Tooling for use with hand-fed woodworking machines

HSE information sheet

Woodworking Information Sheet No 37 (Revision 1)

Introduction

This information sheet gives practical guidance to employers and operators 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.

Accident history

Most accidents at woodworking machines are caused by the operator's hands or fingers making contact with the rotating cutters. If this happened with old style tooling, it tended to pull the hand into the cutters after contact was made. This resulted in severe finger and hand injuries, often resulting in amputations.

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. They also reduce the risk of workpiece kickback and the many other serious injuries that this can cause.

Old-style tooling often only had the cutters held in place by the friction produced by clamping bolts. Fatalities happened if the operator set the machine to run at too fast a speed, with the increase in centrifugal force causing bolts to stretch and the cutters to be ejected. Limited cutter projection tooling is designed to prevent the cutters from being ejected from the tool body as there are two means of securing the cutters, for example, serrations in the head and knife and a bolted clamping wedge (see 'Tool fixing').

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**.

Legal requirements

Limited cutter projection tooling should be designed and constructed to meet BS EN 847-1.[1] Key legal requirements covering the supply, selection and use of tooling are contained in *Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 as applied to woodworking machinery. Approved Code of Practice and guidance*.[2] Regulation 4 of the Provision and Use of Work Equipment Regulations (PUWER) 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 and select tools within the range specified by the machine manufacturer.

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

Where possible to fit them, **there has been a requirement to use limited cutter projection tooling on hand-fed machines** since 5 December 2003.[2] 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.

Limited cutter projection tooling can be used with:

- 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;
- any other machine onto which a moulding tool can be fitted, eg if a moulding tool is fitted onto a circular saw, or a cross-cut saw then the tool should be of a limited cutter projection type.

How do I know if my tooling complies?

The simple answer is to get your supplier to confirm that it complies – all new tooling manufactured in accordance with BS EN 847-1 should be designed to

comply. Sales literature and the information supplied with the 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 should be fitted to the machine.

New moulding/profiling tools for use on hand-fed machines should be permanently marked with a variety of information that will also help identify what type of tooling it is, 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 2008.

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

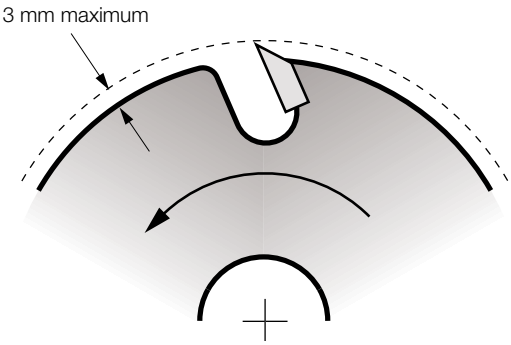
No, they should no longer be used as on this type of tooling there is no means of restricting the cutter projection. Also, the cutters cannot be mounted as safely as those designed to BS EN 847-1. Use limited cutter projection tooling instead because it is safer.

Limited cutter projection tooling

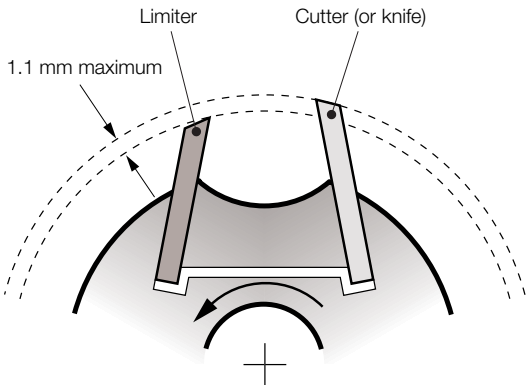
There are two types of limited cutter projection tooling, 'round form' and 'non-round form'. On **round form tools**, as the name suggests, the tool body has a circular shape at any cross-section perpendicular to the rotational axis of the tool. On this type of tool, limited cutter projection is achieved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

With round form tools, the amount of cutter projection beyond the tool body should be limited to a maximum of 3 mm (see Figure 1). The exact figure will depend on a kickback test carried out by the tool manufacturer.[1] In many cases, the projection will be less than 3 mm. For further information you should consult your tooling manufacturer or supplier.

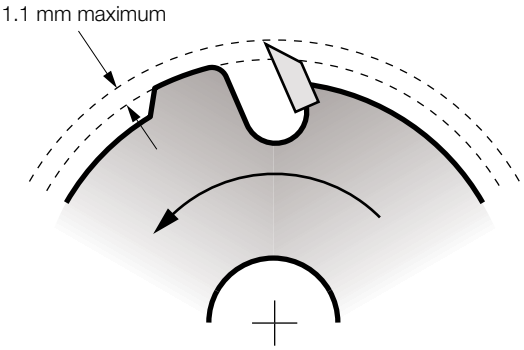


Figures 1a & 1b Round form tool with limited cutter projection



Figures 2a & 2b Use of a 'limiter' to achieve limited cutter projection

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



Figures 3a & 3b Tool body designed to permanently incorporate a limiter. Note: Figure 3a shows a tool also fitted with a spur, a cutter that operates on both the periphery and flank.

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).

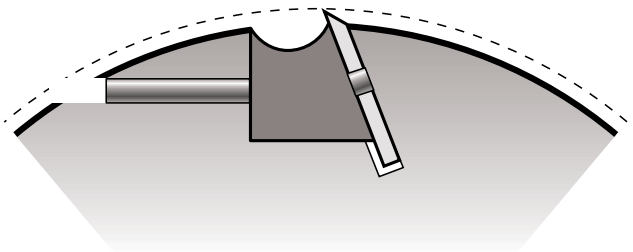


Figure 5a Locking pins

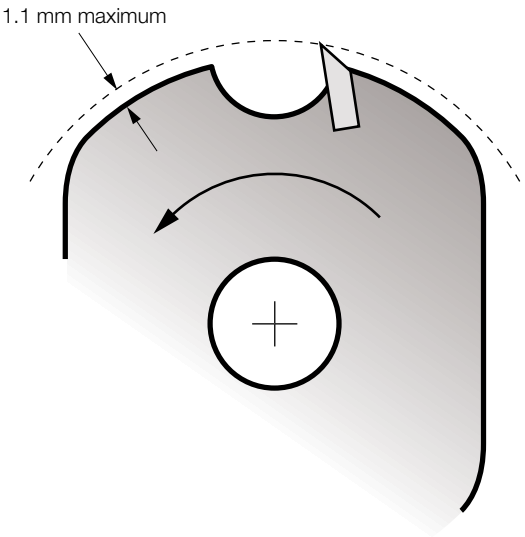


Figure 4 Example of a non-round form tool with limited cutter projection

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 mounted in such a way that they can not be ejected, a problem which used to occur with old-style tooling. This is usually achieved by the use of either:

- locking pins (see Figures 5a and 5b);
- serrated-backed cutters (see Figures 6a and 6b); 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 7);

Example of tooling designs which reduce the risk of cutter ejection:

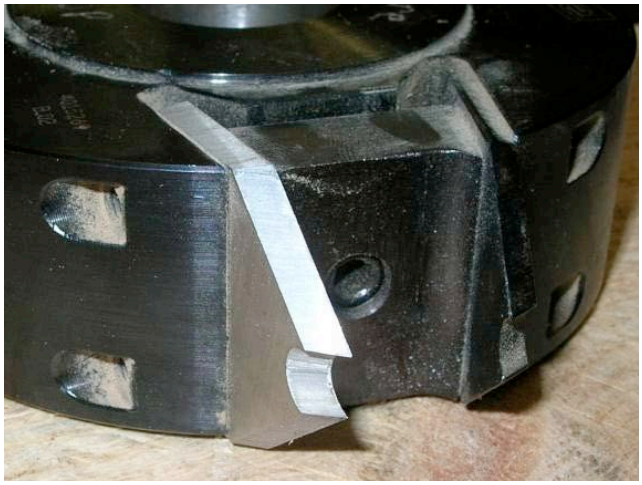
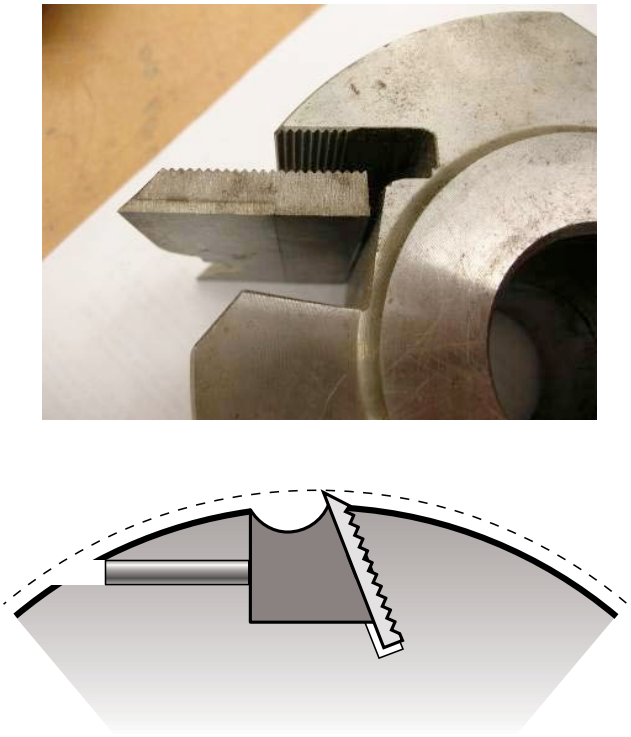


Figure 5b Locking pins

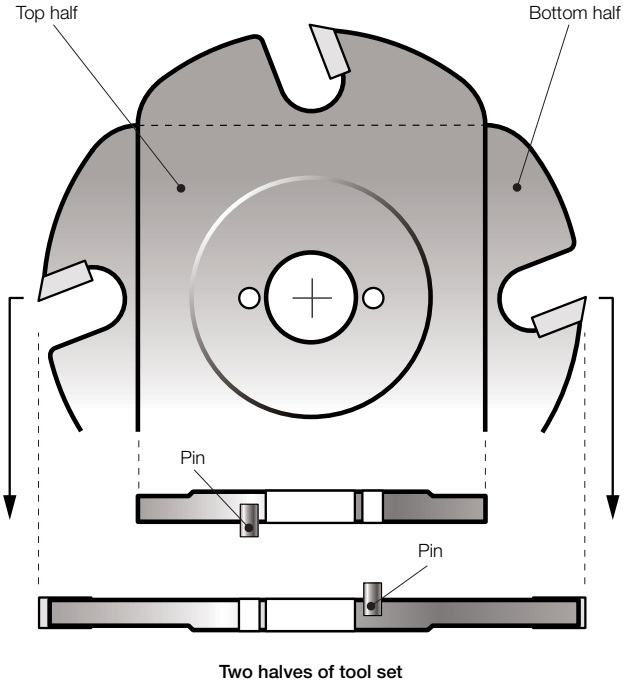


Figures 6a & 6b Serrated-backed cutter

Figure 7 Key or wedge-shaped cutter

Tool sets and stacked tools

Tools that 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, for example by using locating pins in the tools design (see Figures 8a and 8b).



Two halves of tool set

Figures 8a & 8b Examples of suitably designed tool sets

Tool sharpening and maintenance

Any tool repairs should be carried out in accordance with the manufacturer's instructions – consult your supplier if in doubt. Anyone who repairs tools should be adequately trained and have knowledge of the design requirements, particularly BS EN 847-1, and the levels of safety to be achieved.

Are there any other benefits from using limited cutter projection tooling?

In addition to being safer to use, limited cutter projection tooling has the following benefits:

- The reduced depth produces a better finish, so less sanding is required, reducing the health risk and improving production.
- The old-style tooling required a lot more skill and time to set up correctly. Limited cutter projection tooling is simpler to set up and therefore reduces down time during changeover. Also, as it is more likely to be right first time, less timber is wasted. One head can also have several different profiles, which also reduces set up times.
- Chip limited tooling is much better balanced so there is less vibration when it runs. This has the following benefits:
  - Less vibration means there will also be a reduction in noise levels. Noise levels will also be reduced if the tool body is made from aluminium, a feature of some limited cutter projection tools. Lighter aluminium bodies also reduce forces on the motor during braking as well as making the tools easier and safer to handle.
  - Less vibration means that the tool cuts more efficiently so it can therefore have a three to four times longer tool life. There will also be an improved finish and less wear on the shaft and bearings of the machine.

References

1 BS EN 847-1:2013 *Tools for woodworking - safety requirements. Part 1: Milling tools, circular saw blades* British Standards Institution

2 *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 978 0 7176 1630 5 www.hse.gov.uk/pubns/books/L114.htm

Further reading

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Third edition) HSE Books 2008 ISBN 978 0 7176 6295 1 www.hse.gov.uk/pubns/books/l22.htm

More information on woodworking machinery, tooling and other safety and health issues can be found on HSE's woodworking website: www.hse.gov.uk/woodworking.htm

Information for suppliers, importers or hirers of equipment can be found on HSE's Work equipment and machinery website www.hse.gov.uk/work-equipment-machinery/supplier.htm

Further information

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