UL 60745-2-17

STANDARD FOR SAFETY

Hand-Held Motor-Operated Electric Tools – Safety – Part 2-17: Particular Requirements for Routers and Trimmers

UL Standard for Safety for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-17: Particular Requirements for Routers and Trimmers, UL 60745-2-17

Third Edition, Dated February 25, 2011

Summary of Topics

This revision of ANSI/UL 60745-2-17 dated June 17, 2020 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this harmonized standard jointly. However, the revision pages dated June 17, 2020 will not be jointly issued by UL and CSA as these revision pages only address UL ANSI approval dates.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated March 27, 2020.

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February 25, 2011

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This national standard is based on publication IEC 60745-2-17, third Edition (2010).

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ANSI

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as "CSA Group") and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA and UL. CSA and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Third Edition including revisions through June 17, 2020. The most recent designation of ANSI/UL 60745-2-17 as a Reaffirmed American National Standard (ANS) occurred on June 4, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

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Preface

This is the harmonized CSA and UL standard for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-17: Particular Requirements for Routers and Trimmers. It is the third edition of CAN/CSA-C22.2 No. 60745-2-17 and the third edition of UL 60745-2-17. This edition of CAN/CSA-C22.2 No. 60745-2-17 supersedes the previous edition published in 2004. This standard is based on IEC 60745-2-17, third edition.

This harmonized standard was prepared by the Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL).

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This standard was reviewed by the CSA Subcommittee on Safety of Hand-Held Motor-Operated Electric Tools, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard has been approved as a National Standard of Canada by the Standards Council of Canada.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

Where reference is made to a specific number of samples to be tested, the specified number is considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for differences from IEC

Differences from the IEC are being added in order to address regulatory situations present in the U.S. and Canada.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one literal interpretation has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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NATIONAL DIFFERENCES

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

In the CSA and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 60745-2–17, Safety Requirements for Hand-Held Motor-Operated Electrical Tools – Safety – Part-2-17: Particular Requirements for Routers and Trimmers, copyright 2010 are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY – PART 2-17: PARTICULAR REQUIREMENTS FOR ROUTERS AND TRIMMERS

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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International Standard IEC 60745-2-17 has been prepared by IEC technical committee 116: Safety of hand-held motor-operated electric tools.

This third edition cancels and replaces the second edition published in 2003, of which it constitutes a technical revision. Main changes include: Clause 8: Marking and instructions, addition of some router specific safety warnings, clarifications in Annex K, the addition of Annex M: Safety of working stands for operation with hand-held motor-operated electric tools and editorial modifications to match with the fourth edition of IEC 60745-1.

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

FDIS	Report on voting
116/38/FDIS	116/47/RVD

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

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

This Part 2-17 is to be used in conjunction with the fourth edition (2006) of IEC 60745-1: Safety of hand-held motor-operated electric tools – Part 1: General requirements. It was established on the basis of the fourth edition of that standard.

When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly:

NOTE 1 In this standard, the following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in smaller roman type.

Subclauses, tables and figures which are additional to those in Part 1 are numbered starting from 101; additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 60745 series, under the general title: Hand-held motor-operated electric tools – Safety, can be found on the IEC website.

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

• reconfirmed;

• withdrawn;

• replaced by a revised edition; or

• amended.

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY – PART 2-17: PARTICULAR REQUIREMENTS FOR ROUTERS AND TRIMMERS

1 Scope

This clause of Part 1 is applicable, except as follows:

Addition:

This standard applies to routers and trimmers.

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

This clause of Part 1 is applicable, except as follows:

Additional definitions:

3.101 router: tool designed to be fitted with rotary cutter and with a base that allows control of cutting slots into or shaping the edge of various materials

3.102 trimmer: tool designed to be fitted with rotary cutter and a base that allows for control of trimming the edge of laminate sheet or similar materials

4 General requirements

This clause of part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable.

6 Void

7 Classification

This clause of part 1 is applicable.

8 Marking and instructions

This clause of Part 1 is applicable, except as follows:

8.1 *Addition:*

– rated no-load speed in revolutions per minute.

8.12.1.1 *Addition:*

– **Hold power tool by insulated gripping surfaces, because the cutter may contact its own cord.** *Cutting a "live" wire may make exposed metal parts of the power tool "live" and shock the operator.*

– **Use clamps or another practical way to secure and support the workpiece to a stable platform.** *Holding the work by your hand or against the body leaves it unstable and may lead to loss of control.*

8.12.2 *a) Addition:*

7) Details of the type of cutters for which the tool is designed

8) Draw attention to the necessity for using bits of the correct shank diameter suitable for the speed of the tool

9) Information concerning the diameter of shank for which the collet is designed

9 Protection against access to live parts

This clause of Part 1 is applicable.

10 Starting

This clause of Part 1 is applicable.

11 Input and current

This clause of Part 1 is applicable.

12 Heating

This clause of Part 1 is applicable, except as follows:

12.4 *Replacement:*

The tool is operated for 15 cycles, each cycle comprising a period of continuous operation of 1 min and a rest period of 1 min with the tool switched off. During the periods of operation, the tool is loaded by means of a brake adjusted so as to attain rated input or rated current. The temperature rises are measured at the end of the 15th "on" period, or at the manufacturer's option, the tool may be operated continuously until thermal stabilisation.

13 Leakage current

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of part 1 is applicable.

15 Electric strength

This clause of Part 1 is applicable.

16 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

17 Endurance

This clause of Part 1 is applicable.

18 Abnormal operation

This clause of Part 1 is applicable.

19 Mechanical hazards

This clause of Part 1 is applicable, except as follows:

19.1 *Replacement:*

Routers shall be equipped with a base plate which surrounds the cutter in the plane of the plate so as to prevent inadvertent contact with the cutter during normal operation.

Compliance is checked by inspection.

Additional subclauses:

19.4.101 At least two handles are required if the mass exceeds 2 kg.

The handles shall be so shaped or located as to minimise the risk of inadvertent contact of the user's hand with rotating parts. Inadvertent contact of the user's hand is, for example, considered to be sufficiently prevented if the gripping area of the handle is provided with a suitable shroud(s) or barrier at its end(s) adjacent to the body of the tool, or the distance from a defined measuring point on the handle surface to the cutter is a minimum of 120 mm.

Compliance is checked by inspection and measurement. The measurement shall be carried out as a chain distance (see Figure 101).

With the base plate set to maximum depth of cut, to establish the measuring point on the auxiliary handle, follow the outlined procedure below.

a) Establish the closest (A) and the most distant (B) points from the plane of the base plate on the handle. Equidistant between points (A) and (B), draw the horizontal intersecting line on the plane parallel with the base plate and the surface of the handle.

b) The point on the intersecting line of the handle surface with the largest radial distance from the centreline of the spindle is the defined measuring point.

The motor housing can be considered as a handle, if suitably shaped.

The mass is measured without accessories, e.g. mandrels, cutters and flexible cable or cord.

If the motor housing is considered as the only gripping area, it shall be so shaped as to minimise the risk of inadvertent contact of the user with rotating parts. Inadvertent contact of the hand of the user is considered to be sufficiently prevented, if there is a 6 mm high barrier between the grasping surface and the cutter or if the mains switch area is at a distance of at least 120 mm from the cutter, taking into account any base plate which may be fitted.

Adjustment elements capable of being readjusted while the tool is operating, e.g. “revolving depth gauge”, shall be located so that touching of rotating parts is avoided.

Compliance is checked by inspection.

19.101 The no-load speed of the spindle at rated voltage or at the upper limit of the voltage range shall not exceed 110% of the rated no-load speed.

Compliance is checked by measuring the speed of the spindle after the tool has been operating for 15 min at no-load.

20 Mechanical strength

This clause of Part 1 is applicable.

21 Construction

This clause of Part 1 is applicable.

22 Internal wiring

This clause of Part 1 is applicable.

23 Components

This clause of Part 1 is applicable.

24 Supply connection and external flexible cords

This clause of Part 1 is applicable.

25 Terminals for external conductors

This clause of Part 1 is applicable.

26 Provision for earthing

This clause of Part 1 is applicable.

27 Screws and connections

This clause of Part 1 is applicable.

28 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable.

29 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

30 Resistance to rusting

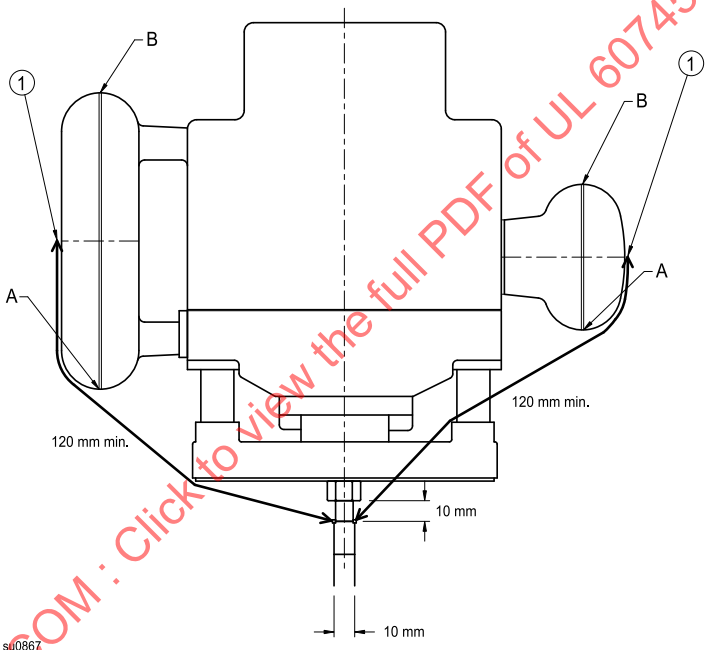
This clause of Part 1 is applicable.

31 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

Figure 101

Measurement of distance between handle and cutter



Key

1 Defined measuring points

A, B Reference points

Annexes

The annexes of Part 1 are applicable except as follows.

Annex K
(normative)

Battery tool and battery packs

K.1 *Addition:*

All clauses of this Part 2 apply unless otherwise specified in this annex.

K.8.12.1.1 *Addition:*

– **Use clamps or another practical way to secure and support the workpiece to a stable platform.** *Holding the work by your hand or against the body leaves it unstable and may lead to loss of control.*

K.12.4 This subclause of Part 2 is not applicable.

K.21.18.2 *Replacement of this subclause of part 2:*

To prevent inadvertent actuation, it shall either not be possible to start the tool when a sphere with a diameter of (100 ±1) mm is applied to the power switch control in any direction with a single linear motion

or

the power switch shall require two separate and dissimilar actions before the motor is switched on (e.g. a power switch which has to be pushed in before it can be moved laterally to close the contacts to start the motor).

Compliance is checked by inspection and by manual test.

Annex L
(normative)

Battery tools and battery packs provided with mains connection or non-isolated sources

L.1 *Addition:*

All clauses of this Part 2 apply unless otherwise specified in this annex.

L.21.18.2 *Replacement of this subclause of part 2:*

To prevent inadvertent actuation, it shall either not be possible to start the tool when a sphere with a diameter of (100 ±1) mm is applied to the power switch control in any direction with a single linear motion

or

the power switch shall require two separate and dissimilar actions before the motor is switched on (e.g. a power switch which has to be pushed in before it can be moved laterally to close the contacts to start the motor).

Compliance is checked by inspection and by manual test.

Annex M
(normative)

Safety of working stands for operation with hand-held motor-operated electric tools

NOTE Subclauses, tables and figures which are additional to those in Annex M of Part 1 are numbered starting from 301 to distinguish them from additional subclauses in Annex M of Part 1, numbered starting from 201.

M.1 Scope

This clause of Part 1 is applicable, except as follows:

Addition:

This annex applies to working stands with a maximum table hole diameter of 105 mm intended to be equipped with hand-held motor operated routers for cutting wood and similar materials.

All clauses of Annex M of Part 1 apply unless otherwise specified in this annex.

M.3 Terms and definitions

Additional definitions:

M.3.301 table for hand-held routers: platform for mounting a hand-held router to be used in a stationary position similar to a vertical moulding machine (see Figure M.301)

M.3.302 straight work: machining of workpiece with one face in contact with the table and a second with a guiding device such as a fence or mitre-guide, and where the work starts at one end of the workpiece and continues through to the other end

M.3.303 curved work: machining of a curved workpiece by having one side of the workpiece in contact with the table (or if held in a jig, the jig having contact with the table) and the other in contact with the vertical reference device such as steady, starter pin or ring guide

M.3.304 kickback: rapid movement of the workpiece opposite to the direction of feed cutting

M.3.305 stopped straight or curved work: the machining of only a part of the workpiece length

M.3.306 fence: linear structure that guides the workpiece in conjunction with the table

M.3.307 pressure device: device that applies a force to the workpiece, to keep the workpiece in contact with the fence or the table

M.3.308 maximum cutter diameter D_{max}: the maximum diameter of the cutting accessory

M.8 Marking and instructions

M.8.1 *Replacement:*

Working stands for routers shall be marked with:

– indication of direction of rotation of the cutter tool, on the table or on the guard of the working stand by an arrow raised or recessed or by any other means no less visible and indelible;

– feed direction of the workpiece;

– rated voltage and maximum rated input or current;

– maximum cutter diameter D_{max};

– details or list of routers that are allowed to be mounted to the router table.

Compliance is checked by inspection.

M.8.12.1 *Addition:*

The instruction manual shall refer to the router manual for appropriate tool warnings. Furthermore, it shall contain warnings against the following hazards and/or hazardous situations and related instructions for safe use:

– instruction to use the correct table rings in relation to the size of the cutter tool;

– the necessity to wear always suitable personal protective equipment. This includes:

• hearing protection to reduce the risk of induced hearing loss;

• respiratory protection to reduce the risk of inhalation of harmful dust;

• gloves to avoid possible injuries when handling cutter block and rough material due to sharp edges;

• safety glasses to avoid eye injury caused by flying particles;

– possible contact of the cutter block with hand and fingers of the operator. Instruction shall be given defining the correct guard and how to adjust guard(s) to prevent accessibility to portions of the cutter tool not being used;

– possible kickback, an unexpected rapid reaction to uncontrolled guiding of small workpieces opposite to the direction of feed cutting. Instruction shall be given to use additional measures such as horizontal pressure devices when working narrow workpieces to ensure safe working;

– hazardous situation due to uncontrolled lift up of the workpiece;

– when performing curved work, the necessity to guide the workpiece in the correct way to prevent cutting injuries. Instruction shall be given what type of guard or guard system is needed to ensure safe operation;

– incorrect use of cutter tools, workpiece and guiding devices may lead to dangerous situation. Instruction shall be given to teach the operator shall in the handling of the workpiece, use, adjustment and operation of workpiece clamps and guiding devices and tool selection;

– unmaintained tools can cause uncontrolled situations. Instruction shall be given to use cutting tools which are sharpened, maintained and adjusted in accordance with the tool manufacturers instructions;

– possible contact with moving parts. Instruction shall be given to switch off the machine and pull the plug before changing or adjusting;

– the necessity to keep hands away during straight work it. Instruction shall be given to use where possible – pressure device in conjunction with the fence;

– missing stops can cause kickback. Instruction shall be given to use back and/or front stops fixed to the fence when doing stopped work;

Sketches may be used to illustrate the modes of operation.

M.8.12.2 *Addition to* b) Operating instructions:

301) Information about the maximum cutter tool diameter the working stand is recommended for

302) Information how to mount and secure the hand-held router to the router table;

303) When machining wood, detailed instruction for the correct assembling of a dust-collecting device;

304) Incorrect adjustment of fences: Instruction how the fences shall be adjusted in relation to the different work. When and how to use a false fence to minimise the gap between cutting tool and fence plate;

305) Possible mistake of tool position: Instruction to fit the cutter tooling to the machine correctly and to feed the workpiece against the direction of spindle rotation;

306) Instruction to select the correct speed corresponding to the tooling and material being used;

307) Information about the workpiece dimensions the working stand is intended for. Information how to support long workpieces.

M.8.12.2DV DR *Modification: Add the following item:*

308) Information explaining the purpose and function of locking the actuator in the OFF position.

M.17 Endurance

M.17.1 *Addition:*

The fitting of table rings shall be designed so that vibration or loosening during ordinary operation is prevented.

Compliance is checked by the tests of M.17.2 using the ring with the smallest diameter d.

M.19 Mechanical hazards

This clause of Part 1 is applicable except as follows:

M.19.1.301 **Table**

The table dimensions according to Figure M.302 shall be in accordance with the maximum recommended cutter diameter D_{max}, as required in the instruction manual by M.8.12.2 b) 301).

$A \geq 6\ D_{max}$;

$L_{in} \geq 3\ D_{max}$ or 1/3 A, whatever is greater;

$L_{out} \geq 3\ D_{max}$ or 1/3 A, whatever is greater;

$C \geq 3\ D_{max}$, but not greater than 500 mm.

The fastening method of the router and the table thickness geometry shall be such that the recommended cutter tools shank insertion to the collets can be maintained for all routers that, in accordance with M.8.1, are allowed to be mounted to the router table.

Compliance is checked by inspection and measurement.

M.19.1.301.1 **Table hole, table rings**

The table hole diameter *d* shall be:

$$D_{max} + 24 \text{ mm} \geq d \geq D_{max} + 4 \text{ mm}$$

A set of rings to reduce the table hole diameter shall be delivered with steps of maximum 20 mm for the inner diameters. For the smallest ring, the inner diameter shall not be greater than 27 mm.

See Figure M.303.

Compliance is checked by inspection and measurement.

M.19.1.302 Workpiece guide systems

M.19.1.302.1 **Straight work**

For straight work, the working stand shall be equipped with a fence as a guidance system (see Figure M.304).

Compliance is checked by inspection.

M.19.1.302.1.1 **Fence dimension**

In order to ensure the vertical stability of the workpiece, the fence plates shall;

a) have a minimum height *h* of 25 mm or 2/3 D_{max}, whatever is greater;

b) the guiding faces of the infeed and outfeed side of the fence, shall have a length ≥ 1/3 *A*;

c) the parallelism shall either be adjustable or be less than 1 mm per 100 mm length, when not adjustable.

Compliance is checked by inspection and measurement. The parallelism is measured 2 mm above the plane of the table at the end points of the fences.

M.19.1.302.1.2 **Fence construction and adjustment**

The following requirements apply.

a) Fence plates shall be adjustable to maintain the radial spacing from the cutter tool to the fence to be less than 3 mm.

b) If an offset movement is possible, the parallelism between infeed and outfeed plate of the fence shall be maintained when offset movement is made as an assembly or when individually adjusted.

c) Fence plates shall be adjustable in the direction perpendicular to the plane of the fence (see Figure M.312).

d) Adjustments of a), b) and c) shall be capable of being undertaken without the aid of a tool.

e) The fence assembly shall be capable of being fixed securely to the table.

f) The part of the fence plates that may be incidentally contacted through the fence adjustment range by any of the recommended cutter tools shall be made of light alloy, plastic, wood, or other material that does not damage the cutter tool.

g) The fence plates shall either be fitted with a device ensuring continuity between the fence plates, or shall be equipped with fixing arrangements which would permit such a device to be fitted (e.g. false fence).

Compliance is checked by inspection and measurement.

M.19.1.302.2 **Curved work**

For curved work, working stands with D_{max} > 27 mm shall be provided with a guide with a lead-in device that allows progressive feed of the workpiece to the cutting tool or a starter pin suitable for curved work in combination with instructions for the use of integrated ball ring cutting tool shall be provided (Figure M.305).

Compliance is checked by inspection.

M.19.1.303 Guarding of the rotating parts

M.19.1.303.1 **Guarding below the table**

Access to the cutter tool between the base plate of the router and the bottom of the table shall be prevented.

Compliance is checked by inspection and by testing with the standard test finger in Figure 1.

M.19.1.303.2 **Guarding above the table**

A barrier guard shall be provided to guard that portion of the cutting tool above the table top which is not required for cutting.

Compliance is checked by inspection.

M.19.1.303.2.1 Guarding for straight work

M.19.1.303.2.1.1 **Cutter tool guarding – cutting area**

Guarding shall be performed by means of a manually adjustable or self adjusting guard, devices such as pressure devices and fence plates described in M.19.1.302.1.

- The periphery and the height of a self adjusting guard shall be sufficient in size to accommodate the maximum permissible cutting tool dimension.

- A manually adjustable guard shall be vertically adjustable from table top level to the height at least equal to the height of the fence or the maximum permissible cutting tool height dimension, whichever is higher, and shall cover at least 180° of the cutter's circumference and the diameter shall be greater than the table hole diameter.

Compliance is checked by inspection, measurement and by the following test.

With the cutter tool fitted which is likely to yield the most unfavourable results, the face of the fence plane is aligned with the axis of the router spindle and the guard is in normal cutter tool covering position.

With the test probe of Figure M.306 is orientated perpendicular to the table, it is advanced towards the cutter tool in the direction perpendicular to the table. Then the probe is advanced in direction parallel to the table, towards the cutter tool. The probe shall not contact any portion of the cutter tool.

Pressure devices shall be designed to keep the workpiece in contact with the table and the fence plates to prevent access to the cutting tool (see Figure M.304).

Working stands with D_{max} > 27 mm shall be provided with fence pressure device. Working stands with D_{max} > 52 mm shall be provided with table and fence pressure device.

The pressure devices shall comply with the following requirements.

a) The table pressure device shall be adjustable in height relative to the table. Adjustment shall be capable of being carried out without the aid of a tool.

b) The fence and table pressure devices shall, over the whole adjustment range, be symmetrically arranged with respect to the spindle. The workpiece guiding surface of the fence pressure device shall be parallel with the fence plates, and the workpiece guiding surface of the table pressure device shall be parallel with the table within a tolerance of 10 mm over any 100 mm length.

c) The pressure devices shall be spring loaded to allow for limited variation in workpiece thickness

d) The length of the table pressure device shoe shall be greater than the maximum opening between the fence plates, and shall allow the workpiece to contact the pressure device before it contacts the tool

e) The pressure device support system shall be so designed that it is possible to move the pressure devices from their working position to a position which will allow for tool changing, without removing them from the machine. The support system, pressure devices and supports shall be in a stable position when in the non working position

f) The support system for the pressure devices shall not be fixed to the table between the fence plate and the front edge of the table.

g) The pressure device shoes shall be able to press a workpiece with a minimum section of 8 mm by 8 mm in the vertical and horizontal directions over the whole length given in item d).

h) The material from which the pressure device shoes are made shall be wood, light alloy or plastic.

i) The vertical adjustment range of the fence pressure device shall be such that:

– when adjusted to its lowest position, the underside of the pressure device shoe shall be on the table surface;

– when adjusted to its highest position, the top surface of the pressure device shoe shall be at least at the same height as the top of the tool when the spindle is adjusted to its highest position.

j) The horizontal adjustment range of the fence pressure device shall cover a distance of at least 3 D_{max} from the spindle axis.

k) The design of the pressure device shoes shall be such that a difference of at least 10 mm is maintained between the contact point of the table pressure device with the workpiece and the contact point of the fence pressure device with the workpiece

l) The vertical adjustment of the table pressure device shall be such that it is possible to machine workpieces of a height of at least 1,2 D_{max}.

Compliance is checked by measurement, inspection and functional testing on the machine.

M.19.1.303.2.1.2 **Cutter tool guarding – non cutting area at the rear of the fence**

Cutter tool guarding at the rear of the fences shall be performed by means of an enclosure fixed to or integrated with the fence.

• The enclosure shall be sufficient in size to accommodate the maximum permissible cutter tool dimension.

• The enclosure shall be designed to facilitate chip extraction.

• The cutter tool shall not be accessible from behind the fences

Compliance is checked by inspection and by following test.

The guarding system is evaluated with the face of the fence plane set to be tangentially aligned with the periphery of the largest diameter cutter tool. The test probe of Figure M.306 shall not contact any portion of the cutter tool from the top side and behind the fence.

M.19.1.303.2.2 **Guarding for curved work**

A rigidly fixed and stable barrier guard shall prevent contact between the operator's hands and the top part of the cutting tool.

- The guard shall cover the largest tool from the top side.
- The shape of the guard, as far as not compromising the guarding function, shall be such as to conduct dust and chips in a streamlined way towards the chip exhaust system.
- The guard shall be capable of adjustment or removal without the aid of a tool.

Compliance is checked by inspection.

M.19.201 *Replacement:*

Working stands shall stand safely on the ground/work surface e.g. benchtop.

Compliance is checked by the following test.

The working stand is fitted with the hand-held router specified by the manufacturer which is likely to give the most unfavourable results for the purpose of this requirement. The working stand is set up or mounted in accordance with the instructions required by M.8.12.2 a) 1) and M.8.12.2 a) 202). A horizontal force measured in N, and numerically equal to 6 D_{max} where D_{max} is measured in mm, is pushing perpendicularly against the front edge of the table top surface and in line with the centre of the table hole. This shall not cause the working stand to tip over.

M.20 Mechanical strength

This clause of Part 1 is applicable except as follows:

M.20.1.301 Cutter tool guards shall be constructed from materials having characteristics listed below or from materials that are better or equivalent in performance.

a) for steel:

Ultimate tensile strength N/mm^2	Minimum thickness mm
350	1,50
380	1,25

b) for light alloy as follows:

Ultimate tensile strength N/mm^2	Minimum thickness mm
160	3,0
200	2,0

c) polycarbonate with a wall thickness of at least 3 mm or other plastic material having an impact strength equal to or better than a polycarbonate of at least 3 mm thickness.

Compliance is checked by inspection and measurement.

M.20.1.302 **Pressure devices**

The mechanical strength of the pressure system shall be adequate.

Compliance is checked by the following test

Figure M.307 and Figure M.308 show the points of application and the direction A, B, C, D and F of the forces to be applied to the fence pressure device under test together with the position of the measuring point.

Figure M.309 shows the points of application and the directions of the forces G and H to be applied to the table pressure device under test, together with the positions of the measuring point.

The pressure devices shall be installed in accordance with the instructions required by M.8.12.2 a)2) and under the conditions shown in Figure M.307 and Figure M.309. The free play due to the direction of force inversion shall be eliminated.

The displacement shall not exceed the values given in Table M.301.

Table M.301
Fences and table pressure device displacement

Direction of force	Force N	Maximum displacement in direction of force mm
A and C	30	7
B and D	30	12
G and H	30	7
F	30	5

M.20.1.303 **Adjustable guard (hand protector)**

Adjustable guards shall have adequate stability.

Compliance is checked by the following test.

Figure M.310 shows the point of application and the direction of the forces A, B, C and F to be applied to the adjustable guard under test together with the position of the measuring point.

Force F is applied to the adjustable guard towards the spindle axis.

The test shall be performed with the safeguarding equipment in a position where the possible displacement is the greatest.

The displacement shall not exceed the values given in Table M.302. The adjustable guard shall not rotate around any horizontal axis.

Table M.302
Adjustable guard deflection

Direction of force	Force N	Maximum displacement in direction of force (including clearance) mm
A	20	3
B	20	3
C	20	6
F	20	3

M.20.1.304 **Guiding steady**

Guiding steadies shall have adequate stability.

Compliance is checked by the following test.

Figure M.311 shows the point of application and the direction A, B, C and F of forces to be applied to the guiding steadily under test, with the position of the measuring point.

Force F is applied to the guiding steady towards the spindle axis.

The test shall be performed with the safeguarding equipment in a position where the possible displacement is the greatest.

The displacement shall not exceed the values given in Table M.303. The guiding steady shall not rotate around any horizontal axis.

Table M.303
Guiding steady deflection

Direction of force	Force N	Maximum displacement in direction of force (including clearance) mm
A	30	2
B	30	2
C	30	7
F	30	0,5

M.20.1.305 The working stand shall have adequate strength.

Compliance is checked by loading the working stand with a mass, measured in kg and numerically equal to 0,5 D_{max} where the D_{max} is measured in mm, is applied in table centre distributed equally on a rectangular area with the dimensions of 0,5 x table length times 0,5 x table width. After removing the mass, the working stand shall not show any permanent deformation.

M.21 Construction

M.21.18 *Replacement:*

Router tables shall be provided with a device for switching the router "on" and "off". The actuator of the device shall be easily accessible from the operator's position.

This switching device shall be capable of being turned off by the operator with a single push motion.

Compliance is checked by inspection.

M.21.18DV DR *Modification: Add the following paragraph:*

The router table shall be provided with a means to prevent unauthorized use. A two-motion device alone shall not be considered an acceptable means.

Note: Examples of acceptable methods are:

a) Key-operated switch with a removable key;

b) Toggle-operated switch with removable toggle;

c) A means for locking the switch in the OFF position using a padlock;

d) Electronic keypad lockout device.

Compliance is checked by inspection.

M.21.18.301 If any router allowed to be mounted to the router table is equipped with a momentary contact switch, the router table shall be provided with a device for locking the momentary switch of the router in the "on" position. This device shall disengage when the router is removed from the working stand.

Compliance is checked by inspection and by a functional test.

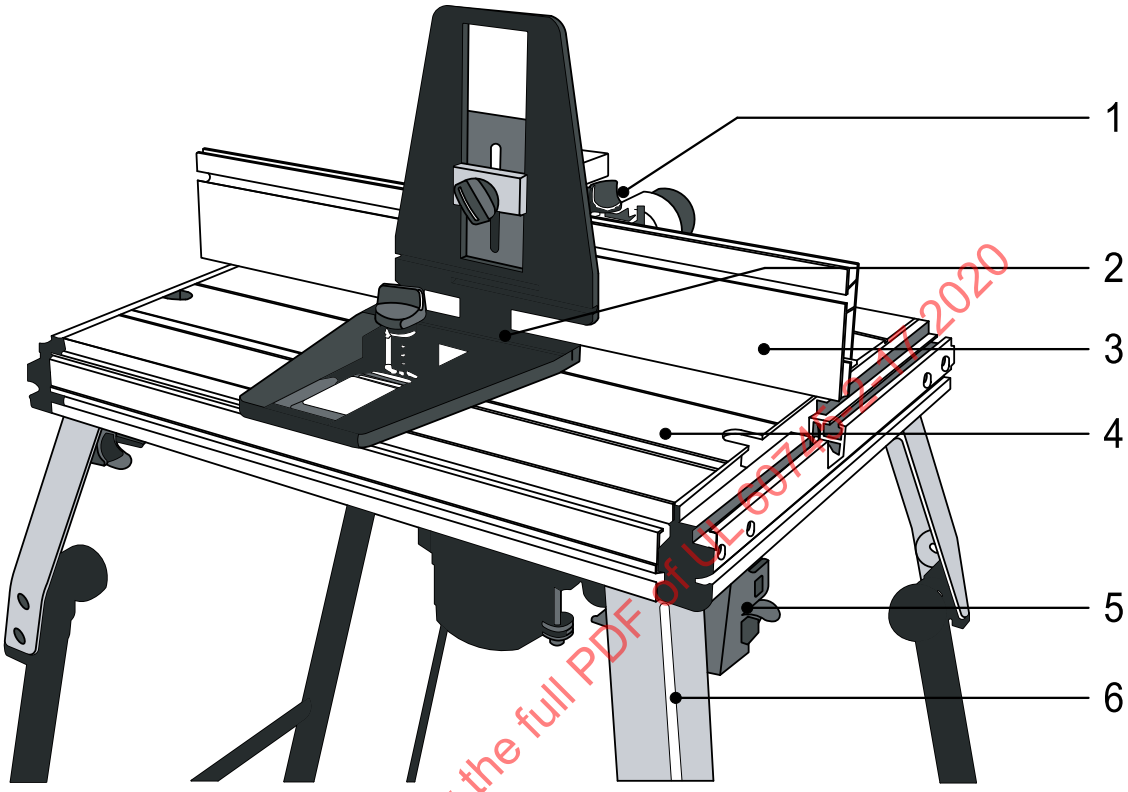
M.21.301 When installed in accordance with the instructions required by M.8.12.2 b) 302), any router allowed to be mounted to the router table shall withstand loads and remain stable during normal and reasonably foreseeable misuse conditions.

Compliance is checked by the following test

A force measured in N, and numerically equal to 6 D_{max} where D_{max} is measured in mm, is applied perpendicular against the straight cutter tool properly installed in the router, at the table top surface in the direction perpendicular to the workpiece feed direction. The router shall not shift with respect to the table.

Figure M.301

Working stand with installed hand-held router



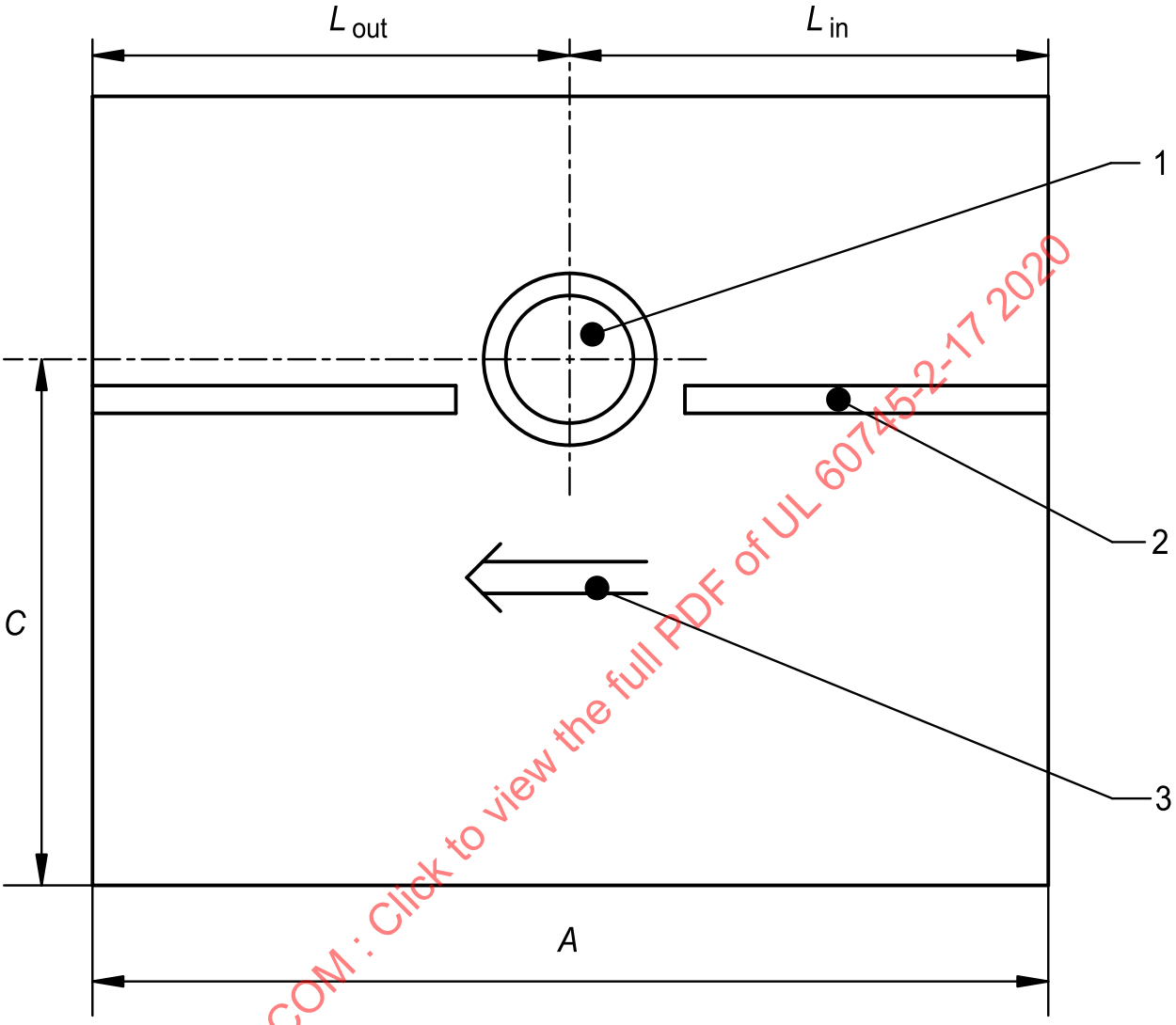
su0661

Key

1 exhaust outlet
2 table ring
3 parallel fence
4 table top
5 switch with plug and socket
6 main frame

Figure M.302

Dimensions of table



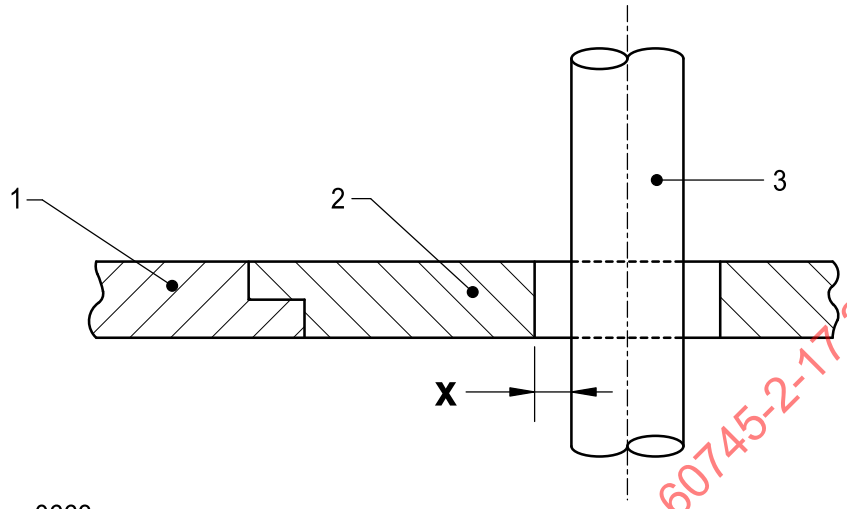
su0662

Key

1 table hole
2 fence
3 feed direction

Figure M.303

Dimension of table rings



su0663

Key

1 table

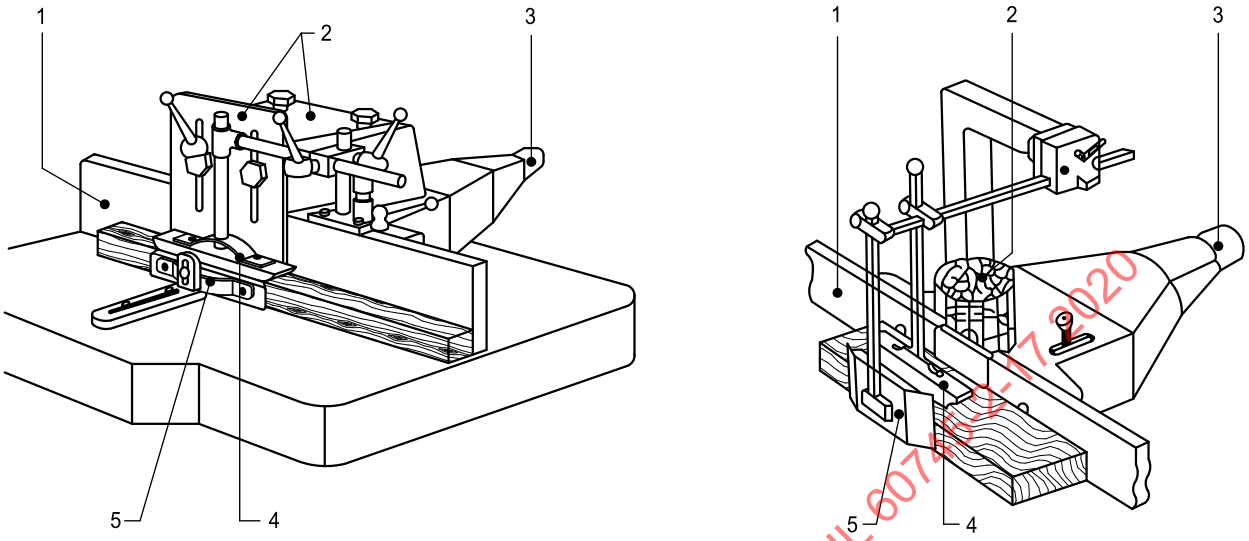
2 table ring

3 spindle of cutter tool

X radial distance between cutter tool and table or table ring

Figure M.304

Fence



su0664

Key

1 fence

2 guard

3 chip exhaust outlet

4 table pressure device

5 fence pressure device