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STANDARD**

**CEI
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Deuxième édition
Second edition
2003-06

**PUBLICATION GROUPÉE DE SÉCURITÉ
GROUP SAFETY PUBLICATION**

**Règles de sécurité pour appareils électriques
de mesure, de régulation et de laboratoire –**

**Partie 2-010:
Exigences particulières pour appareils
de laboratoire utilisés pour l'échauffement
des matières**

**Safety requirements for electrical equipment
for measurement, control and laboratory use –**

**Part 2-010:
Particular requirements for laboratory
equipment for the heating of materials**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT
FOR MEASUREMENT, CONTROL AND LABORATORY USE –****Part 2-010: Particular requirements for laboratory equipment
for the heating of materials**

FOREWORD

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International Standard IEC 61010-2-010, has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

This second edition cancels and replaces the first edition published in 1992, of which it constitutes a technical revision.

It has the status of a group safety publication in accordance with IEC Guide 104.

This bilingual version (2005-01) replaces the English version.

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

FDIS	Report on voting
66/324/FDIS	66/329/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.

The French version of this standard has not been voted upon.

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

This Part 2-010 is intended to be used in conjunction with IEC 61010-1. It was established on the basis of the second edition (2001). Consideration may be given to future editions of, or amendments to, IEC 61010-1.

This Part 2-010 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard *Safety requirements for laboratory equipment for the heating of materials*.

Where a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. Where this part states “addition”, “modification”, “replacement”, or “deletion” the relevant requirement, test specification or note in Part 1 should be adapted accordingly.

In this standard:

- 1) the following print types are used:
 - requirements: in roman type;
 - NOTES: in small roman type;
 - *conformity and test: in italic type*;
 - terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS;
- 2) subclauses, figures, tables and notes which are additional to those in Part 1 are numbered starting from 101.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE –

Part 2-010: Particular requirements for laboratory equipment for the heating of materials

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the text by the following:

This part of IEC 61010 applies only to electrically powered laboratory equipment for the heating of materials, where the heating of materials is the only function or is one of several functions of the equipment.

NOTE If all or part of the equipment falls within the scope of one or more other part 2 standards of IEC 61010 as well as within the scope of this standard, it will also need to meet the requirements of those other part 2 standards. In particular, if equipment is intended to be used for IVD purposes, it will need to meet the requirements of IEC 61010-2-101.

1.1.2 Equipment excluded from scope

Addition:

Add the following three new items after item i):

- aa) equipment for the heating and ventilation of laboratories;
- bb) sterilizing equipment;
- cc) heating equipment which the OPERATOR is intended to enter, and which is large enough for the OPERATOR to remain inside with the door or doors closed.

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

This clause of Part 1 is applicable

4 Tests

This clause of Part 1 is applicable except as follows:

4.3.2 State of equipment

Addition:

Add the following note after the first paragraph:

NOTE In case of doubt, a test may have to be made with more than one combination of conditions.

4.4.2.10 Heating devices

Addition:

Add the following new second paragraph:

If a HAZARD could be caused by overfilling or underfilling with a heat transfer medium, the equipment shall be tested when empty, partially filled, or overfilled, whichever is least favourable. In case of doubt, the test shall be carried out in more than one condition. The heat transfer medium used for the test shall be of a type specified for NORMAL USE.

4.4.4 Conformity after application of fault conditions

4.4.4.2

Replacement:

Replace the second paragraph by the following new paragraph:

Except for heated surfaces of heating equipment (see 10.1), whether they are intended to deliver heat or are hot because of proximity to heating parts, the temperature of such surfaces and parts shall not exceed 105 °C in an ambient temperature of 40 °C or the maximum RATED ambient temperature if higher (see 1.4.2).

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

5.1.3 MAINS supply

Addition:

Add the following note to item c):

NOTE 101 If, for periods of 1 min or less after switching on, the actual power or current can be much higher than the marked maximum RATED power or current, the short-term maximum may be marked in brackets after the maximum RATED power or current.

5.1.6 Switches and circuit-breakers

Addition:

Add a third paragraph as follows:

For ovens and similar equipment, there shall be an indication of the “ON” condition on each side of the equipment which has a door in it or has any other opening intended for loading material.

5.2 Warning markings

Replacement:

Replace the fifth paragraph by the following:

Warning markings are specified in 5.1.5.1 c), 5.2.101, 6.1.2 b), 6.1.2.101 2), 6.5.1.2 g), 6.6.2, 7.2 c), 7.3, 10.1, and 13.2.2.

Addition:

Add the following new subclause:

5.2.101 Equipment with high ACCESSIBLE current

If the ACCESSIBLE current of the equipment exceeds the limit of 6.3.1 b) or 6.3.2 b) for non-permanently connected equipment, but is within the limit for PERMANENTLY CONNECTED EQUIPMENT, there shall be a warning marking against non-permanent connection to the supply source. The marking shall be on or beside the cover of the TERMINALS for connection to the supply source, and the warning shall be repeated in the installation instructions. Symbol 14 of Table 1 is an adequate warning marking, particularly when it may not be known in which country the equipment will be used and, therefore, in which language it would be appropriate to print the warning marking.

Conformity is checked by inspection.

5.4.3 Equipment installation

Replacement:

The documentation shall include installation and specific commissioning instructions (examples are listed below) and, if necessary for safety, warnings against HAZARDS which could arise during installation or commissioning of the equipment:

- a) assembly, location and mounting requirements. If a HAZARD could be caused by hot items falling from the equipment, for example when a door is opened, there shall be a warning that the equipment must not be mounted on a surface of flammable material;
- b) instructions for protective earthing;
- c) connections to the supply, including the warning and statement which are necessary when permanent connection to the supply source is essential (see 5.2.101), and for equipment in which HAZARDOUS LIVE parts may need to be ACCESSIBLE (see 6.1.2), a statement requiring the fitting of a residual current-operated circuit-breaker;
- d) for PERMANENTLY CONNECTED EQUIPMENT:
 - 1) supply wiring requirements;
 - 2) requirements for any external switch or circuit-breaker (see 6.11.2.1) and external overcurrent protection devices (see 9.5.1), and a recommendation that the switch or circuit-breaker be near the equipment;
- e) ventilation requirements;
- f) requirements for special services, for example, air, cooling liquid;
- g) the maximum sound power level produced by equipment which emits sound, if measurement is required by 12.5.1;

- h) instructions relating to sound pressure level (see 12.5.1);
- i) any requirement for drying-out (see 5.4.3.101);
- j) if the heating of materials could lead to liberation of hazardous gases, installation instructions shall warn of any need for an extraction system, additional temperature-limiting devices relating to safe temperatures for the materials, etc. (also see the note to 5.4.1).

NOTE An extraction system is a system which removes air from the building, not a recirculating system.

Additional subclause:

5.4.3.101 Drying-out

If, after transport or storage in humid conditions, equipment could fail to meet all the safety requirements of this standard, the installation instructions shall specify a period of operation to dry out the equipment and restore it to NORMAL CONDITION. The instructions shall include a warning that the equipment cannot be assumed to meet all the safety requirements of this standard during the drying-out process.

Conformity is checked by inspection.

5.4.4 Equipment operation

Addition:

Add the following reference at the end of item g):

(See 5.4.4.101)

Add the following three new items:

- aa) specification of additional protection needed by the OPERATOR when HAZARDOUS LIVE parts are permitted to be ACCESSIBLE (see 6.1.2.101);
- bb) a warning about any possible hazards of explosion, implosion or the release of toxic or flammable gases arising from the materials being heated (also see 5.4.3 j));
- cc) specification of heat transfer media which are suitable for use, for example liquids for use in a heating bath.

Additional subclause:

5.4.4.101 Cleaning and decontamination

The instructions shall include recommendations for cleaning and, where necessary, decontamination, together with the recognized generic names of recommended materials for cleaning and decontamination, and an indication of any materials which could be likely to be used but which are incompatible with parts of the equipment or with material contained in it.

The instructions shall also state that the RESPONSIBLE BODY must ensure that:

- a) appropriate decontamination is carried out if hazardous material is split onto or into the equipment;

- b) no decontamination or cleaning agents are used which could cause a HAZARD as a result of a reaction with parts of the equipment or with material contained in it;
- c) the manufacturer or his agent is consulted if there is any doubt about the compatibility of decontamination or cleaning agents with parts of the equipment or with material contained in it.

If a manufacturer claims that an item can be decontaminated by steam sterilization, it shall be capable of withstanding steam sterilization under at least one of the time-temperature conditions given in Table 101.

NOTE 1 Manufacturers should be aware of the internationally recognized “Laboratory Biosafety Manual”, published in 1984 by the World Health Organization in Geneva, which gives information on decontaminants, their use, dilutions, properties and potential applications. There are also national guidelines which cover these areas.

NOTE 2 Cleaning and decontamination may be necessary as a safeguard when laboratory heating equipment and any accessories are maintained, repaired, or transferred. Manufacturers should provide a format for users to certify that such treatment has been carried out.

Table 101 – Time-temperature conditions

Absolute pressure kPa	Corresponding steam temperature		Minimum hold time min
	Nominal °C	Range °C	
325	136,0	134 - 138	3
250	127,5	126 - 129	10
215	122,5	121 - 124	15
175	116,5	115 - 118	30

NOTE ‘Minimum hold time’ means the time the containment is at steam temperature.

Conformity is checked by inspection.

5.4.5 Equipment maintenance

Addition:

Add the following two new paragraphs after the first paragraph:

If high-temperature or other special cable is used for the MAINS supply cord, the instructions shall state that it is to be replaced only by an equivalent cable.

Instructions shall specify methods for the RESPONSIBLE BODY to check the effective operation of devices or systems for overtemperature protection or liquid-level protection which are necessary for safety, and shall state how often the checks need to be made.

6 Protection against electric shock

This clause of Part 1 is applicable except as follows:

6.1 General

Additional subclause:

6.1.2.101 Exceptions for ovens and furnaces

HAZARDOUS LIVE parts are permitted to be ACCESSIBLE if efficient operation of an oven or furnace would otherwise be impossible for one or more of the following reasons:

- a) continuous access is needed (for example, conveyor ovens and tube furnaces);
- b) ports are needed for observation or for the insertion of probes or sensors;
- c) it is necessary to maintain a steady operating temperature to prevent thermal shock to materials being treated, and therefore ACCESSIBLE heaters, etc. have to remain energized even when a door is opened.

In the above cases, ACCESSIBLE internal parts are permitted to be HAZARDOUS LIVE only if all those of the following conditions that are applicable are met:

- 1) the HAZARDOUS LIVE parts are supplied from a circuit protected by a residual current operated circuit-breaker which interrupts the supply at a differential current of 30 mA or less, or the installation instructions specify that the equipment must be connected to a supply source which incorporates such a circuit-breaker;
- 2) warning markings give notice of the potential HAZARD and a lamp indicates the presence of the HAZARD;
- 3) conveyor belts, muffles, etc. which are conductive are connected to the PROTECTIVE CONDUCTOR TERMINAL;
- 4) the instructions for use state that it is necessary for the OPERATOR to be protected against electric shock, including electric shock resulting from the possibility of simultaneous contact with HAZARDOUS LIVE parts and parts connected to the PROTECTIVE CONDUCTOR TERMINAL, and indicate the means of protection. These protective means may include one or more of the following:
 - i) insulated TOOLS;
 - ii) insulating clothing;
 - iii) standing on an insulating surface;
 - iv) shrouding of parts connected to the PROTECTIVE CONDUCTOR TERMINAL with which the OPERATOR might come into contact in NORMAL USE.

Conformity is checked by inspection.

6.3 Permissible limits for ACCESSIBLE parts

Addition:

Add the following new paragraphs:

If the installation instructions specify a drying-out process (see 5.4.3.101), this is carried out before making the measurements of 6.3. Drying-out is followed by a rest period of 2 h, with the equipment de-energized, before the measurements are taken.

Measurements are made with the equipment at ambient temperature. If there is doubt whether the permissible limits could be exceeded at maximum operating temperature, the relevant measurements are repeated at maximum operating temperature and the higher values are used.

6.3.1 b) 1) Current

Add the following second paragraph:

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times the above values.

6.3.2 b) 1) Current

Add the following second paragraph:

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times the above values.

6.4 Protection in NORMAL CONDITION

Addition:

Number the existing note as Note 1, and add the following new Note 101 after it:

NOTE 101 Although ceramics can provide satisfactory electrical insulation at ambient temperature, their insulating properties are reduced at high temperatures. This is not only because they are susceptible to progressive mechanical deterioration, but also because they can become electrically conductive at high temperatures and in NORMAL USE can be contaminated by conductive material.

6.8.2 Humidity preconditioning

Addition:

Equipment for which a drying-out period is specified (see 5.4.3.101) shall not be subjected to humidity preconditioning.

6.8.3 Conduct of tests

Addition:

Add after the first paragraph the following two new paragraphs:

If the installation instructions specify a drying-out process (see 5.4.3.101), this is carried out before the tests of 6.8.4. Drying-out is followed by a rest period of 2 h with the equipment de-energized. The tests are then performed and completed within 1 h of the end of the rest period.

If there is doubt whether the equipment would pass a particular test at maximum operating temperature, then that test is repeated at maximum operating temperature.

6.10.1 MAINS supply cords

Addition:

Add to item b) the following second sentence:

Alternatively, additional protection shall be provided to prevent the cord contacting the hot surface.

Add to item c) the following second sentence:

The appliance coupler shall have a temperature rating above the temperatures measured under NORMAL CONDITION on any part of the appliance coupler itself.

7 Protection against mechanical HAZARDS

This clause of Part 1 is applicable.

8 Mechanical resistance to shock and impact

This clause of Part 1 is applicable except as follows:

8.1.2 Dynamic test

Addition:

Add the following new third paragraph:

For heating equipment with a horizontal surface of glass, ceramic, or similar material, this surface shall be tested as specified in 8.1.101, the rest of the equipment being tested as specified below.

Additional subclause:

8.1.101 Dynamic test of horizontal heating surfaces of glass or ceramic material

Conformity to the requirements for horizontal heating surfaces made of glass or ceramic material is checked by performing the treatment given below.

- a) The heater is operated at the maximum setting until the surface temperature of the heating zone does not rise by more than 1 °C in 15 min. The heater is then switched off, and a loaded vessel is dropped flat 10 times from a height of 150 mm onto the heating zone. The loaded vessel has a copper or aluminium base which is flat over a diameter of 120 mm ± 10 mm, with a rounded edge of radius at least 10 mm. It is filled to a uniform height with sand or shot to give a total mass of 1,8 kg ± 0,01 kg.*
- b) After the above treatment to each heating zone in turn, the heater is again operated at the maximum setting until the surface temperature does not rise by more than 1 °C in 15 min. (1 ± 0,1) l of a saline solution of 1 % NaCl in water, at a temperature of 15 °C ± 5 °C is poured steadily onto the heating surface. The heater is then switched off and after 15 min all excess solution cleaned off the surface.*
- c) The heater is allowed to cool to approximately room temperature, then the same quantity of the saline solution is poured steadily onto the heating surface and again all excess solution cleaned off the surface.*
- d) A voltage test according to 6.8.4 shall be performed. The test voltage shall be for BASIC INSULATION. No breakdown shall occur.*
- e) No breakage of glass parts shall have occurred which could cause a cutting HAZARD.*

NOTE 102 This subclause corresponds to 21.102 of IEC 60335-2-6:2002.

9 Protection against the spread of fire

This clause of Part 1 is applicable except as follows:

9.4 Requirements for equipment containing or using flammable liquids

Addition:

Add the following note after Note 1:

NOTE 101 The temperature of the surface of heating elements used to heat a liquid can be considerably higher than the temperature of the liquid.

10 Equipment temperature limits and resistance to heat

This clause of Part 1 is applicable except as follows:

10.1 Surface temperature limits for protection against burns

Replacement:

Replace the second paragraph by the following new second paragraph:

If easily touched heated surfaces are necessary for functional reasons, whether because they are intended to deliver heat or are hot because of proximity to heating parts, they are permitted to exceed the values of Table 15 in NORMAL CONDITION and to exceed 105 °C in SINGLE FAULT CONDITION, provided that they are recognizable as such by appearance or function or are marked with symbol 13 of Table 1 (see 5.2).

Additional subclause:

10.101 Overtemperature protection

If a single fault in a temperature control system, heater, cooling means, agitator, or other part could cause a HAZARD through overheating of any part of equipment or of materials being treated, a non-self-resetting overtemperature device or system meeting the requirements of 14.3 shall de-energize the heating means and any other parts which could cause a HAZARD.

If an insufficient quantity of heat-transfer liquid could cause a HAZARD, a self-resetting or non-self-resetting liquid-level device shall de-energize the heating means and any other parts which could cause a HAZARD.

The equipment as a whole, or the relevant parts, shall be de-energized by one of the following methods:

- a) for single-phase equipment, a single-pole device or system; for parts controlled by a temperature control system the overtemperature device shall interrupt the opposite conductor to that of the temperature control system;
- b) for polyphase equipment, either one single device or system disconnecting all phases, or an individual device or system for each phase;
- c) a device or system providing disconnection from all poles of the supply.

NOTE 1 The single-pole overtemperature protection devices described above meet the requirements of this standard for safety in SINGLE FAULT CONDITION. However, overtemperature protection devices which disconnect the relevant parts from all poles of the supply have the advantage that they provide protection in cases where an undetected fault in a component (for example earthing of one part of an isolated supply) does not impair performance or safety but would increase the likelihood of a HAZARD being caused by a subsequent failure in a temperature control system.

NOTE 2 In equipment designed for the heating of materials, HAZARDS may arise from overheating of materials being treated or overheating of heat-transfer media (mainly in heating baths) as well as from overtemperature of parts of the equipment itself. For this reason a higher level of safety may be needed to provide for a single fault in the equipment.

NOTE 3 In some cases a fall in the temperature of a heated medium (for example liquid in a bath or air in an oven or heating cabinet) could cause a HAZARD. If this could occur as a result of the operation of an overtemperature protection device after failure of the temperature control system, a second temperature control system may be fitted to maintain a safe temperature without the overtemperature device operating.

For equipment designed to contain flammable materials, either for treatment or for heat-transfer, overtemperature protection devices or systems shall ensure, when set as directed in the manufacturer's instructions, that the liquid cannot exceed the temperature specified in 9.4 a) in NORMAL USE or SINGLE FAULT CONDITION

NOTE 4 NORMAL USE (which is use in accordance with the manufacturer's instructions) includes the correct setting of any adjustable overtemperature device. Incorrect setting of a device by the use of a TOOL is itself a SINGLE FAULT CONDITION, so tests in any other SINGLE FAULT CONDITION are made with overtemperature protection devices or systems set in accordance with the manufacturer's instructions.

Overtemperature protection devices necessary for safety shall be separate from any temperature control system. This applies not only to the temperature sensing means but also to all disconnecting devices in the circuits to be de-energised. Whether operated by temperature, pressure, liquid-level, airflow or other means, they shall meet the requirements of 14.3.

Adjustable overtemperature and liquid-level devices and systems shall be adjustable only with the aid of a TOOL.

Conformity is checked by inspection and during the fault tests specified in 4.4.2.9 and 4.4.2.10.

11 Protection against HAZARDS from fluids

This clause of Part 1 is applicable

12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure

This clause of Part 1 is applicable.

13 Protection against liberated gases, explosion and implosion

This clause of Part 1 is applicable except as follows:

Replacement:

Replace Subclause 13.2.1 by the following new subclause:

13.2.1 Components, and materials being heated

If components liable to explode if overheated or overcharged are not provided with a pressure relief device, or if the equipment is designed to treat materials which could explode or implode, protection for the OPERATOR shall be incorporated in the apparatus (see also 7.6).

Pressure release devices shall be located so that a discharge will not cause danger to the OPERATOR. The construction shall be such that any pressure release device shall not be obstructed.

Conformity is checked by inspection.

Additional subclause:

13.2.101 Implosion of vacuum ovens

Vacuum ovens shall incorporate protection for the OPERATOR and surroundings against the effects of implosion.

Conformity is checked by inspection of the equipment and of design information and, in case of doubt, by provoking an implosion.

14 Components

This clause of Part 1 is applicable except as follows:

14.3 Overtemperature protection devices

Replacement:

Overtemperature protection devices and systems designed to operate in SINGLE FAULT CONDITION shall be:

- a) constructed and tested to ensure reliable function;
- b) RATED to interrupt the maximum voltage and current of the circuit in which they are employed;
- c) RATED so that components or materials whose temperatures are intended to be limited by the device do not exceed the relevant temperature limits of 9.4 a) and Table 15.

If practicable, means shall be provided for the OPERATOR to check that a device or system will function in the case of SINGLE FAULT CONDITION. The instructions for use shall specify the method and how often the check is required.

NOTE For adjustable devices or systems the check can normally be made by setting the overtemperature device to a lower temperature than that of the temperature control system. For non-adjustable devices or systems which do not also act as liquid-level protection devices, it may be necessary to provide a self-resetting means to override the temperature control system temporarily.

Liquid-level devices used to protect against overtemperature shall meet the same requirements as overtemperature protection devices and systems.

Conformity is checked by studying the operating principle of the device or system and by performing adequate reliability tests with the equipment operated in SINGLE FAULT CONDITION.

The number of operations is as follows:

- 1) non-resetting devices are caused to operate once;*
- 2) non-self-resetting devices and systems, except thermal fuses, are reset after each operation and thus caused to operate 10 times;*
- 3) self-resetting liquid level devices are caused to operate 200 times.*

NOTE Forced cooling and resting periods can be introduced to prevent damage to the equipment.

During the test, resetting devices shall operate each time the SINGLE FAULT CONDITION is applied, and non-resetting devices shall operate once. After the test, resetting devices shall show no sign of damage which could prevent their operation in a further SINGLE FAULT CONDITION.

15 Protection by interlocks

This clause of Part 1 is applicable.

16 Test and measurement equipment

This clause of Part 1 is not applicable.

Annexes

The annexes of Part 1 are applicable.

Bibliography

The bibliography of Part 1 is applicable, except as follows:

Addition:

Laboratory Biosafety Manual, World Health Organization, 1984



Standards Survey

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A Prioritaire

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Q2 Please tell us in what capacity(ies) you bought the standard (tick all that apply). I am the/a:

- purchasing agent ☐
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researcher ☐
design engineer ☐
safety engineer ☐
testing engineer ☐
marketing specialist ☐
other.....

Q3 I work for/in/as a:
(tick all that apply)

- manufacturing ☐
consultant ☐
government ☐
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education ☐
military ☐
other.....

Q4 This standard will be used for:
(tick all that apply)

- general reference ☐
product research ☐
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Q5 This standard meets my needs:
(tick one)

- not at all ☐
nearly ☐
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- standard is out of date ☐
standard is incomplete ☐
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title is misleading ☐
I made the wrong choice ☐
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- (1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
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- French text only ☐
English text only ☐
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