

Safety of laser products —

Part 5: Manufacturer's checklist for IEC 60825-1

ICS 31.260

National foreword

This Published Document reproduces verbatim IEC TR 60825-5:2003. It supersedes BS IEC TR 60825-5:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/76, Optical radiation safety and laser equipment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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TECHNICAL REPORT

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Safety of laser products –

Part 5: Manufacturer's checklist for IEC 60825-1

Sécurité des appareils à laser –

Partie 5: Liste de contrôle du fabricant relative à la CEI 60825-1

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF LASER PRODUCTS –

Part 5: Manufacturer's checklist for IEC 60825-1

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 60825-5, which is a technical report, has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

This second edition of IEC 60825-5 cancels and replaces the first edition published in 1998 and constitutes a technical revision.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
76/244/DTR	76/262/RVC

Full information on the voting for the approval of this technical report 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.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

SAFETY OF LASER PRODUCTS –

Part 5: Manufacturer's checklist for IEC 60825-1

SECTION ONE – GENERAL

NOTE Numbers shown in parenthesis refer to the relevant clause in IEC 60825-1.

1 Scope (1.1)

This technical report is applicable to laser products as described in IEC 60825-1.

2 Object (1.2)

The checklist is intended for use by manufacturers of laser products and their agents to establish that each new or modified design complies with the requirements of IEC 60825-1: 1993 and its amendments 1 and 2. The checklist is not a substitute for IEC 60825-1. It is necessary to use IEC 60825-1 in conjunction with the checklist, as relevant clauses and subclauses are referred to in the text.

The layout of the checklist is intended only as a guide. Manufacturers and examiners are encouraged to produce their own document, omitting questions and clauses that are not relevant to the types of product under examination, but noting in the appropriate positions the numbers of such clauses stating, for example: "subclause 4.3.2: Question omitted – not applicable".

The manufacturer should ensure that the examiner is a person competent in the inspection and classification of laser products.

3 Normative references

The following referenced documents are indispensable for the application 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 60825-1:1993, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide* ¹⁾
Amendment 1 (1997)
Amendment 2 (2001)

4 Definitions

The definitions of IEC 60825-1 apply.

Throughout this document, the abbreviation N.A, means "not applicable".

¹⁾ A consolidated edition of IEC 60825-1 exists consisting of edition 1 (1993) and its Amendments 1 (1997) and 2 (2001).

5 Identification

5.1 Details of examiner

Identification of the person responsible for examining and classifying the product under inspection:

Name: _____ Position: _____
print full name print full title

If the above named person is not an employee of the manufacturer of the laser product to be examined, state the details of the examiner's employer or organization:

Organization:

Address:

5.2 Laser product

Details of product to be inspected:

5.2.1 Is the product a component intended to be incorporated in another laser product ? YES/NO

Manufacturer:

Address:

Name and/or model number of laser product:

Serial number of laser product:

Date of manufacture (if known): _____ Date of examination: _____

SECTION TWO – MANUFACTURING REQUIREMENTS

NOTE 1 Numbers shown in parenthesis and italics refer to the relevant clause in IEC 60825-1.

NOTE 2 Where a YES or NO answer is shown in this text as underlined, failure to give that answer, if applicable for this product, implies failure to comply with the requirements of IEC 60825-1 and corrective action will be required by the manufacturer or his agent if compliance is to be achieved.

NOTE 3 If additional information is available to support answers given, write ENCL. in the right hand column and attach the information to the back of the checklist, referencing the relevant clause in the checklist.

NOTE 4 If a question is not applicable to the laser product being examined, select N/A in the right hand column

6 Tests

6.1 Measurements for determining classification

6.1.1 Have measurements of laser radiation been carried out in accordance with the requirements of Clause 9 of IEC 60825-1? YES/NO/
N.A.

6.1.2 If NO, have measurements been deemed unnecessary by virtue of the physical characteristics and limitations of the laser source, so that the laser product is placed clearly in a particular class according to Clause 9 of IEC 60825-1? YES/NO/
N.A.

- *If NO, measurements for the determination of classification are required and shall be carried out in accordance with the requirements of Clause 9 of IEC 60825-1 before proceeding further. See Annex A of this technical report for guidance.*

6.1.3 If YES to either 6.1.1 or 6.1.2, state the following:

- wavelength or wavelength range of accessible laser radiation:
- maximum level of accessible laser radiation:

7 Classification

7.1 Classification procedure

See Annex A

State the class assigned to the laser product: _____

7.1.1 Are the measurement results enclosed ? YES/NO/
N.A.

7.1.2 Are calculations of the accessible emission limit(s) (AEL) enclosed ? YES/NO/
N.A.

8 Labelling for laser radiation (5)

- 8.0.1** For all labels for light emitting diodes, is the word "laser" replaced by "LED"? YES/NO/
N.A.
- 8.0.2** For output of the laser outside the visible range of 400 nm – 700 nm wavelength, are the words "laser radiation" replaced by "invisible laser radiation" ? YES/NO/
N.A.
- 8.0.3** For output of the laser both inside and outside the visible range of 400 nm – 700 nm wavelength, are the words "laser radiation" substituted by "visible and invisible laser radiation" ? YES/NO/
N.A.
- 8.0.4** For a product classified on the basis of the level of visible laser radiation and which also emits in excess of the AEL of Class 1 at invisible wavelengths, does the label include the words "visible and invisible laser radiation" in lieu of "laser radiation" ? YES/NO/
N.A.
- 8.0.5** Are all required labels permanently affixed? YES/NO/
N.A.
- 8.0.6** Are labels legible and clearly visible during operation, maintenance or service, according to their purpose ? YES/NO/
N.A.
- 8.0.7** Are all required labels positioned so that they can be read without the necessity for human exposure to laser radiation in excess of the AEL for Class 1 ? YES/NO/
N.A.
- 8.0.8** Are labels with black text on a yellow background, except for Class 1 where this colour combination need not be used ? YES/NO/
N.A.

NOTE 1 The words "laser light" on explanatory labels may be substituted for "laser radiation" if the output of the laser is in the visible range of 400 nm – 700 nm wavelength.

NOTE 2 If the size or design of the product makes labelling impractical, the labels should be included with the user information or the package

8.1 Class 1 laser products

- 8.1.1** Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product or included in the information for the user?

CLASS 1 LASER PRODUCT

YES/NO/N.A.

NOTE The colour combination of black/yellow is optional for this label.

8.2 Class 1M laser products

- 8.2.1** Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product or included in the information for the user?

LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 1M LASER PRODUCT

YES/NO/N.A.

(See 8.8 for additional requirements for this label.)

NOTE The type of optical instruments which could result in an increased hazard may be added in parenthesis after the word "instruments".

8.3 Class 2 laser products

8.3.1 Is a warning label affixed to the product (IEC 60825-1, Figure 14)? YES/NO/N.A.

8.3.2 Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product?

LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

YES/NO/N.A.

(See 8.8 for additional requirements for this label.)

8.4 Class 2M laser products

8.4.1 Is a warning label affixed to the product (IEC 60825-1, Figure 14)? YES/NO/N.A.

8.4.2 Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product?

LASER RADIATION

DO NOT STARE INTO THE BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 2M LASER PRODUCT

YES/NO/N.A.

(See 8.8 for additional requirements for this label.)

NOTE The type of optical instruments which could result in an increased hazard may be added in parenthesis after the word "instrument".

8.5 Class 3R laser products

8.5.1 Is a warning label affixed to the product (IEC 60825-1, Figure 14)? YES/NO/N.A.

8.5.2 Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product:

LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT

YES/NO/N.A.

for products in the wavelength range from 400 nm to 1400 nm, or

LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3R LASER PRODUCT

for other wavelengths?

(See 8.8 for additional requirements for this label.)

- 8.5.3** An aperture warning label shall be affixed on Class 3R laser products close to each laser aperture through which laser radiation in excess of the AEL for Class 1 or Class 2 is emitted. The label should bear the words:

LASER APERTURE

or the words:

AVOID EXPOSURE – LASER RADIATION IS EMITTED
FROM THIS APERTURE

Aperture warning label(s) affixed? YES/NO/N.A.

8.6 Class 3B laser products

- 8.6.1** Is a warning label affixed to the product (IEC 60825-1, Figure 14)? YES/NO/N.A.

- 8.6.2** Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product?

LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT

YES/NO/N.A.

(See 8.8 for additional requirements for this label.)

- 8.6.3** An aperture warning label shall be affixed on Class 3B laser products close to each laser aperture through which laser radiation in excess of the AEL for Class 1 or Class 2 is emitted. The label should bear the words:

LASER APERTURE

or the words:

AVOID EXPOSURE – LASER RADIATION IS EMITTED
FROM THIS APERTURE

Aperture warning label(s) affixed? YES/NO/N.A.

8.7 Class 4 laser products

- 8.7.1** Is a warning label affixed to the product (IEC 60825-1, Figure 14)? YES/NO/N.A.

- 8.7.2** Is the following explanatory label (IEC 60825-1, Figure 15) affixed to the product?

LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT

YES/NO/N.A.

(See 8.8 for additional requirements for this label.)

- 8.7.3** An aperture warning label shall be affixed on Class 4 laser products close to each laser aperture through which laser radiation in excess of the AEL for Class 1 or Class 2 is emitted. The label should bear the words:

LASER APERTURE

or the words:

AVOID EXPOSURE – LASER RADIATION
IS EMITTED FROM THIS APERTURE

Aperture warning label(s) affixed? YES/NO/N.A.

8.8 Radiation output and standards information (5.8)

- 8.8.1** If the laser product is in Class 1M, Class 2, Class 2M, Class 3R, Class 3B or Class 4, does the explanatory label include statements of:

- the maximum output of laser radiation? YES/NO/N.A.
- the pulse duration (if appropriate)? YES/NO/N.A.
- the emitted wavelength(s)? YES/NO/N.A.
- for all laser classes, the name and publication date of the standard to which the laser product was classified (may be included elsewhere on the laser product, close to the explanatory label)? YES/NO/N.A.

Is this information included on the explanatory label? YES/NO/N.A.

For Classes 1 and 1M, if NO, is this information included in the user manual if not provided in the explanatory label? YES/NO/N.A.

9 Engineering specifications

9.1 Protective housing (4.2)

- 9.1.1** Does the laser product have a protective housing which, when in place, apart from laser apertures, prevents human access to laser radiation in excess of Class 1, except where human access is necessary for the performance of the functions of the product? YES/NO/N.A.
(3.36 and 4.2.1)

The laser product cannot be certified to comply with the requirements of IEC 60825-1 unless all deficiencies are corrected.

- 9.1.2** Is a removable laser product included within the protective housing? (4.2.3) YES/NO

– If NO:

Answer questions below as appropriate to the laser classification.

- If YES:

Can the laser product be removed from the protective housing and operated without modification? YES/NO/N.A.

- If NO, answer questions below as appropriate to the laser class assigned to the complete system.
- If YES, the removable laser product shall comply with the requirements of Clauses 4 and 5 of IEC 60825-1 appropriate to its class and should additionally be inspected according to the appropriate questions in this checklist.

9.2 Access panels and safety interlocks (4.2 and 4.3)

9.2.1 Are all non-interlocked panels which are intended for removal or displacement for service and which would allow access to laser radiation in excess of the AEL assigned, secured in such a way that removal or displacement requires the use of tools? (4.2.2) YES/NO/N.A.

NOTE The labels described in 9.2.2 and 9.2.6 below shall be subject to the same wording changes as described in the notes to Clause 8 as appropriate for LED and visible and/or invisible radiation products.

9.2.2 Is each non-interlocked panel or connection, which would allow access to laser radiation in excess of the AEL of Class 1 when removed or displaced, fitted with a label bearing the following words? (5.9.1): YES/NO/N.A.

- For accessible radiation not exceeding the AEL for Class 1M where the level of radiation is measured according to 9.2 g) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 1M LASER RADIATION WHEN OPEN
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

- For accessible radiation not exceeding the AEL for Class 2 where the level of radiation is measured according to 9.2 h) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 2 LASER RADIATION WHEN OPEN
DO NOT STARE INTO BEAM

- For accessible radiation not exceeding the AEL for Class 2M, where the level of radiation is measured according to 9.2 h) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 2M LASER RADIATION WHEN OPEN
DO NOT STARE INTO BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS

- For accessible radiation not exceeding the AEL for Class 3R, if the accessible radiation is in the wavelength range from 400 nm to 1 400 nm: YES/NO/N.A.

CAUTION – CLASS 3R LASER RADIATION WHEN OPEN
AVOID DIRECT EYE EXPOSURE

- For accessible radiation not exceeding the AEL for Class 3R, if the accessible radiation is outside the wavelength range from 400 nm to 1 400 nm; YES/NO/N.A.

CAUTION – CLASS 3R LASER RADIATION WHEN OPEN
AVOID EXPOSURE TO BEAM

- For accessible radiation not exceeding the AEL for Class 3B: YES/NO/N.A.

CAUTION – CLASS 3B LASER RADIATION WHEN OPEN
AVOID EXPOSURE TO THE BEAM

- For accessible radiation exceeding the limits for Class 3B at any wavelength:

CAUTION – CLASS 4 LASER RADIATION WHEN OPEN
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

Correct label(s) fitted? YES/NO/N.A.

- 9.2.3** Are all panels, which are intended for removal or displacement in order to gain access during maintenance or operation, interlocked to prevent human access to interior laser radiation as indicated in the table below? (4.3.1) YES/NO/N.A.

Product Class	Interlock required when accessible emission is of the following class or higher
1, 1M	3R
2, 2M	3R
3R	3B
3B	3B
4	3B

Relevant panels interlocked? YES/NO/N.A.

- 9.2.4** Does the removal of the panel result in emission through the opening not higher than AEL for Laser Class 1M or Class 2M as applicable according to the wavelength ? YES/NO/N.A.

- 9.2.5** Where interlocked panels are removable, is the safety interlock of a design which ensures that the accessible laser radiation falls below that of the assigned class, or below the limits specified in 4.3.1b) of IEC 60825-1 before removal is possible? (4.3.1) YES/NO/N.A.

- 9.2.6** Is inadvertent resetting of any interlock of a removable panel possible, so that laser radiation is restored above that of the AEL of the assigned class, or above the limits assigned in the table in 9.2.3? (4.3.1) YES/NO/N.A.

- 9.2.7** If an interlock override system is provided (4.3.2):
- Are safe working instructions provided? YES/NO/N.A.
 - Is it possible to leave the override system in operation when the access panel is returned to its normal position? YES/NO/N.A.
 - Is an interlock override warning visible or audible whenever the override is in operation and the laser is energized or its capacitor banks are not fully discharged, whether or not an interlocked panel is removed or displaced? YES/NO/N.A.
 - Are visible warnings clearly visible through protective eyewear specifically designed or specified for the wavelength(s) of the accessible laser radiation? YES/NO/N.A.
 - Is a warning label clearly associated with each interlocked opening, as follows, and visible prior to and during interlock override? (5.9.2)
 - For accessible radiation not exceeding the AEL for Class 1M where the level of radiation is measured according to 9.2 g) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 1M LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
 - For accessible radiation not exceeding the AEL for Class 2 where the level of radiation is measured according to 9.2 h) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 2 LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
DO NOT STARE INTO BEAM
 - For accessible radiation not exceeding the AEL for Class 2M, where the level of radiation is measured according to 9.2 h) and 9.3 of IEC 60825-1: YES/NO/N.A.

CAUTION – CLASS 2M LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
DO NOT STARE INTO BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS
 - For accessible radiation not exceeding the AEL for Class 3R and in the wavelength range from 400 nm to 1 400 nm : YES/NO/N.A.

CAUTION – CLASS 3R LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
AVOID DIRECT EYE EXPOSURE
 - For accessible radiation not exceeding the AEL for Class 3R and outside the wavelength range from 400 nm to 1 400 nm : YES/NO/N.A.

CAUTION – CLASS 3R LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
AVOID EXPOSURE TO THE BEAM

- For accessible radiation not exceeding the AEL for Class 3B: YES/NO/N.A.

CAUTION – CLASS 3B LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
AVOID EXPOSURE TO BEAM

- For accessible radiation exceeding the limits for Class 3B at any wavelength:

CAUTION – CLASS 4 LASER RADIATION WHEN OPEN
AND INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

Correct label(s) fitted? YES/NO/N.A.

9.3 Remote interlock connector (4.4)

9.3.1 If the laser product is in one of the following classes:

- Class 3B
- Class 4

is a remote interlock connector provided? YES/NO/N.A.

- When the terminals are open circuited, will this prevent access to laser radiation in excess of the AEL for Class 1M or Class 2M according to the wavelength? YES/NO/N.A.

9.4 Key Control (4.5)

9.4.1 If the laser product is in one of the following classes:

- Class 3B
- Class 4

is a key control provided? YES/NO/N.A.

9.4.2 If a key control is provided:

is the key removable? YES/NO/N.A.

is laser radiation accessible when the key is removed? YES/NO/N.A.

State the form that the key takes (e.g. conventional key, cipher combination, magnetic card, etc.):

9.5 Laser radiation emission warning (4.6)**9.5.1** If the laser product is in one of the following classes:

- Class 3R, the wavelength range below 400 nm and above 700 nm,
- Class 3B,
- Class 4,

is an audible or visible warning device provided? YES/NO/N.A.

is the warning device fail-safe or redundant? YES/NO/N.A.

- If a visible warning is provided, is it clearly visible through protective eyewear specifically designed or specified for the wavelength(s) of the emitted laser radiation? YES/NO/N.A.
- Are visible warning devices located so that viewing does not require exposure to laser radiation in excess of the AEL for Class 1M or Class 2M? YES/NO/N.A.
- Can operational controls be separated by 2 m or more from a radiation emission warning device? YES/NO/N.A.
- If YES, are the operational controls provided with audible or visible warning devices? YES/NO/N.A.
- Can the laser aperture be separated by 2 m or more from a radiation emission warning device? YES/NO/N.A.
- If YES, is the laser aperture provided with an audible or visible warning device? YES/NO/N.A.
- Where more than one output aperture is provided, does a visible warning device located at each aperture clearly indicate through which aperture(s) laser emission can occur? YES/NO/N.A.

9.6 Beam stop or attenuator (4.7)**9.6.1** If the laser product is in one of the following classes:

- Class 3B
- Class 4

is permanently attached beam stop or attenuator provided? YES/NO/N.A.

- Is the beam stop or attenuator capable of preventing access to laser radiation in excess of the AEL for Class 1M or 2M? YES/NO/N.A.

9.7 Controls (4.8)

- 9.7.1** Are the controls for the laser product located so that adjustment and operation do not require exposure to laser radiation of Class 3R, Class 3B or 4? YES/NO/N.A.

9.8 Viewing optics (4.9)

- 9.8.1** If viewing optics, viewport or display screens are provided, is attenuation of laser radiation sufficient to prevent human access in excess of the AEL for Class 1M? YES/NO/N.A.

- 9.8.2** If a shutter or variable attenuator is incorporated in the viewing optics, viewport or display screen:

– are means provided to prevent human access to laser radiation in excess of the AEL for Class 1M when the shutter is open or the attenuation is varied? YES/NO/N.A.

– is the shutter prevented from opening or is the attenuator prevented from variation when exposure to laser radiation is possible in excess of the AEL for Class 1M? YES/NO/N.A.

9.9 Scanning safeguard (4.10)

- 9.9.1** Does the laser product include means of scanning the emitted laser radiation? YES/NO/N.A.

– If YES, has the laser product been classified on this basis? YES/NO/N.A.

– If YES, is human access to laser radiation in excess of the AEL for the assigned class prevented if there is a scan failure or if there is unscheduled variation in either scan velocity or amplitude? YES/NO/N.A.

9.10 Alignment aids (4.11)

- 9.10.1** Is a safe means provided for the alignment of beam path components where this is required as part of the routine maintenance? YES/NO/N.A.

9.11 "Walk-in" access (4.12)

- 9.11.1** If the protective housing is equipped with access panels which provide "walk-in" access:

– Are means provided so that any person inside the housing can prevent activation of the laser of Class 3B or 4 ? YES/NO/N.A.

– Is an emission warning device located so as to provide adequate warning to any person who might be within the housing of emission of laser radiation in excess of the AEL for Class Class 3R, the wavelength range below 400 nm and above 700 nm, 3B or 4. YES/NO/N.A.

9.12 Environmental considerations (4.13)

9.12.1 Does the laser product meet the safety requirements defined in IEC 60825-1 or any relevant product safety standard under all expected operating conditions appropriate for the intended use of the product, including:

- Climatic conditions (e.g. temperature, relative humidity)? YES/NO/N.A.
- Vibration and shock? YES/NO/N.A.

9.13 Protection against other hazards (4.14)

9.13.1 Are the requirements of relevant product safety standards fulfilled during normal operation and in the event of a single fault for the following:

- Electrical hazards? YES/NO/N.A.
- Excessive temperature? YES/NO/N.A.
- Spread of fire from the equipment? YES/NO/N.A.
- Sound and ultrasonics? YES/NO/N.A.
- Harmful substances? YES/NO/N.A.
- Explosion? YES/NO/N.A.

9.13.2 Does the protective housing protect against human access to the hazards of collateral radiation (e.g. UV, visible, IR)? YES/NO/N.A.

- If NO, has the radiation been evaluated and found not to be above the permitted MPE level(s)? YES/NO/N.A.

10 Other informational requirements**10.1 Information for the user (6.1)**

10.1.1 Is an operation manual, or are user instructions supplied with the laser product? YES/NO/N.A.

- If NO, state the name of the person/company who will provide the manual/instructions:

This person/company shall be asked to provide answers to the remaining questions of 10.1 and 10.2, as appropriate.

- If YES, inspect the manual/instructions and answer the following questions:

This requirement is implied in 6.1 of IEC 60825-1.

- 10.1.2** Are adequate instructions included:
- for proper assembly of the product? YES/NO/N.A.
 - for proper maintenance of the product? YES/NO/N.A.
 - for the safe use of the product, including clear warnings concerning precautions to avoid possible exposure to hazardous laser radiation? YES/NO/N.A.
- 10.1.3** For Class 1M and 2M laser products, are adequate instructions included:
- for diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard ? YES/NO/N.A.
 - for collimated beams, this warning shall state that viewing the laser output with certain optical instruments designed for use at a distance (for example, telescopes or binoculars) may pose an eye hazard ? YES/NO/N.A.
- 10.1.4** Statements should be provided, in appropriate units, for the following characteristics of the laser output.
- Write the stated values in the spaces below:
- Beam divergence of collimated beams: _____
 - Pulse duration: _____
 - Maximum output: _____
- Has allowance been made in the above stated values to the magnitudes of the cumulative measurement uncertainty and any expected increase in the measured quantities at any time after manufacture? YES/NO/N.A.
- Duration of pulses resulting from unintentional mode-locking need not be specified; however, those conditions associated with the product known to result in unintentional mode-locking shall be specified.*
- 10.1.5** Are legible reproductions (colour optional) of all required labels included in the manual/instructions? YES/NO/N.A.
- Is the corresponding position of each label on the product indicated: YES/NO/N.A.
- If NO:
- are the labels provided with the product but not affixed? YES/NO/N.A.

- is a statement made in the information that the labels have been provided separately, including a description of the form and manner in which they have been provided? YES/NO/N.A.
- 10.1.6** Is information provided in the operation manual/user instructions indicating the positions of all laser apertures? YES/NO/N.A.
- 10.1.7** Does the operation manual/user instructions include a listing of:
- the controls? YES/NO/N.A.
 - the adjustments? YES/NO/N.A.
 - procedures for operation? YES/NO/N.A.
 - procedures for maintenance? YES/NO/N.A.
- 10.1.8** Does the operation manual/user instructions include the following statement:
- "CAUTION – USE OF CONTROLS OR ADJUSTMENTS OR
PERFORMANCE OF PROCEDURES OTHER THAN THOSE
SPECIFIED HEREIN MAY RESULT IN HAZARDOUS
RADIATION EXPOSURE"
- YES/NO/N.A.
- 10.1.9** Is the laser energy source necessary for laser emission included in the laser product? YES/NO/N.A.
- If NO, does the operation manual/user instructions include a statement of the compatibility requirements for a laser energy source in order to ensure safety. YES/NO/N.A.
- 10.1.10** For embedded laser products and other incorporated laser products, is similar information to the above provided to describe the incorporated laser, including appropriate safety instructions to avoid inadvertent exposure to hazardous laser radiation? YES/NO/N.A.
- 10.2 Purchasing and service information (6.2)**
- 10.2.1** Is the safety classification of the laser product and any warning required by 10.1.3 stated in all:
- catalogues? YES/NO/N.A.
 - specification sheets? YES/NO/N.A.
 - descriptive brochures? YES/NO/N.A.
- 10.2.2** Are adequate instructions provided to servicing dealers, distributors, and to others upon request, for service adjustments and procedures as follows?

- clear warnings and precautions to be taken to avoid possible exposure to laser radiation and other hazards? YES/NO/N.A.
- a schedule of maintenance necessary to keep the product in compliance? YES/NO/N.A.
- a listing of controls and procedures which could be utilised by persons other than the manufacturer or his agents to increase accessible emission levels of radiation? YES/NO/N.A.
- a description of the location of displaceable portions of the protective housing which could allow access to laser radiation in excess of the accessible limits in Tables 1, 2, 3 and 4 of IEC 60825-1? YES/NO/N.A.
- protective procedures for service personnel? YES/NO/N.A.
- legible reproductions (colour optional) of the required labels and hazard warnings? YES/NO/N.A.

Annex A (normative)

Classification procedure

NOTE This procedure is given as an interim guide to aid the assessment of classification. Work currently under way in IEC TC76 WG3 is expected to supersede this annex.

Test measurements and the classification of laser products are described in Clauses 8 and 9 of IEC 60825-1. The following is provided as a step-by-step guide to these requirements.

The laser classification procedure can be carried out as follows:

Subclause 9.1 of IEC 60825-1 states that tests shall be carried out during operation of the laser product, and under each and every reasonably foreseeable single fault condition.

- a) Read 9.2 and 9.3 of IEC 60825-1 to establish conditions under which measurements should be made.
 - 1) Assume a trial class (e.g. Class 1).
 - 2) Determine the emission wavelength(s).
 - 3) Determine the appropriate timebase for the product (8.4 e) of IEC 60825-1).
 - 4) Assess the angular subtense of the source (8.3 c) and 8.3 d) of IEC 60825-1).
 - 5) Obtain data on the emission time profile (pulse repetition rate, pulse length, peak power, etc.).
 - 6) Determine the measurement aperture and measurement distance (9.3 a) and b) of IEC 60825-1).
 - 7) Determine the position of the apparent source. This is necessary in order to place the measurement aperture at the required measurement distance.
 - 8) Obtain data on the beam spatial profile at the required measurement distance. This is required to determine the most restrictive point and to calculate the radiation passing through the measurement aperture.
- b) Calculate the trial AEL (e.g. AEL for Class 1) using Tables 1 to 4 in IEC 60825-1. (C_1 to C_7 , T_1 and T_2 are calculated using the notes to Tables 1 to 4).

For multiple wavelengths, relevant parameters must be obtained for each separate wavelength.

NOTE 1 If the wavelengths are additive (IEC 60825-1, table 5), conformance is calculated by adding partial fractions of AEL (8.4 b) of IEC 60825-1).

NOTE 2 If the wavelengths are not additive, they must be treated independently.

- c) Check conformity by calculation for all additive wavelengths, if reasonably possible.
- d) Check conformity by measurement for all additive wavelengths, if necessary. This is definitive (9.2 and 9.3 of IEC 60825-1).
- e) Check as necessary for all multiple pulse conditions (8.4 f) of IEC 60825-1).
- f) Iterate as necessary if multiple sources are present (8.4 d) of EC 60825-1).
- h) Repeat as necessary by changing the trial class to achieve conformity.
- i) Repeat for each wavelength.

Annex B
(informative)

Arrangement of the checklist – rationale

IEC 60825-1, Section Two: Manufacturing requirements is arranged in a sequence which, while logical from the point of view of the information retrieval, does not make straightforward reading for a design review or for an inspector. The equivalent section of the checklist has therefore been arranged to take this into account:

Checklist Section Two	IEC 60825-1 Section Two
Tests	Engineering specifications
Classification	Labelling
Classification labelling	Other informational requirements
Engineering specifications	Additional requirements for specific laser products
Panel labelling	Classification
Other informational requirements	Measurements for classification

The inspector or examiner is able to follow the checklist in sequence to make the necessary measurements for classification, to classify the product, assess the engineering requirements for the particular class, including the relevant labelling for laser radiation warnings and the protective housing, consider any additional requirements for specific product categories, and check the manuals and any other information supplied for safety-related information.

No account has been taken of particular requirements for electrical, mechanical or other areas of safety not directly covered by IEC 60825-1. The relevant IEC standards should be consulted in each case, and some of these have been referred to in the text of IEC 60825-1.

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