manufacturers, users and research institutions together around one table. Owing to this composition, the document reflects the combined practical experience of the professional community and pursues a clear objective: to establish a common, generally comprehensible terminology for magnetic measurement scales that avoids misunderstandings and facilitates technical exchange across company and national boundaries.

Special thanks are due to Dr. Michael Ortner of Silicon Austria Labs, who contributed decisively to the preparation of this guideline. We likewise thank all contributing authors as well as the participating companies and institutes, without whose commitment this document would not have been possible.

We wish all readers a stimulating read and hope that this guideline will find as broad an application in practice as its predecessor.

Dr. Rolf Slatter, Chairman of the Board, INNOMAG e. V.

Dr. Jürgen Gerber, Managing Director, INNOMAG e. V.

Abbreviations and Symbols

List of Abbreviations

Abbreviation	Meaning
CS	coordinate system
IP	in-plane
OOP	out-of-plane

List of Symbols for Fundamental Quantities

Symbol	Meaning	Unit
$\vec{B}$	magnetic flux density, B-field	T
$\vec{H}$	magnetic field strength, H-field	A/m
$\vec{M}$	magnetization	A/m
$\vec{J}$	magnetic polarization	T
μ_0	vacuum permeability	T m/A
p	coordinate in longitudinal direction	m or °
o	coordinate in transverse direction	m
n	coordinate in normal direction; measurement height where applicable	m
o	origin of a coordinate system	–
$\vec{e}_p$	unit vector in p-direction	–
$\vec{e}_o$	unit vector in o-direction	–
$\vec{e}_n$	unit vector in n-direction	–
$\vec{r}$	position vector	m

1 Introduction

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Literatur

Innomag. 2022. *Anforderungen an Die Technische Darstellung von Magnetischen Maßverkörperungen in Konstruktionszeichnungen*. DIN SPEC 91411:2022-08. DIN Deutsches Institut für Normung e. V. https://doi.org/10.31030/3359425.