



PUWER 98: Selection of tooling for use with hand-fed woodworking machines

Woodworking Sheet No 37

Introduction

This information sheet is one of a series produced by HSE's Woodworking National Interest Group in agreement with the Woodworking Machinery Suppliers Association. Its purpose is to give practical guidance on the selection of moulding and profiling tools for use on hand-fed woodworking machines. Safety aspects of circular saw blades, band saw blades and the tooling for planing/thicknessing machines are not covered here.

Legal requirements

Key legal requirements covering the supply, selection and use of tooling are contained in the Provision and Use of Work Equipment Regulations 1998 (PUWER 98);¹ the Supply of Machinery (Safety) Regulations 1992;² and section 6 of the Health and Safety at Work etc Act 1974 (the HSW Act).³

Regulation 4 of PUWER 98 requires work equipment to be constructed or adapted to be suitable, in respect of health and safety, for the purpose for which it is used or provided. When selecting suitable work equipment, employers should pay attention to the type of tool chosen, selecting tools within the range specified by the machine manufacturer.

Limited cutter projection tooling

Limited cutter projection tooling (sometimes referred to as chip thickness limitation tooling) significantly reduces:

- the severity of injury if a machine operator's fingers contact the rotating tool;
- the risk of workpiece kickback.

Most accidents at woodworking machines are due to the operator's hands or fingers coming into contact with the rotating cutters. Amputation usually results. Between 1993 and 1996 there were 165 injuries (amputations and severe lacerations) at machines where limited cutter projection tooling could have been fitted. It is estimated that limited cutter projection tooling would have reduced the seriousness of injury in 90% of these accidents. By reducing the risk of kickback, this type of tooling can also help prevent many other serious injuries.

There are two types of limited cutter projection tooling, 'round form' and 'non-round form'. On **round form tools**, as the name suggests, the tool body has a circular shape at any cross-section perpendicular to the rotational axis

of the tool. On this type of tool, limited cutter projection should be achieved by restricting the projection of the cutter beyond either:

- the round profile of the tool body (see Figure 1); or
- a 'limiter' (also called a deflector or counter knife) which mirrors each cutter (see Figure 2).

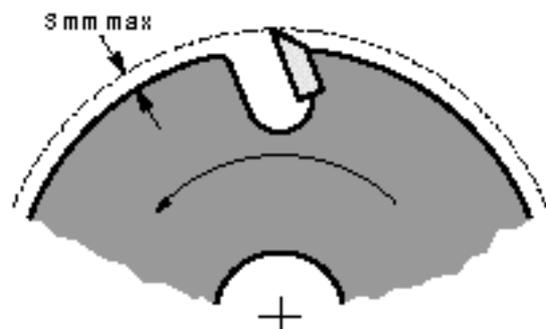


Figure 1 Round form tool with limited cutter projection

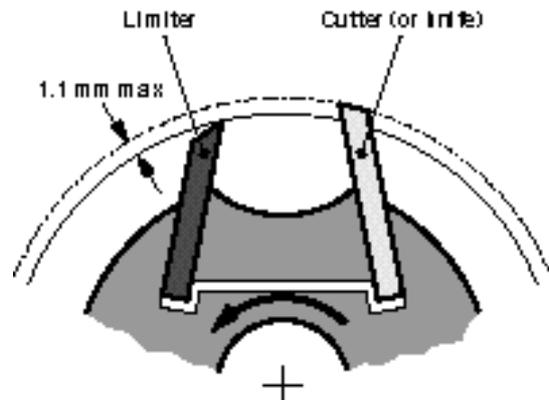


Figure 2 Use of a 'limiter' to achieve limited cutter projection

With the first type, the amount of cutter projection beyond the tool body should be limited to a maximum of 3 mm (the exact figure depends on a kickback test carried out by the manufacturer⁴). In many cases the projection will be less than 3 mm. If in doubt consult your tooling manufacturer or supplier.

Where limiters are used, the amount of cutter projection beyond the corresponding limiter should be restricted to a maximum of 1.1 mm. Exchangeable limiters can be mounted on the tool body (see Figure 2), or the tool body can be shaped in such a way that it permanently incorporates the limiter (see Figure 3). The latter design restricts the range of cutters that can be used on a particular tool body.

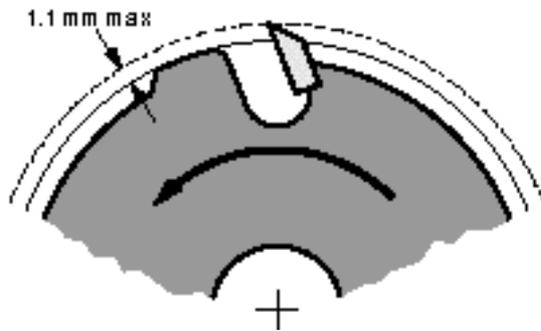


Figure 3 Tool body designed to permanently incorporate a 'limiter'

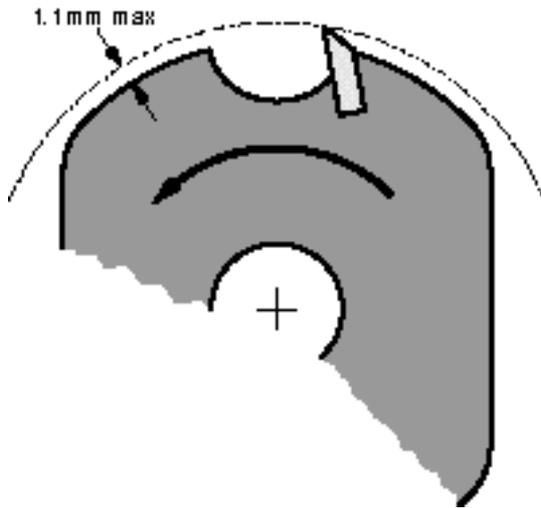


Figure 4 Example of a non-round form tool with limited cutter projection

Non-round form tools should be designed in such a way that cutters project a maximum of 1.1 mm beyond the edge of the tool body or limiter (see Figure 4).

On which machines do I have to use limited cutter projection tooling?

Where possible, limited cutter projection tooling should be used on the following **hand-fed** machines:

- vertical spindle moulders;
- single-end tenoners;
- rotary knife and copy lathes where the hazards of ejection and contact with the tool are not prevented by a system of fixed guards and/or interlocked movable guards and/or self-closing guards; and
- any other machine onto which a moulding tool can be fitted, eg if a moulding tool is fitted onto a circular saw, the tool should be of a limited cutter projection type.

The term 'hand-fed' includes the use of demountable power feed units and hand-operated carriages on which the workpiece is placed manually or clamped.

Note: Limited cutter projection tooling should be used in addition to the normal guards, protection appliances (jigs etc) and safe working practices, not as an alternative.

How long do I have to convert to limited cutter projection tooling?

If you already have limited cutter projection tooling, then that alone should be used as from 5 December 1998. Otherwise, the changeover should be made as and when replacement tooling is obtained, or by 5 December 2003, whichever is the sooner

How do I know if my tooling complies?

Ask your supplier. All new tooling manufactured in accordance with BS EN 847-1: 1997⁴ should be suitably designed. Sales literature and the information for use supplied with tooling will declare whether a particular tool has been designed to this Standard. European health and safety standards for the design and manufacture of new woodworking machines require the machine manufacturer to specify in the instruction handbook that only tooling complying with BS EN 847-1: 1997 should be fitted to the machine.

Tool fixing

Detachable cutters and limiters should be of the correct thickness for the tool body in which they are used. Cutters and limiters should be capable of being mounted in such a way as to prevent them being ejected (see Figure 5). This is usually achieved by the use of either:

- locking pins (see Figure 5a);
- serrated-backed cutters (see Figure 5b); or
- 'key' or wedge-shaped cutters, ie that slot into a similarly shaped hole in the tool body and which cannot be ejected because the slot narrows towards the outer edge of the tool body (see Figure 5c);

Figure 5 Example of tooling designs which reduce the risk of cutter ejection



Figure 5a Locking pins



Figure 5b Serrated-backed cutter



Figure 5c Key or wedge-shaped cutter

Tool sets and stacked tools

Tools which belong to a tool set, or are part of a stacked tool, which do not in themselves meet the design requirements already described, should be designed in such a way as to prevent the parts being used individually, eg by using pins (see Figure 6).

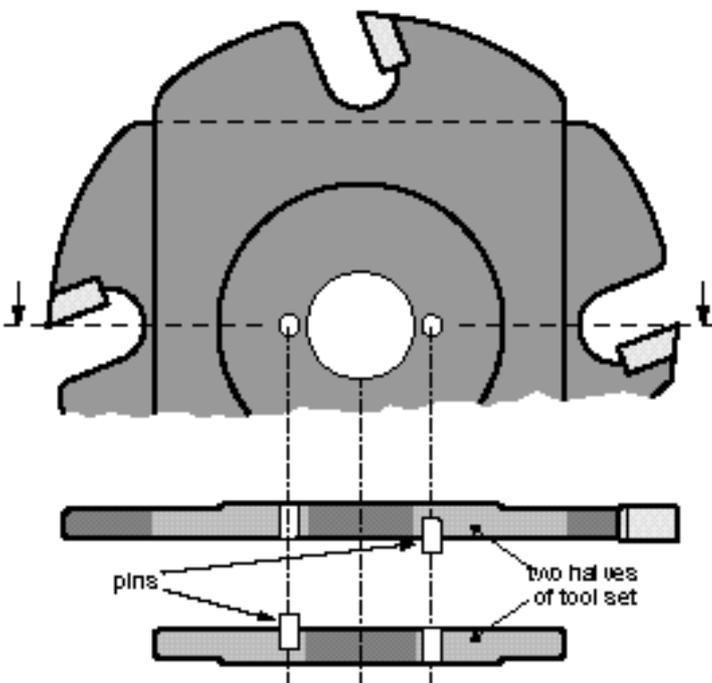


Figure 6 An example of a suitably designed tool set

Tool sharpening and maintenance

Repair of tools should be carried out in accordance with the manufacturer's instructions - consult your supplier if in doubt. People who carry out repairs to tools should be adequately trained and have knowledge of the design requirements (eg BS EN 847-1: 1997) and levels of safety to be achieved.

Tool marking/identification

New moulding/profiling tools for use on hand-fed machines should be permanently marked with a variety of information, including:

- the name/trademark of the manufacturer/supplier;
- the designed speed range;

- 'MAN' (indicating hand feed); and
- the tool dimensions.

Most tools are also marked with an arrow which indicates the intended direction of rotation. Tools are not required to have the CE marking - when supplied separately from a machine they are not covered by the Supply of Machinery (Safety) Regulations 1992.

Are there any machining operations where it is not possible to use limited cutter projection tooling?

The use of limited cutter projection tooling should always be the first option considered as part of the tool selection procedure. Other types of tooling should only be used where the desired profile cannot be achieved with the use of limited cutter projection tooling. Grooving will generally be the only operation where limited cutter projection tooling cannot be used, eg a grooving saw might have to be fitted instead.

Are French (or slotted) spindles and slotted collars acceptable on vertical spindle moulding machines?

No, they should also be phased out under the requirements of regulation 4 of PUWER 98. On this type of tooling there is no means of restricting the cutter projection; additionally, cutters cannot be mounted as safely as those designed to BS EN 847-1. Limited cutter projection tooling should be selected instead because it is safer.

The European Standard for vertical spindle moulding machines (BS EN 848-1⁵) states that the machine spindle 'shall not be provided with a slot for inserting cutter blades'. It should therefore not be possible to use slotted or French head spindles on machines with the CE marking and constructed to BS EN 848-1.

References and further reading

- 1 *Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 as applied to woodworking machinery. Approved Code of Practice and guidance* L114 HSE Books 1998 ISBN 0 7176 1630 4
- 2 *Product standards - Machinery - A guide to the UK Regulations* (May 1995) HMSO/DTI URN 95/650. Copies available from the DTI's Business in Europe Hotline on 0117 944 4888
- 3 *Health and Safety at Work etc Act 1974 Ch 37* The Stationery Office ISBN 0 10 543774 3
- 4 BS EN 847-1: 1997 *Tools for woodworking - Safety requirements Part 1: Milling tools and circular saw blades*

5 BS EN 848-1: 1999 *Safety of woodworking machines. One side moulding machines with rotating tool. Single spindle vertical moulding machines*

6 *Buying new machinery: A short guide to the law and some information on what to do for anyone buying new machinery for use at work* INDG271 HSE Books 1998 (Available free for single copies and in priced packs of 15 on ISBN 0 7176 1559 6)

7 *Supplying new machinery: Advice for suppliers of workplace machinery* INDG270 HSE Books 1998 (Available free for single copies and in priced packs of 15 on ISBN 0 7176 1560 X)

8 *Using work equipment safely* INDG229 HSE Books 1998 (Available free for single copies and in priced packs of 5 on ISBN 0 7176 1326 7)

9 *Circular saw benches: Safe working practices* WIS16 HSE Books 1999

10 *Safe use of hand-fed planing machines* WIS17 HSE Books 2000

11 *Safe use of vertical spindle moulding machines* WIS18 HSE Books 2001

The future availability and accuracy of the references listed in this publication cannot be guaranteed.

Further information

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