

2.4.15 Machining centre

LEGISLATIVE Decree 81/08 APP. V and VI, PRESIDENTIAL DECREE 459/96 APP. I, UNI EN 12417:2003



Machine tool in which the horizontal or vertical spindle can carry out two or more machining processes (e.g. milling, drilling, boring) with a single placement of the workpiece, and which has functions for automatic tool changeover.

2.4.15.1 HAZARDS

Contact, crushing and dragging with hazardous equipment in the work area, tool changeovers, pallet changeovers, chip removal system.

The machining centre work area must be fully protected with fixed guards (see “Fixed guards” in 2.2.3.2) or movable interlocked guards (see “Movable guards” in 2.2.3.2) with guard-locking (see “Movable interlocked guards with guard-locking” in 2.2.3.2) if the hazardous movements can continue even after the guard is opened. To do this, a perimeter guard can be set up around the machine using a combination of these types of guard and presence detection devices (immaterial barriers (see 2.2.5.3 “Immaterial barriers”), sensitive mats (see 2.2.5.4 “Sensitive mats”), etc.).

Particular attention should be paid if the operator goes into areas where the following automated operations take place:

- Tool changeover;
- Pallet changeover;
- Chip removal.

Operators should only access these areas in safe conditions. If they need to access these hazardous areas, while movements are in progress, alternative safety measures must be immediately and automatically introduced, such as reduced speed or hold-to-run controls.

A careful assessment must be made if there are inspection pits or high operator platforms on or near the machine.

2. Safety

4. Main machines

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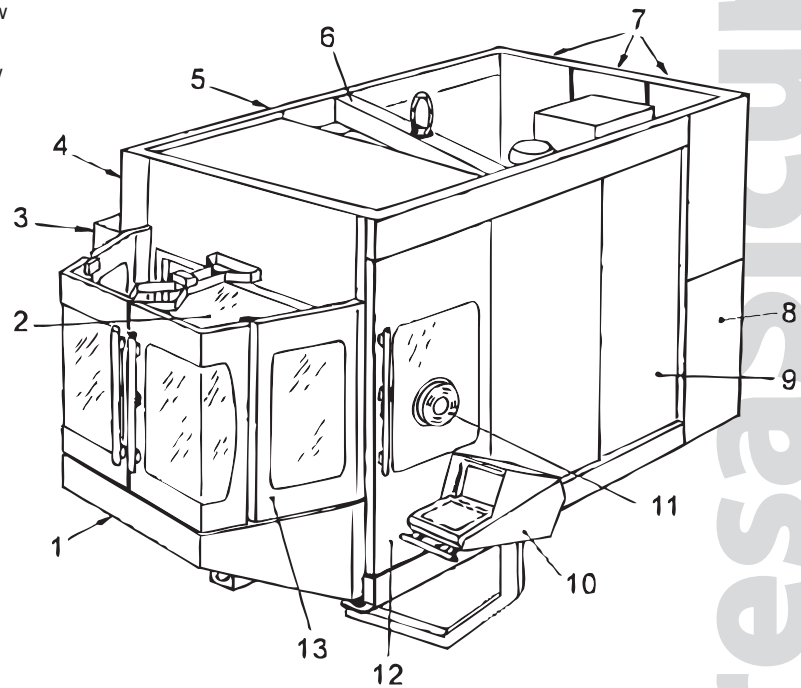
TRANSLATION OF ORIGINAL INSTRUCTIONS

ImpresaSicura  **METALMECCANICA**

Protection using fixed guards and movable interlocked guards

Legend

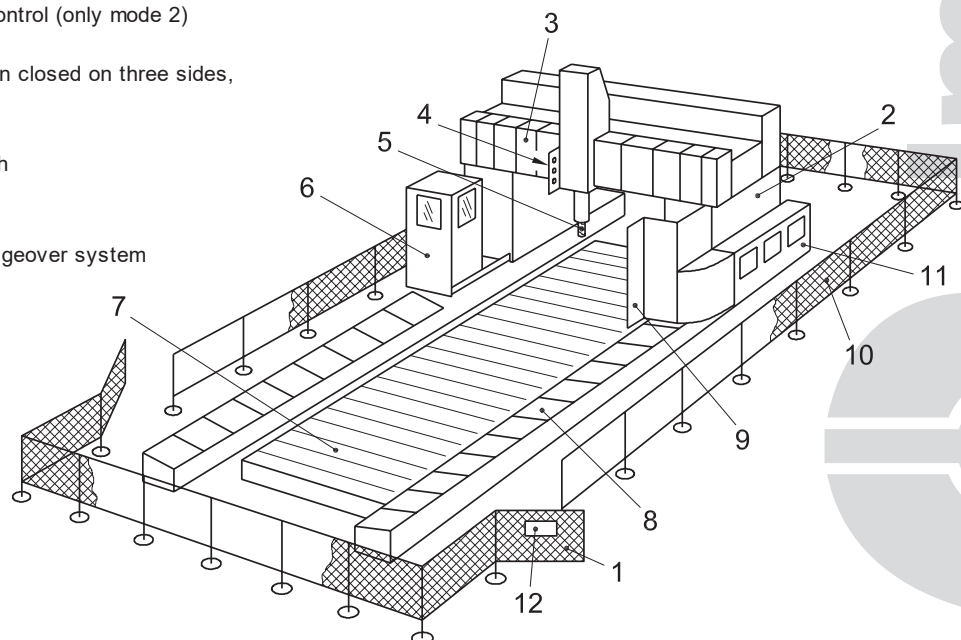
- 1 Set-up station
- 2 Pallet changeover system rotary window
- 3 Chip conveyor
- 4 Tool changeover system control window
- 5 Tool loader control window
- 6 Crossbeam for transporting machine
- 7 Rear maintenance door (hydraulic, pneumatic, central lubrication, motor fan units)
- 8 Cabinet door
- 9 Maintenance door
- 10 Control panel
- 11 Rotary control window
- 12 Sliding opening to the work area
- 13 Folding front door



Protection using perimeter guard

Legend

- 1 Access gates
- 2 Movable portal
- 3 Expandable steel covers
- 4 Auxiliary portable control (only mode 2)
- 5 Milling machine
- 6 Operator workstation closed on three sides, runs with portal
- 7 Machine bed
- 8 Covers on slide path
- 9 Swarf/chip deviator
- 10 Perimeter guard
- 11 Automatic tool changeover system
- 12 Warning signs



2.4.15.1A PERIMETER GUARD

The perimeter guards must be at least 1.4 metres high, be placed at an appropriate safety distance from the hazardous area (see 2.2.4 "Safety distances") and must not leave spaces of more than 300 mm to the floor.

The guards protecting the work area must be capable of containing or preventing the ejection of swarf, chips, cutting fluid or other parts that could be ejected towards the operator. The guards' resistance must be adequate for the type of machining, taking into account the maximum spindle speed, the tool diameter, the mass of the inserts, the distance between tools and guard, the type and size of material being machined, etc.

2.4.15.1B OVERRIDING THE GUARD INTERLOCK IN THE TOOL CHANGEOVER DEVICE

If tool changeover movements are needed with the interlocked guards open, the guard interlock must be overridden with a special key selector (see 2.2.6.5 "Operating mode selector"). Overriding the interlock must immediately activate the following safety functions:

- Tool changeover movements must be made using a hold-to-run control device, if a single movement has to be controlled, or with a two-hand control if continuous movements have to be controlled;
- The speed must be reduced (i.e. 15 m/min for an impact hazard; 2 m/min for a crushing, shearing or entrapment hazard) or be controlled from a safe distance from the hazardous machine parts.

Hazardous parts must not be accessible within this area and the operator must be protected against the risk of the ejection of chips or cutting fluid; otherwise the machining must be stopped.

2.4.15.1C OVERRIDING THE GUARD INTERLOCK OR SAFETY DEVICES IN THE PALLET CHANGEOVER OR WORKPIECE CHANGEOVER AREA

If access is needed to the hazardous movements in the pallet changeover or workpiece changeover area, the guard or interlock safety devices must be overridden with a special key selector (see 2.2.6.5 "Operating mode selector"). Overriding the interlock or the safety devices must ensure that the hazardous movements are made:

- With a hold-to-run control device (see 2.2.6.2 "Hold-to-run") and an enabling device if the movement is intermittent;
- With a two-hand control (see 2.2.5.2 "Two-hand control") if continuous movement is needed.

2.4.15.1D OVERRIDING THE GUARD INTERLOCK IN THE CHIP REMOVAL SYSTEM AREA

If access is needed to the chip removal system while it is moving, the guard interlock must be overridden with a special key selector (see 2.2.6.5 "Operating mode selector"). Overriding the interlock must ensure that the hazardous movements of the chip removal system are made in the following conditions:

- A hold-to-run control device must be activated (see 2.2.6.2 "Hold-to-run");

- There must be an emergency stop device ([see 2.2.6.4 "Emergency stop"](#)) very close by;
- There must be a warning sign indicating the hazardous unloading area of the chip removal system.

Hazardous parts must not be accessible within this area and the operator must be protected against the risk of the ejection of chips or cutting fluid; otherwise the machining must be stopped.

2.4.15.1E INSPECTION PITS

If there are pits near the machine, these must be covered (for example with floor grates) or protected with a wall at least 1 metre high above the floor.

If the pit is opened or made accessible, a chain (red/white or black/yellow) must be placed around it, at a distance of around 1 metre from the edge, together with a warning sign.

If access to the pits is needed for observation, maintenance or adjustment purposes, the pit should be entered through interlocked gates ([see "Movable guards" in 2.2.3.2](#)) that prevent the machine moving in automatic mode and, if necessary, activate "set-up" mode ([see 2.4.15.2B](#)).

2.4.15.1F WORK PLATFORMS

If there are work platforms, these must meet the following requirements:

- Be protected against the risk of users falling from them and the risk of objects or material falling (for example with a wall at least 1 metre high) if the platform is at a height of more than 500 mm.
- Useful height for the operator (distance between floor and overhead part) of at least 2100 mm, clear width of at least 600 mm and preferably 800 mm;
- Guarantee of adequate lighting and ventilation;
- Presence of easy means to access and leave the platform in an emergency;
- Hazardous parts must not be accessible from the platform and the operator must be protected against the risk of the ejection of chips or cutting fluid.

Contact, crushing or dragging with motion transmission equipment

Access to motion transmission equipment (belts, chains, gears, pulleys, shafts) must be prevented using fixed guards ([see "Fixed guards" in 2.2.3.2](#)) or movable interlocked guards ([see "Movable guards" in 2.2.3.2](#)).

2.4.15.2 CONTROL EQUIPMENT

Starting

The only way to start the machine is to use specific control devices ([see 2.2.6.1 "Starting"](#)) that are easy to recognise and are protected against the risk of being accidentally activated.

Operating modes

Each machine must have at least two operating modes:

- **Automatic cycle;**
- **Set-up;**

With the option of a third optional mode:

- **Manual intervention in limited operating conditions.**

The operating mode must be selected using a key selector (see 2.2.6.5 "Mode selector") or with an access code and must be possible only from outside the work area.

Whatever mode is selected, the operator's safety and that of other exposed persons must be guaranteed at all times.

2.4.15.2A AUTOMATIC CYCLE

In this operating mode, all guards must be closed and protective devices activated.

2.4.15.2B SET-UP

If a movable interlocked guard must be opened for set-up operations or a protective device must be overridden, the machine movements should happen only in the following conditions:

- Movement of only one axis at a time with a maximum speed of 2 m/min or a maximum increment of 10 mm, controlled with:
 - A hold-to-run control device (see 2.2.6.2 "Hold-to-run");
 - An electronic wheel;
 - Manual data entry followed by starting the cycle with an enabling device.
- The spindle rotation speed must be such that the inertia following a stop control is not more than 2 revolutions.
- The spindle rotation must be started and maintained only using one of the following means:
 - A hold-to-run control device (see 2.2.6.2 "Hold-to-run");
 - A control device and an enabling device.
- The automatic mechanism for tool changeover or workpiece changeover must remain inhibited.
- The movements of the chip conveyor, if accessible, must be started and maintained only using a hold-to-run control device (see 2.2.6.2 "Hold-to-run").

2.4.15.2C MANUAL INTERVENTION IN LIMITED OPERATING CONDITIONS

This operating mode allows the machine to be used with manual or programmed control, while the guards are open or the protective devices are overridden, and can be used when:

- The work methods and characteristics are clearly defined;
- The machining is to be done by qualified staff;
- The movement of the individual axes is at a maximum speed of 5 m/min;
- The spindle rotation speed must be such that the inertia following a stop control is not more than 5 revolutions;

- The execution of a program must be started using a control device and an enabling device; the latter must be held throughout the program duration.
- Manually-controlled machining must be done as follows:
 - The spindle rotation must be started using a control device and an enabling device; the latter must be held throughout the machining process.
 - The axis movement must be started and maintained only using one of the following means:
 - A hold-to-run control device (see 2.2.6.2 "Hold-to-run");
 - An electronic wheel;
 - Manual data entry followed by starting the cycle with an enabling device.
- The automatic mechanism for tool changeover or workpiece changeover must remain inhibited.
- The movements of the chip conveyor, if accessible, must be started and maintained only using a hold-to-run control device (see 2.2.6.2 "Hold-to-run").

Unexpected restart

Spontaneous restarts (see 2.3 "Machine electrical systems") of the machine after power is restored must be prevented using a specific device.

Stopping

The machine must have a control device (see 2.2.6.3 "Stopping") to stop it safely.

Emergency stop

All machines must have at least one emergency stop device (see 2.2.6.4 "Emergency stop") placed within easy reach of the operator to stop it safely. If there are several workstations where there might be an operator (for example in the tool changeover area) they too must have an emergency stop (see 2.2.6.4 "Emergency stop").

2.4.15.2D STOPPING SAFELY

In normal stopping conditions and for emergency stops it must be possible to control the movements of the equipment in relation to all the machine axes (for example to release trapped persons).

2.4.15.3 ERGONOMICS

Positioning

The machine must allow free access to the work area even when setting, loading and unloading devices, etc. are being used (for example, lifting devices).

2.4.15.4 OCCUPATIONAL HEALTH AND SAFETY

Emissions

The machine must be fitted with an appropriate local exhaust ventilation system (see 3.6 "Local exhaust ventilation systems").

Noise

Find out the noise levels to which staff are exposed when using the machine and follow the employer's instructions.

2.4.15.5 PERSONAL PROTECTIVE EQUIPMENT

The machining work must be assessed carefully so that the use of PPE can be defined:



Safety glasses (see 5.4 "Eye and face protection") can be omitted only if the guards fully protect the work area, preventing any material or cutting fluid being ejected towards the operator.



Gloves (see 5.6.4 "Gloves giving protection from mechanical risks") protecting against mechanical risks and which are waterproof when cutting fluid is used.



Safety shoes (see 5.7 "Foot protection") with protective toe cap (S1).



Hearing protectors (see 5.3 "Hearing protection").

2.4.15.6 OPERATING INSTRUCTIONS

The machine must come with a manual, in Italian, explaining correct use and maintenance, including a programme of periodic inspections.

2.4.15.7 OCCUPATIONAL HEALTH AND SAFETY ACTIONS**Before use**

- Read the Operating Instructions and be trained on using the machine safely.
- Check that the guards (see 2.2.3 "Guards") and safety devices (see 2.2.5 "Safety devices") are present and positioned correctly.
- Check that the guard interlock systems work (see 2.2.5.1 "Interlock systems").
- Check that the emergency stop button works (see 2.2.6.4 "Emergency stop").
- Make sure that the right amount and pressure of cutting fluid needed for machining is used (to avoid overheating and fumes).
- Activate the exhaust system if the work conditions require one to be installed.
- Secure the workpiece properly to the table.
- Make sure that there are no keys, tools or other items on the table or near the workpiece being machined.
- Wear clothes that cannot become entangled with the hazardous moving parts on the machine.
- Do not wear scarves, necklaces, bracelets, watches or rings and tie up long hair.
- Wear the personal protective equipment (PPE) shown in this data sheet.

**During use**

- Keep the guards on the machine positioned correctly.
- Do not override or tamper with the safety devices. If they have to be deactivated for a specific job, other safety measures must be adopted immediately, such as very slow machining speed and hold-to-run controls, etc.
- Never leave the machine unsupervised while it is in operation (only move away from the machine when the machining is complete or the machine is stopped).
- Workpiece changeovers should take place only after the machine is stopped or put into safe condition.
- Carry out cleaning operations only when the machine is stopped.
- Report any malfunctions or faults promptly to the supervisor.
- Avoid getting cutting fluid on your hands or clothes (do not wear dirty overalls or canvas shoes, do not clean your hands on your overalls, do not keep dirty cloths in your pocket); wash your hands often (after finishing work and before eating, going to the bathroom and putting on gloves).
- Contain any cutting-fluid spills with special materials or substances provided by the employer.

After use

- Switch off the machine.
- Put measuring equipment and instruments back in their containers.
- Leave the machine and the area around it (especially the workstation) clean (free of machining residue and cutting fluid) and tidy.
- Reactivate any deactivated guards.