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Manufacturing Sector		SIM 03/2005/13 (replaces SIM 03/2002/31)	
Engineering - European Standards			
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Target Audience:
All HSE Inspectors

EUROPEAN STANDARDS FOR ENGINEERING MACHINE TOOLS

This SIM provides Inspectors with details of European Standards that have been published for engineering machine tools. A summary of the key health and safety requirements in each Standard is provided. It updates and replaces SIM 03/2002/31 and reflects the status of the standards as of March 2005. The main changes relate to standards which have been published since 2002 and future revisions or conversion to ISO standards. There are no significant technical changes to the key health and safety requirements.

INTRODUCTION

1 The Standards described below have been produced as part of the European Committee for Standardization (CEN) Standards programme in support of the Machinery Directive. They are published in the UK as part of the BS EN series, by the British Standards Institute (BSI). Future revisions and conversions of the EN Standards are planned as part of the International Standards Organisation (ISO) programme of work, under the Vienna agreement, following which they will be published by BSI, as part of the BS EN ISO series.

2 The Standards apply to machinery manufactured after their dates of publication. It is not mandatory for manufacturers to use them, but a machine manufactured to a particular Standard provides a presumption of conformity with the Machinery Directive (**implemented in the UK as the Supply of Machinery (Safety) Regulations 1992 (as amended)** (SMR)). If a manufacturer is claiming conformity with a Standard, it should be listed on the declaration of conformity that must be provided with the machine. For older CE marked machines, or where the manufacturer is not claiming conformity with the Standard, the EN or EN ISO Standards can be used as a benchmark from which to check that an adequate level of risk reduction has been achieved and so assess the compliance with the relevant essential health and safety requirements (Schedule 3 of SMR) for the particular type of machine.

3 It should be noted that some of the Standards require care when reading and interpreting the safety requirements. The Manufacturing Sector, in Birmingham,

should be contacted in cases of doubt, or in all cases where action is proposed under SMR, e.g. prohibition on supply, before enforcement action is initiated.

4 All British Standards can be accessed via the Internet on BS Online. A user guide to BS Online, prepared by BSD4 IMU, can be accessed via "[HSE Information Services](#)". To gain access to the full-text standards registration is first necessary; access is then by user name and password.

5 The current status of all machinery related product standards can be reviewed on the internet to the 98/37/EC (Machinery Directive) [New approach Directive web site](#).

EN STANDARDS FOR COMMON ENGINEERING MACHINE TOOLS

Turning Machines (Lathes)

Small NC turning machines and turning centres

6 Small machines are classified according to bed length i.e. up to 2000mm between centres (BC) and the diameter of chuck (up to 500mm) and are covered by **BS EN 12415:2001 Machine-tools – Safety – Small numerically controlled turning machines and turning centres**. This standard is still current. Work has started on an editorial revision prior to conversion to an ISO Standard. However, its publication as an ISO Standard is unlikely before 2006.

7 The Standard has been amended to update the requirements for the strength of vision panels and the materials used in their construction. This is to take account of particular problems associated with the degrading of polycarbonate, the clear plastic, normally used in vision panel construction.

Key safety features covered in the Standard. (See Standard for further details)

- Full enclosure
- Movements of axes hold-to-run with workzone guards open
- 2m/min for axis
- 50rpm for spindle
- Similar restrictions for other tool holding spindles on turning centres
- Turret (tool holder) indexing two-hand control outside workzone
- Workzone guards interlocked with guard locking
- Powered tailstock – hold to run

- Tool magazines – interlocked guards – hold-to-run with guards open
- Integral lighting (**500 lux**)
- Laminated vision panels (see also [Engineering Information Sheet 33](#)). **Note: the requirements for appropriate strength requirements for vision panels apply to all type of turning machine provided with automatic cycle capability).**
- No movements of swarf/chip conveyor with workzone guard open unless otherwise safe – but hold to run in ‘setting’ mode with conveyor guards open.

Large NC turning machines and turning centres

8 Large machines are classified as over 2000 mm BC and/or over 500mm chuck diameter (**i.e. large machine can be less than 2000mm BC**) and are covered by **BS EN 12478:2001 Safety of machine tools – large numerically controlled turning machines and turning centres**. This standard is still current. Work has started on an editorial revision prior to conversion to an ISO Standard. However, its publication as an ISO Standard is unlikely before 2006.

Key safety features covered in the Standard. (See Standard for further details)

- Front saddle guard – interlocked – moves with saddle
- Chuck guard – interlocked
- Rear guard, either full length or partial, if used in conjunction with perimeter guards
- Operating platforms – interlocked guarding to prevent access to workzone
- Movement of axes up to 5m/min hold-to-run with interlocked open for setting
- 50rpm for spindle or max of 1m/s peripheral speed on very large diameter chucks
- other features as per small machines

Manually controlled turning machines (with or without automatic control)

9 Classifications for small and large are the same as for CNC turning machines. Covered by **BS EN 12840 “ Safety of machine tools – Manually controlled turning machines with or without automatic control”**. This standard is still current. Work has started on an editorial revision prior to conversion to an ISO Standard. However, its publication as an ISO Standard is unlikely before 2006.

Manual Machines

Key safety features covered in the Standard. (See Standard for further details)

- Front chip/splash guard
- Chuck guard – interlocked
- Rear guard – full length for small machines – full or partial with perimeter guard large machines
- Warning signs affixed regarding use of stock bar guard
- Manual machines may be ‘electronic’ but all movements (with limited exceptions) are under the direct control of the operator
- Verification of spindle speed (input) required for machines with variable speed spindle drives and/or constant surface speed (CSS)
- Tool posts/turrets, tailstock etc should normally be manually operated i.e. not powered
- Lead screws and feed shafts should be guarded

10 This Standard also covers so called ‘hybrid’ type machines of all kinds. These are machines which are provided with the ability to be operated both manually, in the same way as a conventional manual lathe, and automatically using CNC. These hybrid machines are classified into three types depending on the level of CNC functionality. As the level of automatic functions increases there is a corresponding increase in the level of guarding required. These lathes are normally flat bed machines (production CNC machines are usually slant bed) and similar in configuration to a conventional lathe. They are generally used in ‘toolroom’ type applications but may be used for small batch production.

‘Hybrid’ Machines

Key safety features (covered in the Standard. See Standard for further details)

- Extent of guarding depends on range of functionality provided by NC
- Guarding at the workzone on small machines may vary from interlocked chuckguards and saddle guard to ‘partial’ enclosure allowing access to the tailstock or full enclosure with access to the tailstock (see standard for details or if in doubt consult the NEG)
- Numerous ‘options’ are available for powered turrets, tailstock etc

- Rear guard – full length for small machines – full or partial with perimeter guard large machines
- Warning signs affixed regarding use of stock bar guard
- Chuck guard - interlocked unless covered by workzone guard
- Requirements for adequate strength and durability of vision panels similar to that for small numerically controlled turning machines and turning centres.
- Verification of spindle speed (input) required for machines with variable speed spindle drives and/or constant surface speed (CSS)

NOTE: The Engineering Sector has Section 6 responsibility for the principal suppliers. The Sector should be consulted prior to contact with any supplier of this type of machine.

Multi-spindle automatic turning machines

11 These machines are covered by **BS EN 13788:2002 Machine tools - Safety - Multi spindle automatic turning machines**. This standard is still current. Work has started on an editorial revision prior to conversion to an ISO Standard. However, its publication as an ISO Standard is unlikely before 2006.

Key safety features covered in the Standard. (See Standard for further details)

- Full enclosure with fixed and interlocked moveable guards.
- Facilities for setting similar to those provided at other types of CNC turning machine.
- Machines usually supplied with bar loading and bar feeding equipment – specific requirements for these devices - see standard for details.

Machining centres

12 These machines are covered by **BS EN 12417:2001 Machine tools – Safety – Machining centres**. This standard is still current, but work has started to introduce a revision under the 'Unique Acceptance Procedure' (UAP) procedures to allow modified guarding arrangements in operating Mode 3 – see key features below, for each type of machine. It will be converted to an ISO standard in due course.

Smaller Machines

Key safety features covered in the Standard. (See Standard for further details)

- Full enclosure – interlocked guards normally with guard locking

- Movements of axes hold-to-run with interlocked guard open
- Spindle (setting) limited to stopping within 2 revs
- Axis 2m/min
- Tool magazine interlocked guard – hold-to-run with guard open - same for tool changer
- Programmed movement with guard open under hold-to-run with restricted speeds for applications which must be specified in the instruction manual (referred to as 'Mode 3' in the standard - less likely to be provided on smaller machines)
- Swarf/chip conveyors fixed and interlocked guards – hold-to-run if guards open for cleaning/maintenance

Larger Machines

Key safety features covered in the Standard. (See Standard for further details)

- Enclose as far as possible but usually a combination of moveable interlocked guards, perimeter guards (min 1.4m) and/or other protective devices
- Machines may be moving table, column or combination of both – this will determine configuration of guards
- Spindle rotation with guards open – if stopping performance cannot be achieved additional measures required e.g. local guarding
- Axis speeds up to 5m/min guards open
- Swarf/chip conveyors hold-to-run – guards open
- Tool magazines/tool changers interlocked guards – hold-to-run guards open
- Protected operator position – cabin
- Other requirements for elevating platforms/pits
- Other features as per smaller machines

Milling Machines (including boring machines)

13. These machines are covered by **BS EN 13128: 2001 Machine tools – Safety – Milling machines (including boring machines)**. The Standard covers all types of

machine including CNC and manual. This standard is still current, but work has started to introduce a revision under the 'Unique Acceptance Procedure' (UAP) procedures to allow modified guarding arrangements in operating Mode 3 – see key features for machining centres. It will be converted to an ISO standard in due course.

CNC Machines

Key safety features covered in the Standard. (See Standard for further details)

- For full CNC machines – as per machining centres (but no tool magazines)
- Retrofitted manual machines e.g. Bridgeport type turret mills – interlocked table guard with adjustable elements for access to manual controls (feed for drilling, reaming etc).

Manual Machines

Key safety features (covered in the Standard. See Standard for further details)

- Adjustable table guard e.g. Maxijust type or cutter guard

Drilling Machines

14. These machines are covered by **BS EN 12717:2001 Machine tools – Safety – Drilling machines**. This standard is still current and no work has started on any revision.

Key safety features covered in the Standard. (See Standard for further details)

- Essentially as per existing UK Standards
- Some additional requirements for automatic machines e.g. specific features to permit safe setting
- See SIM 3/A/1998/13 regarding 'flag' guards on manual drilling machines

Power Presses and Press Brakes

15 The following EN Standards are relevant to power presses and press brakes. See 'Further Reading' for other guidance which contains more detailed guidance on the safety requirements.

BS EN 692:2001 Machine tools - Safety - Mechanical presses (under revision). A revised version made under the 'Unique Acceptance Procedure' (UAP) following objections, by France, to the inclusion of 'full revolution' clutch presses in the original version is now at the publishing stage (due to be completed 2005). A further more detailed revision is also being processed towards a public enquiry. Publication of the

second revision is not expected before late 2006 but probably in to 2007). (Also see paragraphs below concerning EN 693: 2001 and EN 13736:2003).

Note: The above situation will mean that at some stage there will have been three versions EN 692. Inspectors will need to ensure that older machines are assessed against the correct version of the standard, depending on the date of manufacture.

BS EN 693:2001 Machine tools – Safety - Hydraulic presses

Subject to formal objection from the UK due to the option to provide two-hand-controls as the sole safeguard at the operating position. Requirements on THC's are to be amended during revision of EN 692, 693 and 13736. Any changes to the application of two-hand controls agreed for this standard will also be reflect in the other presses standards. Publication of the revision not expected before 2006/07.

BS EN 12622:2001 Machine tools – Safety - Hydraulic press brakes

Under revision - public enquiry stage completed early 2004 – final publication of the revision is not expected before 2005/06.

BS EN 13736:2003 Machine tools - Safety - Pneumatic presses

Will be revised to ensure to consistency with other press standards – see above.

Guillotine Shears

16 These machines are covered by **BS EN 13985:2003 Machine tools - Safety - Guillotine shears**.

Key safety features covered in the Standard. (See Standard for further details)

- As per existing UK standards for front and rear guarding.
- More specific requirements for the application of light curtain and light beam devices
- Deviations from the requirements of BS EN 294 for relationship between gaps under front guards and reach distances to dangerous parts - new values proposed in Standard (Note: for existing machines apply BS 5305 or BS EN 294 or contact Engineering Sector for advice)

Stationary Grinding Machines/Abrasive Wheels

17 These are defined as 'a machine tool that is fixed in position during operation and which is intended to machine workpieces by means of abrasive products'. They are covered by **BS EN 13218: 2002 "Machine tools - safety - Stationary grinding machines"**. This standard is still current and no work has started on any revision.

Key safety features covered in the Standard. (See Standard for further details)

- Guarding which encloses the abrasive product to the greatest extent practicable and to contain fragments in event of breakage of abrasive product
- Workzone guards required at machines other than manually-guided grinding or cutting-off and mechanically-guided grinding with manual feed
- Adjustable workpiece rests to be provided at machines reliant on manual guiding of workpiece so that the distance between the abrasive product and the workpiece rest does not exceed 2mm. Clamping devices to hold or guide workpieces to be fitted at other machines.

Metal-Cutting Saws

18 These machines are covered by **BS EN 13898:2003 Machine tools - Safety - Sawing machines for cold metal**. The Standard covers circular saws, band saws and hack saws. This standard is likely to be adopted for conversion to an ISO Standard via the so called 'fast track' procedure. This is not likely to take place before 2005.

Key safety features covered in the Standard. (See Standard for further details)

- Fixed, interlocked or adjustable guarding to prevent access to the saw blade (except at the point of operation), or any saw-cleaning device, during sawing; guards must be capable of containing any ejected fragments of workpiece or blade
- Band-saw wheels to be guarded by interlocked guards fitted with a single detector actuated in positive mode
- Adjustable guide to be fitted to band-saws to support the blade during sawing and reduce risk of blade breakage in use
- Work-zone guarding at band-saws with power-operated feed at a rate >2m/min
- Pivoting head saws to be fitted with self-closing guards e.g. mechanically interlocked
- Machines (with certain exceptions) to be fitted with workpiece clamping devices to prevent unintentional movement

Electro-Discharge Machines (EDM)

19 These are machines which remove material by constant (non pulsed) electro discharges performed in a dielectric medium and are covered by **BS EN 12957:2001 Machine tools – Safety – Electro discharge machines**. This standard is still

current. This standard is likely to be adopted for conversion to an ISO Standard via the so called 'fast track' procedure. This is not likely to take place before 2005.

Key safety features (covered in the Standard. See Standard for further details)

- Fixed guards to be fitted where no access to danger zones necessary during intended use
- Where access to wire transportation systems is required fixed guards to be fitted (interlocked if access is required more than once per day)
- Interlocked guards must stop all current operations when opened in automatic mode
- Where whole body access to enclosures is required through interlocked doors these must be fitted with a device to prevent inadvertent closure
- Access to transfer equipment e.g. tool magazine, tool changer etc, to be prevented by fixed guard or interlocked guard with guard locking
- Standard sets out specified safety information that must be included in the supplier's operating/maintenance handbook.

ACTION BY INSPECTORS

20 This SIM is primarily for information and no particular action is requested concerning enforcement issues. Matters relating to enforcement action for specific machines can be found in other guidance (see Further Reading). Relevant guidance concerning the inspection of new machinery and enforcement procedures can be found in the [HSE Guide to the inspection of manufacture and supply](#).

FURTHER INFORMATION

21 Inspectors should contact the Manufacturing Sector in Birmingham, if further information or technical support is required concerning the use or application of these Standards. The Sector contacts for these topics are Jan Willets, or David Arnsby in Midlands SG.

FURTHER READING

[SIM 3/A/1997/11](#): Safety of Machine Tools – Lathes

[SIM 3/A/1997/12](#): Safety of Machine Tools - CNC Milling Machines and Machining Centres

[SIM 3/A/1998/4](#): Accidents at Drilling Machines

[SIM 3/A/1998/5](#): Direct Readout [DRO] Devices on Turret Milling Machines

[SIM 3/A/1998/13](#): Drilling Machines - "Flag" Guards

[SIM 3/2000/27](#): Fatal Accident at Lumsden Vertical Spindle Surface Grinder

[SIM 3/2002/27](#): Safeguarding press brakes - laser based AOPD's

[SIM 3/2003/04](#): The Safeguarding of Press Brakes

SIM 3/2003/10: Accidents at power presses and press brakes
EIS 33: (see CNC turning machines - Controlling risks from ejected parts. para 7)

CANCELLATION OF INSTRUCTIONS

SIM 03/2002/31 – Cancel and destroy

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