



## Engineering machine tools - Retrofitting CNC

### Engineering Sheet No 19

#### Introduction

The guidance set out in this information sheet is intended primarily for people who retrofit engineering machine tools with CNC (computer numeric control) systems. The information is also relevant to users of retrofitted machinery or employers considering retrofitting existing equipment.

#### Background

A range of CNC systems that can be fitted to previously manually operated machine tools is available. These systems provide a selection of features which can significantly improve the productivity of the machine and the quality of the work produced. Milling machines and lathes are common examples of the type of machine which can be modified. When machines are retrofitted, new hazards and increased risks to the operator may be introduced.

If a new machine is supplied, it has to comply with the Supply of Machinery (Safety) Regulations 1992 and requires CE marking. If a machine in service prior to the introduction of these Regulations is given such a substantial refurbishment that it may also be regarded as a new machine,\* the same requirements apply, and important safety considerations should be taken into account. Regardless of a machine's date of manufacture it must be 'safe' and, from the user's point of view, it must comply with the relevant parts of the Provision and Use of Work Equipment Regulations 1992 (PUWER). More often than not, the safeguards provided on existing manual machines will not meet the minimum legal requirements when CNC retrofits are added.

#### Hazards and risks

A previously manual machine that has been the subject of a CNC retrofit retains the mechanical hazards such as entanglement with rotating parts, contact with sharp tools, shearing, crushing and ejection.

\* Refurbished machinery from inside the European Union may also have to comply with the Supply of Machinery (Safety) Regulations 1992 if the degree of refurbishment is substantial, such as where machinery is given computer control function which introduces increased speeds and adds new functions. A new coat of paint and the straight replacement of worn out items would not fall into this category. Imported machines from outside the European Union have to comply with the above Regulations.

Automation of the machining process can introduce increased axis speeds, the hazard of unexpected movement and the possibility of programming error or potentially dangerous fault conditions in the control system. Automation also changes the way the operator interacts with the machine and, to some extent, the way the hazards may be presented to the operator.

Before retrofitting, each movement of a machine element was initiated and/or sustained by the deliberate manual intervention of the operator, but with CNC there is a shift in the extent of control from operator to machine. The opportunity to avoid hazards, following a change in speed or direction on the machine, can be significantly reduced. It is well known that injuries at engineering machine tools can be very severe and sometimes fatal.

#### Risk assessment

Because of the change from manual to automatic operation a retrofitted machine should be subject to a risk assessment. The assessment should identify clearly the hazards present and then establish the measures necessary to control the risks and hence satisfy the relevant legal requirements, eg PUWER. The assessment should also consider the need to modify or update any relevant drawings and diagrams and amend the instruction manual. Changes to the safety-related instructions should take into account all aspects of use including setting, cleaning and maintenance activities.

#### Safeguarding

The safeguarding principles are well established for CNC engineering machine tools. Fixed and interlocked guards which prevent access to the danger zone during the automatic cycle should normally be provided. Where it is necessary to have powered movement of a machine element, with the interlocked guard open, eg for setting purposes, this should be done under limited speed conditions with hold-to-run control.

There may be other matters to consider such as the location of machine controls. Examples have been noted where, when a suitable guard has been provided, there have been difficulties in accessing or viewing the machine's control panel. Indeed, as part of the retrofit, controls may need to be relocated in order to meet specific legal requirements under PUWER.

Detailed consideration should be given to the safety-related parts of the machine's control system. A number of BS EN standards provide specific guidance on this

matter and further information should be available from the control system component supplier. The measures that may need to be taken concerning the safety aspects of control system design should evolve from the risk assessment process, eg when considering the measures needed to comply with regulation 18 of PUWER (or if appropriate Clause 1.2 of the Essential Health and Safety Requirements (EHSRs) of the Supply of Machinery (Safety) Regulations 1992 (as amended)).

Further machine specific guidance can be found in other HSE publications which also include references to a range of relevant standards.

### **Useful publications**

*Work equipment* Provision and Use of Work Equipment Regulations 1992. Guidance on Regulations L22 HSE Books ISBN 0 7176 0414 4

*Health and safety in engineering workshops* HSG129 HSE Books ISBN 0 7176 0880 0

BS EN 1050:1997 *Safety of machinery - Principles for risk assessment*

BS EN 292:1991 Parts 1 and 2: *Safety of machinery - Basic concepts, general principles for design*

BS EN 60204:1993 *Safety of machinery - Electrical equipment of machines Part 1: Specification for general requirements*

The future availability and accuracy of the publications listed in this information sheet cannot be guaranteed.

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