

IEC TS 60825-20

Edition 1.0 2025-09

TECHNICAL SPECIFICATION

Safety of laser products - Teh Standards
Part 20: Safety requirements for products intentionally exposing face or eyes to laser radiation (https://standards.iteh.al)

Document Preview

IEC TS 60825-20:2025

https://standards.iteh.ai/catalog/standards/iec/98c7913b-6902-44a7-a9da-f87bfc96d1a0/iec-ts-60825-20-202

ICS 13.110; 31.260 ISBN 978-2-8327-0718-0



THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2025 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 Secretariat Tel.: +41 22 919 02 11

3, rue de Varembé info@iec.ch CH-1211 Geneva 20 www.iec.ch

Switzerland

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 It also gives information on projects, replaced and withdrawn publications.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/justpublishedStay 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.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Preview

IEC TS 60825-20:2025

https://standards.iteh.ai/catalog/standards/iec/98c7913b-6902-44a7-a9da-f87bfc96d1a0/iec-ts-60825-20-2025

IEC TS 60825-20:2025 © IEC 2025

CONTENTS

F	OREWOR	D	4
IN	ITRODUC	CTION	6
1	Scope		7
2	•	tive references	
3		, definitions and abbreviated terms	
Ū		Ferms and definitions	
	3.1.1	FMEA-related terms and definitions	
	3.1.2	Miscellaneous terms and definitions	
		Abbreviated terms	
4		arison against IEC 60825-1:2014	
•	•	Determination of the accessible emission level and product classification	
		Description of the classes and potentially associated hazards	
5		ng	
		-	
6		nalysis and risk management process (design)	
		General	
		Perform risk analysis	
	6.2.1	General	
	6.2.2	Step 1: Intended use	
	6.2.3 6.2.4	Step 2: Identification and analysis of known or foreseeable hazards	
	6.2.4	Step 3: Risk estimation	
	6.2.5 6.2.6	Step 4: Determination of the necessity for risk reduction Step 5: Options for risk reduction methods	
	6.2.7	Step 6: Determination of risk reducibility	
	6.2.8	Step 7: Implementation, verification, and documentation of controls	
	6.2.9	Step 8: Evaluation of new failure modes leading to potentially excessive	10
		omiggione due to rick control maggire 444	17
	6.2.10	emissions due to risk control measure 2022 Step 9: Final risk category 2022-4447-49da-187bfc96d140/iec-ts-6	0825-20-2
	6.2.11	Step 10: Documentation of risk analysis	
Αı	nnex A (n	ormative)Risk process overview chart	
	•	oformative) Examples of energy sources leading to internal failure modes	
	`	nformative) Sample risk analysis FMEA	
,		General	
		Example 1.1 from Annex F (Transients)	
	C.2.1	Overview	
	C.2.1	Initiating event or cause of failure (Step 2)	
	C.2.3	Component or description or function (Step 2)	
	C.2.4	Potential failure mode or failure mechanism (Step 2)	
	C.2.5	Potential failure effect (Step 2)	
	C.2.6	Potential harm (Step 2)	
	C.2.7	Potential failure cause (Step 2)	
	C.2.8	Current controls or current prevention controls (Step 2)	
	C.2.9	Severity (Step 3)	
	C.2.10	• • • •	
	C.2.11	(1)	
	C.2.12		
	C.2.13	, ,	
	_	1 /	

IEC TS 60825-20:2025 © IEC 2025

C.2.14	Final risk category (Step 9)	24
C.3 Exa	mple 2.2 from Annex F (Laser diffusing optic failure)	24
C.3.1	Overview	24
C.3.2	Initiating event or cause of failure (Step 2)	24
C.3.3	Component or description or function (Step 2)	24
C.3.4	Potential failure mode or failure mechanism (Step 2)	24
C.3.5	Potential failure effect (Step 2)	24
C.3.6	Potential harm (Step 2)	24
C.3.7	Potential failure cause (Step 2)	25
C.3.8	Current controls or current prevention controls (Step 2)	25
C.3.9	Severity (Step 3)	25
C.3.10	Occurrence (Step 3)	25
C.3.11	Initial risk category (Step 4)	25
C.3.12	Actions recommended (Steps 5 and Step 6)	25
C.3.13	Actions taken (Step 7 and Step 8)	26
C.3.14	Final risk category (Step 9)	26
C.4 Exa	mple 4.1 from Annex F (Software failure)	26
C.4.1	Overview	26
C.4.2	Initiating event or cause of failure (Step 2)	26
C.4.3	Component or description or function (Step 2)	26
C.4.4	Potential failure mode or failure mechanism (Step 2)	26
C.4.5	Potential failure effect (Step 2)	26
C.4.6	Potential harm (Step 2):	26
C.4.7	Potential failure cause (Step 2):	27
C.4.8	Current controls or current prevention controls (Step 2)	27
C.4.9	Severity (Step 3)	27
C.4.10	Occurrence (Step 3)	27
C.4.11	Initial risk category (Step 4)	27
https://standG.4.12eh.a	Actions recommended (Step 5 and Step 6)	9-6082.270- 202
C.4.13	Actions taken (Step 7 and Step 8)	27
C.4.14	Final risk category (Step 9)	28
C.5 Exa	mple 5.1 from Annex F (Mirror and safety software failures)	28
C.5.1	Overview	28
C.5.2	Initiating event or cause of failure (Step 2)	28
C.5.3	Component or description or function (Step 2)	28
C.5.4	Potential failure mode or failure mechanism (Step 2)	28
C.5.5	Potential failure effects (Step 2)	28
C.5.6	Potential harm (Step 2)	29
C.5.7	Potential failure cause (Step 2)	29
C.5.8	Current controls or current prevention controls (Step 2)	29
C.5.9	Severity (Step 3)	29
C.5.10	Occurrence (Step 3)	
C.5.11	Initial risk category (Step 4)	30
C.5.12	Actions recommended (Step 5 and Step 6)	30
C.5.13	Actions taken (Step 7 and 8)	30
C.5.14	Final risk category (Step 9)	30
Annex D (infor	rmative) Manufacturing process FMEA	31
Annex E (infor	rmative) Emission limits for extended direct exposure of human eyes	33

IEC TS 60825-20:2025 © IEC 2025

E.1 IE	C 60825-1 emission limits for $t > 1000 \text{ s}$ – General information and	
ba	ckground	33
E.1.1	General	33
E.1.2	Visible wavelength AELs	33
E.1.3	Ultraviolet and infrared AELs	33
E.2 La	ser beams directed intentionally at the human face	34
E.2.1	Current applications	34
E.2.2	Historical record	34
E.2.3	Comparison with lamp AELs	35
E.3 Lir	mits to protect the retina – the biological bases	35
E.4 Ar	terior segment – lens and cornea	36
E.5 Ex	posure acceptability during fault conditions	36
E.6 Co	onclusion	37
Annex F (info	ormative) Risk analysis FMEA worksheet example	38
Annex G (inf	ormative) Future product changes	41
Bibliography		42
Figure A.1 –	Steps for the risk process flow	19
Table 1 – Se	verity levels of harm classification (refer to Annex E)	14
Table 2 – Oc	currence levels	15
Table 3 – Ris	sk prioritization (SxO) matrix	15
	Examples of external energy factors	
	Examples of resulting failure modes	
Table F 1 _ F	Risk analysis FMEA worksheet example	30
1 4 D D D D D D D D	TION GITGIFOLD I IVILA WOLKSHOOL GAGIIIDIG	

IEC TS 60825-20:2025

https://standards.iteh.ai/catalog/standards/iec/98c7913b-6902-44a7-a9da-f87bfc96d1a0/iec-ts-60825-20-2025

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Safety of laser products -Part 20: Safety requirements for products intentionally exposing face or eyes to laser radiation

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.
- 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 60825-20 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment. It is a Technical Specification.

This Technical Specification is to be used in conjunction with IEC 60825-1:2014.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
76/766/DTS	76/776/RVDTS

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

The language used for the development of this Technical Specification is English.