IEC 63093-4

Edition 1.0 2019-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Ferrite cores – Guidelines on dimensions and the limits of surface irregularities – Part 4: RM-cores

Noyaux ferrites – Lignes directrices relatives aux dimensions et aux limites des irrégularités de surface – Partie 4: Noyaux RM

IEC 63093-4:2019-03(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

IEC 63093-4

Edition 1.0 2019-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Ferrite cores – Guidelines on dimensions and the limits of surface irregularities – Part 4: RM-cores

Noyaux ferrites – Lignes directrices relatives aux dimensions et aux limites des irrégularités de surface – Partie 4: Noyaux RM

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.100.10

ISBN 978-2-8322-6615-1

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

FERRITE CORES – GUIDELINES ON DIMENSIONS AND THE LIMITS OF SURFACE IRREGULARITIES

Part 4: RM-cores

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 63093-4 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This first edition cancels and replaces the first edition of IEC 62317-4 published in 2005 and the second edition of IEC 60424-2 published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 62317-4:2005 and IEC 60424-2:2015:

a) IEC 63093-4 integrates the contents of IEC 62317-4:2005 and IEC 60424-2:2015;
b) IEC 60424-2:2015, Table 2, has been included in Annex C as Table C.1.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
51/1265/FDIS	51/1275/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63093 series, published under the general title Ferrite cores – Guidelines on dim*ensions and the limits of surface irregularities*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

FERRITE CORES – GUIDELINES ON DIMENSIONS AND THE LIMITS OF SURFACE IRREGULARITIES

Part 4: RM-cores

1 Scope

This part of IEC 63093 specifies the dimensions that are of importance for mechanical interchangeability for a preferred range of RM-cores and low-profile RM-cores made of ferrite, and the locations of their terminal pins on a 2,54 mm printed wiring grid in relation to the base outlines of the cores. It also gives guidance on allowable limits of surface irregularities applicable to RM-cores in accordance with the relevant generic specification.

The selection of core sizes for this document is based on the philosophy of including those sizes which are industrial standards, either by inclusion in a national standard, or by broad-based use in industry.

This document is a specification useful in the negotiations between ferrite core manufacturers and customers about surface irregularities.

The general considerations that the design of this range of cores is based upon are given in Annex A.

2 Normative references

The following documents 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.

IEC 60205, *Calculation of the effective parameters of magnetic piece parts*

IEC 60401-1, *Terms and nomenclature for cores made of magnetically soft ferrites – Part 1: Terms used for physical irregularities*

IEC 60424-1, *Ferrite cores – Guidelines on the limits of surface irregularities – Part 1: General specification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60401-1 and IEC 60424-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Primary dimensions

4.1 General

Compliance with the following requirements ensures mechanical interchangeability of complete assemblies and wound coil formers.

4.2 Dimensions of RM-cores

4.2.1 Principal dimensions

The principal dimensions of RM-cores shall be as given in Table 1 and those of the low-profile RM-cores shall be as given in Table 2. See also Figure 1 and Figure 2.

4.2.2 Effective parameter and A_{min} values

The effective parameter values for cores having the dimensions given in 4.2.1 are as shown in Table 3 and Table 4. The definitions of effective parameters and their calculations shall be as given in IEC 60205.

4.3 Main dimensions for coil formers

4.3.1 Shape of coil former and pin numbering

When the coil former is viewed from the pin side, the pins shall be numbered in a clockwise direction. Pin 1 shall be a corner pin, or the pin immediately to the right of a corner, and closest to the base outline.

For asymmetrical arrangements, pin 1 shall be at the side with the largest number of pins. The coil former shall show an asymmetry, which shall preferably be visible (or detectable) when the assembled inductor is held with the pins downwards. This asymmetry shall clearly indicate pin 1. For pin numbering of recommended core patterns and for recommended asymmetrical pin arrangements, see 4.4.

NOTE It is not required that the pin numbers be marked on the coil former.

4.3.2 Dimensions of coil formers for RM-cores for the primary standard

The dimensions specified in Table 7 and Table 8 are illustrated in Figure 5.

4.3.3 RM-cores intended particularly for power applications

These coil formers are intended for use with cores RM 6-S, RM 8, RM 10, RM 12 and RM 14A, all without centre holes. Each is provided with twelve terminal pins except for the RM 6-S coil former, which has only eight.

Figure 7 shows the features specific to this format and the corresponding dimensions are given in Table 9.

4.4 Pin locations and base outlines

These shall be as shown in Figure 6 and Figure 8 (for power applications), in which the base is viewed from the pin side, i.e. from the underside of the printed wiring boards.

The pins should fit into holes, the nominal hole diameter being:

- 1 mm when the shortest distance between pins is 2,54 mm;
- 1,3 mm when the shortest distance between pins is 2,54 $\sqrt{2}$ mm or more.

4.5 Spring recess

RM-cores usually have recesses that allow the core halves to be held together by two spring clamps snapping into these recesses. The recesses consist of a flat spring rest and a locking ridge. The dimensions are given in Table 5 and Figure 3; the profile of this spring recess is not defined but the limit dimensions shall be complied with.

4.6 Stud recess

Those RM-cores with centre-pole holes may have recesses for the fixed part of the adjusting device with dimensions in accordance with Table 6 and Figure 4. These dimensions are not mandatory for manufacturers who supply cores with the fixed part of the adjusting device attached

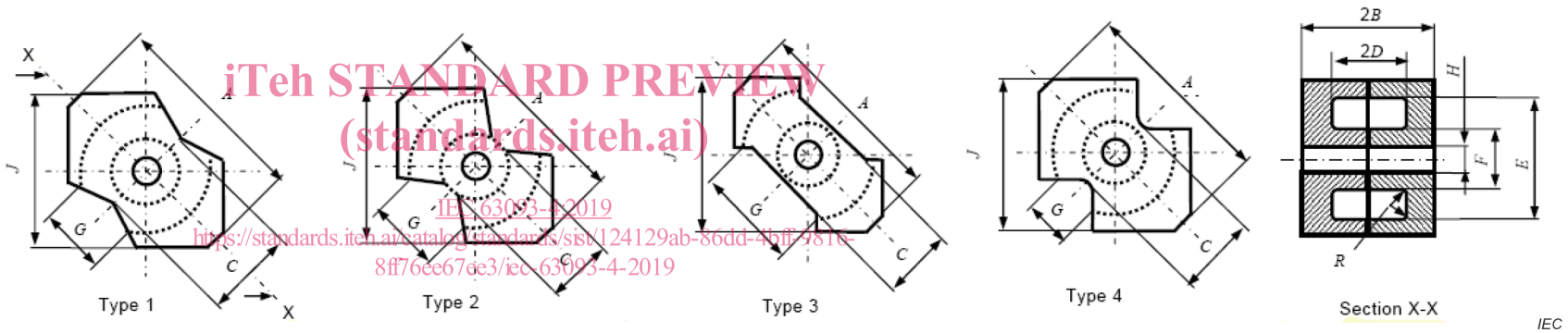

Figure 1 – Dimensions of RM-cores

Table 1 – Dimensions of RM-cores

Size	*A* mm		*B* mm		*C* mm		*D* mm		*E* mm		*F* mm		*G* mm	*H*[a] mm		*J* mm		*R* mm	Type
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	Min.	Max.	Max.	
RM 4	10,6	11,8	5,15	5,25	4,40	4,60	3,50	3,70	7,95	8,35	3,70	3,90	5,80	2,0	2,1	9,40	9,80	0,3	3
RM 5	14,0	14,9	5,15	5,25	6,40	6,80	3,15	3,35	10,20	10,60	4,70	4,90	6,00	2,0	2,1	11,80	12,30	0,3	3
RM 6-S	17,2	18,3	6,15	6,25	7,80	8,20	4,00	4,20	12,40	12,90	6,10	6,40	8,40	3,0	3,1	14,10	14,70	0,3	1
RM 6-R	17,2	18,3	6,15	6,25	7,00	7,40	4,00	4,20	12,40	12,90	6,10	6,40	6,30	3,0	3,1	14,10	14,70	0,3	4
RM 7	19,5	20,3	6,65	6,75	6,95	7,25	4,20	4,45	14,75	15,40	6,95	7,25	9,30	3,0	3,1	16,50	17,20	0,3	2
RM 8	22,3	23,2	8,15	8,25	10,60	11,00	5,40	5,65	17,00	17,70	8,25	8,55	9,50	4,4	4,6	18,90	19,70	0,3	3
RM 10	27,2	28,5	9,25	9,35	13,00	13,50	6,20	6,50	21,20	22,10	10,50	10,90	10,90	5,4	5,6	23,60	24,70	0,3	3
RM 12	36,1	37,4	12,20	12,30	15,60	16,10	8,40	8,70	25,00	26,00	12,30	12,80	12,90	-	-	28,70	29,80	0,3	3
RM 14	40,8	42,2	14,40	14,50	18,40	19,00	10,40	10,70	29,00	30,20	14,40	15,00	17,00	5,4	5,6	33,50	34,70	0,3	3
RM 14A	40,8	42,2	15,00	15,10	18,40	19,00	10,40	10,70	29,00	30,20	14,40	15,00	17,00	-	-	33,50	34,70	0,3	3

[a] Solid centre-pole cores are available for each size.

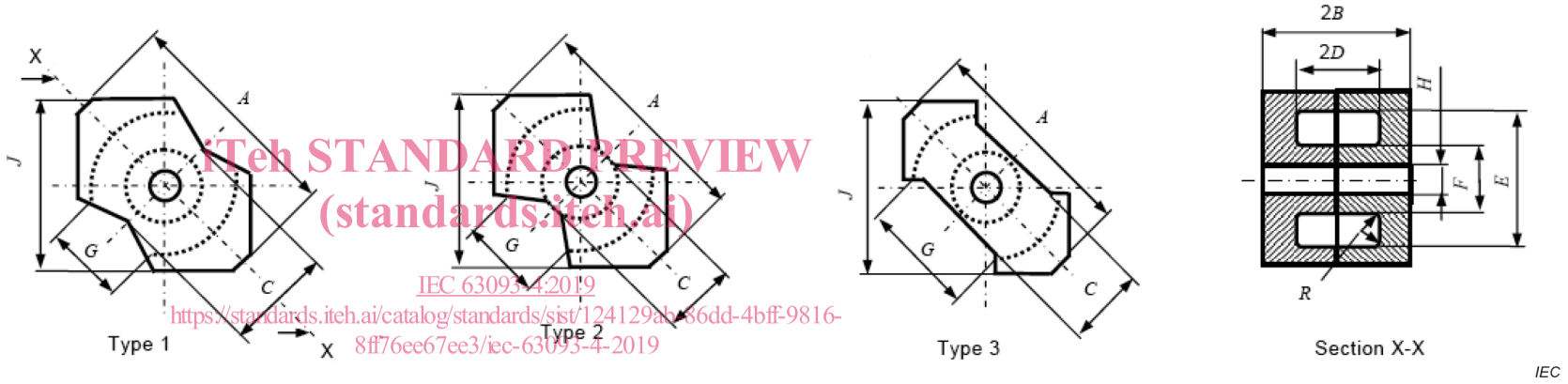

Figure 2 – Dimensions of low-profile RM-cores

Table 2 – Dimensions of low-profile RM-cores

Size	*A* mm		*B* mm		*C* mm		*D* mm		*E* mm		*F* mm		*G* mm	*H*[a] mm		*J* mm		*R* mm	Type
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Max.	Min.	Max.	Max.	
RM 4/8	10,6	11,8	3,80	3,90	4,40	4,60	2,15	2,35	7,95	8,35	3,70	3,90	5,80	2,0	2,1	9,40	9,80	0,3	3
RM 5/8	14,0	14,9	3,80	3,90	6,40	6,80	1,80	2,00	10,20	10,60	4,70	4,90	6,00	2,0	2,1	11,80	12,30	0,3	3
RM 6/9	17,2	18,3	4,40	4,50	7,80	8,20	2,25	2,45	12,40	12,90	6,10	6,40	8,40	3,0	3,1	14,10	14,70	0,3	1
RM 7/10	19,5	20,3	4,80	4,90	6,95	7,25	2,35	2,60	14,75	15,40	6,95	7,25	9,30	3,0	3,1	16,50	17,20	0,3	2
RM 8/11	22,3	23,2	5,70	5,80	10,60	11,00	2,95	3,15	17,00	17,70	8,25	8,55	9,50	4,4	4,6	18,90	19,70	0,3	3
RM 10/13	27,2	28,5	6,40	6,50	13,00	13,50	3,35	3,55	21,20	22,10	10,50	10,90	10,90	5,4	5,6	23,60	24,70	0,3	3
RM 12/17	36,1	37,4	8,30	8,40	15,60	16,10	4,50	4,75	25,00	26,00	12,30	12,80	12,90	5,4	5,6	28,70	29,80	0,3	3
RM 14/20	40,8	42,2	10,15	10,25	18,40	19,00	5,55	5,85	29,00	30,20	14,40	15,00	17,00	5,4	5,6	33,50	34,70	0,3	3

[a] Solid centre-pole cores are available for each size.

Table 3 – Effective parameter and A_{min} values for RM-cores

Size	with hole ○ no hole Φ	C_1 mm^{-1}	C_2 $\times 10^{-3}$ mm^{-3}	A_e mm^2	l_e mm	V_e mm^3	A_{min} [a] mm^2
RM 4	○	1,874 3	171,63	10,9	20,5	224	8,04
	Φ	1,617 3	115,43	14,0	22,7	318	11,3
RM 5	○	1,021 5	50,075	20,4	20,8	425	14,8
	Φ	0,943 62	39,983	23,6	22,3	526	18,1
RM 6-S	○	0,897 83	29,592	30,3	27,2	830	23,4
	Φ	0,816 68	23,099	35,4	28,9	1 020	30,7
RM 6-R	○	0,821 49	25,728	31,3	25,7	810	23,4
	Φ	0,740 34	19,737	37,5	27,8	1 040	30,7
RM 7	○	0,720 27	17,389	41,4	29,8	1 240	32,3
	Φ	0,672 53	14,509	46,4	31,2	1 450	39,6
RM 8	○	0,680 17	13,134	51,8	35,2	1 820	39.5
	Φ	0,602 06	9,546 4	63,1	38,0	2 390	55,4
RM 10	○	0,503 89	6,034 9	83,5	42,1	3 510	66,2
	Φ	0,454 85	4,647 8	97,9	44,5	4 360	89,9
RM 12	Φ	0,383 33	2,626 6	146	55,9	8 160	124
RM 14	○	0,381 70	2,187 8	174	66,6	11 600	146
	Φ	0,362 17	1,918 9	189	68,4	12 900	170
RM 14A	Φ	0,350 29	1,771 1	198	69,3	13 700	170
The manufacturers may indicate in their catalogues more precise values than those given in the above table.							
[a] See IEC 60205 for the definition of A_{min}.							

Table 4 – Effective parameter and A_{min} values for low-profile RM-cores

Size	with hole ○ no hole Φ	C_1 mm^{-1}	C_2 $\times 10^{-3} mm^{-3}$	A_e mm^2	l_e mm	V_e mm^3	A_{min} [a] mm^2
RM 4/8	○	1,377 4	120,26	11,5	15,8	181	8,04
	Φ	1,218 7	84,830	14,4	17,5	252	11,3
RM 5/8	○	0,748 11	34,680	21,6	16,1	348	14,8
	Φ	0,703 52	28,678	24,5	17,3	423	18,1
RM 6/9	○	0,656 34	20,781	31,6	20,7	655	23,4
	Φ	0,610 85	16,976	36,0	22,0	791	31,2
RM 7/10	○	0,528 24	12,220	43,2	22,8	987	32,3
	Φ	0,501 64	10,529	47,6	23,9	1 140	39,6
RM 8/11	○	0,477 42	8,744 5	54,6	26,1	1 420	39,5
	Φ	0,435 25	6,717 3	64,8	28,2	1 830	55,4
RM 10/13	○	0,358 02	4,117 3	87,0	31,1	2 710	66,2
	Φ	0,332 13	3,339 0	99,5	33,0	3 290	89,9
RM 12/17	○	0,294 33	2,226 4	132	38,9	5 140	99,9
	Φ	0,277 60	1,882 8	147	40,9	6 030	124
RM 14/20	○	0,262 62	1,411 5	186	48,9	9 090	146
	Φ	0,252 35	1,262 9	200	50,4	10 100	170
The manufacturers may indicate in their catalogues more precise values than those given in the above table.							
[a] See IEC 60205 for the definition of A_{min}.							

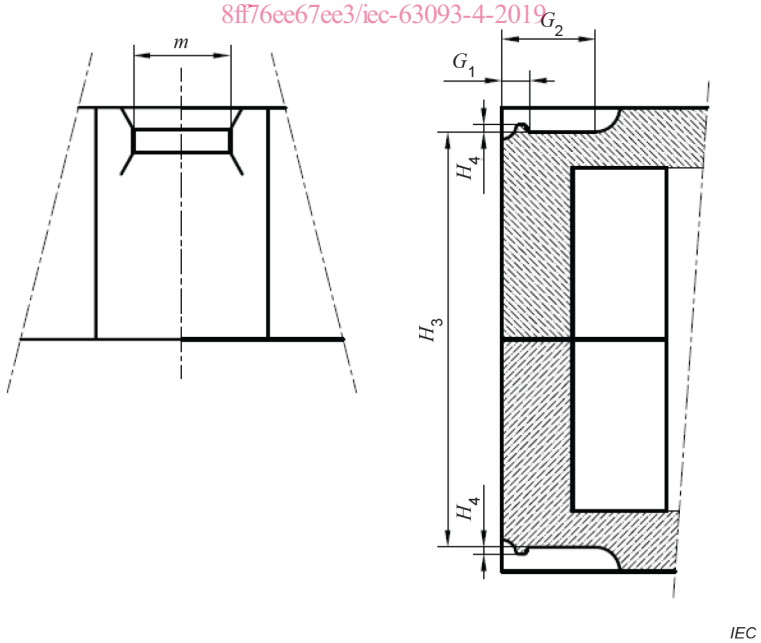

Figure 3 – Dimensions of spring recess

Table 5 – Dimensions of spring recess

Size	H_3 [a, b] mm		H_4 mm		G_1 [a, c] mm	G_2 [a, d] mm	m mm
	Min.	Max.	Min.	Max.	Max.	Min.	Max.
RM 4	8,75	9,25	0,05	0,15	1,0	1,65	2,5
RM 5	8,75	9,25	0,05	0,15	1,0	1,65	2,5
RM 6	10,09	10,59	0,10	0,20	1,3	2,20	2,5
RM 7	11,09	11,59	0,10	0,20	1,3	2,20	3,3
RM 8	14,05	14,55	0,10	0,20	1,3	2,20	5,0
RM 10	15,95	16,45	0,15	0,25	1,3	2,25	5,0
RM 12	21,4	21,90	0,15	0,25	1,3	3,50	5,0
RM 14	25,55	26,05	0,15	0,25	1,3	3,60	5,6
RM 14A	26,80	27,30	0,15	0,25	1,3	3,60	5,6

[a] Dimensions G_1 and G_2 define the boundaries of the flat spring rest.

[b] In particular cases, the design of the spring can require the tolerance on H_3 to be smaller.

[c] The form of the locking ridge is not specified but it shall be essentially uniform over the width m in order not to hinder the correct application of the spring. The outer side may be of any form facilitating the introduction of the spring into the recess; the inner side may be of any form but shall not protrude through a flat plane making an angle of 120° with the flat spring rest and containing its boundary defined by dimensions G_1.

[d] The inner side of the spring recess may be of any form but it shall not protrude through a flat plane making an angle of 120° with the flat spring rest and containing its boundary defined by dimension G_2.

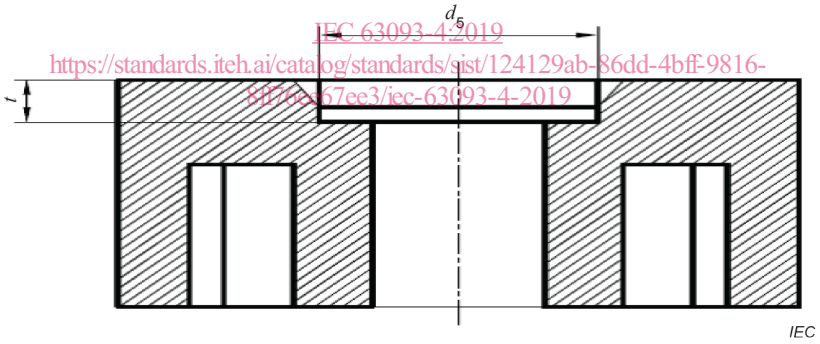

Figure 4 – Dimensions of stud recess

Table 6 – Dimensions of stud recess

Size	d_5 mm	t mm	
	Min.	Min.	Max.
RM 4	3,0	0,4	0,7
RM 5	3,0	0,4	0,7
RM 6	4,3	0,7	1,0
RM 7	4,3	0,7	1,0
RM 8	6,0	0,7	1,0
RM 10	7,6	0,8	1,1
RM 14	7,6	0,8	1,1