EESTI STANDARD EVS-EN 60601-1-2:2015+A1:2021

ELEKTRILISED MEDITSIINISEADMED. OSA 1-2: ÜLDNÕUDED ESMASELE OHUTUSELE JA OLULISTELE TOIMIMISNÄITAJATELE. KOLLATERAALSTANDARD: ELEKTROMAGNETILINE ÜHILDUVUS. NÕUDED JA KATSETUSED

ANS COCUN

Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic disturbances -Requirements and tests (IEC 60601-1-2:2014 + IEC 60601-1-2:2014/A1:2020)



EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 60601-1-2:2015 +A1:2021 sisaldab Euroopa standardi EN 60601-1-2:2015 ja selle muudatuse A1:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 60601-1-2:2015 +A1:2021 consists of the English text of the European standard EN 60601-1-2:2015 and its amendment A1:2021.		
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.		
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 18.09.2015, muudatus A1 19.03.2021.	Date of Availability of the European standard is 18.09.2015, for A1 19.03.2021.		
Muudatusega A1 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega A) (A1.	The start and finish of text introduced or altered by amendment A1 is indicated in the text by tags A_1 A_1 .		
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.		
Γagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi			

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile <u>standardiosakond@evs.ee</u>.

ICS 11.040.01; 33.100.10; 33.100.20

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis-ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis-ja Akrediteerimiskeskusega: Koduleht <u>www.evs.ee</u>; telefon 605 5050; e-post <u>info@evs.ee</u>

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage <u>www.evs.ee</u>; phone +372 605 5050; e-mail <u>info@evs.ee</u>

EUROPEAN STANDARD NORME EUROPÉENNE EUROPÄISCHE NORM

EN 60601-1-2 +A1

September 2015, March 2021

ICS 11.040.01; 33.100.10; 33.100.20

Supersedes EN 60601-1-2:2007

English Version

Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests (IEC 60601-1-2:2014 + IEC 60601-1-2:2014/A1:2020)

Appareils électromédicaux - Partie 1-2: Exigences générales pour la sécurité de base et les performances essentielles - Norme collatérale: Perturbations électromagnétiques - Exigences et essais (IEC 60601-1-2:2014 + IEC 60601-1-2:2014/A1:2020)

Medizinische elektrische Geräte - Teil 1-2: Allgemeine Festlegungen für die Sicherheit einschließlich der wesentlichen Leistungsmerkmale - Ergänzungsnorm: Elektromagnetische Störgrößen - Anforderungen und Prüfungen (IEC 60601-1-2:2014 + IEC 60601-1-2:2014/A1:2020)

This European Standard was approved by CENELEC on 2014-04-01. Amendment A1 was approved by CENELEC on 2020-10-06. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard and its amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard and its amendment A1 exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization Comité Européen de Normalisation Electrotechnique Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2021 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

EVS-EN 60601-1-2:2015+A1:2021

European foreword

The text of document 62A/916/FDIS, future edition 4 of IEC 60601-1-2, prepared by SC 62A, "Common aspects of electrical equipment used in medical practice", of IEC/TC 62 "Electrical equipment in medical practice" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60601-1-2:2015.

The following dates are fixed:

•	latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-03-18
•	latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-12-31

This document supersedes EN 60601-1-2:2007.

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

Endorsement notice

The text of the International Standard IEC 60601-1-2:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

	0 1 37	Ũ	
IEC 60601-1-2:2007	NOTE	Harmonized as EN 6	0601-1-2:2007 (not modified)
IEC 60601-2-27:2011	NOTE	Harmonized as EN 6	60601-2-27:2006 (not modified)
IEC 60601-2-44:2009	NOTE	Harmonized as EN 6	0601-2-44:2009 (not modified)
IEC 61000-3-11:2000	NOTE	Harmonized as EN 6	31000-3-11:2000 (not modified)
IEC 61000-3-12:2011	NOTE	Harmonized as EN 6	31000-3-12:2011 (not modified)
IEC 61000-3-12:2011	NOTE	Harmonized as EN 6	1000-3-12:2011 (not modified)
IEC 60601-6-1:2005	NOTE	Harmonized as EN 6	0601-6-1:2007 (not modified)
IEC 60601-6-2:2005	NOTE	Harmonized as EN 6	0601-6-2:2005 (not modified)
IEC 61496-1:2008	NOTE	Harmonized as EN 6	1496-1:2008 (not modified)
CISPR 16-1-1:2010	NOTE	Harmonized as EN 5	5016-1-1:2010 (not modified)
CISPR 16-2-3:2010	NOTE	Harmonized as EN 5	5016-2-3:2010 (not modified)
CISPR 24:2010	NOTE	Harmonized as EN 5	5024:2010 (not modified)
CISPR 25:2008	NOTE	Harmonized as EN 5	5025:2008 (not modified)
ISO 17025:2005	NOTE	Harmonized as EN IS	SO/IEC 17025:2005 (not modified)

An Amendment A1 European foreword

The text of document 62A/1390/FDIS, future IEC 60601-1-2/A1, prepared by SC 62A "Common aspects of electrical equipment used in medical practice" of IEC/TC 62 "Electrical equipment in medical practice" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60601-1-2:2015/A1:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2021-09-19 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with (dow) 2024-03-19 • the document have to be withdrawn

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

Endorsement notice

The text of the International Standard IEC 60601-1-2:2014/A1:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

6

IEC 61000-1-2:2016	NOTE	Harmonized as EN 61000-1-2:2016 (not modified)
IEC 60601-2 (series)	NOTE	Harmonized as EN 60601-2 (series)
ISO/TR 24971:2020	NOTE	Harmonized as CEN ISO/TR 24971:2020 (not modified)
CISPR 35:2016	NOTE	Harmonized as EN 55035:2017
		(A)



IEC 60601-1-2

Edition 4.1 2020-09 CONSOLIDATED VERSION

INTERNATIONAL



Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests



THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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 between 2002 and 2015. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.





Edition 4.1 2020-09 CONSOLIDATED VERSION

INTERNATIONAL STANDARD



Medical electrical equipment –

Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ISBN 978-2-8322-8836-8

ICS 11.040.01; 33.100.10; 33.100.20

Warning! Make sure that you obtained this publication from an authorized distributor.

this occument is a proview concrete where the owner of the owner of the owner of the owner own

CONTENTS

FOF	REWORD			6
$ A_1\rangle$	MENDM	ENT A1 FC	DREWORD 街	9
ΙΝΤΙ	RODUCT	ION		.10
A_1	NTRODU	ICTION TO	AMENDMENT 1 🔄	.12
1	Scope, o	object and r	elated standards	.13
	1.1	* Scope		.13
	1.2			
	1.3	Related sta	andards	.13
		1.3.1	IEC 60601-1	.13
		1.3.2	Particular standards	.13
2	Normativ	ve referenc	es	.13
3	Terms a	nd definitio	ns	.15
4	General	requiremer	nts	.19
	4.1	RISK MANA	GEMENT PROCESS for ME EQUIPMENT and ME SYSTEMS	.19
	4.2	* Non-ме е	EQUIPMENT used in an ME SYSTEM	.19
	4.3	General te	st conditions	.19
		4.3.1	* Configurations	.19
		4.3.2	Artificial hand	.20
		4.3.3	* Power input voltages and frequencies	.20
5	Me equi	PMENT and	ME SYSTEMS identification, marking and documents	.22
	5.1	ME SYSTEM	requirements for marking on the outside of ME EQUIPMENT and Is that are specified for use only in a shielded location SPECIAL ENT	22
	5.2		IVING DOCUMENTS	
	0.2	5.2.1	Instructions for use	
		5.2.2	Technical description	
6	Docume	ntation of tl	he tests	
	6.1	General		.25
	6.2			
	6.3		t	
7	ELECTRO		EMISSIONS requirements for ME EQUIPMENT and ME SYSTEMS	
	7.1	Protection	of radio services and other equipment	.25
		7.1.1	* General	
		7.1.2	Operating modes	.25
		7.1.3	Multimedia equipment	.26
		7.1.4	* Subsystems	.26
		7.1.5	ME EQUIPMENT and ME SYSTEMS specified for use only in a shielded location SPECIAL ENVIRONMENT	.26
		7.1.6	ME EQUIPMENT and ME SYSTEMS that include radio equipment	
		7.1.7	* ME EQUIPMENT whose main functions are performed by motors and switching or regulating devices	
		7.1.8	ME EQUIPMENT and ME SYSTEMS containing X-ray generators	.27
		7.1.9	PATIENT physiological simulation	
		7.1.10	Artificial hand	
		7.1.11	PATIENT-coupled cables	.27

		7.1.12	A1) * PERMANENTLY INSTALLED LARGE ME EQUIPMENT and LARGE ME SYSTEMS (A1)	27
	7.2	Protection	of the PUBLIC MAINS NETWORK	28
		7.2.1	* Harmonic distortion	28
	6	7.2.2	* Voltage fluctuations and flicker	28
	7.3	EMISSIONS	requirements summary	
8	Electron		MUNITY requirements for ME EQUIPMENT and ME SYSTEMS	
	8.1	-	·	
	8.2		nysiological simulation	
	8.3		on of PATIENT-COUPLED parts	
	8.4		ME EQUIPMENT and parts intended to be HAND-HELD	
	8.5		- ms	
	8.6		ANENTLY INSTALLED LARGE ME EQUIPMENT and LARGE	33
	8.7		g modes	
	8.8	•	S EQUIPMENT	
	8.9		TEST LEVELS	
	8.10		to proximity fields from RF wireless communications	41
	8.11	* IMMUNITY	to proximity magnetic fields in the frequency range 9 kHz to	
9	* Test re			
Ann			General guidance and rationale	
	A.1		I performance	
	A.2		normally non-observable functions	
	A.3	-	for particular clauses and subclauses	
Ann		ormative) (Guide to marking and labelling requirements for ME EQUIPMENT	
	B.1		n the outside of ME EQUIPMENT, ME SYSTEMS or their parts	
	B.2	-	IVING DOCUMENTS, instructions for use	
	B.3		IYING DOCUMENTS, technical description	
Ann			Guidance in classification according to CISPR 11	
	C.1		~ Q_	
	C.2	Separation	n into groups	70
	C.3	Division in	to classes	71
Ann	ex D (info	ormative) (Guidance in the application of IEC 60601-1-2 to particular	
	D.1			
	D.2		nded modifications	
	0.2	D.2.1	Testing requirements	
		D.2.2	ACCOMPANYING DOCUMENTS	
	D.3	Cautions.		
Ann	ex E (info	ormative) [Determination of IMMUNITY TEST LEVELS for SPECIAL	
	E.1			
	E.2		of method for E.1 a)	
	E.3		of method for E.1 b), c) and d)	
	E.4	•	tion of EM DISTURBANCE level reduction	
	E.5		nt of EM DISTURBANCE sources	

E.7 Determination of IMMUNITY TEST LEVELS .78 E.8 RF radiators in SPECIAL ENVIRONMENTS .79 E.9 Examples of mitigations and special conditions .79 Annex F (informative) Guidance on the application of RISK MANAGEMENT with regard to ELECTROMAGNETIC DISTURBANCES in this collateral standard .81 Annex G (informative) PATIENT-coupled cables EMISSIONS .90 Annex H (informative) PATIENT-coupled cables EMISSIONS .92 H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS .92 H.3 Rationale .92 H.3 Rationale .92 H.3 Rationale .92 H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS .92 H.3 Rationale .92 H.3 Rationale .92 H.3 Rationale .92 H.3 RATIONAL pass/fail criteria principles .94 I.2.1 IMMUNITY pass/fail criteria determination .94 I.2.1 IMMUNITY pass/fail criteria determination .94 I.3.1 General .95 .13.1 General examples J.3.1	E.6	Reasonably foreseeable maximum EM DISTURBANCE levels	78
E.9 Examples of mitigations and special conditions	E.7	Determination of IMMUNITY TEST LEVELS	78
Annex F (informative) Guidance on the application of RISK MANAGEMENT with regard to ELECTROMAGNETIC DISTURBANCES in this collateral standard 81 Annex G (informative) Guidance: Test plan 90 G.1 Test plan contents. 90 Annex H (informative) PATIENT-coupled cables EMISSIONS 92 H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS 92 H.2 Test method 92 Annex I (informative) Identification of IMMUNITY pass/fail criteria 94 1.1 General 94 1.2 IMMUNITY pass/fail criteria principles 94 1.2.1 General 94 1.2.2 IMMUNITY pass/fail criteria determination 94 1.3.1 General examples 95 1.3.1 General examples 95 1.3.2 Example of IMMUNITY pass/fail criteria for a radiological table system 96 Annex Z2 (informative) Normative references to international publications with their corresponding European publications 98 Index of defined terms used in this collateral standard 109 Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME	E.8	RF radiators in SPECIAL ENVIRONMENTS	79
ELECTROMAGNETIC DISTURBANCES in this collateral standard. .81 Annex G (informative) Guidance: Test plan .90 G.1 Test plan contents .90 Annex H (informative) PATIENT-coupled cables EMISSIONS .92 H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS .92 H.2 Test method .92 H.3 Rationale .92 Annex I (informative) Identification of IMMUNITY pass/fail criteria .94 1.1 General .94 1.2 IMMUNITY pass/fail criteria principles .94 1.2.1 General .94 1.2.2 IMMUNITY pass/fail criteria for non-ME EQUIPMENT used in an ME SYSTEM .94 1.3.1 MENNITY pass/fail criteria examples .95 1.3.1 General examples .95 1.3.2 Example of IMMUNITY pass/fail criteria for a radiological table system .96 Annex ZA (normative) Normative references to international publications with their corresponding European publications .98 Index of defined terms used in this collateral standard .99 Figure 1 – RC element of the artificial hand .20 Figure 2 – PORTS of ME EQUIPMENT and M	E.9	Examples of mitigations and special conditions	79
G.1 Test plan contents 90 Annex H (informative) PATIENT-coupled cables EMISSIONS 92 H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS 92 H.2 Test method 92 H.3 Rationale 92 H.3 Rationale 92 Annex I (informative) Identification of IMMUNITY pass/fail criteria 94 I.1 General 94 I.2 IMMUNITY pass/fail criteria for non-ME EQUIPMENT used in an ME SYSTEM 94 I.2.1 General 94 I.2.2 IMMUNITY pass/fail criteria examples 95 I.3.1 General examples 95 I.3.2 Example of IMMUNITY pass/fail criteria for a radiological table system 96 Annex Z2 (informative) Normative references to international publications with their corresponding European publications 98 Index of defined terms used in this collateral standard 99 105 Index of defined terms used in this collateral standard 99 Figure 1 – RC element of the artificial hand 20 Figure 3 – ED Examples of Iocations within EM ENVIRONMENTS (Electrostatic voltages to which oPERTS of ME EQUIPMENT a			81
Annex H (informative) PATIENT-coupled cables EMISSIONS	Annex G (inf	formative) Guidance: Test plan	90
H.1 * Protection of other equipment from PATIENT cable conducted EMISSIONS 92 H.2 Test method 92 H.3 Rationale 92 Annex I (informative) Identification of IMMUNITY pass/fail criteria 94 I.1 General 94 I.2 IMMUNITY pass/fail criteria principles 94 I.2.1 General 94 I.2.2 IMMUNITY pass/fail criteria for non-ME EQUIPMENT used in an ME SYSTEM 94 I.2.3 IMMUNITY pass/fail criteria examples 95 I.3.1 General examples 95 I.3.2 Example of IMMUNITY pass/fail criteria for a radiological table system 96 Annex ZZ (informative) Normative references to international publications with their corresponding European publications 98 Annex ZZ (informative) Coverage of Essential Requirements of EU Directives 102 Bibliography 105 Index of defined terms used in this collateral standard 20 Figure 1 – RC element of the artificial hand 20 20 52 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 52 Figure A.1 – Examples of locations within EM ENVIRONMENTS () 52 5	G.1	Test plan contents	90
H.2 Test method	Annex H (inf	formative) PATIENT-coupled cables EMISSIONS	92
H.3 Rationale	H.1	* Protection of other equipment from PATIENT cable conducted EMISSIONS	92
Annex I (informative) Identification of IMMUNITY pass/fail criteria	H.2	Test method	92
1.1 General	H.3	Rationale	92
I.2 IMMUNITY pass/fail criteria principles	Annex I (info	ormative) Identification of IMMUNITY pass/fail criteria	94
I.2.1 General	I.1	General	94
I.2.2 IMMUNITY pass/fail criteria for non-ME EQUIPMENT used in an ME SYSTEM	1.2	IMMUNITY pass/fail criteria principles	94
ME SYSTEM		I.2.1 General	94
I.3 IMMUNITY pass/fail criteria examples			94
I.3.1 General examples		I.2.3 IMMUNITY pass/fail criteria determination	94
1.3.2 Example of IMMUNITY pass/fail criteria for a radiological table system 96 Annex ZA (normative) Normative references to international publications with their corresponding European publications 98 Annex ZZ (informative) Coverage of Essential Requirements of EU Directives 102 Bibliography 105 105 Index of defined terms used in this collateral standard 109 Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – M Examples of locations within EM ENVIRONMENTS (1) 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76	1.3	IMMUNITY pass/fail criteria examples	95
system96Annex ZA (normative) Normative references to international publications with their corresponding European publications98Annex ZZ (informative) Coverage of Essential Requirements of EU Directives102Bibliography105Index of defined terms used in this collateral standard109Figure 1 – RC element of the artificial hand20Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS29Figure 3 – \Box Examples of locations within EM ENVIRONMENTS \Box 35Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005)52Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.259Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields63Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii65Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil 		I.3.1 General examples	95
corresponding European publications 98 Annex ZZ (informative) Coverage of Essential Requirements of EU Directives 102 Bibliography 105 Index of defined terms used in this collateral standard 109 Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – P Examples of locations within EM ENVIRONMENTS (A) 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 66 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			96
Bibliography 105 Index of defined terms used in this collateral standard 109 Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – Examples of locations within EM ENVIRONMENTS (*] 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			98
Bibliography 105 Index of defined terms used in this collateral standard 109 Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – Examples of locations within EM ENVIRONMENTS (*] 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76	Annex ZZ (ir	nformative) Coverage of Essential Requirements of EU Directives	102
Index of defined terms used in this collateral standard			
Figure 1 – RC element of the artificial hand 20 Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – A Examples of locations within EM ENVIRONMENTS 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			
Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – A Examples of locations within EM ENVIRONMENTS (1) 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			
Figure 2 – PORTS of ME EQUIPMENT and ME SYSTEMS 29 Figure 3 – A Examples of locations within EM ENVIRONMENTS (1) 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76	Figure 1 D	C element of the ortificial hand	20
Figure 3 – A Examples of locations within EM ENVIRONMENTS A 35 Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005) 52 Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2 59 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields 63 Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			
Figure A.1 – Examples of PORTS (from IEC 61000-6-1:2005).52Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.2.59Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields.63Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii.65Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.).65Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.).66Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known.75Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS.76			
Figure A.2 – IEC 61000-4-2 Figure A.1 – Maximum values of electrostatic voltages to which OPERATORS can be charged while in contact with the materials mentioned in A.259 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields			
which OPERATORS can be charged while in contact with the materials mentioned in A.259 Figure A.3 – Steps for evaluation of IMMUNITY to proximity magnetic fields	Figure A.1 –	Examples of PORTS (from IEC 61000-6-1:2005)	52
Figure A.4 – Magnetic field roll-off characteristics along the x-axis for a thin planar coil and various coil radii 65 Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.) 65 Figure A.6 – Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.) 66 Figure E.1 – Test plan development flow when SPECIAL ENVIRONMENTS are known 75 Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS 76			59
and various coil radii	Figure A.3 -	Steps for evaluation of IMMUNITY to proximity magnetic fields.	63
Figure A.5 – Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil operating at 134,2 kHz and H ₀ of 82,65 A/m (r.m.s.)			65
operating at 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.)	Figure A.5 –	Voltage induced in a 1-turn, 6 cm radius coil by a 6 cm radiating coil	
Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS	Figure A.6 – operating at	Voltage induced in a 1-turn, 2 cm radius coil by a 2 cm radiating coil 13,56 MHz and H ₀ of 7,5 A/m (r.m.s.)	66
Figure E.2 – Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS	Figure E.1 –	Test plan development flow when SPECIAL ENVIRONMENTS are known	75
	Figure E.2 –	Sub-process for determination of IMMUNITY TEST LEVELS for SPECIAL	

– 5 – EVS-EN 60601-1-2:2015+A1:2021

Figure H.1 – Setup for PATIENT-COUPLED cables conducted EMISSIONS test for ME EQUIPMENT and ME SYSTEMS that conform to IEC 60601-2-27	3
Table 1 – Power input voltages and frequencies during the tests (1 of 2)	1
Table 2 – EMISSION limits per environment	3
Table 3 – Procedure for continuing to test ME EQUIPMENT or ME SYSTEMS that are damaged by an IMMUNITY test signal	
Table 4 – * ENCLOSURE PORT	
Table 5 – * Input a.c. power PORT (1 of 2)	7
Table 6 – Input d.c. power PORT	
Table 7 – * PATIENT coupling PORT	С
Table 8 – A SIP/SOP PORT A	1
Table 9 – Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment 4	2
Table 11 – Test specifications for ENCLOSURE PORT IMMUNITY to proximity magnetic fields	3
Table 10 – * Minimum test report contents (1 of 2)44	4
Table A.2 – Example calculations for applying the allowance to test at a single RATED power input voltage	3
Table A.1 – IEC/TR 61000-2-5 information considered in specifying IMMUNITY TEST LEVELS for each IMMUNITY TEST	5
A) Table A.3 – Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment (A)	1
Table B.1 – Marking on the outside of ME EQUIPMENT, ME SYSTEMS or their parts	
Table B.2 – ACCOMPANYING DOCUMENTS, instructions for use 68	3
Table B.3 – Accompanying documents, technical description	Э
Table E.1 – Examples of specific mitigations / environmental conditions	Э
Table F.1 – Specific guidance for subclauses of this collateral standard that reference RISK MANAGEMENT (1 of 6)	1
Table G.1 – Recommended minimum test plan contents (1 of 2)	С
Table H.1 – PATIENT-COUPLED conducted EMISSIONS recommended limit 92	2
Table I.1 – Example of IMMUNITY pass criteria for a radiological table system97	7
Table ZZ.1: Relationship between Essential Requirements of Directive 93/42/EEC, andClauses and Subclauses of this standard103	3
Clauses and Subclauses of this standard)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEDICAL ELECTRICAL EQUIPMENT -

Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests

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 for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 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 60601-1-2 has been prepared by IEC subcommittee 62A: Common aspects of electrical equipment used in medical practice of IEC technical committee 62: Electrical equipment in medical practice.

This fourth edition cancels and replaces the third edition of IEC 60601-1-2, published in 2007, and constitutes a technical revision.

This fourth edition constitutes a collateral standard to IEC 60601-1: *Medical electrical equipment – Part 1: General requirements for safety and essential performance* hereafter referred to as the general standard.

The most significant changes with respect to the previous edition include the following modifications:

 specification of IMMUNITY TEST LEVELS according to the environments of INTENDED USE, categorized according to locations that are harmonized with IEC 60601-1-11: the professional healthcare facility environment, the HOME HEALTHCARE ENVIRONMENT and SPECIAL ENVIRONMENTS;

- 7 -

- specification of tests and test levels to improve the safety of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS when PORTABLE RF communications equipment is used closer to the MEDICAL ELECTRICAL EQUIPMENT than was recommended based on the IMMUNITY TEST LEVELS that were specified in the third edition;
- specification of IMMUNITY tests and IMMUNITY TEST LEVELS according to the PORTS of the MEDICAL ELECTRICAL EQUIPMENT OR MEDICAL ELECTRICAL SYSTEM;
- specification of IMMUNITY TEST LEVELS based on the reasonably foreseeable maximum level of ELECTROMAGNETIC DISTURBANCES in the environments of INTENDED USE, resulting in some IMMUNITY TEST LEVELS that are higher than in the previous edition; and
- better harmonization with the RISK concepts of BASIC SAFETY and ESSENTIAL PERFORMANCE, including deletion of the defined term "life-supporting";

and the following additions:

- guidance for determination of IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS;
- guidance for adjustment of IMMUNITY TEST LEVELS when special considerations of mitigations or INTENDED USE are applicable;
- guidance on RISK MANAGEMENT for BASIC SAFETY and ESSENTIAL PERFORMANCE with regard to ELECTROMAGNETIC DISTURBANCES; and
- guidance on identification of IMMUNITY pass/fail criteria.

The text of this collateral standard is based on the following documents:

FDIS	Report on voting
62A/916/FDIS	62A/924/RVD

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

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

In the 60601 series of publications, collateral standards specify general requirements for safety applicable to:

- a subgroup of MEDICAL ELECTRICAL EQUIPMENT (e.g. radiological equipment); or
- a specific characteristic of all MEDICAL ELECTRICAL EQUIPMENT, not fully addressed in the general standard (e.g. ALARM SYSTEMS).

In this collateral standard, the following print types are used:

- Requirements and definitions: roman type.
- Test specifications: italic type.
- Informative material appearing outside of tables, such as notes, examples and references: in smaller type.
 Normative text of tables is also in a smaller type.
- TERMS DEFINED IN CLAUSE 3 OF THE GENERAL STANDARD, IN THIS COLLATERAL STANDARD OR AS NOTED: SMALL CAPITALS.

In referring to the structure of this collateral standard, the term

 "clause" means one of the numbered divisions within the table of contents, inclusive of all subdivisions (e.g. Clause 1 includes 1.1, 1.2, etc.); "subclause" means a numbered subdivision of a clause (e.g. 1.1, 1.2 and 1.3.1 are all subclauses of Clause 1).

References to clauses within this collateral standard are preceded by the term "Clause" followed by the clause number. References to subclauses within this collateral standard are by number only.

In this collateral standard, the conjunctive "or" is used as an "inclusive or" so a statement is true if any combination of the conditions is true.

The verbal forms used in this collateral standard conform to usage described in Annex H of the ISO/IEC Directives, Part 2. For the purposes of this collateral standard, the auxiliary verb:

- "shall" means that compliance with a requirement or a test is mandatory for compliance with this collateral standard;
- "should" means that compliance with a requirement or a test is recommended but is not mandatory for compliance with this collateral standard;
- "may" is used to describe a permissible way to achieve compliance with a requirement or test.

An asterisk (*) as the first character of a title or at the beginning of a paragraph or table title indicates that there is guidance or rationale related to that item in Annex A.

A list of all parts of the IEC 60601 series, published under the general title *Medical electrical equipment*, can be found on the IEC website.

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

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

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip them for conducting new or revised tests. It is the recommendation of the committee that the content of this publication be adopted for mandatory implementation nationally not earlier than 3 years from the date of publication.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

A AMENDMENT A1 FOREWORD

This amendment has been prepared by subcommittee 62A: Common aspects of electrical equipment used in medical practice, of IEC technical committee 62: Electrical equipment in medical practice.

The text of this amendment is based on the following documents:

FDIS	Report on voting
62A/1390/FDIS	62A/1405/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "<u>http://webstore.iec.ch</u>" in the data related to the specific publication. At this date, the publication will be

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

NOTE The attention of users of this document is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC or ISO publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests. It is the recommendation of the committee that the content of this publication be adopted for mandatory implementation nationally not earlier than 3 years from the date of publication.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

(A1

-9-

EVS-EN 60601-1-2:2015+A1:2021

INTRODUCTION

The need for establishing specific standards for BASIC SAFETY and ESSENTIAL PERFORMANCE with regard to ELECTROMAGNETIC DISTURBANCES for MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS is well recognized.

The requirements and tests specified by this collateral standard are generally applicable to MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS as defined in 3.63 and 3.64 in the general standard. For certain types of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS, these requirements might need to be modified by the special requirements of a particular standard. Writers of particular standards are encouraged to refer to Annex D for guidance in the application of this collateral standard.

MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS are expected to provide their BASIC SAFETY and ESSENTIAL PERFORMANCE without interfering with other equipment and systems in the ELECTROMAGNETIC ENVIRONMENTS in which they are intended by their MANUFACTURER to be used. The application of ELECTROMAGNETIC EMISSION standards is essential for the protection of:

- safety services;
- other MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS;
- non-ME EQUIPMENT (e.g. computers);
- telecommunications (e.g. radio/TV, telephone, radio-navigation).

Of even more importance, the application of ELECTROMAGNETIC IMMUNITY standards is essential to ensure safety of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS. To ensure safety, MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS are expected to provide their BASIC SAFETY and ESSENTIAL PERFORMANCE in the ELECTROMAGNETIC ENVIRONMENTS of INTENDED USE throughout their EXPECTED SERVICE LIFE.

This collateral standard specifies IMMUNITY TEST LEVELS for safety for ME EQUIPMENT and ME SYSTEMS intended by their MANUFACTURER for use in the professional healthcare facility environment or the HOME HEALTHCARE ENVIRONMENT. It recognizes that RF wireless communications equipment can no longer be prohibited from most PATIENT ENVIRONMENTS because in many cases it has become essential to the efficient provision of healthcare. This collateral standard also recognizes that, for certain SPECIAL ENVIRONMENTS, higher or lower IMMUNITY TEST LEVELS than those specified for the professional healthcare facility environment and the HOME HEALTHCARE ENVIRONMENT might be appropriate. This collateral standard provides guidance in determining appropriate IMMUNITY TEST LEVELS for SPECIAL ENVIRONMENTS.

The IMMUNITY TEST LEVELS specified for BASIC SAFETY and ESSENTIAL PERFORMANCE are based on the reasonably foreseeable maximum of the ELECTROMAGNETIC DISTURBANCE phenomena in the applicable environments of INTENDED USE.

Not all ELECTROMAGNETIC DISTURBANCE phenomena are covered by this collateral standard, as it is not practical to do so. MANUFACTURERS of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS need to address this during their RISK ASSESSMENT and evaluate if other ELECTROMAGNETIC DISTURBANCE phenomena could make their product unsafe. This evaluation should be based on the environments of INTENDED USE and the reasonably foreseeable maximum levels of ELECTROMAGNETIC DISTURBANCES expected throughout the EXPECTED SERVICE LIFE.

This collateral standard recognizes that the MANUFACTURER has the responsibility to design and perform VERIFICATION of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS to meet the requirements of this collateral standard and to disclose information to the RESPONSIBLE ORGANIZATION or OPERATOR so that the MEDICAL ELECTRICAL EQUIPMENT or MEDICAL ELECTRICAL SYSTEM will remain safe throughout its EXPECTED SERVICE LIFE.

This collateral standard provides guidance in incorporating considerations regarding ELECTROMAGNETIC DISTURBANCES into the RISK MANAGEMENT PROCESS.

This collateral standard is based on existing IEC standards prepared by subcommittee 62A, technical committee 77 (ELECTROMAGNETIC COMPATIBILITY between electrical equipment nork attee o. including networks), ISO (International standards organization), and CISPR (International special committee on radio interference).

EVS-EN 60601-1-2:2015+A1:2021

▲ INTRODUCTION TO AMENDMENT 1

The fourth edition of IEC 60601-1-2 was published in 2014. Since the publication of IEC 60601-1-2:2014, the IEC Subcommittee (SC) 62A Secretariat has been collecting issues from a variety of sources including comments from National Committees. At the November 2015 meeting of IEC/SC 62A in Kobe, Japan, the subcommittee initiated a process to identify high-priority issues that need to be considered in an amendment and should not wait until the fifth edition of IEC 60601-1-2, which is presently targeted for publication sometime after 2024.

Those issues selected for inclusion on the final "short list" to be addressed in Amendment 1 were those approved by a 2/3 majority of the National Committees present and voting at the Frankfurt meeting of SC 62A. At the meeting held on 10 October 2016, 15 items were presented to the National Committees present. All 15 items received the required 2/3 majority of the National Committees present and voting and have been included in the "short list" for consideration in preparing Amendment 1. All remaining issues have been placed on a "long list" for consideration in the fifth edition of IEC 60601-1-2.

The "short list" of issues was documented in the design specification for Amendment 1. MT 23 was directed to consider each issue described in Clause 6 of the design specification and develop an appropriate solution for the identified problem. That final solution in this amendment can encompass any technical solution proposed by the author of the issue or it can involve a different solution developed by the expert group. The expert group can also have recommended that no change to the standard was justified by the problem statement.

Because this is an amendment to IEC 60601-1-2:2014, the style in force at the time of publication of IEC 60601-1-2 has been applied to this amendment. The style specified in ISO/IEC Directives Part 2:2018 has only been applied when implementing the new style guidance would not result in additional editorial changes.

Users of this document should note that when constructing the dated references to specific elements in a standard, such as definitions, amendments are only referenced if they modified the text being cited. For example, if a reference is made to a definition that has not been modified by an amendment, then the reference to the amendment is not included in the dated reference.

MEDICAL ELECTRICAL EQUIPMENT -

- 13 -

Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests

1 Scope, object and related standards

1.1 * Scope

This International Standard applies to the BASIC SAFETY and ESSENTIAL PERFORMANCE of MEDICAL ELECTRICAL EQUIPMENT and MEDICAL ELECTRICAL SYSTEMS, hereafter referred to as ME EQUIPMENT and ME SYSTEMS.

This collateral standard applies to the BASIC SAFETY and ESSENTIAL PERFORMANCE of ME EQUIPMENT and ME SYSTEMS in the presence of ELECTROMAGNETIC DISTURBANCES and to ELECTROMAGNETIC DISTURBANCES emitted by ME EQUIPMENT and ME SYSTEMS.

BASIC SAFETY with regard to ELECTROMAGNETIC DISTURBANCES is applicable to all ME EQUIPMENT and ME SYSTEMS.

1.2 Object

The object of this collateral standard is to specify general requirements and tests for BASIC SAFETY and ESSENTIAL PERFORMANCE with regard to ELECTROMAGNETIC DISTURBANCES and for ELECTROMAGNETIC EMISSIONS of ME EQUIPMENT and ME SYSTEMS. They are in addition to the requirements of the general standard and serve as the basis for particular standards.

1.3 Related standards

1.3.1 IEC 60601-1

For ME EQUIPMENT and ME SYSTEMS, this collateral standard complements IEC 60601-1.

When referring to IEC 60601-1 or to this collateral standard, either individually or in combination, the following conventions are used:

- A "the general standard" designates IEC 60601-1 alone, including any amendments;
- "this collateral standard" designates IEC 60601-1-2 alone, including any amendments; A
- "this standard" designates the combination of the general standard and this collateral standard.

1.3.2 Particular standards

A requirement in a particular standard takes priority over the corresponding requirement in this collateral standard.

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.

EVS-EN 60601-1-2:2015+A1:2021

NOTE The way in which these referenced documents are cited in normative requirements determines the extent (in whole or in part) to which they apply.

A IEC 60601-1:2005, Medical electrical equipment – Part 1: General requirements for basic safety and essential performance Amendment 1:2012 Amendment 2:2020

IEC 60601-1-8:2006, Medical electrical equipment – Part 1-8: General requirements for basic safety and essential performance – Collateral Standard: General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems Amendment 1:2012 Amendment 2:2020

IEC 60601-1-11:2015, Medical electrical equipment – Part 1-11: General requirements for basic safety and essential performance – Collateral Standard: Requirements for medical electrical equipment and medical electrical systems used in the home healthcare environment Amendment 1:2020

IEC 60601-1-12:2014, Medical electrical equipment – Part 1-12: General requirements for basic safety and essential performance – Collateral Standard: Requirements for medical electrical equipment and medical electrical systems intended for use in the emergency medical services environment

Amendment 1:2020 (An

IEC 60601-2-2:2009, Medical electrical equipment – Part 2-2: Particular requirements for the basic safety and essential performance of high frequency surgical equipment and high frequency surgical accessories

IEC 60601-2-3:2012, Medical electrical equipment – Part 2-3: Particular requirements for the basic safety and essential performance of short-wave therapy equipment

IEC 61000-3-2:2005²⁾, Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase) Amendment 1:2008 Amendment 2:2009

IEC 61000-3-3:2013, Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current \leq 16 A per phase and not subject to conditional connection

IEC 61000-4-2:2008, Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test

IEC 61000-4-3:2006³⁾, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test* Amendment 1:2007 Amendment 2:2010

IEC 61000-4-4:2012, Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test

²⁾ There exists a consolidated edition 3.2, including IEC 61000-3-2:2005 and its Amendment 1:2008 and Amendment 2:2009.

³⁾ There exists a consolidated edition 3.2, including IEC 61000-4-3:2006 and its Amendment 1:2007 and Amendment 2:2010.

A IEC 61000-4-5:2014, Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test Amendment 1:2017 ▲

IEC 61000-4-6:2013, Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

IEC 61000-4-8:2009, Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test

► IEC 61000-4-11:2004, Electromagnetic compatibility (EMC) – Part 4-11: Testing and measuring techniques – Voltage dips, short interruptions and voltage variations immunity tests Amendment 1:2017

► IEC 61000-4-39:2017, Electromagnetic compatibility (EMC) – Part 4-39: Testing and measurement techniques – Radiated fields in close proximity – Immunity test

A) CISPR 11:2015, Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement Amendment 1:2016 Amendment 2:2019

CISPR 14-1:2016, Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission

CISPR 16-1-2:2014, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements Amendment 1:2017

CISPR 32:2015, Electromagnetic compatibility of multimedia equipment – Emission requirements (A)

A₁ deleted text (A₁

ISO 7637-2:2011, Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only

N ISO 14971:2019, Medical devices - Application of risk management to medical devices (A)

3 Terms and definitions

A) For the purposes of this document, the terms and definitions given in IEC 60601-1:2005 +A1:2012+A2:2020, IEC 60601-1-8:2006+A1:2012+A2:2020, IEC 60601-1-11:2015+A1:2020, IEC 60601-1-12:2014+A1:2020, IEC 60601-2-2:2009, IEC 60601-2-3:2012 and the following definitions apply. ▲

NOTE 1 Where the terms "voltage" and "current" are used in this document, they mean the r.m.s. values of an alternating, direct or composite voltage or current unless stated otherwise.

NOTE 2 The term "electrical equipment" is used to mean ME EQUIPMENT or other electrical equipment. This collateral standard also uses the term "equipment" to mean ME EQUIPMENT or other electrical or non-electrical equipment in the context of an ME SYSTEM.

NOTE 3 An index of defined terms is found beginning on page 109.