



**Procedures for daily inspection and testing of mechanical power presses and press brakes**



## INTRODUCTION

This leaflet gives guidance on the minimum safety checks that should be carried out on mechanical power presses and press brakes by the appointed person, as required by regulation 33 of the Provision and Use of Work Equipment Regulations 1998 (PUWER 1998). It does not apply to hydraulic presses or those presses exempted from the requirements of regulation 33 as detailed in Schedule 2 in PUWER 1998. These may still require inspection in accordance with regulation 6 of PUWER.

The daily inspection and test must be done on each press in use within the first four hours of every working period and after setting, resetting or adjustment of the tools when any of the guards or protection devices have been disturbed.

A power press is defined in PUWER 98 as 'a press or press brake for the working of metal by means of tools, or for die proving, which is power driven and which embodies a flywheel and a clutch.'

### **Appointment and training**

As an 'appointed person' you must be properly appointed in writing by your employer, and be suitably trained and competent to carry out all the necessary inspections and tests for the type of press you work on.

### **Inspection and tests**

The purpose of the inspection and test is to ensure that all the guards and other protective devices, eg light curtains, fitted to the machine are in efficient and effective working order and that the press is safe to use. After the inspection and test, you must complete and sign a certificate (daily inspection card) which is normally kept on or near the press.

### **Doing the inspection and tests**

In order to ensure that the inspection and tests are done safely, some are carried out with:

- **power off** - with the machine stationary and appropriately isolated from all power sources, eg electricity, compressed air, and hydraulic pressure;

- **power on** - with power sources restored to the machine. These tests can be either:
  - *static* - with the machine stationary; or
  - *dynamic* - with the machine operational.

**Power-on** tests should be carried out **after completion of the relevant power-off checks and in accordance with a safe system of work.**

Individual machines will have their own combination of guards and/or safety devices. Before you start your inspection you will need to clearly identify what safeguarding arrangements are provided and therefore which checks are relevant.

### **Trial strokes**

Trial strokes should always be carried out with all safeguards in place.

### **Additional tests**

Some types of guard (eg sequentially operated) may require additional checks to those set out in this guidance; in such cases the manufacturer's guidance should be followed.

### **Completion of inspection and tests**

If the guarding system or safety device fails any of these inspections and tests:

- switch the press off and isolate it;
- attach a suitable warning label;
- inform the supervisor and operators;
- do not use it until appropriate remedial action has been taken.

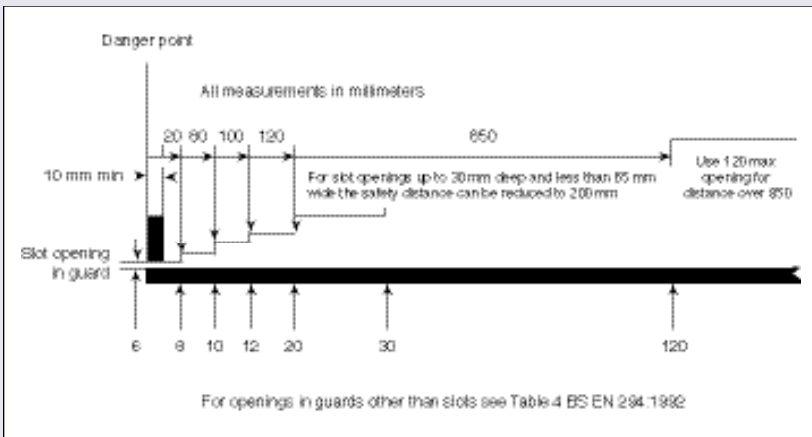
The press certificate should only be completed, signed and dated upon satisfactory completion of all inspections and tests. Operators and supervisors should be informed that checks are completed and the press is safe to use.

## FIXED GUARDS

### General

Fixed guards should prevent access to the danger zone, eg the trap between the tools, by any part of the body. They should be firmly secured in position by fastenings that need a tool to release them.

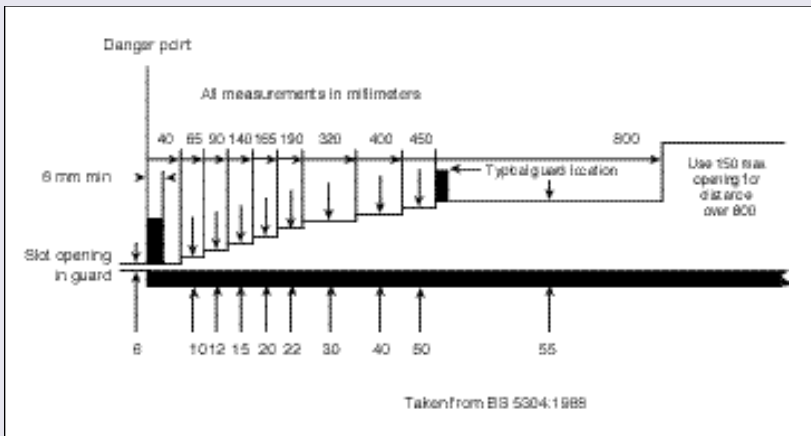
Where it is necessary to have slotted openings in fixed guards, eg for component feeding or removal, the relationship between the size of the opening and its distance from the trapping point should conform to the standards for safety distances set out in the diagram below.



**Example:** If it is necessary to provide an opening between 12 and 20 mm, the guard should be positioned at least 120 mm away from the danger point.

The data in the above diagram have been derived from Table 4 of BS EN 294:1992.

Older guards designed using figures in BS 5304:1988 should be checked using the diagram below.



*Example:* If it is necessary to provide an opening 30 mm deep, the guard should be positioned at least 190 mm away from the danger point.

### **Power-off checks for fixed guards**

**Check** that the guards are securely fastened in place with devices requiring a tool to release them and that no access is possible from any direction to the danger zone;

**Check** that the construction of the guard is sound, that no bars are bent or missing and that the guard cannot be bent or deflected to permit access to the danger zone;

**Check** that where openings are provided it is not possible to reach into the danger zone through them.

### **Power-on checks for fixed guards**

**Check** that there are no other trapping points created between the guard itself and any moving part of the machine or adjacent equipment.

## INTERLOCKING GUARDS

### General

An interlocking guard is one which is movable, or has a movable part(s), and is interconnected (either mechanically, electrically, hydraulically or pneumatically) with the control system of the machine so that:

- it prevents the machinery from moving until the guard is closed; and
- the guard remains locked closed until the dangerous movement has stopped; or
- opening of the guard causes the dangerous movement to stop.

The interlocking system should be designed to minimise the risk of failure to danger and should not be readily defeatable.

### Power-off checks for interlocking guards

#### All presses

**Check** that the guard is secured to the press and that it prevents access to the danger zone from any direction when the guard is closed;

**Check** that there are no missing, loose, bent or unduly worn parts;

**Check** that the toolsetter's connection (where fitted) is 'spanner tight' and in good condition;

**Check** that the guard taper pins are tight;

**Check** that guard linkages are in good condition, that there are no missing split pins, washers, circlips etc;

**Check** that the guard control mechanism is in good working order, as follows:

#### Positive clutch presses

**Check** that the guard control disc/cup is secure, that the slot is not oversized (usually understood to mean that the slot size is not greater than 1.5 times the diameter of the roller) and that the roller runs freely;

On presses where there is mechanical actuation of the extractor, press the pedal, close the guard slowly and then **check** that the extractor remains locked until the guard has fully closed (plus an overlap of 10% of the total gate movement); when the extractor is unlocked, pedal pressure should move the extractor into the clutch engaged position, at which the guard control roller should just be clear of the slot in the control disc/cup; with the pedal kept depressed **check** that the guard cannot be opened;

**Check** for wear on the engaging face of the extractor scotch and all linkages;

Close the gate, depress the pedal and slowly rotate the flywheel by hand until the clutch is engaged; release the pedal and **check** that the guard cannot be opened and that the control arm roller is on the periphery of the control disc/cup; ensure that sufficient crankshaft rotation has taken place to enable the control disc/cup to keep the guard closed; complete the rotation of the flywheel and **check** that the guard cannot be opened until the crankshaft has reached its normal stopping position and the extractor has returned to the disengaged position;

**Check** that overrun or fall-back of the crankshaft is prevented by the control roller fitting well into the slot of the control disc/cup; overrun should also be prevented by a stop incorporated in the clutch extractor or by a pawl and notch arrangement.

### **Friction clutch presses**

**Check** that the control disc/cam is secure and that there is no undue wear on the slot which receives the control arm and roller;

**Check** that the roller rotates freely and enters the slot when the guard is opened; (for a pneumatic guard control, check that the roller is not worn and that it is lying in the bottom of the cam profile);

**Check** the integrity of the electrical wiring and airline connections.

## **Power-on checks for interlocking guards**

### **All presses**

#### **Static**

**Check** the correct functionality of limit switches.

#### **Dynamic**

**Check** that there are no other danger areas created between the guard itself and any moving part of the machine or adjacent equipment.

### **Positive clutch presses**

#### **Dynamic**

**Check** that the guard operates freely under normal operating conditions;

**Check** that the brake stops the crankshaft at its normal stopping position and that at this point the guard control roller drops into the slot when the guard is opened;

Make several trial strokes and **check** that the guard can be opened only when the crankshaft has stopped at its normal stopping position - usually Top Dead Centre (TDC);

If depression of the foot pedal can give continuous clutch engagement, carry out a number of strokes; **check** that the guard remains closed until the clutch is fully disengaged and the crankshaft is stationary at its normal stopping position.

### **Friction clutch presses**

#### **Static**

With the flywheel stationary, close the gate slowly and **check** that the limit switches do not operate until the gate has fully closed (plus an overlap of 10% of total gate movement); at this point the guard control roller should just be clear of the slot in the control disc. (NB: It may be easier to assess the point of operation of the limit switches with the press motor switched off but with the control circuit



energised and the compressed air circuit pressurised; the clutch air valve may be heard to operate when the electrical circuit is complete.)

### Dynamic

Start the flywheel, then:

**Check** that the guard operates freely under normal operating conditions;

**Check** to ensure that the crankshaft stops at its normal stopping position - usually TDC;

**If a guard lock or control is fitted** - make several trial strokes and **check** that the guard can only be opened when the crankshaft has stopped at its normal stopping position - usually TDC; or

**If no guard lock or control is fitted** - initiate a stroke and immediately attempt to reopen the guard; **check** that there is no movement of the press slide with the guard open;

Where a pneumatic guard control is fitted **check** it is not possible to open the guard against the locking cylinder. (There should be a slight time delay before the guard can be opened at the end of the stroke - normally about one second, dependant on press speed and stroke.)

## AUTOMATIC GUARDS

### General

An automatic guard is one that is moved into position automatically by the machine, thereby removing any part of a person from the danger zone.

An automatic guard should only be used on a press with a speed not exceeding that specified in the following table:

	<b>Length of stroke</b>	<b>The speed should not be more than the equivalent of:</b>
<b>Single acting presses</b>	More than 200 mm	30 strokes/minute
	Between 150 and 200 mm	25 strokes/minute
<b>Double or multiple acting presses</b>	More than 150 mm	15 strokes/minute

*Note: The stroke should not be less than 150 mm and should not be adjustable.*

### Power-off checks for automatic guards

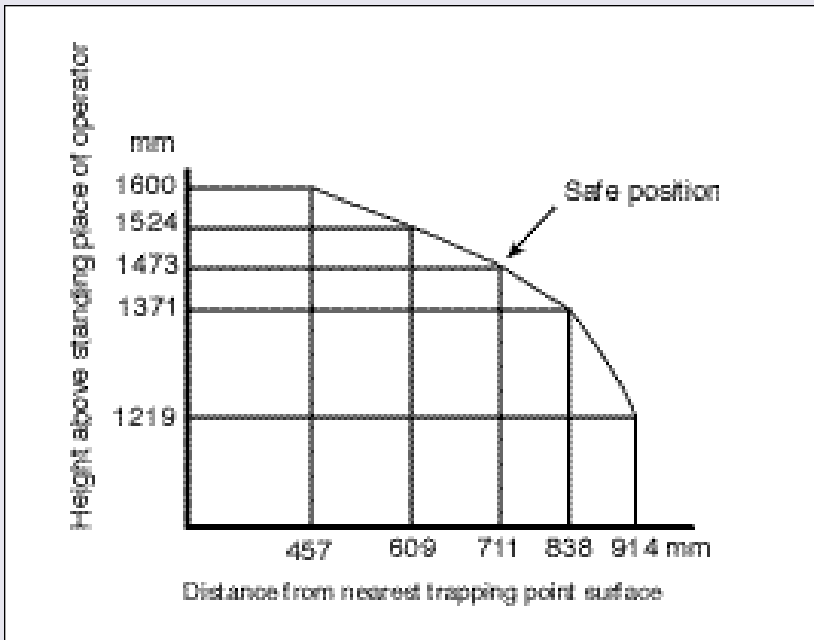
**Check** that there are no loose, missing, bent or unduly worn guard parts and that guards are securely fixed to the press;

**Check** that the top of the outward/upward moving member of the guard is never less than 1070 mm above the standing position of the operator.

### Power-on checks for automatic guards

**Check** that the moving screen and fixed side guard(s) prevent access to the trapping area between the tools before the space between the nearest trapping surfaces is less than 50 mm (including the component at any stage of its entry or withdrawal). A safe distance is considered to be within the range of relative

distances shown in the diagram below. (The distances are measured from the top of the outward and upward moving member of the guard.)



**Example:** When the guard is 1524 mm above the standing position of the operator the trapping surface should be at least 609 mm away.

**Check** that access to the trapping area(s) from beneath the outward/upward moving member of the guard is prevented at all parts of the press stroke by a suitable screen;

**Check** that there are no trapping points created between the guard itself and any moving part of the machine or adjacent equipment.

## PHOTO-ELECTRIC SAFETY DEVICES

These must ensure that:

- it is not possible for the tools of the machine to be set in dangerous motion while any part of a person is in a position which will actuate the photo-electric device (ie be in danger of getting trapped between the tools);
- when the tools are in motion, actuation of the photo-electric device during a dangerous part of the operating cycle (ie when the tools are closing) results in the tools being brought to rest before any part of any person can reach them. It must not be possible for the tools to be set in motion again until the safety system has been completely restored to its normal condition and the machine controls re-operated;
- the safety system is not so affected by stray light, whether artificial, natural or deliberately applied, as to cause danger.

Requirements for performance are given in HSE guidance *Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery* (see 'Further reading', page 15).

### **Power-off checks for photo-electric safety devices**

**Check** that access to the danger zone is not possible from any direction not protected by the photo-electric device;

**Check** the side and rear fixed guards (see 'Fixed guards', page 4);

**Check** that there are no other trapping zones created between the guard itself and any moving part of the machine or adjacent equipment;

**Check** that the minimum distance from the nearest trapping point (between the tools) to the photo-electric light curtain is not less than that recommended by the manufacturer or as detailed in *Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery* (see 'Further reading', page 15);

**Check** that it is not possible for a person to stand between the light curtain and the trapping area between the tools. (If necessary, fixed guards, a feed table or additional photo-electric beams should be provided.) The gap between the light

curtain and the trapping area should not exceed 175 mm on older machines or 75 mm on newer CE-marked machines;

**Check** the cam and switch settings within the control box and ensure that they are secure;

**Check** that the cabinets housing the electronic apparatus and cam assemblies are closed and locked and the keys removed for retention by an authorised person, eg the supervisor.

### **Power-on checks for photo-electric safety devices**

#### **Static**

**Check** that the light curtain is functioning, then switch off the 'mute' function (if fitted);

**Check** the operational effectiveness by inserting a test piece (of a type specified by the guard or press manufacturer/supplier) into the light curtain and at right angles to the plane of it. It should be passed very slowly through the full height of the curtain in three separate places:

- close to one emitter/receptor column;
- in the middle of the curtain;
- close to the other emitter/receptor column.

(Where a 'guard test' light, which indicates interruption of the curtain, is included in the device, it should be illuminated whenever the test piece is in the light curtain. If the photo-electric device is not fitted with a guard test light, or other similar indicator, continually press and release the operating control while passing the test piece very slowly down the curtain. At no point during the test should movement of the tools be possible.)

#### **Dynamic - stroke test**

**Check** the closing motion of the tools by initiating a press stroke and inserting the test piece into the light curtain at right angles to the plane of it; ensure that the closing motion of the tools stops without apparent delay. At no point should an attempt be made to insert the test piece between the tools.

Mute check - press brakes

Switch to mute mode (if fitted).

**Check** to ensure that the 'Guard off' sign is illuminated.

**Check** to ensure that muting does not occur until the top tool is 6 mm or less from the workpiece surface. (NB: If power press tools are being used, ensure that the muting facility is inoperative and that the photo-electric device is operative throughout the cycle.)

Mute check - power presses

If the light curtain is muted on the return stroke, **check** to ensure that there are no accessible trapping points created.

## FURTHER READING

*Safe use of power presses. Provision and Use of Work Equipment Regulations 1992 as applied to power presses. Approved Code of Practice and guidance* L112 HSE Books 1998 ISBN 0 7176 1627 4

*Safe use of work equipment. The Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance on Regulations* L22 HSE Books 1998 ISBN 0 7176 1626 6

*Power presses: Maintenance and thorough examination* HSG236 HSE Books 2003 ISBN 0 7176 2171 5

*Power presses: A summary of guidance on maintenance and thorough examination* Leaflet INDG375 HSE Books 2003 (single copy free or priced packs of 10 ISBN 0 7176 2169 3)

*Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery* HSG180 HSE Books 1999 ISBN 0 7176 1550 2

BS EN 294: 1992 *Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs*

BS EN 692: 1997 *Mechanical presses - safety*

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

## ACKNOWLEDGEMENT

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## FURTHER INFORMATION

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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ISBN 0 7176 1780 7. Single free copies are also available from HSE Books.

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