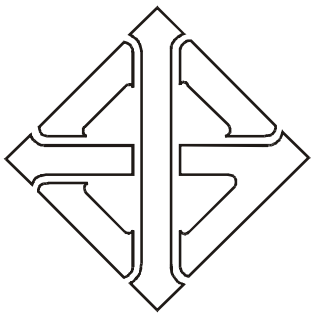

มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 1869 – 2553

IEC 60335 – 2 – 77(2002 – 07)

ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัย และงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES - SAFETY

PART 2-77 : PARTICULAR REQUIREMENTS FOR PEDESTRIAN CONTROLLED MAINS-OPERATED LAWNMOWERS

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

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มาตรฐานผลิตภัณฑ์อุตสาหกรรม
ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัย และงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม

มอก. 1869 – 2553

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400
โทรศัพท์ 02 202 3300

ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 128 ตอนพิเศษ 56ง
วันที่ 20 พฤษภาคม พุทธศักราช 2554

มาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม นี้ได้ประกาศใช้ครั้งแรกเป็นมาตรฐานเลขที่ มอก.1869-2542 ในราชกิจจานุเบกษา ฉบับประกาศทั่วไป เล่ม 117 ตอนพิเศษ 133ง วันที่ 28 ธันวาคม พุทธศักราช 2543 ต่อมาได้พิจารณาเห็นสมควรแก้ไขปรับปรุงเพื่อให้ทันสมัยและเป็นไปตามเอกสารอ้างอิงฉบับล่าสุด จึงได้แก้ไขปรับปรุงโดยการยกเลิกมาตรฐานเดิมและกำหนดมาตรฐานนี้ขึ้นใหม่

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60335-2-77(2002-07) Household and similar electrical appliances - Safety - Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นเพื่อให้ทันกับความต้องการของผู้ใช้ และจักได้แปลเป็นภาษาไทยในโอกาสอันควร หากมีข้อสงสัยโปรดติดต่อสอบถามที่สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตามมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511

ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 4313 (พ.ศ. 2554)

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง ยกเลิกและกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน

ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม

โดยที่เป็นการสมควรปรับปรุงมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม มาตรฐานเลขที่ มอก.1869-2542

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศยกเลิกประกาศกระทรวงอุตสาหกรรม ฉบับที่ 2743 (พ.ศ.2543) ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ.2511 เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม ลงวันที่ 9 ตุลาคม พ.ศ.2543 และออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม มาตรฐานเลขที่ มอก.1869-2553 ขึ้นใหม่ ดังมีรายละเอียดต่อท้ายประกาศนี้

ทั้งนี้ให้มีผลตั้งแต่วันถัดจากวันที่ประกาศในราชกิจจานุเบกษาเป็นต้นไป

ประกาศ ณ วันที่ 10 มกราคม พ.ศ. 2554

ชัยวุฒิ บรรณวัฒน์

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

มาตรฐานผลิตภัณฑ์อุตสาหกรรม
ความปลอดภัยของเครื่องใช้ไฟฟ้า สำหรับใช้ในที่อยู่อาศัยและงานที่มีลักษณะคล้ายกัน ข้อกำหนดเฉพาะสำหรับเครื่องตัดหญ้าชนิดเดินตาม

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60335-2-77(2002-07) Household and similar electrical appliances - Safety - Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ต้องใช้ร่วมกับมาตรฐานผลิตภัณฑ์อุตสาหกรรมความปลอดภัยของเครื่องใช้ไฟฟ้าสำหรับใช้ในที่อยู่อาศัยและเครื่องใช้ไฟฟ้าอื่นที่คล้ายกัน ข้อกำหนดทั่วไป มาตรฐานเลขที่ มอก.1375-2547

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดคุณลักษณะที่ต้องการด้านความปลอดภัยของเครื่องตัดหญ้าไฟฟ้าชนิดเดินตามแบบทรงกระบอกหรือแบบโรตารี ที่ออกแบบให้ใช้งานในบริเวณรอบ ๆ ที่อยู่อาศัยหรืองานที่มีลักษณะคล้ายกัน มีแรงดันไฟฟ้าที่กำหนดไม่เกิน 250 โวลต์ สำหรับเครื่องตัดหญ้าเฟสเดียว

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ไม่ครอบคลุมถึงเครื่องตัดหญ้าแบบโรตารีที่มีอุปกรณ์ตัดเป็นสายอโลหะ 1 เส้นหรือมากกว่า หรือชิ้นส่วนอโลหะ 1 ชิ้นหรือมากกว่าติดตั้งบนชุดขับเคลื่อนตรงกึ่งกลางซึ่งโดยทั่วไปเป็นรูปวงกลมในลักษณะที่หมุนได้รอบตัว อุปกรณ์ตัดนี้ต้องใช้แรงเหวี่ยงในการตัด พลังงานจลน์ของอุปกรณ์ตัดแต่ละครั้งไม่เกิน 10 จูล อุปกรณ์ตัดไม่สามารถเปลี่ยนทดแทนด้วยวัสดุโลหะหรือวัสดุแข็งคงรูปอื่นที่เทียบเท่ากับวัสดุที่ผู้ทำจัดหาให้ได้โดยทั่วไป มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ไม่ได้คำนึงถึง

- การใช้งานเครื่องตัดหญ้าไฟฟ้าโดยเด็กเล็กหรือบุคคลทุพพลภาพที่ไม่ได้รับการควบคุมดูแล
- การเล่นเครื่องตัดหญ้าไฟฟ้าโดยเด็กเล็ก

หมายเหตุ 101 *ข้อควรคำนึง*

- *ข้อกำหนดเพิ่มเติมอาจระบุโดยกระทรวงสาธารณสุข กระทรวงแรงงาน และองค์กรที่คล้ายกัน*

หมายเหตุ 103 *มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ไม่ครอบคลุมถึง*

- *เครื่องตัดแต่งสนามหญ้า เครื่องตัดแต่งขอบสนามหญ้า เครื่องทำขอบสนามหญ้า เครื่องตัดหญ้าชนิดใบมีดแกว่ง เครื่องตัดหญ้าแบบเคียว-แท่ง หรือเครื่องเก็บเกี่ยวทางการเกษตร*

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดบทนิยาม ข้อกำหนดทั่วไป ภาวะทั่วไปสำหรับการทดสอบ การจำแนกประเภท การทำเครื่องหมายและฉลาก และข้อแนะนำ การป้องกันการเข้าถึงส่วนที่มีไฟฟ้า การเริ่มเดินเครื่องใช้ไฟฟ้าทำงานด้วยมอเตอร์ กำลังไฟฟ้าเข้าและกระแสไฟฟ้า การเกิดความร้อน กระแสไฟฟ้ารั่วและความทนทานไฟฟ้าที่อุณหภูมิทำงาน แรงดันไฟฟ้าเกินชั่วครู่ ความต้านทานต่อความชื้น กระแสไฟฟ้ารั่วและความทนทานไฟฟ้า การป้องกันโหลดเกินของหม้อแปลงไฟฟ้าและวงจรไฟฟ้าที่เกี่ยวข้อง ความทนทานการทำงานผิดปกติ เสถียรภาพและอันตรายทางกล ความแข็งแรงทางกล การสร้าง สายไฟฟ้าภายใน ส่วนประกอบ การต่อกับแหล่งจ่ายไฟฟ้าและสายอ่อนภายนอก ขั้วต่อสายสำหรับตัวนำภายนอก การเตรียมการสำหรับการต่อลงดิน หมุดเกลียวและจุดต่อ ระยะห่างในอากาศ ระยะห่างตามผิวฉนวน และฉนวนตัน ความทนความร้อนและไฟ ความต้านทานการเป็นสนิม และการแผ่รังสี ความเป็นพิษ และอันตรายที่คล้ายกัน รายละเอียดให้เป็นไปตาม IEC 60335-2-77(2002-07)

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY

Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers

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.

2) The formal decisions or agreements of the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This part of International Standard IEC 60335 has been prepared by IEC subcommittee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

This second edition cancels and replaces the first edition published in 1996. It constitutes a technical revision.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61F/452/FDIS	61F/472/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 part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for pedestrian controlled mains-operated electric lawnmowers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type;

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

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

INTRODUCTION

It has been assumed in the drafting of this international standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY

Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of **pedestrian controlled** mains-operated electrical**, cylinder** or **rotary lawnmowers** designed primarily for use around the home or for similar purposes, their **rated voltage** being not more than 250 V single phase.

Rotary mowers are excluded from the requirements of this standard if the **cutting means** is either one or more non-metallic filaments, or one or more non-metallic cutting elements pivotally mounted on a generally circular central drive unit. These **cutting means** rely on centrifugal force to achieve cutting. The kinetic energy of a single **cutting means** will not exceed 10 J, the **cutting means** not being replaceable with metallic or other rigid material equivalents supplied by the manufacturer.

This standard does not, in general, take into account

– the use of appliances by young children or infirm persons without supervision;

– playing with the appliance by young children.

NOTE 101 Attention is drawn to the fact that

– in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, and similar authorities.

NOTE 102 This standard does not apply to

– **lawn trimmers, lawn edge trimmers, lawn edgers, flail mowers, sickle-bar mowers,** or agricultural **mowers.**

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition

ISO 2758:2001, *Paper – Determination of bursting strength*

ISO 3411:1995, *Earth-moving machinery – Human physical dimensions of operators and minimum operator space envelope*

ISO 3767-1:1998, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Part 1: Common symbols*

ISO 3767-3:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Part 3: Symbols for powered lawn and garden equipment*

ISO 3864, *Safety colours and safety signs*

ISO 5395:1990, *Power lawn-mowers, lawn tractors, lawn and garden tractors, professional mowers and lawn and garden tractors with mowing attachments – Definitions, safety requirements and test procedures*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation
operation of the appliance under the following conditions

The appliance is operated at **rated voltage** with the load necessary to attain **rated power input.**

3.101
blade
term used in warnings and instructions to denote **cutting means** (see 3.104)

3.102
braking system
combination of one or more brakes and related means of operation and **control**

3.103
control
means or device which controls the operation of the appliance or any specific operating function thereof

3.104
cutting means
mechanism used to provide the cutting action of a **lawnmower**

3.105
cutting means enclosure (housing)
part or assembly which provides the protective means around the **cutting means**

3.106
cutting means tip circle
the path described by the outermost point of the **cutting means** as it rotates about its shaft axis

3.107
cutting position
any height setting of the **cutting means** designated by the manufacturer for cutting grass

3.108
cutting width
the width of cut measured across the **cutting means** at right angles to the direction of travel and calculated from the dimensions of the **cutting means** or the diameter(s) of the **cutting means tip circle**(s)

3.109
cylinder mower
lawnmower with one or more **cutting means** rotating about a horizontal axis to provide a shearing action with a fixed cutter bar or knife

3.110
discharge chute
an extension of the **cutting means enclosure** from the **discharge opening,** generally used to control the discharge of material from the **cutting means**

3.111
discharge opening
gap or opening in the **cutting means enclosure** through which grass may be discharged

3.112
flail mower
grass-cutting appliance with a multiplicity of free-swinging cutting elements that rotate about an axis parallel to the cutting plane and cut by impact

3.113
grass catcher
part or combination of parts which provide a means for collecting grass clippings or debris

3.114
guard
a part of the appliance or a component incorporated to provide protection for the operator and/or bystander

3.115
handle
part likely to be hand-held for guiding the appliance in **intended use**

3.116
hit
the test projectile passing completely through all layers of the target material

3.117
hover mower
lawnmower which uses a cushion of air instead of wheels as a ground support

3.118
intended use
any use of the appliance which is reasonably foreseeable, as described in the user instructions, and which is consistent with such activities as cutting grass, starting, stopping, or connecting to (or disconnecting) from a **power source**

3.119
lawn edger
powered appliance suitable for cutting lawn and soil, usually in a vertical plane

3.120
lawn edge trimmer
powered grass-cutting appliance for trimming lawn edges, usually in a vertical plane

3.121
lawnmower (mower)
grass-cutting appliance in which the **cutting means** operates in a plane approximately parallel to the ground and which uses the ground to determine the height of cut by means of wheels, air cushion or skids, etc., and which utilises an electric motor for a **power source**

3.122
lawn trimmer
powered grass-cutting appliance where the operator determines the plane of operation of the **cutting means** and the height of cut, possibly assisted by a wheel or skid, etc.

3.123
maximum operating motor speed
the highest motor speed obtained when adjusted in accordance with the manufacturer's specifications and/or instructions, with the **cutting means** engaged

3.124
mowing attachment
a **cutting means** designed to be easily detached from the appliance, generally to allow the appliance to be used for other purposes

3.125
mulching mower
rotary mower without discharge openings in the cutting means enclosure

3.126
no-load
the minimum load attainable at **rated voltage** (for **cylinder mowers** there is no cylinder to fixed cutter bar or knife contact)

3.127
operator control
any **control** requiring operator actuation to perform specific functions

3.128
operator presence control
a **control** designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed

3.129
operator zone
the operator zone for persons operating a **lawnmower** as presented in Figure 101

3.130
parking brake
device incorporated in the appliance which, when operated, prevents the appliance from moving from a stationary position and remains applied without the operator present

3.131
pedestrian controlled mower
grass-cutting appliance, either pushed or self-propelled, normally controlled by the operator walking behind the unit

3.132
power source
a motor which provides mechanical energy for linear and/or rotational movement

3.133
rotary mower
a **lawnmower** in which the **cutting means**, cutting by impact, rotates about an axis (axes) normal to the cutting plane

3.134
service brake
the designated primary means for decelerating and stopping a machine from its ground travel speed

3.135
sickle bar mower
lawnmower which uses a **power source** to reciprocate a knife or knives to provide a shearing action with a stationary cutter bar or movable knife

3.136
stopping time
the time elapsed between the instant when the actuator is released and the instant at which the appliance or component comes to a stop

3.137
throw line (cylinder mowers)
the steepest line in a vertical plane, tangential to the periphery of the cutting cylinder in the direction of rotation, which does not intersect a **guard** or portion of the appliance (see Figure 110)

3.138
thrown object hazard
the potential for injury caused by object(s) propelled by the moving **cutting means**

3.139
traction drive
the means (system) used to transmit power from the **power source** to the ground drive means

4 General requirement

This clause of Part 1 is applicable except as follows.

4.101 Where **mowing attachments** are available from the original manufacturer which modify the use of a **lawnmower,** the complete appliance shall still comply with the electrical safety requirements of this standard.

Compliance is checked by inspection and by the relevant tests, where applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.5 *Addition:*

*During the tests, the **cutting means** are adjusted and lubricated in accordance with the manufacturer's instructions specific to the test.*

NOTE 101 For example, **cylinder mower cutting means** may not be able to run for extended periods at normal adjustment because of lack of lubrication, etc., normally provided by the grass.

5.6 *Addition:*

*Electronic speed **control** devices are set for the highest speed.*

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Replacement:*

Appliances shall be **class II** or **class III** with respect to protection against electric shock.

Compliance is checked by inspection and by the relevant tests.

6.2 *Addition:*

Appliances shall be at least IPX4.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Appliances shall be marked with their **rated power input**.

The substance of the following warning shall be placed in a prominent position on the appliance. The letters shall be a minimum of 3 mm high in black on a yellow background. Where appropriate IEC/ISO symbols or pictograms are available, they shall be used. Marking or symbols giving cautionary information shall be located close to the hazard.

WARNING: Switch off and remove plug from mains before adjusting, cleaning or if the cord is entangled or damaged.

Read the instructions sheet.

Keep the supply flexible cord away from the cutting blades.

Blades continue to rotate after machine is switched off.

For rotary mowers

– the **cutting means** shall be marked for identification;
– if a **grass catcher** adaptor is used, instructions shall be affixed to the **lawnmower** near the **discharge opening** and to the **grass catcher** adaptor stating that the **lawnmower** shall not be operated without either the entire **grass catcher** or the **guard** in place.

7.6 *Addition*:

NOTE 101 Information on operator symbols may be found in ISO 3767-1 and ISO 3767-3, and in ISO 3864 for colours.

7.9 *Modification:*

Replace the first paragraph by the following:

Operator controls as described in 20.101.1, other than those whose purpose is obvious, shall have the function, direction and/or method of operation clearly identified by a durable label or mark.

7.12 *Replacement:*

An instruction sheet shall be supplied with the appliance.

The instructions shall include

a) those warnings required to be marked on the appliance together with further explanation, where appropriate;
b) instructions for the proper assembly of the appliance for use, if the appliance is not supplied in a completely assembled form;
c) instructions for proper adjustment of the appliance, including a warning of the danger of rotating **blade**(s); for example: “Caution – Do not touch rotating blade”;
d) instructions for the safe operation of the appliance, including a recommendation that the appliance should by supplied via a residual current device (RCD) with a tripping current of not more than 30 mA;
e) instructions on the operation of all **controls**;
f) advice on the use, type and the maximum length of extension cord to be used (not lighter than required by 25.7);
g) instructions for fitting and use of attachments, if any;
h) the substance of the following, where appropriate:
    1) Training
        – Read the instructions carefully. Be familiar with the controls and the proper use of the appliance.

– Never allow children or people unfamiliar with these instructions to use the appliance. Local regulations may restrict the age of the operator.

– Never mow while people, especially children, or pets are nearby.

– The operator or user is responsible for accidents or hazards occurring to other people or their property.

2) Preparation

– While mowing, always wear substantial footwear and long trousers.

– Do not operate the appliance when barefoot or wearing open sandals.

– Thoroughly inspect the area where the appliance is to be used and remove all stones, sticks, wires, bones, and other foreign objects.

– Before using, always visually inspect to see that the blades, blade bolts and cutter assembly are not worn or damaged. Replace worn or damaged blades and bolts in sets to preserve balance.

– On multi-bladed appliances, take care as rotating one blade can cause other blades to rotate.

3) Operation

– Mow only in daylight or in good artificial light.

– Avoid operating the appliance in wet grass, where feasible.

– Always be sure of your footing on slopes.

– Walk, never run.

– For wheeled rotary mowers, mow across the face of slopes, never up and down.

– Exercise extreme caution when changing direction on slopes.

– Do not mow excessively steep slopes.

– Use extreme caution when reversing or pulling the appliance towards you.

– Stop the blade(s) if the appliance has to be tilted for transportation when crossing surfaces other than grass, and when transporting the appliance to and from the area to be mowed.

– Never operate the appliance with defective guards or shields, or without safety devices, for example deflectors and/or grass catchers, in place.

– Switch on the motor according to instructions and with feet well away from the blade(s).

– Do not tilt the appliance when switching on the motor, except if the appliance has to be tilted for starting. In this case, do not tilt it more than absolutely necessary and lift only the part which is away from the operator. Always ensure that both hands are in the operating position before returning the appliance to the ground.

– Do not put hands or feet near or under rotating parts. For rotary mowers, keep clear of the discharge opening at all times.

– Never pick up or carry an appliance while the motor is running.

– Pull the plug from the socket:

- whenever you leave the machine;
- before clearing a blockage;
- before checking, cleaning or working on the appliance;

- after striking a foreign object. Inspect the appliance for damage and make repairs as necessary;
- if the appliance starts to vibrate abnormally (check immediately).

4) Maintenance and storage

– Keep all nuts, bolts, and screws tight to be sure the appliance is in safe working condition.

– Check the grass catcher frequently for wear or deterioration.

– Replace worn or damaged parts for safety.

– For cylinder mowers, be careful during adjustment of the appliance to prevent entrapment of the fingers between moving blades and fixed parts of the appliance.

– For rotary mowers, ensure that only replacement cutting means of the right type are used.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.2 *Addition:*

For **class II rotary mowers,** access to the surface of **basic insulation** or metal parts separated from **live parts** by **basic insulation** shall be permitted when the **cutting means** is removed if a **tool** is required for its removal.

9 Starting of motor-operated appliances

This clause of Part 1 is replaced by the following.

Motors shall start under all normal voltage conditions which may occur in use.

Centrifugal and other automatic starting switches shall operate reliably and without contact chattering.

*Compliance is checked by starting the appliance three times, at **no-load**, at a voltage equal to 0,85 times **rated voltage** or the lower limit of the **rated voltage range**, with any **control** device set at maximum speed.*

*For the test the **cutting means** are adjusted according to the manufacturer's instructions related to this test.*

The appliance shall operate in such a way that safety is not affected.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 Not applicable

11 Heating

This clause of Part 1 is applicable.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.2 *Addition:*

Appliances fitted with an appliance inlet or cable coupler shall be tested with the appropriate mating connector in place.

Air filters are not removed.

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.3 *Addition:*

Insulation equivalent to ***supplementary insulation*** *provided to comply with 22.35 shall be tested in accordance with the requirements for* ***supplementary insulation.***

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

18.101 Appliances shall be so constructed that, in **intended use**, there will be no electrical or mechanical failure that might impair compliance with this standard. The insulation shall not be damaged and contacts and connections shall not have worked loose as a result of heating, vibration, etc.

Moreover, overload **protective devices** shall not operate under **intended use** conditions.

Compliance is checked by the tests of 18.102

18.102 *The appliance is operated at **no-load**, series motors being supplied at a voltage such that the rotating speed is the same as that obtained at **rated voltage** and under **normal operation.** The appliance is operated for 48 h, reduced by the running time necessary for the tests of Clauses 11 and 13.*

Appliances are operated continuously, or for a corresponding number of periods, each period being not less than 8 h.

*During the test, replacement of carbon brushes is allowed and the appliance is lubricated as in **intended use**.*

18.103 *During the tests of 18.102, overload **protective devices** shall not operate.*

*After the tests of 18.102, the appliance shall withstand the tests of Clause 16. Connections, **handles, guards,** brush-caps and other fittings or components shall not have worked loose, and there shall be no deterioration impairing safety in **intended use**.*

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.7 *Addition:*

*This test is not made on appliances with flexible or freely pivoting **cutting means** mounted on a generally circular drive unit.*

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.2 *Replacement:*

To prevent unexpected operation which may result in a hazard, only manually reset cut-outs and those which require the operating **control** to be released are allowed.

Power-driven gears, chains, sprockets, belts, friction drives, pulleys, fan wheels and other moving parts, whenever they create a pinch point capable of causing injury during the **intended use** of the appliance, shall be so positioned or shielded by **guards** or similar attachments as to prevent accidental contact with these components.

Driving belts and chains having connectors which are capable of causing injury during the **intended use** of the appliance shall be guarded along their whole length. Other belt or chain drives which are not capable of causing injury during the **intended use** of the appliance shall be guarded at least at the run-on points. Drive shafts shall be fully guarded.

The principles given in Annex AA shall be followed when developing a guarding system.

Rotating covers or discs shall have a continuous unbroken or smooth surface.

Where a **guard** is designed to be operated or removed and which exposes to a hazard, a safety sign warning of the hazard shall be located on the **guard** or adjacent to the **guard.**

All the **guards** shall be permanently attached to the appliance and shall not be detachable without the use of **tools**. The opening of **guards** shall require the use of a **tool.** Exceptions to this are the opening or removal of interlocked **guards** which disable the protected moving parts or the opening of hinged **guards** for grass **discharge chutes**.

These requirements do not apply to

– the **cutting means**, or
– any component part functioning in contact with the soil.

Compliance is checked by inspection and measurement.

20.101 Control

20.101.1 General

Operator controls shall accommodate the 5th to 95th percentile adult operator as specified in ISO 3411.

The following are not **operator controls**:

– height of cut setting;
– fixed cutter bar or knife (on-cut) setting or adjustment on **cylinder mowers**;
– **grass catcher** discharge arrangements;
– cable restraint/guides.

The location and range of movement of **operator controls** shall be convenient to the operator and shall remain within the anthropometric dimensions given in Figure 101. The operating range of less frequently used **operator controls** may be extended by allowing the operator's trunk, when standing with both feet on the ground, to articulate within the confines of the **operator zone** (for example to lean forward until contacting the **handle** in any of the operating positions).

20.101.2 Operator presence control

Appliances shall be fitted with a device on the control **handle** which will automatically stop **cutting means** rotation when the operator's hands are removed from the **handle**. This may be accomplished either by stopping the drive motor or by an intermediate **cutting means** clutch/brake mechanism. For starting **cutting means** rotation the **control** shall require two separate and dissimilar actions. If these actions are to be carried out by using the same hand then the actions shall be totally distinct to prevent accidental switch-on.

For **hover mowers** for which there is no instruction to tilt when starting, the switch-on of the **blade** shall not require either hand to cross the centre line of the **operator zone**.

20.101.3 Traction drive

For appliances with **traction drive**

- the **control** for **traction drive** shall automatically stop or disengage the **traction drive** when the operator leaves the normal operating position;
- the reverse function of the **traction drive control** shall require continuous activation in the direction of travel;
- it shall be possible to engage or disengage the **traction drive** when the **cutting means** is operating.

20.102 Braking requirements

20.102.1 General

Appliances shall not require an excessive force to hold the appliance stationary on a slope.

Appliances requiring additional means, i.e. a **service brake** or **parking brake** system, shall meet the requirements of 20.102.2 and 20.102.3

The appliance shall be equipped with the tyres provided by the manufacturer having the least tread area in contact with the test surface.

If steering-assist brakes are also used as **service brakes,** it shall be possible to connect them in a way that they apply both brakes with equal force.

For appliances without braking means, compliance is checked as follows.

Tests are carried out with the appliance facing directly up and directly down a 30 % (16,7°) slope. A force of not more than 220 N, applied at or below the centre of gravity and directly up and down the slope, shall be required to hold the appliance stationary.

20.102.2 Service brake

*Test stops are conducted on a substantially level (not to exceed 1 % gradient), dry, smooth, hard surface roadway of concrete (or equivalent test surface). When testing an appliance with separate clutch and brake **control means**, the clutch shall be simultaneously disengaged with brake engagement. Tests are carried out with the appliance in both forward and reverse directions at the maximum ground speed attainable.*

*Using the **braking system** provided, the appliance shall stop within a distance of 0,19 m for each 1 km/h.*

20.102.3 Parking brake

*A **parking brake** shall be provided on appliances requiring a **service brake.***

*The **parking brake** may be in combination with the **service brake.***

*An automatic **parking brake,** when provided, shall be activated when the **operator presence control** is released.*

*Tests are conducted on a 30 % slope with a coefficient of friction such that the appliance does not slide down the slope. The appliance is positioned on the slope with its **parking brake** engaged and locked, transmission in neutral and the motor switched off. The appliance is tested both with its front downhill and its rear downhill.*

*The appliance shall not move down the slope and the force required to engage and unlock the **parking** brake shall not exceed 220 N.*

20.103 Requirements for rotary mowers

20.103.1 Cutting means enclosure

20.103.1.1 General

The **cutting means enclosure** shall extend at least 3 mm below the plane of the **cutting means tip circle**, except as allowed in 20.103.1.2 and at the grass **discharge opening**. The bolt heads of **cutting means** securing screws may extend below the **cutting means enclosure** providing these are located within the inner 50 % **cutting means tip circle** diameter.

Any extension of the wall(s) of the **cutting means enclosure** adjacent to the **discharge opening,** including walls of the **discharge chute,** not meeting this requirement shall be considered as part of the **discharge opening.** The walls(s) shall be tested by the foot probe (see 20.103.4) and meet all the other requirements of this standard.

20.103.1.2 Front opening

Front openings may be provided on appliances having a **cutting width** of 600 mm or greater.

Where provided, such openings shall not exceed either the **cutting width** or the opening generated by two radial lines extending from the **cutting means** spindle(s) centre(s) at an angle of 50° to the direction of travel where these lines meet the enclosure, whichever is the smaller. (See figures 102 and 103.)

The highest point of all openings in the **cutting means enclosure** at the front, except the **discharge openings,** shall be limited by a vertical angle of opening of 15° and a maximum distance of 30 mm above the horizontal plane of the **cutting means** in the lowest **cutting means** position. The highest point in the openings of a front comb or rake arrangement shall be considered as a point on the bottom edge of the **cutting means enclosure** front. (See views A and B of figures 102 and 103.)

20.103.1.3 Discharge openings (chutes)

When open **discharge chutes** are provided, no tangential line from the **cutting means tip circle** in or above the plane of the **cutting means tip circle** and in the direction of rotation of the **cutting means** shall intersect the operator target area without first contacting the **cutting means enclosure** or **guard.**

20.103.1.4 Guards and grass catchers

Swinging **guards** or **guards** which have to be displaced in order to fit the **grass catcher** shall automatically return to the full **guard** position when the **grass catcher** is removed. The **guards** shall be considered as forming part of the **cutting means enclosure.**

20.103.2 Cutting means stopping

20.103.2.1 Cutting means stopping time

On appliances up to and including 600 mm **cutting width,** the **cutting means** shall stop from their maximum rotational speed within 3 s after the operator releases the **controls.**

On appliances over 600 mm **cutting width,** the **stopping time** shall be 5 s.

20.103.2.2 Life expectancy of cutting means stopping mechanism

The **cutting means** stopping mechanism shall meet the required stop time over the life expectancy of the appliance between major overhauls as recommended by the manufacturer. The tests shall consist of at least 5 000 on and off cycles at a rate to be specified by the manufacturer.

20.103.3 Thrown object hazard

Appliances shall be so constructed to provide in **intended use** adequate protection against risk of injury to persons from foreign objects that may be thrown out by the rotating **cutting means.**

Compliance is checked by the following test:

The appliance is placed in the test enclosure described in Annex BB with the base of the enclosure being as described in Annex CC. The target panel construction used shall be checked by the tests in Clause BB.2 immediately before and after this test. The target panels shall be divided into elevation zones by horizontal lines as indicated in Figure BB.1 and described in Annex DD.

The projectiles used in the test are 6,35 mm diameter balls of hardened steel 45 HRC minimum (e.g. balls used as ball bearings).

*Injection points for the projectiles shall be provided at the 12 o'clock position as in Figures BB.2 and BB.3 and located 25 mm ± 5 mm inside the **cutting means tip circle** for injection of projectiles. An injection point shall be provided for each **cutting means** of a multi-spindle appliance.*

The injection tube outlets shall be fixed and flush with the upper surface of the coconut mat (see Figure CC.1) and the system shall be so arranged that the ball may be ejected with variable velocity.

*Where necessary, the appliance may be elastically restrained at the **handle** to prevent horizontal movement.*

*During the tests, the appliance shall be operated at **maximum operating motor speed** (as defined in 3.123).*

*Tests are conducted for each **cutting means** assembly.*

The appliance shall be tested in all operational configurations, for example, both with and without attachments and accessories such as grass collectors or mulching parts.

NOTE 1 Test personnel should either be kept out of the test area or otherwise protected from the **hazard of the thrown objects.**

*The **cutting means** should be adjusted to a 30 mm cut height or the next higher cutting position when set on a hard level surface. Appliances with a maximum height setting of 30 mm or less shall be set at their maximum height setting.*

*Before the test, adjust the velocity with which the ball is ejected so that the ball rises not less than 30 mm above the surface of the coconut matting and within an angle of 10° of the vertical axis. Then with the appliance in place, allow balls one at a time into the appliance. Increase the velocity of the balls in small increments until each ball is hit by the appliance **cutting means**. Start the test when this minimum velocity is established. Chipped or damaged balls shall be replaced.*

Inject 500 projectiles into each injection point for each test. On multi-spindle appliances, the test shall be run for each spindle with the results evaluated for each test.

*During any of the tests, in the event of excessive **hits** in a localised area, it may be necessary to repair or replace the target before continuing with the tests. Replace the target panels if **hits** from previous tests leave holes that cannot be covered by a 40 mm square gummed label. Not more than one thickness of gummed labels (patch) shall be placed over any one area.*

*Balls remaining within the test fixture (or on the test surface) may be removed at the option of the tester to minimise ricochet **hits**.*

*If a retest is required, a new **cutting means** shall be used for each test (500 projectiles) unless the **cutting means** is not damaged by impact with projectiles.*

NOTE 2 The test does not require that the appliance be suitable for use after test.

*Count and record **hits** on the data sheet shown in Annex DD. Projectiles that **hit** and damage the centreline of the target area height line shall be scored with the target area below that line.*

*For **cutting width** equal to and less than 600 mm, for each test (500 projectiles), not more than 40 projectiles shall **hit** the target between the base and the 450 mm line (lower and middle elevation area) of which not more than six may **hit** the target above the 300 mm line (middle elevation area). There shall be no **hits** above the 450 mm line (top elevation area) and not more than two **hits** in the operator target area between the base and the 450 mm line.*

*For **cutting width** greater than 600 mm, for each test (500 projectiles), not more than 50 projectiles shall **hit** the target between the base and the 450 mm line (lower and middle elevation area) of which not more than six may **hit** the target above the 300 mm line (middle elevation area). There shall be no **hits** above the 450 mm line (top elevation area) and not more than two **hits** in the operator target area between the base and the 450 mm line.*

In the event of a test failure, two additional appliances may be tested both of which shall then pass the test.

20.103.4 Access to cutting means

Inadvertent access to the **cutting means** by the feet during operation shall be prevented, so far as reasonably practicable.

*Compliance is checked by the following test, using the foot probe as illustrated in Figure 104. The appliance is placed on a hard flat surface. The **guards** or deflectors, or both, being in the normal operating position on the **cutting means enclosure** and the appliance support members in contact with the supporting surface. **Hover mowers** are supported in the highest position they can reach under their normal working conditions.*

*Components of appliances, such as wheels and frames, are, where relevant, considered as part of the **cutting means enclosure** for the purpose of this test. The test is conducted under static conditions.*

*The tests are made with the **cutting means** in highest and lowest **cutting positions.** If the **cutting means** path height is different at different **cutting means** speeds, the test is conducted so as to include the two extremes of **cutting means** height.*

*The base of the probe is held horizontally at any height and then inclined up to 15° forward or backward from the horizontal (see Figure 104). The probe is applied at any point of the **discharge opening** with a force of 20 N or until the **cutting means enclosure** lifts from the original position, whichever occurs first.*

The probe is applied to the rear of all appliances as described in Figure 104.

*The test probe shall not enter the path of the **cutting means** assembly.*

20.103.5 Handle construction

The appliance **handle** shall be fastened to the appliance so as to prevent loss of control by unintentional uncoupling while in operation.

A positive means (latch or upper stop) shall be provided which cannot be unintentionally disengaged during **intended use** of the appliance, and shall not allow the end of the **handle** adjacent to the operator to come nearer than 450 mm horizontally behind the nearest path of the appliance **cutting means** during **intended use** of the appliance (see Figure 105).

However, if a **handle** park position is provided, the **handle** shall automatically lock back into the operating position(s) when it is moved into this (these) position(s).

Compliance is checked by inspection and measurement.

20.104 Requirements for cylinder mowers

20.104.1 General construction – guarding and shielding

20.104.1.1 Cutting cylinders shall be guarded on both sides and from front and rear, so that it is not possible for a vertical rod 50 mm in diameter and 500 mm in length, with its lower end in contact with the ground (supporting surface) to approach any portion of the cylinder within 10 mm when any **grass catcher** has been removed (see Figure 106).

20.104.1.2 Cutting cylinders shall be covered at the sides with **guards** extending at least as shown in Figure 107.

20.104.1.3 Cutting cylinders of free discharge and of rear discharge appliances shall be covered from above with a **guard** that extends so that its projection on the horizontal plane covers at least the projection of the cylinder on the same horizontal plane, when any **grass catcher** has been removed (see Figure 108).

20.104.1.4 Cutting cylinders of front discharge appliances shall be covered from the rear with a **guard** that extends so that its projection on the vertical plane covers at least the projection of the cylinder on the same vertical plane, less up to 25 mm (see Figure 109).

Compliance with the requirements of 20.104.1 shall be checked by measurement and inspection.

NOTE 1 Free discharge denotes throwing out grass clippings without guiding or collecting.

NOTE 2 Rear discharge denotes throwing out grass clippings so that they will be collected in a **grass catcher** which is located behind the cylinder.

NOTE 3 Front discharge denotes throwing out grass clippings so that they will be collected in a **grass catcher** which is located in front of the cylinder.

20.104.2 Thrown grass, thrown objects, operator safety

Rear discharge and free discharge (not front discharge) appliances shall be fitted with a **non-detachable guard** which limits the vertical **throw line** to a maximum height of 1 m in the vertical plane of the **handle** grips.

Compliance is checked by measurements in accordance with Figure 110.

20.104.3 Handle structure

If the end of the **handle** adjacent to the operator is less than 450 mm horizontally to the rear vertical tangent of the cutting cylinder, the appliance shall be so constructed that access to the cutting cylinder by the operator's feet is unlikely.

Compliance is checked by measurement and if applicable by the following test.

With the appliance set at the most unfavourable height of cut, the foot probe of Figure 104 is applied from the operator position side only, with the sole of the probe held horizontally at any height and then tilted forward or backward up to 15° from the horizontal.

The probe shall not contact the cutting cylinder.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Modification:

The impact energy shall be 1,0 J ± 0,05 J.

21.101 Requirements for rotary mowers

For the tests of this subclause the appliance is operated at maximum speed and may be elastically restrained at the **handle** to prevent the horizontal movement.

21.101.1 Strength of cutting means and cutting means mountings

21.101.1.1 Cutting means and their mountings shall have adequate strength to withstand impact with solid objects.

Compliance is checked by the following test.

The appliance is placed in the test enclosure described in Annex BB using the impact test fixture as shown in Figure 111.

*The appliance is positioned over a 30 mm x 3 mm (nominal) welded or seamless steel tube that has been placed in the test fixture (see Figure 111). The **cutting means** of the test appliance is adjusted to the cutting height closest to 50 mm and so positioned that when the tube is inserted into the path of the rotating **cutting means**, the **cutting means** will strike the exposed portion of the tube within 10 mm to 15 mm of the **cutting means** (see Figure 111). The tube is inserted once into the path of each **cutting means** assembly. A new piece of tube is used for each test.*

The appliance shall be run for 15 s, or until the cutter stops or the tube is severed.

Where it is not possible to insert the tube due to appliance design, the appliance is moved the minimum distance necessary to permit the tube to be inserted.

NOTE The test does not require that the appliance be suitable for use after test.

*During the test, no complete **cutting means**, arm or disc to which it is mounted shall become detached nor shall any part of the appliance pass through all layers of the wall of the fibreboard enclosure. Also, any breakage of the **cutting means** or **cutting means** retaining device shall be considered a failure of the test. Breakage of the drive shearing device or chipping of the **cutting means** cutting edge are not considered a test failure.*

21.101.1.2 The appliance shall withstand the out of balance forces that may occur due to wear, etc., of the **cutting means** or its assembly.

Compliance is checked by the following test.

*The appliance is placed in the test enclosure described in Annex BB. The test is conducted on a smooth hard level surface. **Hover mowers** are tested on grass or a synthetic material equivalent to grass.*

*The **cutting means** imbalance, in kilogram metres, is first determined by the formula $0{,}024\ L^3$ where L is the diameter of the **cutting means tip circle,** in metres.*

*The calculated imbalance is created by removing material from, or adding it to, the **cutting means** until the desired imbalance is obtained.*

*The test is run for 1 h in the test enclosure for each **cutting means** assembly.*

*All **cutting means** assemblies of a multi-spindle appliance are tested singly. It is permissible to test all **cutting means** assemblies of a multi-spindle appliance simultaneously at the discretion of the manufacturer. A new appliance may be used for each test.*

NOTE The test does not require that the appliance be suitable for use after test.

During the test, the appliance shall not lose any component necessary for compliance with the requirements of this standard nor shall any component or part of the appliance pass through all layers of the wall of the test enclosure.

21.101.2 Structural integrity of cutting means enclosures, discharge chutes, guards and grass catchers

Cutting means enclosures, discharge chutes, guards and **grass catchers** shall have sufficient strength to withstand the impact from foreign objects which may be thrown out by the **cutting means.**

Compliance is checked by the following test:

*The appliance is placed in the test enclosure described in Annex BB. The test fixture base consists of a steel plate of at least 1,5 mm thickness backed by a 19 mm plywood panel. The steel plate is to be large enough to extend at least 25 mm beyond the **cutting means enclosure** of the appliance.*

*An air inlet hole that is concentric shall be provided with each **cutting means tip circle** with an approximate maximum diameter as follows:*

Mower type	***Cutting means tip circle BTC***	***Air inlet diameter***
Non-mulching	*All BTC*	*0,3 × BTC*
Mulching	*BTC up to 635 mm*	*BTC − 127 mm*
Mulching	*BTC > 635 mm*	*0,8 × BTC*

NOTE 1 During the tests, personnel should stand behind a shield for protection against possible thrown objects.

*The location of one injection point B shall be, for **mulching mowers** at the 12 o'clock position as detailed in 20.103.3, for non-**mulching mower,** 25 mm inside the **cutting means tip circle** on a line BC which is 45° from a line AC in a direction counter to the direction of **cutting means** rotation, where A is the centre of the **discharge chute** exit and C is the centre of the **cutting means** axis.*

Ten injection points, equally spaced apart from point B and the centre C, of approximately 15 mm in diameter, are used for the introduction of projectiles, or if preferred instead of using 10 injection points, the appliance may be rotated in 36° increments from injection point 'B'.

The injection tubes shall not protrude above the steel plate.

The projectiles used in the test are hardened $13^{\ 0}_{-0,5}$ mm diameter balls of steel, 45 HRC minimum (e.g. used as ball bearings).

*Means shall be provided to inject ball projectiles with variable velocity. Adjust the velocity with which the ball is injected so that the ball rises a minimum of 30 mm and a maximum of 300 mm above the cutting plane of the **cutting means.***

*The appliance is positioned on the steel plate with the **cutting means** axis C over centre of the test panel. The **cutting means** are set at the lowest adjustable cutting height but not less than 30 mm. If the maximum height of cut is less than 30 mm then the machine is tested when adjusted to its maximum height.*

Ten projectiles are injected through each of the ten injection points (100 projectiles in total).

*The test is conducted once for each **cutting means** assembly.*

*A new appliance **housing** may be used for each **cutting means** of a multi-cutting means appliance.*

*The **cutting means enclosure, guard** or **grass catcher** shall be considered to have failed the test if any of the following occurs:*

*a) a hole in the **cutting means enclosure, guard(s)** or **grass catcher(s)** which allows the ball to pass through. A hole in a secondary enclosure, such as an internal baffle, shall not be considered a failure;*

*b) deformation of any part of the **cutting means enclosure, guard(s)** or **grass catcher** into the path of the blade;*

*c) the dislodging of the **grass catcher** or **guard** from its adaptor;*

*d) the **grass catcher** or **guard** falling from its normal operating position.*

In the event of a test failure, two additional identical appliances may be tested. If either of the two appliances fails a test, the model has failed the test.

NOTE 2 The test does not require that the appliance be suitable for use after test.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

Any holes provided to prevent accumulation of water in an enclosure shall be at least 5 mm in diameter or 20 mm^2 area with a width of at least 3 mm.

Compliance is checked by inspection and measurement.

22.35 *Replacement:*

For **class II appliances:**

Handles and **operator controls** which are hand-held when operating the appliance shall either be of insulating material or covered by insulating material having a thickness of at least 1 mm or separated by insulation equivalent to **supplementary insulation** from other **accessible** metal **parts**.

Handle shafts shall be

a) of insulating material or,

b) if of metal, covered with insulating material having a thickness of at least 1 mm which extends for a distance of 150 mm from **handles** and **handle** mounted **operator controls**, or,

c) so insulated that **accessible** metal parts within 150 mm of the **handles** and **handle-**mounted **operator controls** are insulated, by insulation equivalent to supplementary insulation, from other **accessible** metal parts which are within 75 mm of the ground measured as a clearance or from **accessible** metal **parts** connected to such parts.

Cable restraints/guides are not considered to be **operator controls.**

For **rotary mowers,** the **cutting means** shall be insulated from other parts, which are **accessible** when the appliance is in its normal position of use, by insulating material equivalent to **supplementary insulation.**

*Compliance is checked by inspection, by measurement and for the covering of insulating material on **handles, operator controls** and **handle** shafts, by the following tests.*

A sample of the covered part is conditioned at a temperature of 70 °C ± 2 °C for 7 days (168 h). After conditioning, the sample is allowed to attain approximately room temperature.

Inspection shall show that the covering has not shrunk to such an extent that the required length of 150 mm or the required insulation is no longer given or that the covering has not peeled off, so that it may move longitudinally.

After this, the sample is maintained for 4 h at a temperature of –10 °C ± 2 °C.

While still at this temperature, the sample is then subjected to impact by means of the apparatus shown in Figure 113. The weight A having a mass of 300 g falls from a height of 350 mm onto the chisel B of hardened steel, the edge of which is placed on the sample.

*One impact is applied to each place where the covering is likely to be weak or damaged in **intended use,** the distance between the points of impact being at least 10 mm.*

After this test, inspection shall show that the covering has not peeled off and an electric strength test is made between metal parts and metal foil wrapped round the covering in the area required to be insulated.

The test voltage of 2 750 V is applied for 1 min.

During this test, no flashover or breakdown shall occur.

22.36 Not applicable (covered by 22.35).

22.101 Appliances shall be provided with a means such that damage to the supply cable due to movement of the appliance is prevented as far as possible. The means provided shall be re-usable.

This requirement is considered to be met by, for example,

- a device to keep the cable out of the vicinity of the **cutting means** to which the cable may be adequately fastened, or,
- the supply cable entry or attachment being at least 0,6 m from the nearest point of the **cutting means.**

Compliance is checked by inspection and according to the following test procedure, except for automatic cord reel-in devices.

*The **supply cord** as delivered with the appliance is attached to the device in accordance with the instruction manual. The **supply cord** is then subjected 10 times to a pull of 100 N, the pull being applied in the most unfavourable direction, without jerks for 1 s.*

*After the test the power **supply cord** shall show no damage within the meaning of this standard and it shall not have been displaced longitudinally in the device by more than 2 mm.*

22.102 Air filters which can be removed for cleaning purposes shall be so designed that they are unlikely to come off in **intended use**.

This requirement is met if, for example, the air filter can only be removed with the aid of a **tool**, or

- is provided with a spring that prevents it from falling away in **intended use** due to vibration, or
- needs a deliberate action of the user for its removal.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.3 *Addition:*

Mains switches shall have a contact separation in all poles that provide full disconnection under overvoltage category III conditions.

The number of cycles of operation declared for 7.1.4 of IEC 61058-1 shall be at least 50 000.

25 Supply connection and external flexible cables and cords

This clause of Part 1 is applicable except as follows.

25.1 *Replacement*:

Appliances shall be provided with a **supply cord** or a connector inlet.

Appliances shall not allow the introduction of a connector complying with the standard sheets of IEC 60320-1.

Compliance is checked by inspection.

25.5 *Replacement*:

Appliances shall be provided with one of the following:

- a **supply cord** not less than 10 m in length with **type X attachment**, or

– a **supply cord** of length not exceeding 0,5 m with **type X or Y attachment** and terminating in a cable coupler (this includes the appropriate mating connector), or

– an appliance inlet supplied with the appropriate mating connector.

Compliance is checked by inspection.

25.7 *Modification:*

Replace the first paragraph by the following:

Supply cords shall be not lighter than,

– if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 60245 IEC 53);

– if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 53);

In some countries, these **supply cords** are not suitable and the **supply cord** shall be ordinary polychloroprene sheathed flexible cord (60245 IEC 57).

25.14 *Addition:*

This requirement also applies to external cables or cords where, because of the design of the appliance, there is relative movement of more than 45° of the cable or cord at its point of entry into an enclosure.

25.15 *Addition:*

This requirement applies to all **accessible** cables or cords.

Modification:

*The pull force on the **supply cord** shall be 150 N.*

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable except as follows.

28.1 *Addition:*

Screws or nuts for fastening the **cutting means** of **rotary lawnmowers** may be of insulating material or covered with insulating material, provided they cannot be replaced by readily available metal screws or nuts.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

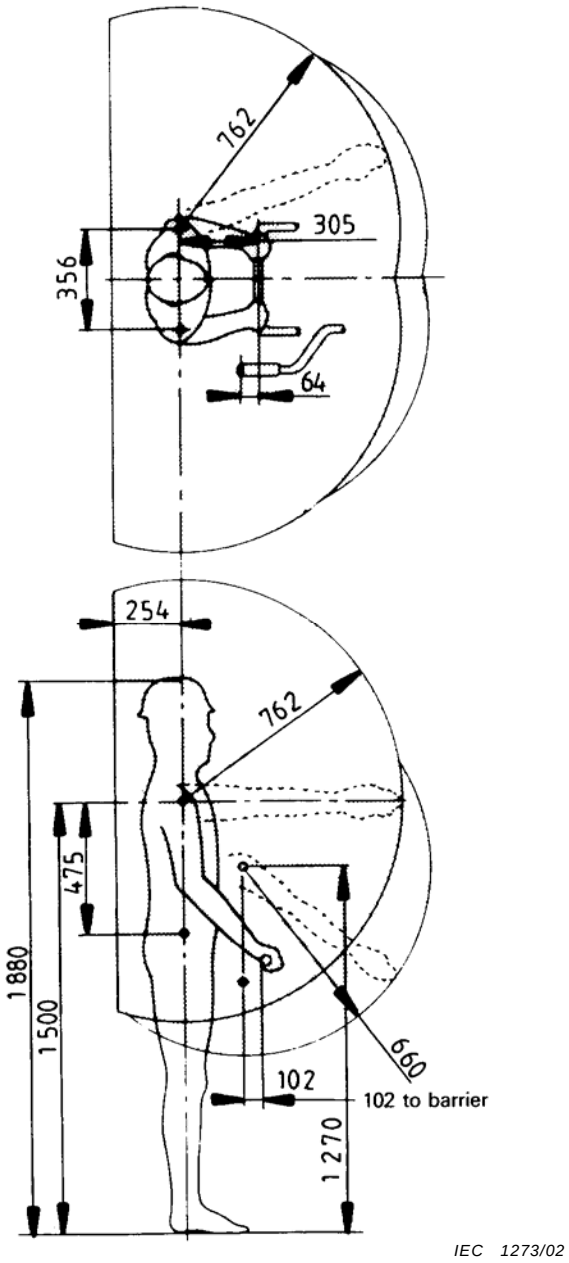
30.2.3 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.



Dimensions in millimetres

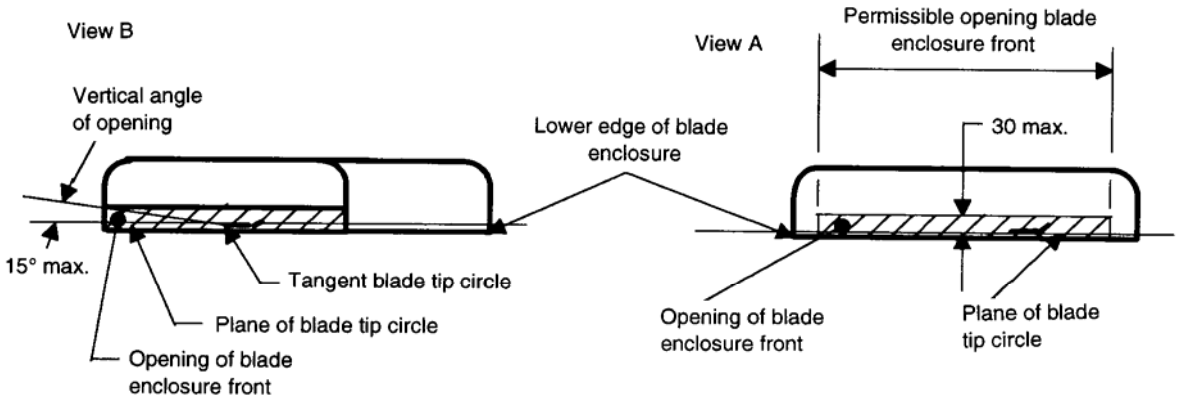
NOTE 1 The operator zone is the area into which the extremities of a 95th percentile male can reach from the normal operator position.

NOTE 2 The lower forward zone is the area into which a 5th percentile male or a 50th percentile female can reach when against the handle barrier. This zone can also be reached by a 95th percentile male leaning forward against the handle barrier.

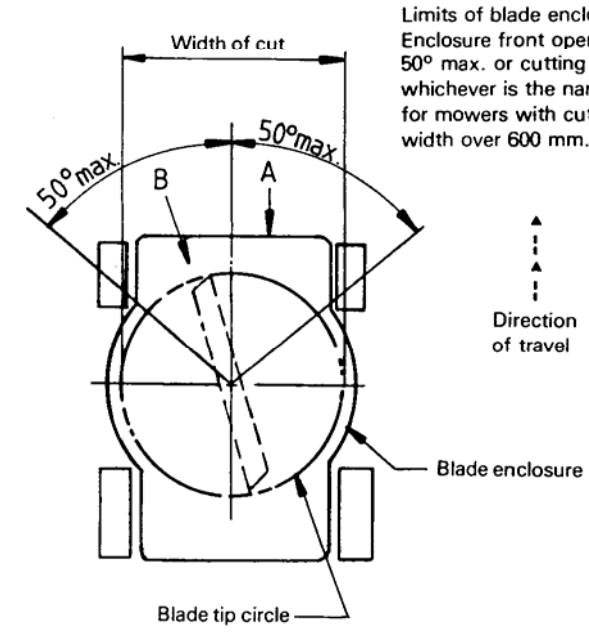
NOTE 3 All barriers within the operator zone will reduce the zone by the space occupied and protected by the barrier.

NOTE 4 The operator zone includes the maximum range of all frequently used operator control movements but is not intended to represent preferred operator control positions.

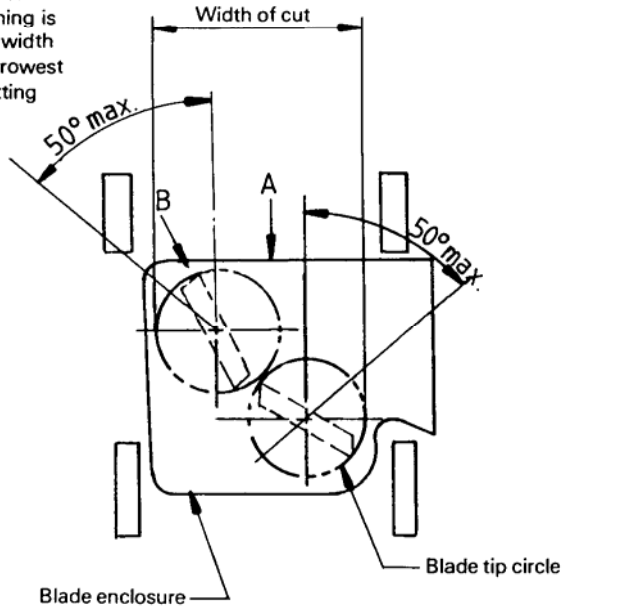
Figure 101 – Operator zone



Views A and B apply to both single and multispindle mowers



IEC 1274/02

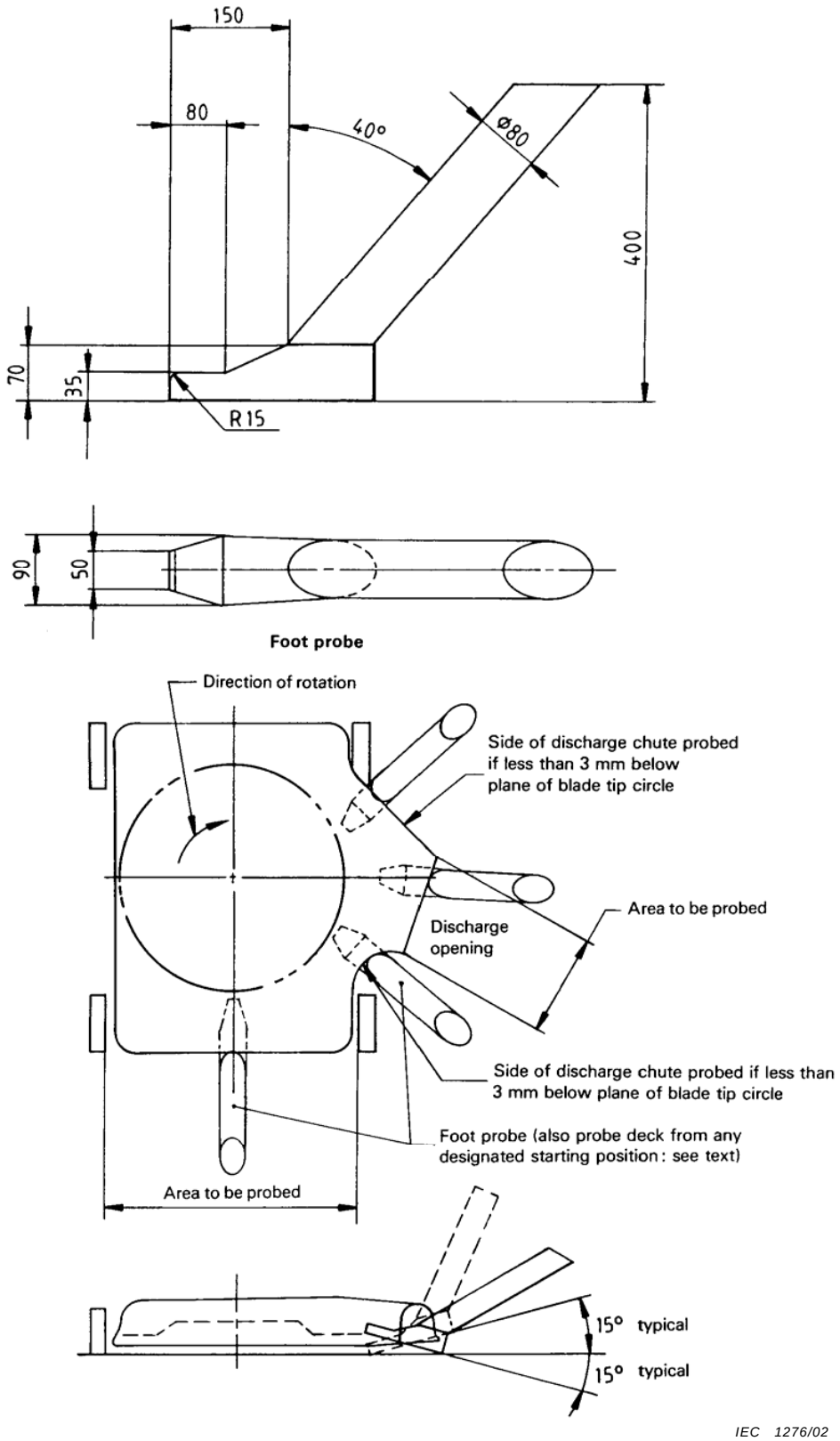


IEC 1275/02

Dimensions in millimetres

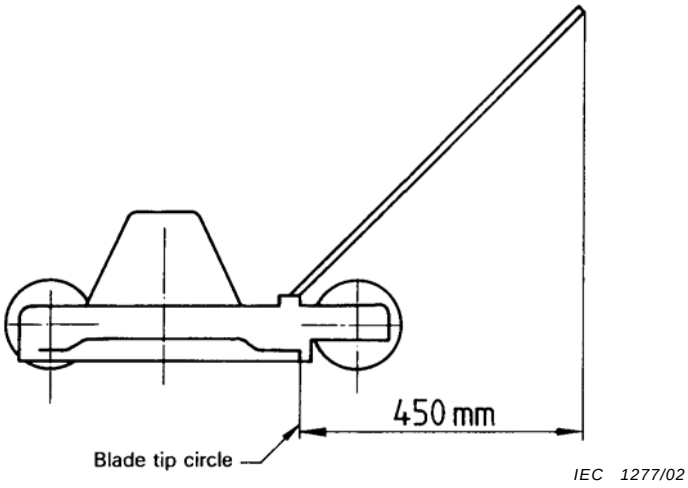
Figure 102 – Front opening restrictions – Single-spindle mowers

Figure 103 – Front opening restrictions – Multi-spindle mowers



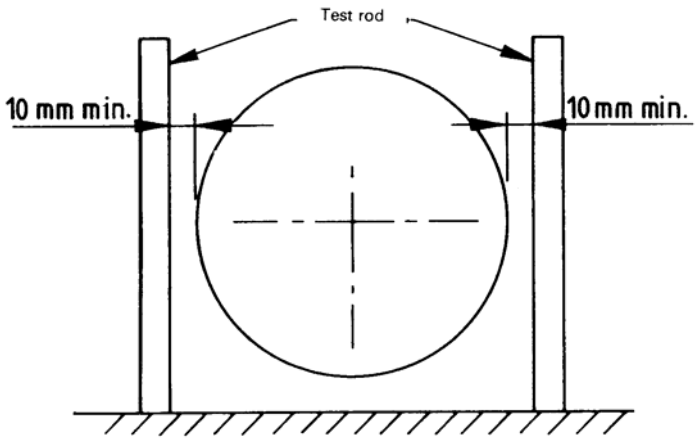
Dimensions in millimetres

Figure 104 – Foot probe test

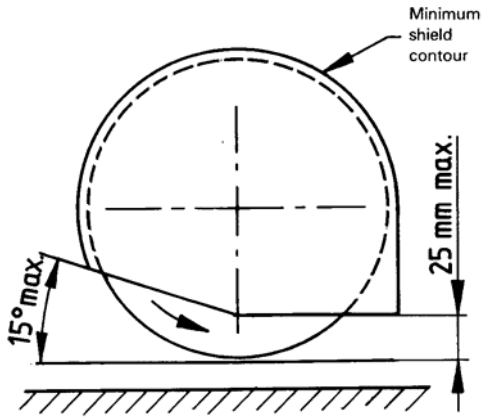


Dimensions in millimetres

Figure 105 – Handle length



IEC 1278/02

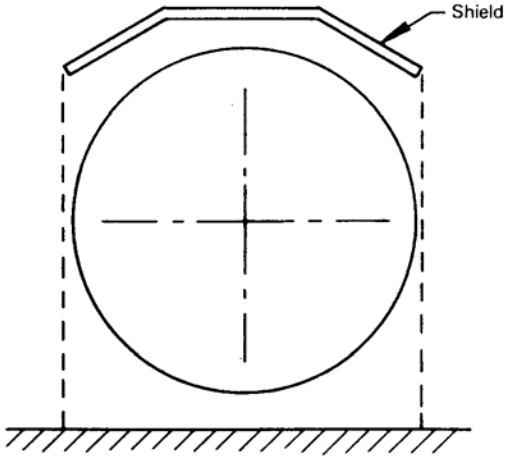


IEC 1279/02

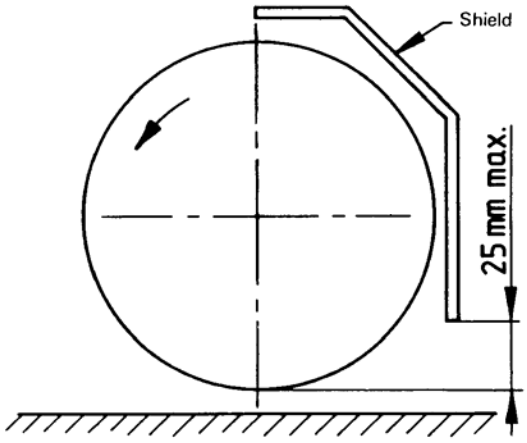
Dimensions in millimetres

Figure 106 – Guarding of cylinders

Figure 107 – Minimum guarding of cylinders at the side



IEC 1280/02

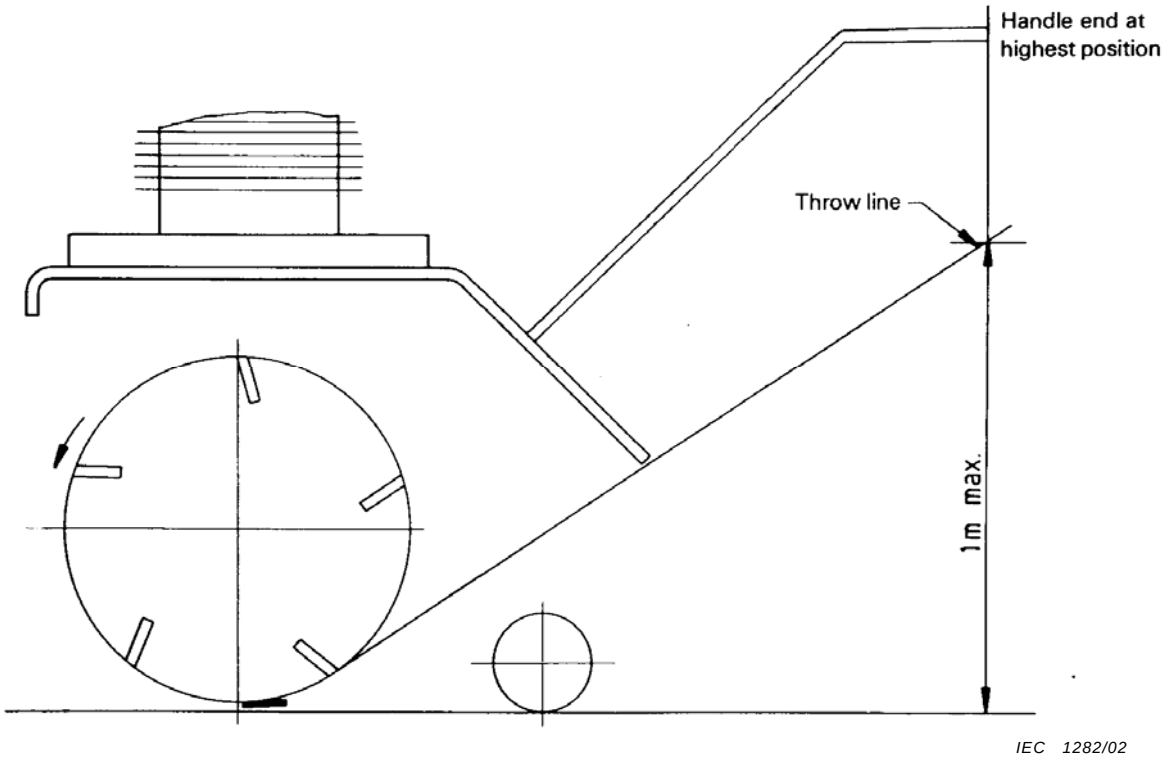


IEC 1281/02

Dimensions in millimetres

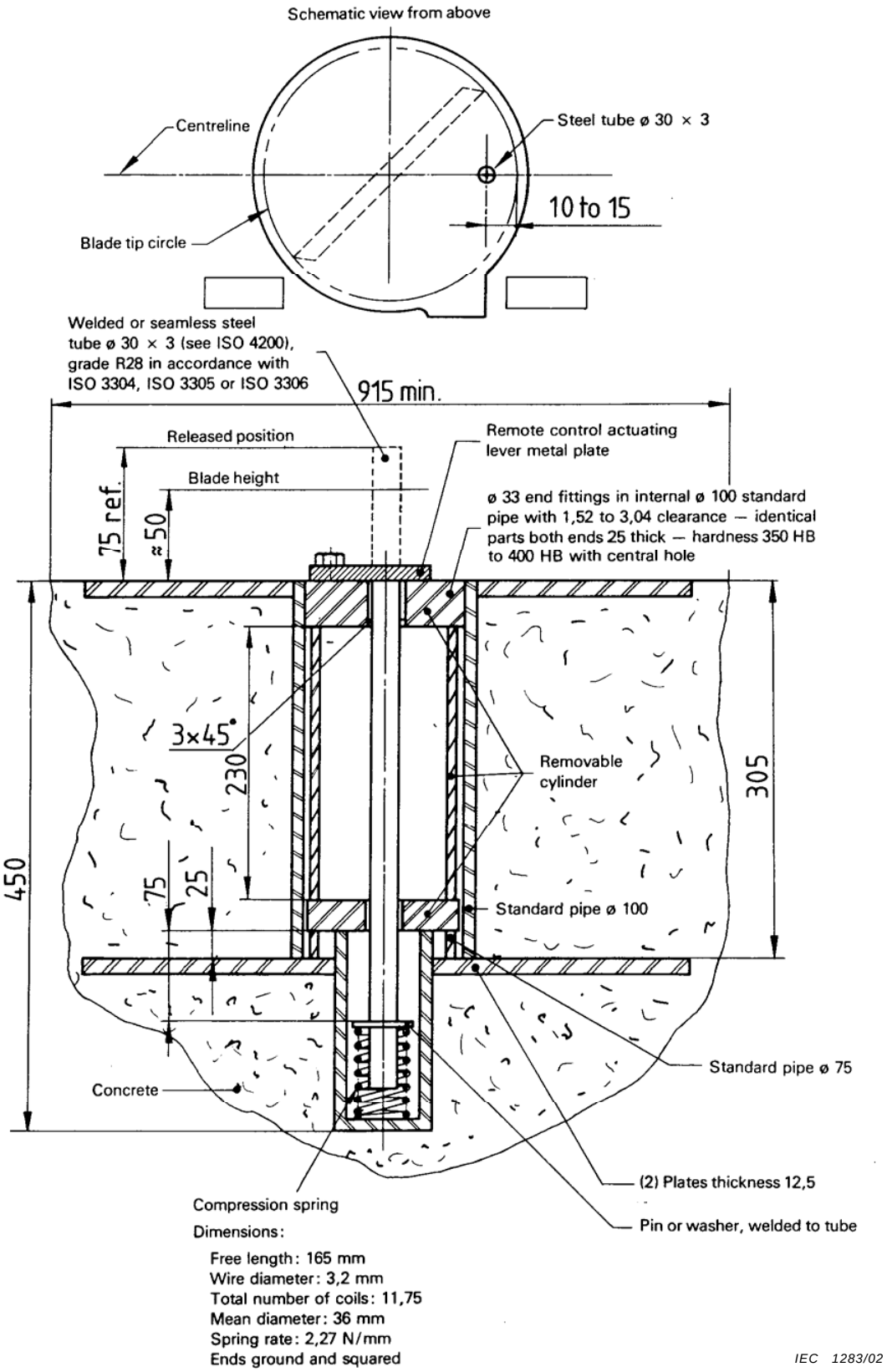
Figure 108 – Guarding of cylinders from above in free discharge and rear discharge appliances

Figure 109 – Guarding of cylinders from rear of front discharge appliances



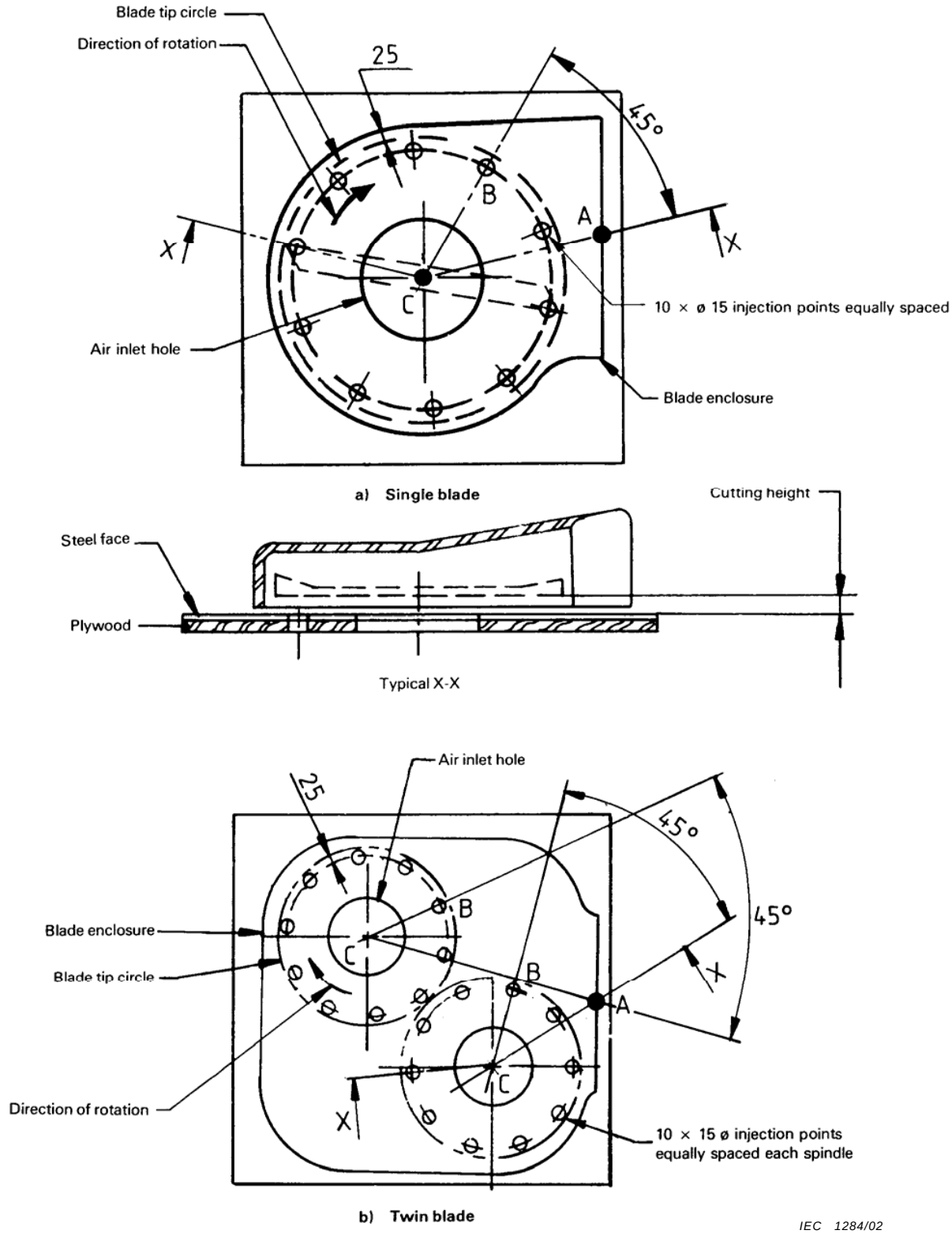
Dimensions in millimetres

Figure 110 – Cylinder mower – Throw line



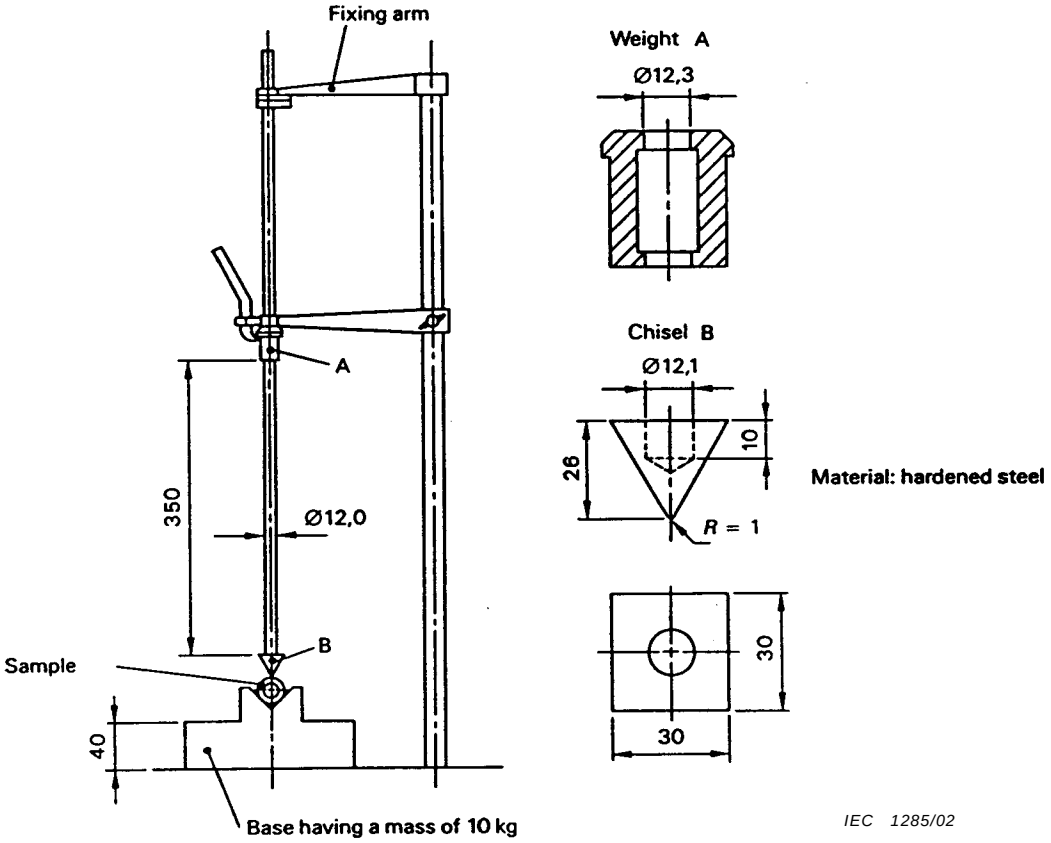
Dimensions in millimetres

Figure 111 – Impact test fixture



Dimensions in millimetres

Figure 112 – Structural integrity test



Dimensions in millimetres

Figure 113 – Impact test fixture for handle insulation

Annexes

The annexes of Part 1 are applicable except as follows.

Annex AA
(normative)

Principles of guarding

AA.1 Safety distances from dangerous parts

The safety distance is based on measurements from the location a person can occupy to start, mount or operate the appliance.

In those instances where other guarding requirements do not apply and where safety distances are used to provide personal protection, the clauses of this annex shall be followed.

AA.2 Reach round

When reaching edges in any position, the safety distance of freely articulating body parts is given in Table AA.1.

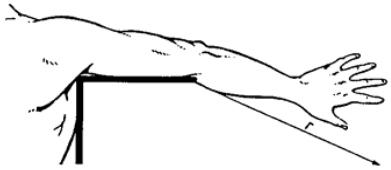
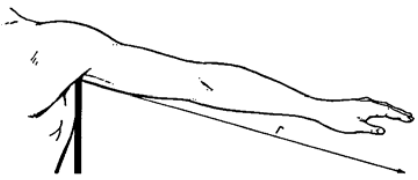
The radius of the movement, *r*, about a fixed edge is determined by the reach of given body parts. The safety distances assigned should be respected as a minimum if the body part concerned is not to be allowed to reach a danger point.

Of special importance is the danger area which can be reached when these body parts are introduced through slots.

When applying safety distances, it is to be assumed that the basic joint component of the relevant body part is in fixed contact with the edge. The safety distances apply only if it is ensured that further advance or penetration of the body part towards the danger point is excluded.

Table AA.1 – Extent of reach

Dimensions in millimetres

Body part	Safety distance, *r* mm	Illustration
Hand (from root of finger to fingertip)	≥120	
Hand from waist to fingertip	≥230	
Arm from elbow to fingertip	≥550	
Arm from armpit to fingertip	≥850	

AA.3 Reaching in and through elongated openings with parallel sides.

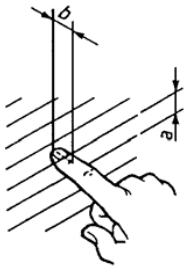
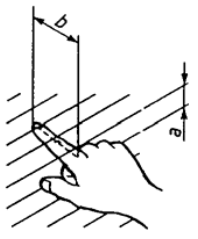
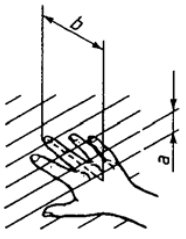
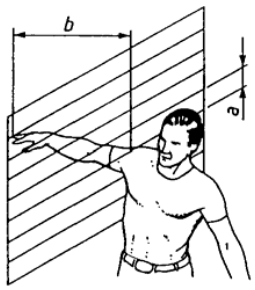
Safety distances are given in Table AA.2, where

– *a* is the smaller dimension of the aperture;

– *b* is the safety distance to the danger point.

Table AA.2 – Values of *a* and *b*

Dimensions in millimetres

Fingertip	Finger		Hand to ball of thumb	Arm to armpit
				
$4 < a \leq 8$	$8 < a \leq 12$	$12 < a \leq 20$	$20 < a \leq 30$	$30 < a < 150$ max.
$b \geq 15$	$b \geq 80$	$b \geq 120$	$b \geq 200$	$b \geq 850$

AA.4 Reaching in and through square or circular apertures

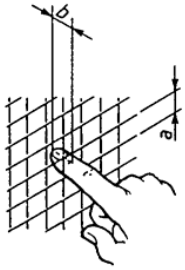
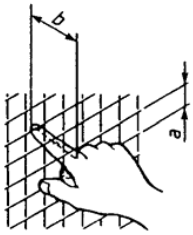
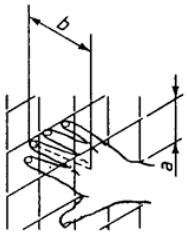
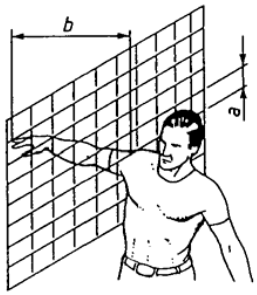
Safety distances are given in Table AA.3, where

– *a* is the aperture diameter or length of side;

– *b* is the safety distance to the danger point.

Table AA.3 – Values of *a* and *b* for circular apertures

Dimensions in millimetres

Fingertip	Finger		Hand to thumb root	Arm to armpit
				
$4 < a \leq 8$	$8 < a \leq 12$	$12 < a \leq 25$	$25 < a \leq 40$	$40 < a < 150$ max.
$b \geq 15$	$b \geq 80$	$b \geq 120$	$b \geq 200$	$b \geq 850$

AA.5 Openings of irregular shape

To choose a safety distance for an opening of irregular shape, refer to Table AA.2 and Table AA.3 using either the smallest circular aperture, *d*, that describes the opening, or the narrowest slot with parallel sides, *e*, that will contain the opening (see Figure AA.1). The greatest safety distance arrived at using this method should be employed.

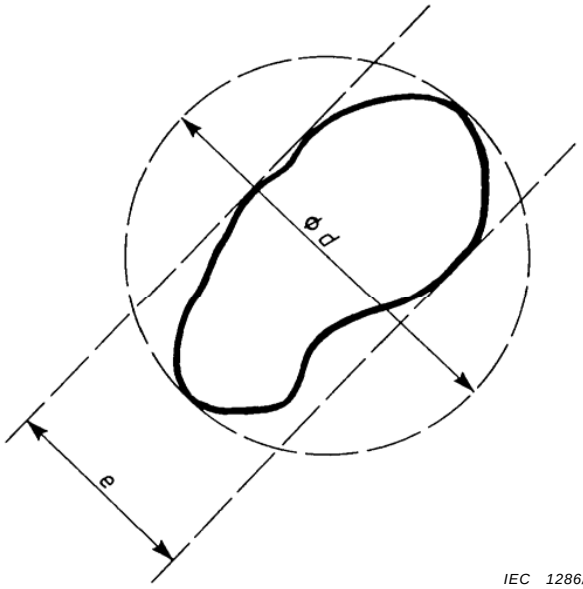


Figure AA.1 – Determination of standard aperture

Annex BB
(normative)

Test enclosure construction

BB.1 General construction

The test enclosure shall be generally constructed as shown in Figure BB.1; variations to accommodate different appliance types are shown in figures BB.2 and BB.3.

The walls shall consist of eight target panels, each 900 mm high, perpendicular to the base of the test fixture (see Figure BB.4), so as to form an octagon. The target panel composition shall meet the material specification of BB.2. The target in the operator area above 900 mm shall consist of a single sheet of Kraft paper rising to a height of 2 m. In order to facilitate the counting of hits, the panel support should be designed to allow the sliding in and out of at least one target panel.

The targets shall be generally located perpendicular to a radial line extending 750 mm ± 50 mm from the **cutting means tip circle** of single-spindle appliances, or to the nearest **cutting means tip circle** of multi-spindle appliances (see figures BB.2 and BB.3). If a target interferes with a part of the appliance such as grass box, **handle,** or wheel, the target shall be moved back to avoid such interference.

The operator target is determined by the intersection of lines extending from centre A (Figure BB.2) of the **cutting means tip circle** for single blade mowers or from the centre B (Figure BB.3) of a line through the centres of the outer **cutting means tip circles** for multi-**cutting-means** appliances and tangent to the 1 m diameter operator area. The centre of the operator area is located 330 mm to the rear of the **handles** on a line passing from the centres A or B through the centre of the hand grip part of the **handle** (figures BB.2 and BB.3). The target surface between the intersection of the two tangents and the target is the operator target area.

For appliances with movable offset **handles**, the **handle** shall be positioned to the left to locate the left limit of the operator target area, and then to the right to locate the corresponding right limit.

BB.2 Target panel construction

The target panels shall consist of one or more sheets of corrugated fibreboard together with sheets of Kraft paper as required to meet the test criteria.

The fibreboard construction may have two or three liners and have one or two flutes.

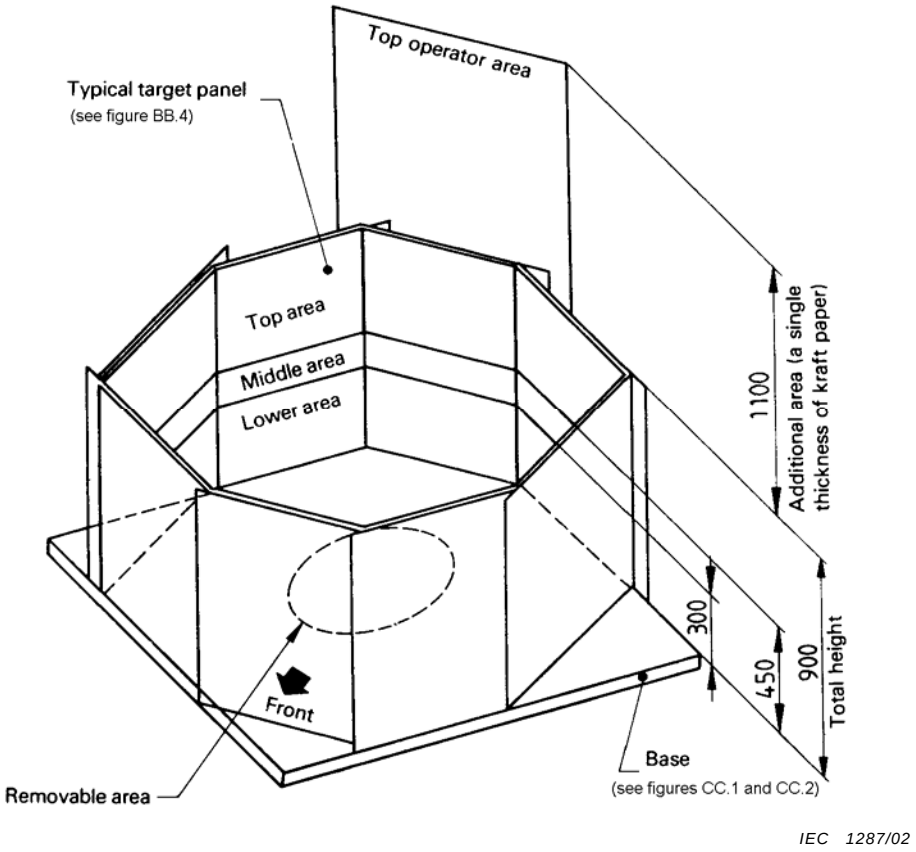
The Kraft paper shall be of nominal 225 g/m^2 construction which satisfies the conditions of ISO 2758. Samples of the target panel construction used shall be cut into 150 mm x 150 mm squares and tested in the fixture shown in Figure BB.5 as follows.

The samples are placed centrally on the bottom plate, the edges of the square samples may be secured by adhesive tape. Cover with the top plate, making sure that the central holes in the top and bottom plates are aligned and that the fibre board is flattened by the steel plate.

The penetrator test is carried out on five samples at a height of 300 mm and then on a further five samples at a height of 400 mm.

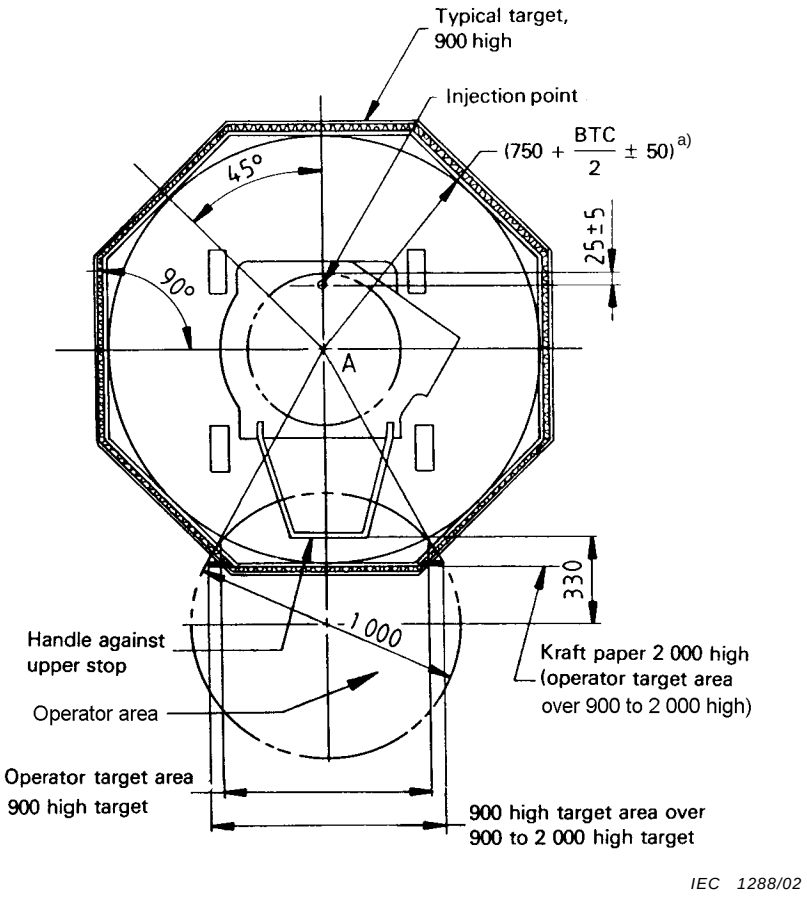
When dropped from 300 mm, the penetrator shall not penetrate completely through the target panel in more than two out of five samples.

When dropped from 400 mm, the penetrator shall pass completely through the target panel in at least four out of five samples.



Dimensions in millimetres

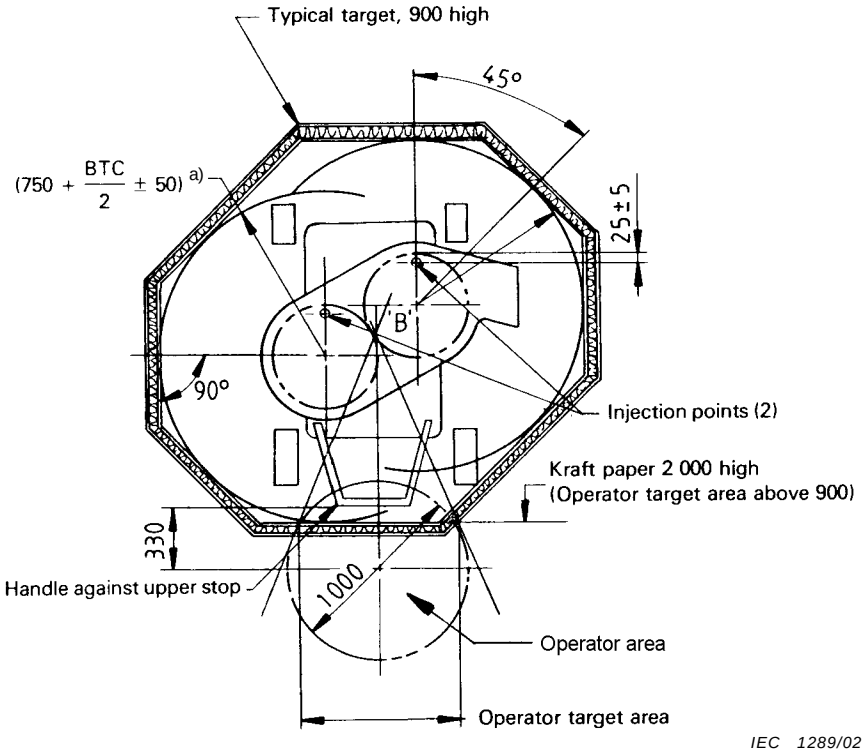
Figure BB.1 – Thrown object test fixtures – General layout



a) BTC = Blade tip circle

Dimensions in millimetres

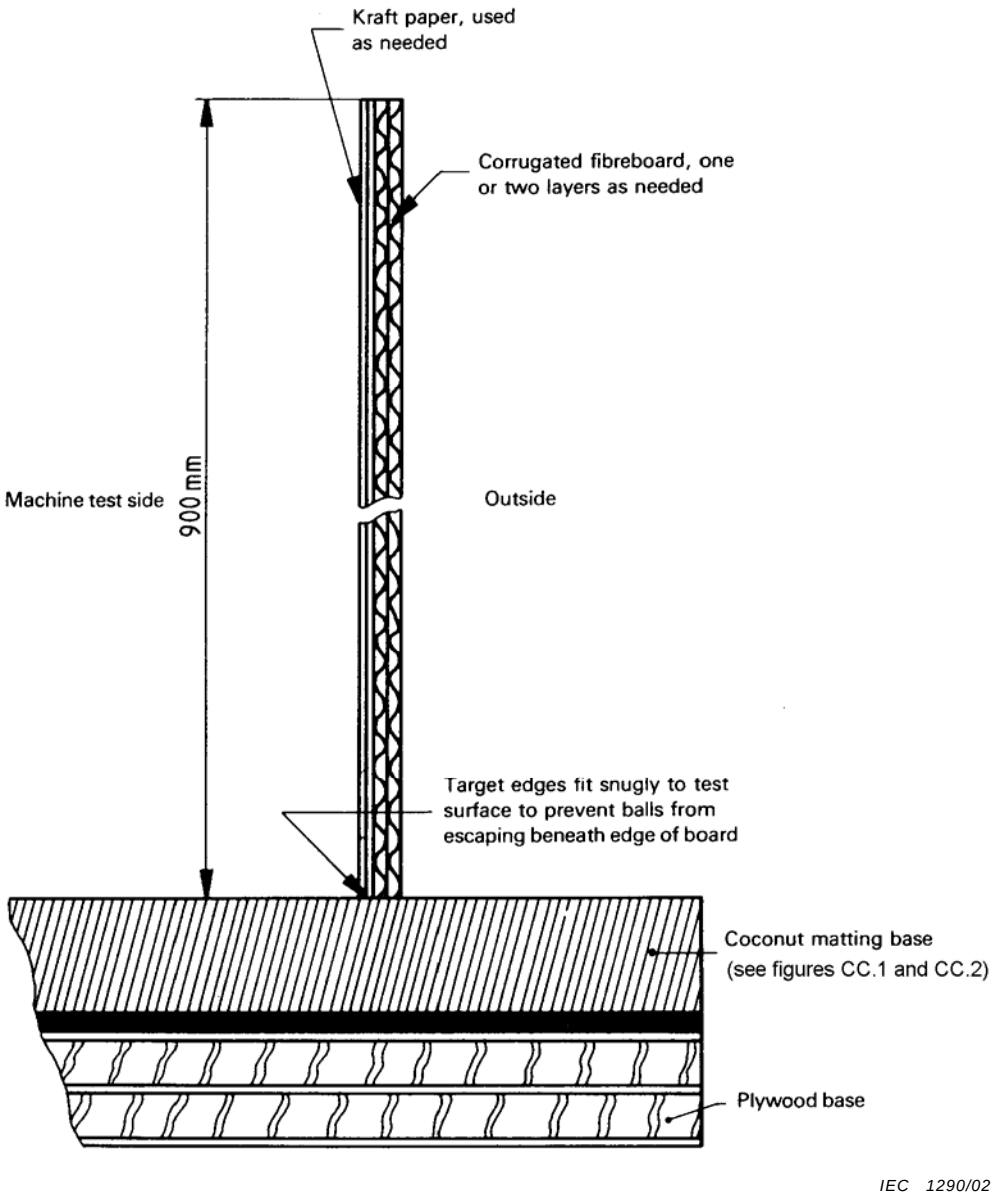
Figure BB.2 – Single-spindle mower – Test enclosure



a) BTC = Blade tip circle

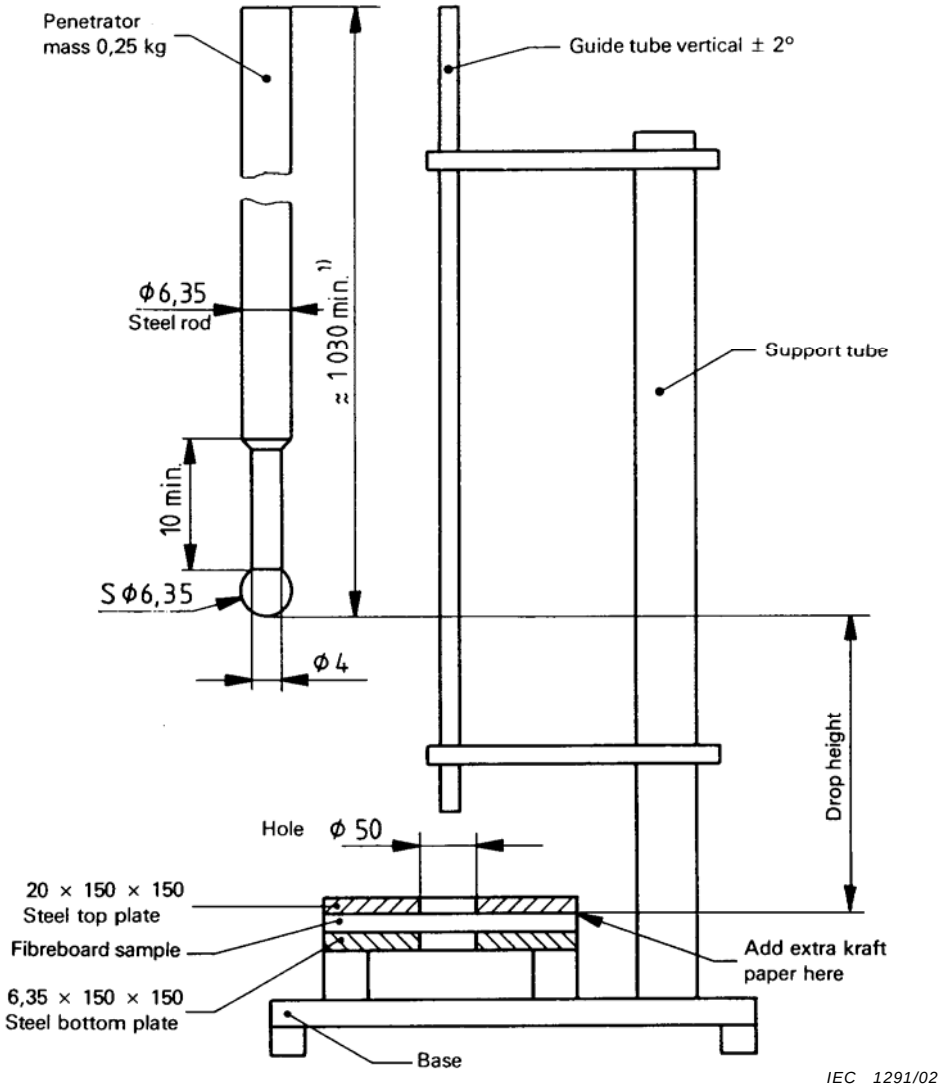
Dimensions in millimetres

Figure BB.3 – Multi-spindle mower – Test enclosure



Dimensions in millimetres

Figure BB.4 – Test enclosure walls and base



Dimensions in millimetres

Figure BB.5 – Test fixture for corrugated fibreboard penetration test

Annex CC
(normative)

Base for thrown object test enclosure

CC.1 Construction

The test fixture base shall consist of 19 mm plywood covered with squares of coconut matting of dimensions 500 mm x 500 mm in accordance with CC.3, nailed to the plywood as shown in Figure CC.1 with nails spaced as shown in Figure CC.2.

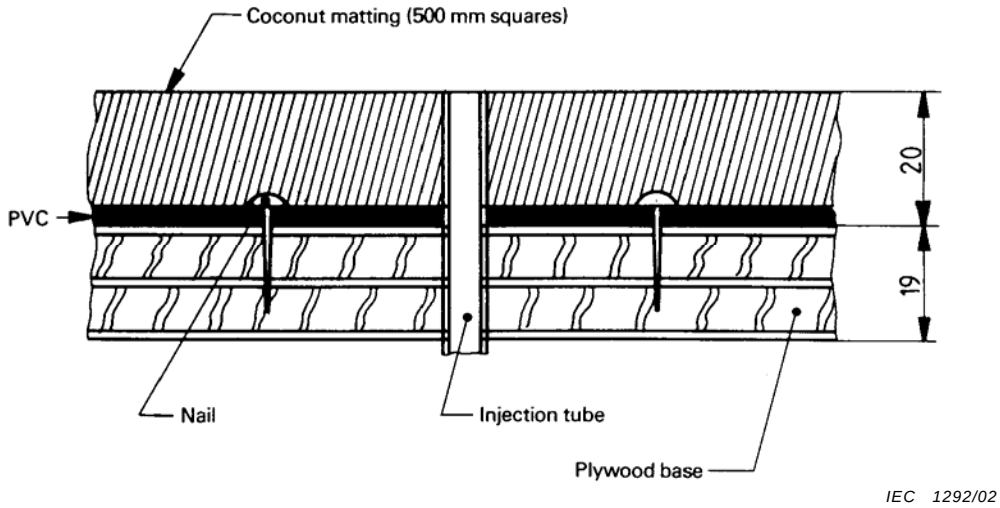
NOTE Squares are used so that, should wear develop, the worn area can be replaced without replacing the entire test surface.

CC.2 Minimum size

The minimum base size shall be such that with the test enclosure constructed in accordance with Annex BB, the target panels rest completely on the coconut matting base.

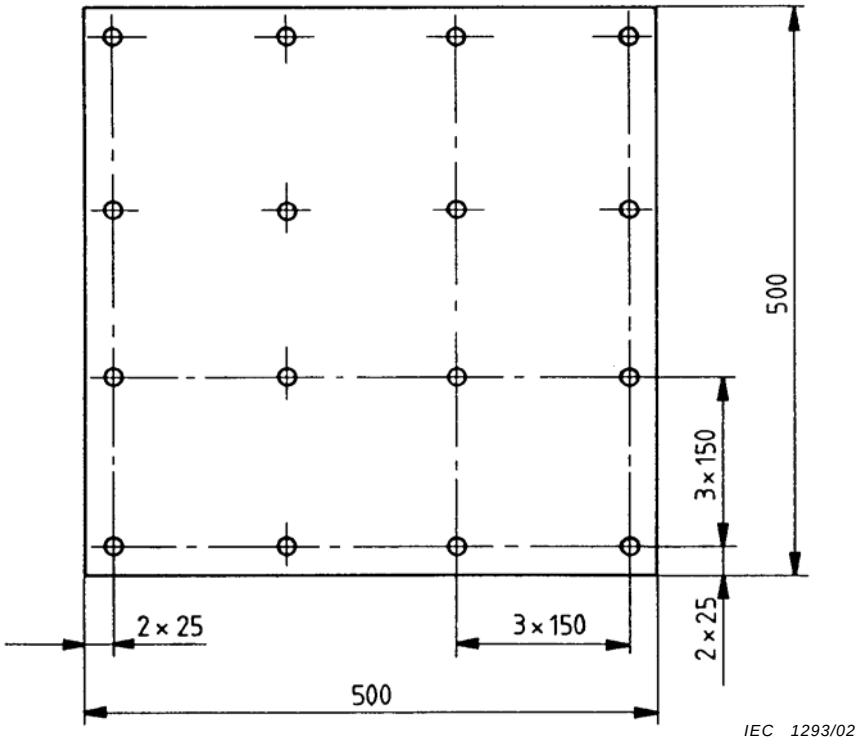
CC.3 Coconut matting

The coconut matting shall have approximately 20 mm high fibres embedded in a PVC base and shall weigh approximately 7 000 g/m^2.



Dimensions in millimetres

Figure CC.1 – Thrown object test fixture – Base detail



Dimensions in millimetres

Figure CC.2 – Nail plan of test fixture base

Annex DD
(normative)

Target panel elevation zones and recommended test report for thrown object test

DD.1 Target elevation zones

The target panels are divided horizontally into three elevation zones as shown in Figure BB.1.

DD.1.1 Lower elevation zone

The area between the base and the 300 mm line.

DD.1.2 Middle elevation zone

The area between the 300 mm line and the 450 mm line.

DD.1.3 Top elevation zone

The area between the 450 mm line and the top of the 900 mm target panel.

DD.2 Operator target area

It is determined in accordance with Clause BB.1 and extends from the base to the top of the 2 m high Kraft paper.

DD.3 Recommended test data sheet

The format suggested allows for counting **hits** by lots of 100 projectiles and summarising the results at the bottom of the sheet (see Figure DD.1).

Manufacturer: ..... Model: ..... Size: .....

Discharge location: .....

Blades: number ..... r/min: .....

Lot	Elevation area	Sector		Total hits
		Operator (rear)	Other (front/sides)	
1	Top [a)]			
	Middle			
	Lower			
2	Top [a)]			
	Middle			
	Lower			
3	Top [a)]			
	Middle			
	Lower			
4	Top [a)]			
	Middle			
	Lower			
5	Top [a)]			
	Middle			
	Lower			
Test summary	Top [a)]			
	Middle			
	Lower			
	All areas			

[a)] Top includes the 900 mm to 2 000 mm high kraft paper panel of the operator target area.

IEC 1294/02

Figure DD.1 – Recommended data sheet for thrown object test

Annex EE
(informative)

Relationship with ISO 5395

Many of the requirements in this standard related to mechanical strength and mechanical safety together with other supporting information have been extracted from ISO 5395.

However, because this IEC standard only covers a small part of the scope of ISO 5395, it was deemed essential to repeat the relevant technical content in this standard in order to produce a single coherent workable document.

The link between the tests of this standard and ISO 5395 is given in the following tables.

Table EE.1 – Relationship between IEC subclauses and ISO 5395

IEC subclause number	ISO 5395 reference
3.101. to 3.114 3.116. to 3.125 3.127. to 3.139	From Subclause 1.3
Part of 7.12	From Annex E
20.2	From Subclause 2.2.1
Part of 20.101	From Subclause 2.2.9.1
20.102	From Subclause 3.4.3
20.103.1	From Sublause 3.2
20.103.2	From Subclause 3.2.4.2
20.103.3	From Subclauses 3.3.14.2 and 3.3.2 and Annex E
20.103.4	Subclause 3.3.5
20.103.5	Subclause 3.4.2
20.104.1	Subclause 4.2
20.104.2	Subclause 4.3
20.104.3	Subclause 4.4
21.101.1	Subclause 3.3.3 and 3.3.4
21.101.2	Subclause 3.3.6

Table EE.2 – Relationship between IEC figures and ISO 5395

IEC figure numbers	ISO figure numbers
101	2
102 and 103	3
104	11
105	13
106 to 110	14 to 18
111	10
112	12

Table EE.3 – Relationship between IEC annexes and ISO 5395

IEC annexes	ISO reference
Annex AA	Annex A
Annex BB	Annex B, Annex C and Subclause 3.3.1.4
Figure BB.1	Figure 4
Figure BB.2	Figure 5
Figure BB.3	Figure 6
Figure BB.4	Figure B.3
Figure BB.5	Figure C.1
Annex CC	Annex B
Figure CC.1	Figures B.2
Figure CC.2	Figure B.1
Annex DD	Annex D

Bibliography

The bibliography of Part 1 is applicable.

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