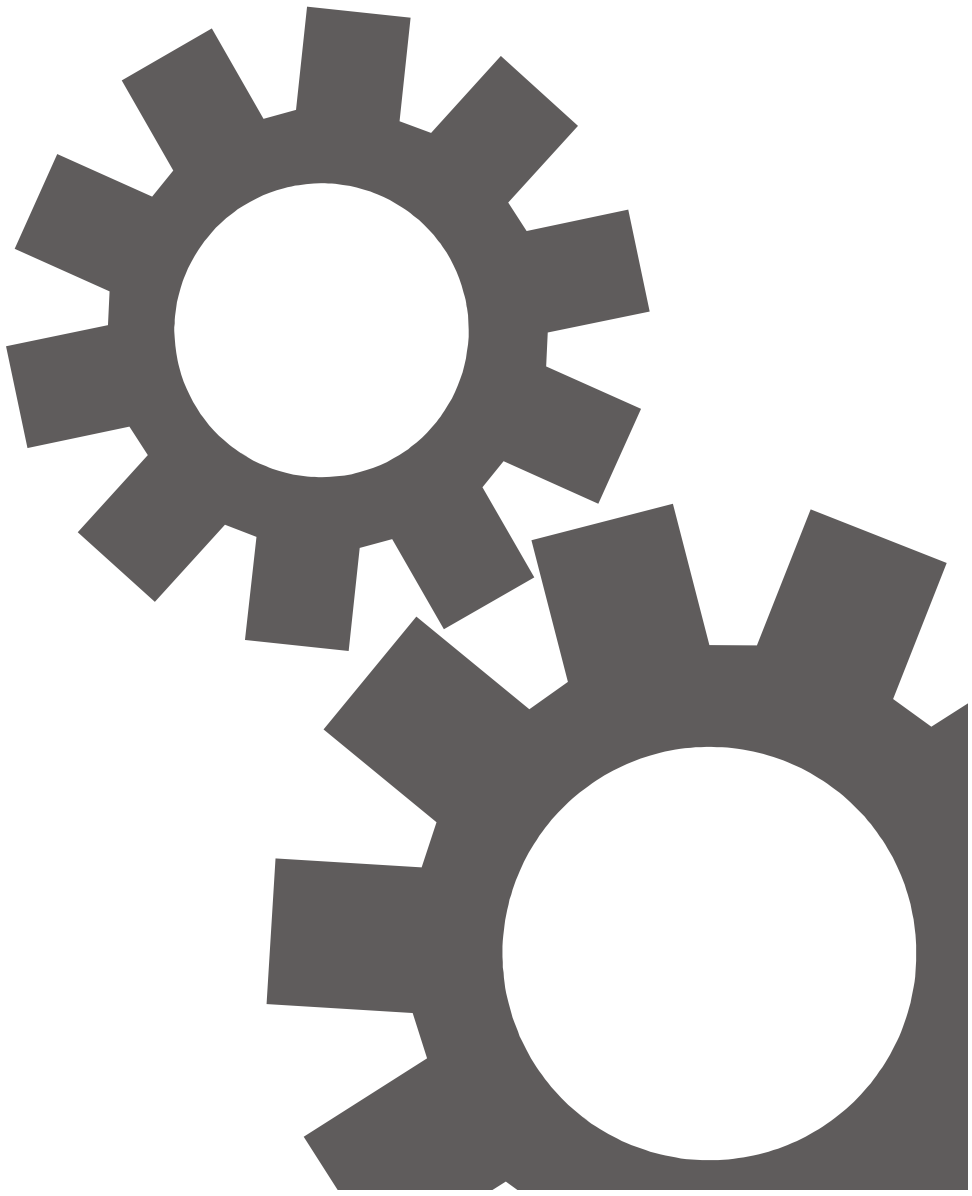
BIESSE

SKIPPER 100

NC processing centre

MACHINE USER'S MANUAL



1.6
K9802K0030gb ENGLISH
Serial number

Information on this publication

Code	Issue	Revision	Approval number
K9802K0030gb	1	0 (05, 2004)	G04-0004
		1 (05, 2005)	G05-0170M
		2 (06, 2006)	G06-0212M
		3 (09, 2006)	G06-0274M
		4 (12, 2006)	G06-0349M
		5 (05, 2008)	G08-0091M
		6 (05, 2009)	G09-0078M

List of changes			
Revision	Additions	Deletions	Changes
0	new document		
1	sections: 5.8.		sections: 7.1, 7.2.2, A.8, B.4, B.8.
2			sections: 7.1, B.5, B.10.
3	sections: 1.8.1, 1.8.2, 1.8.3, 1.9, C.3.2, C.3.3, C.3.4.	section: F.1.	sections: 1.4, 1.5, 1.7, 1.8, 2.6, 3.2, 4.2, 7.1, 8.3, 8.5, B.1, B.8, B.10, C.2, C.3, D.1, D.3.
4			appendix: C
5			sections: 1.6, 1.8.1, 3.3, 5.8, 6.1, 7.1, B.1, B.4.
6			chapter: 7.

The document is supplied together with the machine It must be kept in a safe easily accessible place known to those responsible for running or maintaining the machine. It must be used with care throughout the machine's working life, and must be handed over with the machine if the latter is passed on to third parties.

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Uses

Tooling

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A Safety information

B Technical characteristics

C Transport

D Fitting

Introduction

Field of Application and Limits of the Manual

This manual is aimed at users of the machine for which it provides basic information that the user must know before starting to use the machine. It also contains information on the maintenance of the machine necessary to ensure that it remains efficient and safe over time. In order to use the machine properly, the Software user's manual and Enclosures must also be consulted.

The configuration of certain parts or devices described or illustrated in this manual may differ from the ones actually fitted on your machine, but this will in no way compromise understanding of the manual itself.

Documents Supplied with the Machine

The following is a list of the main documents provided with the machine:

- **Machine user's manual**; contains basic information on the use and maintenance of the machine.
- **Software user's manual**; contains information on the operations and procedures required to create programs that can be run using the software connected to the machine.
- **Spare parts catalogue**; can be used to find and/or order components to be replaced.
  If the machine is provided with the "InDocs (Interactive Reference Documentation for User)" cd-rom, this document will only be supplied if specifically requested.
- **InDocs (Interactive Reference Documentation for User) Cd-rom**; can be used to find and/or order components to be replaced and to consult the following documents:
  - Machine user's manual;
  - Software user's manual;
  - Pneumatic system diagrams.
- **Electrical system wiring diagrams**; describe the machine's electrical system, and are to be used by the technician responsible for problem solving.
- **Pneumatic system diagrams**; describe the machine's pneumatic system, and are to be used by the technician responsible for problem solving.
- **CE Declaration of conformity**; certifies that the machine conforms with the directives indicated.
  It is only issued for machines sold in EEC countries and in countries where Directive 98/37 is applied.
- **Documentation for special devices**; contains information on any special parts of the machine.

Warning signs

Paragraphs that should not be overlooked are highlighted and preceded by the symbols described and illustrated below.

Paragraphs marked with this symbol indicate an imminent danger, and the contents must therefore be taken into careful account in order to prevent a serious accident.

Paragraphs marked with this symbol indicate procedures to be used to avoid any damage to goods and property.

This symbol is used to indicate points of particular importance that must not be overlooked.

Warnings

The safety information provided in the appendix to this manual must be read before using the machine.

Description

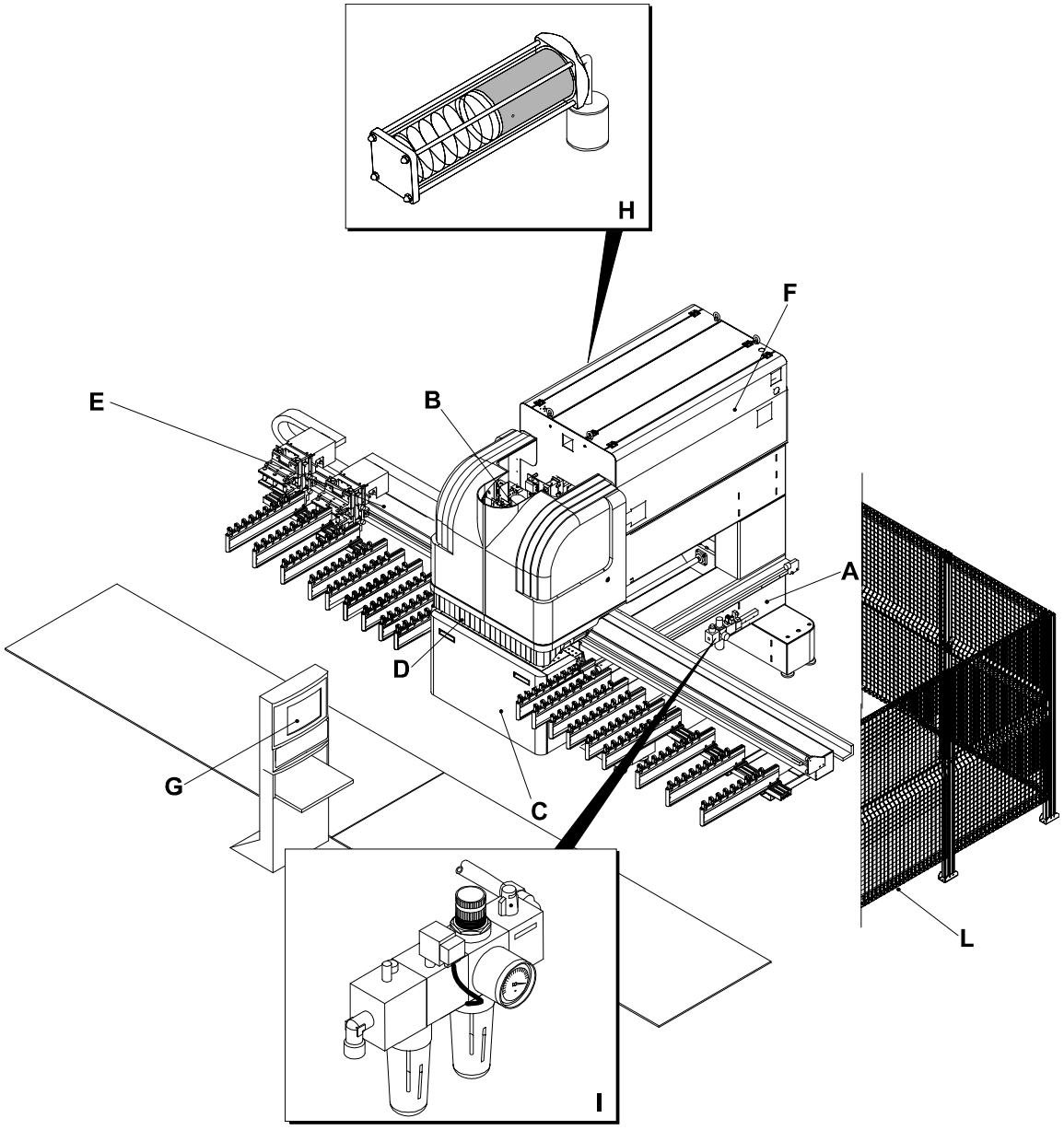
1 Main parts

This chapter provides information on the type of machine, its main and optional parts, and on the configuration of the various models available.

1.1 General description of the machine

The **Skipper 100** is a processing centre with a swan's neck structure, which operates with the panel in movement and is equipped with top and bottom machining heads capable of operating simultaneously on both sides of the piece or on a pair of opposite pieces.
Each model can be identified by the special plate located on the machine, at the point indicated in the paragraph 1.9 "Identification of the manufacturer and the machine".
The following paragraph gives a general view of the machine, in which the main parts are identified and described.

1.2 General view and main parts



A - **Base**; this is the machine's bearing structure, with a "swan's neck" configuration. For further information, see page 17

B - **Top machining head**; this is made up of the vertical and horizontal boring spindles, the mill and the cutting blade. For further information, see page 18

C - **Bottom machining head**; this is similar to the above. For further information, see page 18

D - **Air cushion work table**; supports the piece during machining operations. For further information, see page 19

E - **Y-axis beam**; this is equipped with clamps that grip the piece and introduce it into the machine for working. For further information, see page 20

F - Electrical cabinet; contains the main electronic equipment.

G - Numerical control and operator control panel; serve to manage operation of the machine. For further information, see chapter 4 “Controls and indicator devices”.

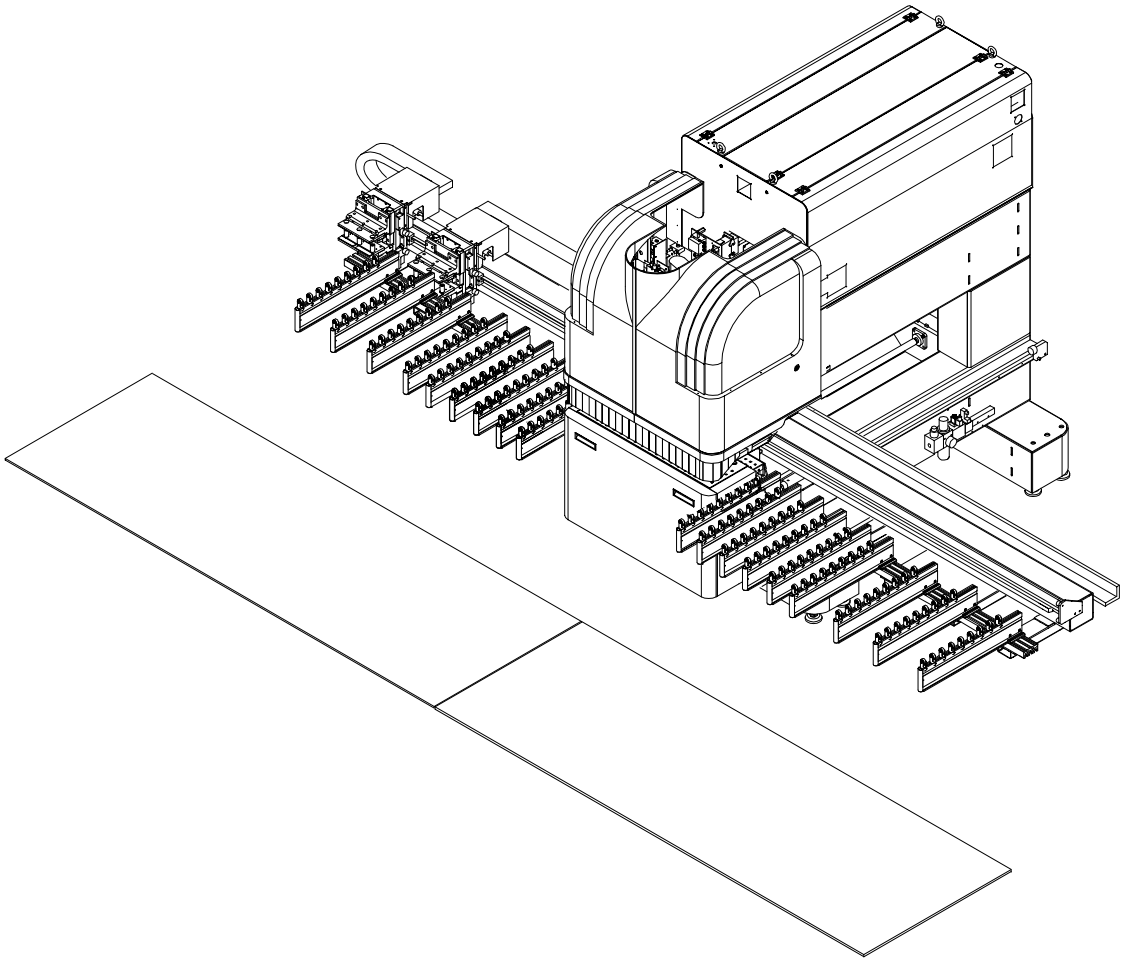
H - Lubrication system; lubricates the least accessible parts of the machine (slide blocks, guides,...).

I - F.R.L. unit; feeds the air cushion table and the machine’s pneumatic devices.

L - Safety fence; prevents access to the danger areas in the machine. For further information, see page 26

1.3 Base

The base is made of metal structural elements and has a “swan’s neck” configuration; the guides used to move the beams with clamps are located on the bottom part.
The machine-side devices are inserted in niches formed along the base, whereas the electric panels are located in the top part and are protected by special casings.
The machine is equipped with adjustable feet for levelling.

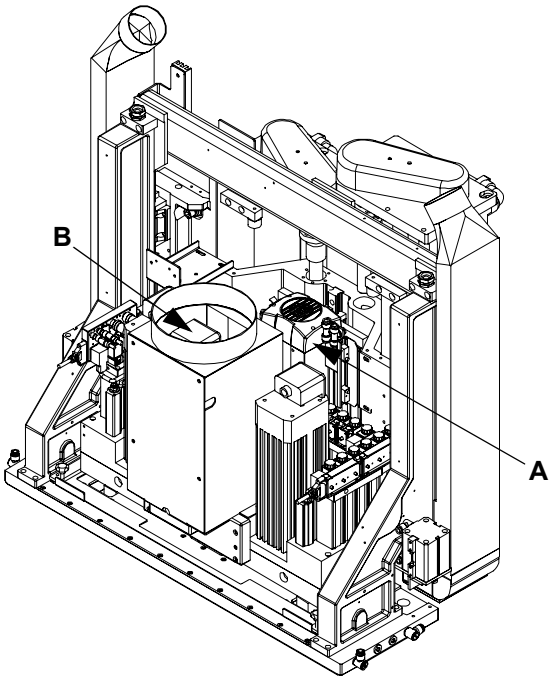


1.4 Machining heads

The machining heads, top and bottom, are located in the top part of the machine and under the work table, respectively.

Each machining head is made up of:

- 29 vertical boring spindles.
- An electrospindle unit (**A**) with independent pneumatic disengagement.
- A blade unit (**B**) to cut the piece.



The top head is also fitted with a horizontal boring unit, made up of spindles arranged as follows:

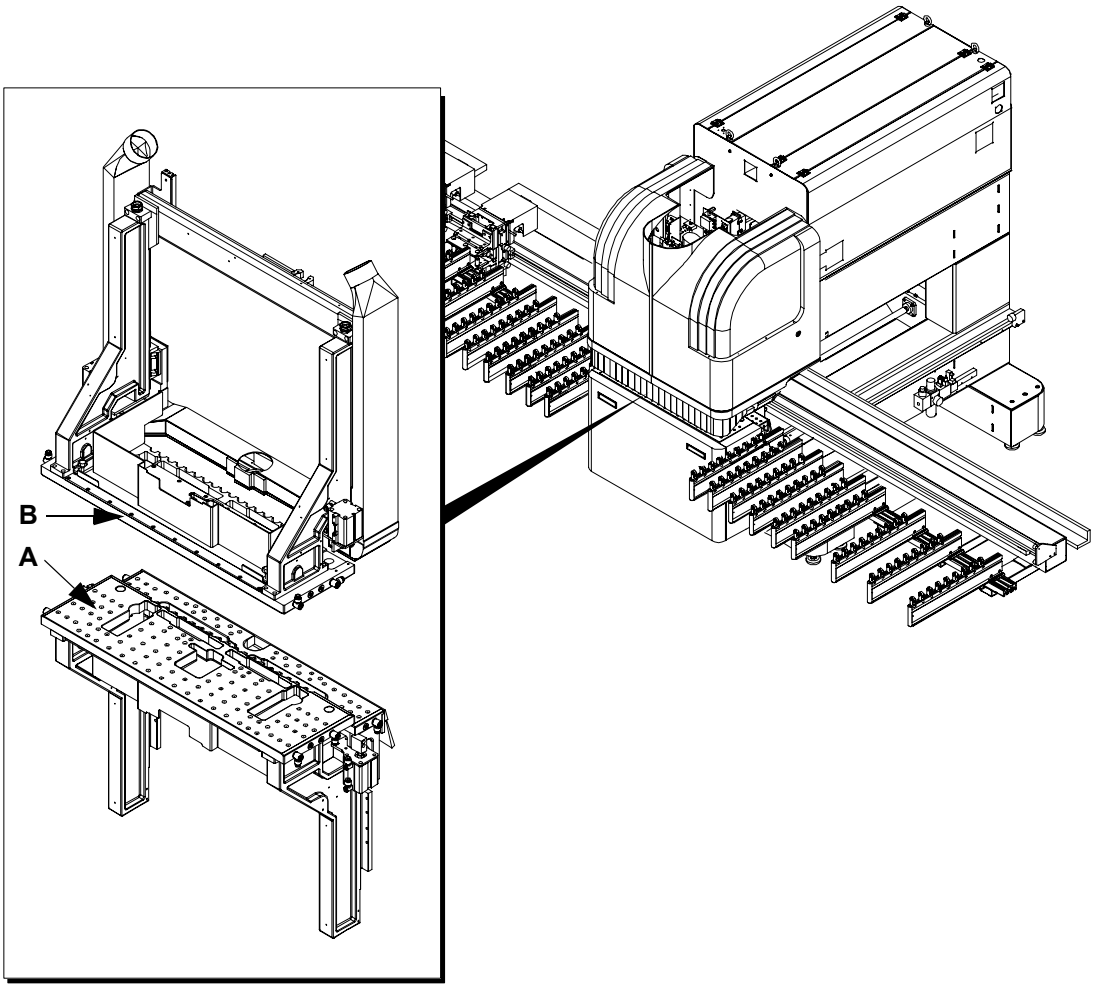
- 8 for boring, along the X-axis, of the head and tail of the piece;
- 2 for boring along the outside of the piece along the Y-axis.

The head is fitted with an auxiliary table that has the job of supporting the panel during machining with the mill. As the carriage advances, this table is disabled to prevent collision with the other moving parts.

1.5 Air cushion work table

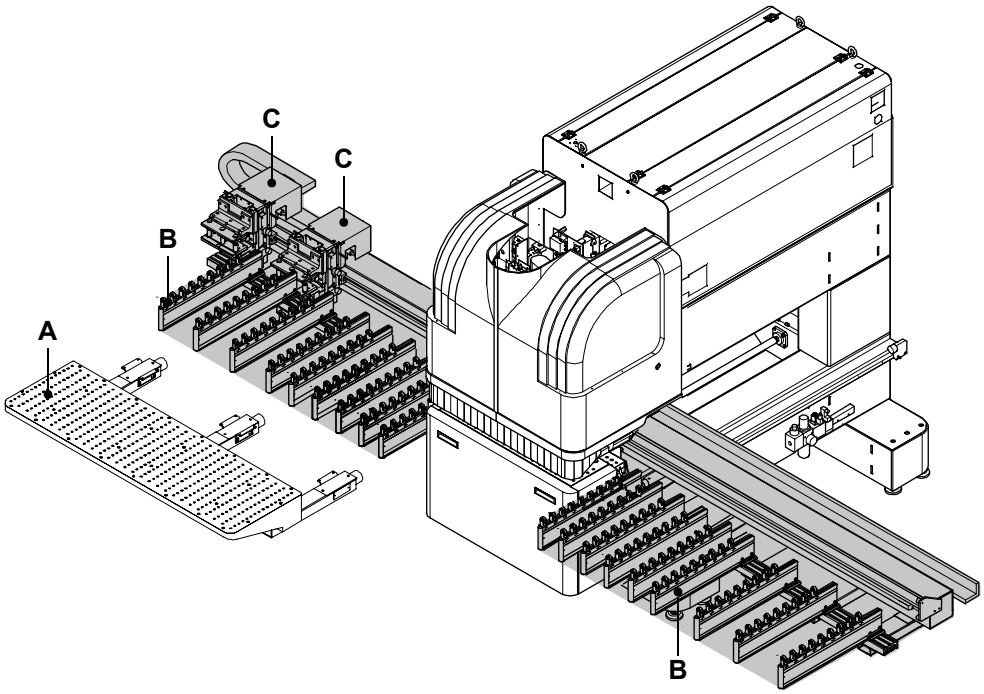
The work table **A** is fitted with a fixed stop (that drops down by means of a pneumatic drive) allowing positioning of the piece: according to the type of machine (with left or right hand feed) the drop-down stop will be positioned on one side or the other of the work table.
The mobile presser **B** is located in the top part of the machine.
The presser positions itself a few tenths of a mm above the surface to allow the piece to slide during machining operations.

Both the fixed table and the presser are equipped with bores through which the air is blown to form a cushion, protecting the surface of the piece.



1.6 Y-axis beam

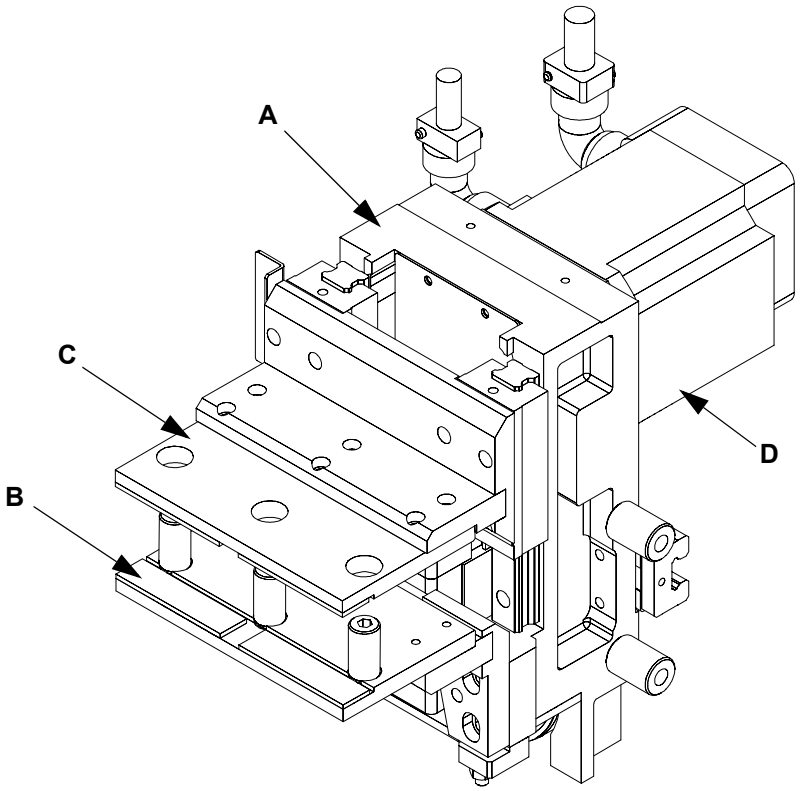
The Y-axis beam slides on two straight guides located on the base; this beam allows the piece to be machined to move in the X-Y direction on the working area using two clamps. The beam has an air cushion loading surface (**A**) or extruded bars in aluminium oriented in the 'Y' direction and with upper PVC wheels (**B**); an unloading surface with extruded bars in aluminium oriented in the 'Y' direction and upper PVC wheels (**B**), and two clamps (**C**) independent and movable in X direction.



Each clamp is made up of the following parts:

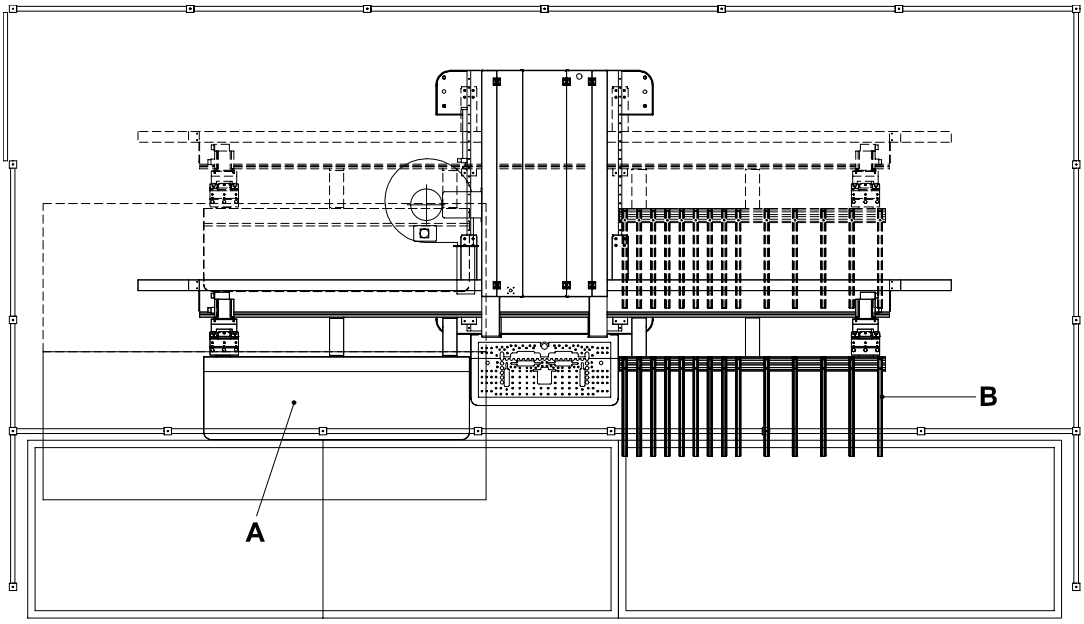
- Mobile carriage **A** which slides on a straight guide, located along the X-axis.
- Fixed bottom table **B** which is adjusted during set-up of the machine. The clamp reference stops are fixed to this table.
- Mobile top table **C**, driven by the pneumatic cylinder, which descends to lock the piece. The surfaces of the two tables are coated with rubber to increase friction.

- Transfer device made up, in turn, of a motor **D** (located in the top part of the clamp), a belt drive and a toothed wheel that engages on the rack located along the X-axis.



i During movement of the piece, the clamps are managed by the numerical control, but they can perform independent movements to allow specific parts of the piece to be machined; e.g. if a bore has to be machined at a point close to a clamp, the Y beam stops in position, the clamp releases its grip and moves until it is outside the working dimensions, while the other holds the piece still.

According to needs, the Y beam can be fitted with an air cushion loading table **A** or with an idle wheel loading table **B**. Only the idle wheel table **B** is foreseen for unloading.

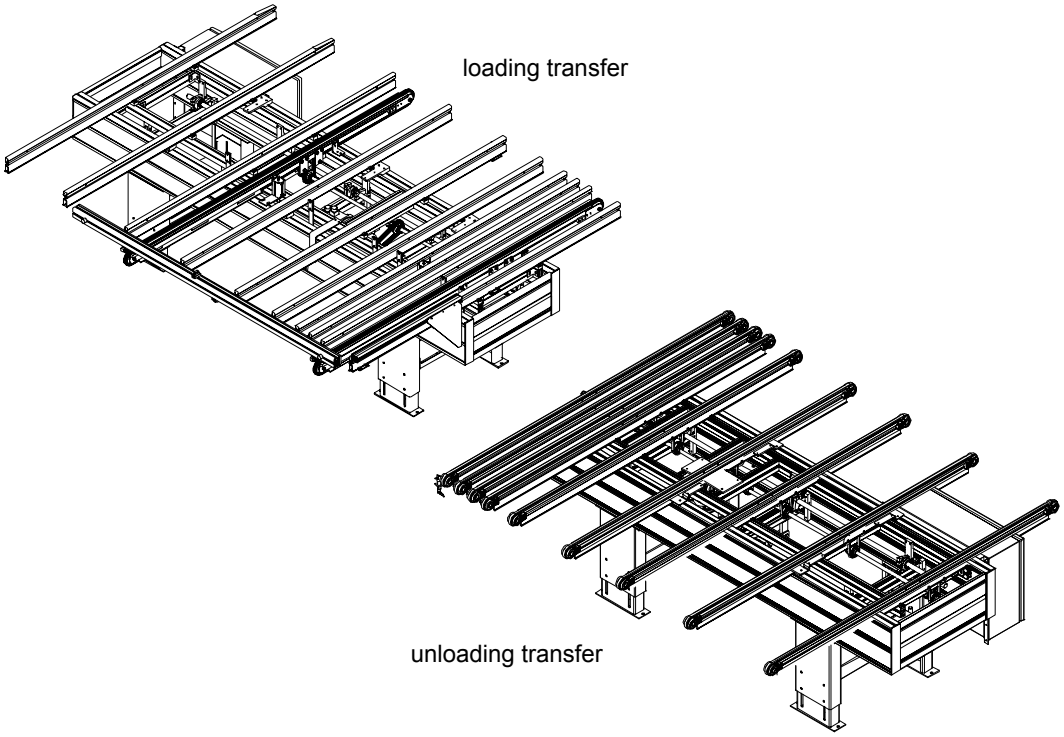


1.7 Transfer (optional)

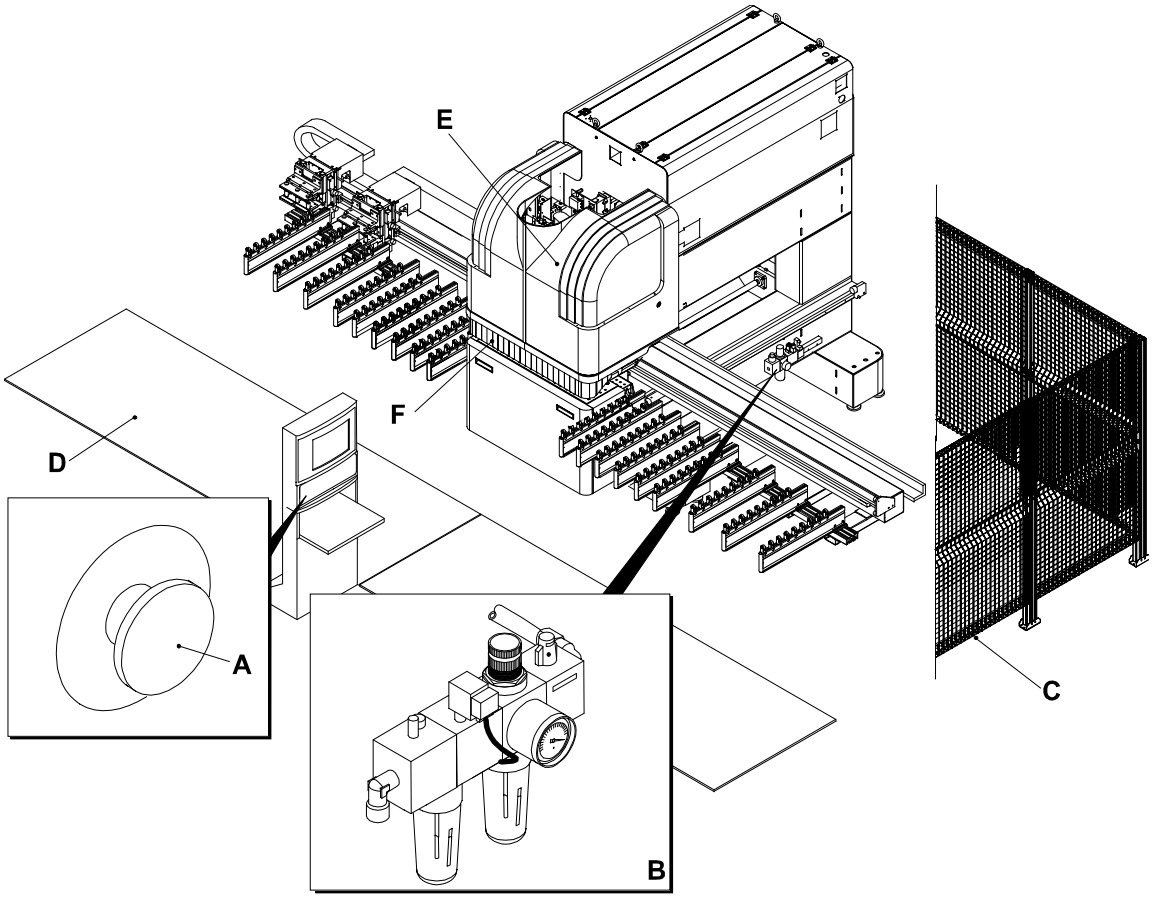
The transfer is a device that, according to needs, can be used to load and/or unload the panels. In particular, if it is positioned on the unloading side, the transfer picks up the machined panel, lifting it from the roller table and, using the belts, carries it to the rest/pick-up position, from which it is picked up manually by the operator.

i According to the dimensions of the panel it is possible to hold one or two rows of panels in the rest position.

The transfer structure is made of aluminium profiles mounted on support legs (made of structural elements) that can be adjusted in height.
The belt table that moves/lifts the panel is driven by pneumatic cylinders fed by a pneumatic panel located on one side of the structure.
The belts are driven by a gear motor and are controlled by photocells that detect the passage and presence (in a fixed position) of the panel.
The transfer is equipped with its own electric panel, but it is also electrically connected to the machine, which manages it according to production cycles.



1.8 Safety devices



A - **“Emergency” button**; used to stop the machine immediately, it is located on the main control panel and in other areas around the machine. For further information, please see chapter 2 “Basic information”.

B - **Cut-out valve**; the cut-out valve located in the FR unit is used to isolate the compressed air system of the machine to carry out maintenance and /or repair operations in total safety. For further information, see 1.8.1 “Cut-out valve”

C - **Safety fence**; the safety fence prevents access to the danger areas while the machine is operating. For further information, see 1.8.2 “Safety fence”

D - **Contact mats**; for safety reasons, these mats cause the machine to stop immediately if somebody steps on them. For further information, see 1.8.3 “Contact mats”

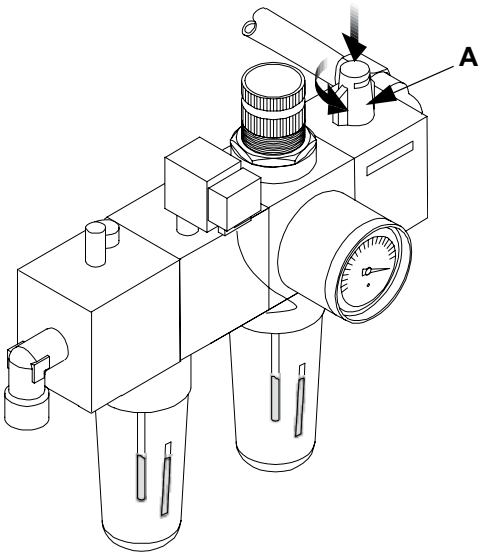
E - **Casing**; encloses the two machining heads (top and bottom).

F- **Rubber curtain guard protection**; this is fixed under the top casing and has the job of protecting the operator from any chips or pieces of tool that might fly out of the machine during milling operations.

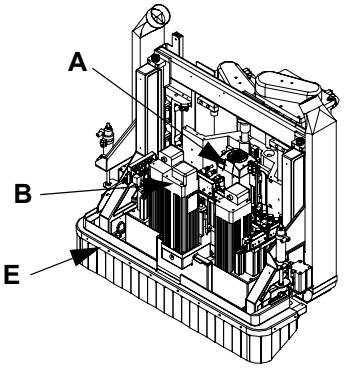
1.8.1 Cut-out valve

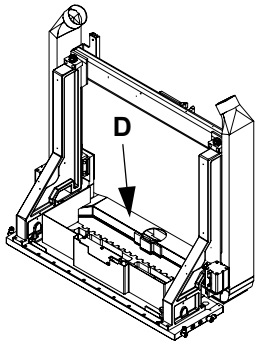
Operate this cut-out valve to flow out the air from the machine system and to block the air flow coming from the external supply source.

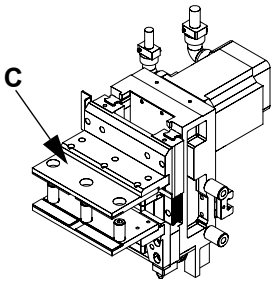
To close the cut-out valve, press and turn the handle **A** anticlockwise.



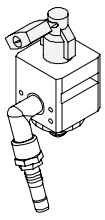
⚠ **By operating the cut-out valve some units may be come drop down by gravity (the electrospindle unit A, the circular blade unit B, the upper mobile table C of the collet unit, the auxiliary table D and the band unit E). Maintain a safe distance from all moving parts of the machine.**



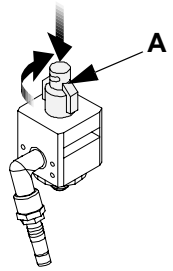




⚠ **Lock the cut-out valve so that the compressed air cannot be accidentally restored during machining.**



To open the cut-out valve, and thus restore the machine functions, press and turn the handle **A** clockwise.

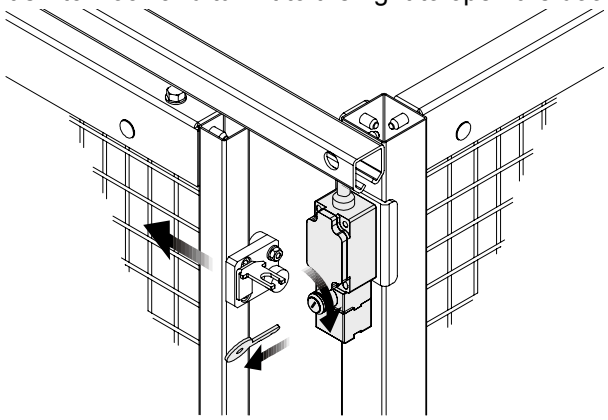


1.8.2 Safety fence

⚠ **Do not place your hands or any objects at the top of the panels of the safety fence.**

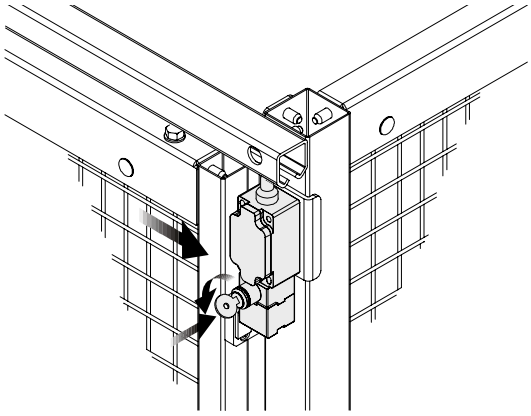
The safety fence consists of adequately arranged wire netting panels and there are doors to allow access to the machine for any operation required. When the doors are opened, all the machine functions are stopped at once thanks to the activation of a limit switch.

Insert the key in the limit switch lock and turn it to the right to open the door of the safety fence.



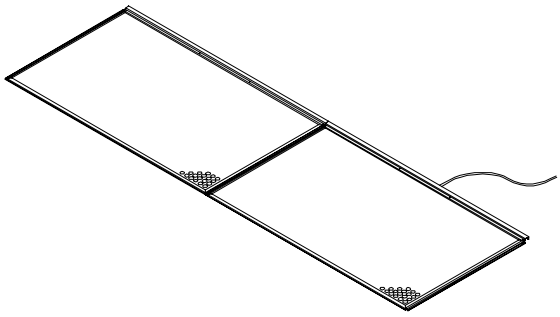
⚠ **In order to prevent anyone from accidentally restoring machine operation, extract the key from the limit switch lock and carry it with you once inside the area protected by the safety fence.**

To restore machine operation, close the door, insert the key in the lock and turn it to the left in order to lock the limit switch.



1.8.3 Contact mats

Contact mats have a safety function, stopping operation of the machine when they are triggered/ stepped on by an operator during the working cycle.
During loading and unloading, in order to allow the operator to set down or pick up the piece, it is possible to tread on the contact mats, as movement of the axes is disabled. After moving off the mats, press START to restore the machine to normal operation.



⚠ **Contact mats do not detect people weighing below 35 kg (children, for example), about 2.55 N/cm^2.**

1.9 Identification of the manufacturer and the machine

The manufacturer and the machine can be identified from the special identification plates located at the points indicated in the figure. The identification plates contain various data and, for machines sold within the European market and in markets where Directive 98/37 is applied, they also carry the CE mark.

A - logo

B - CE mark

C - address

D - model

E - serial number

F - year of construction

G - pneumatic supply

H - suction air speed

J - machine mass

K - wiring diagram number

L - electrical cabinet mass

M - supply voltage

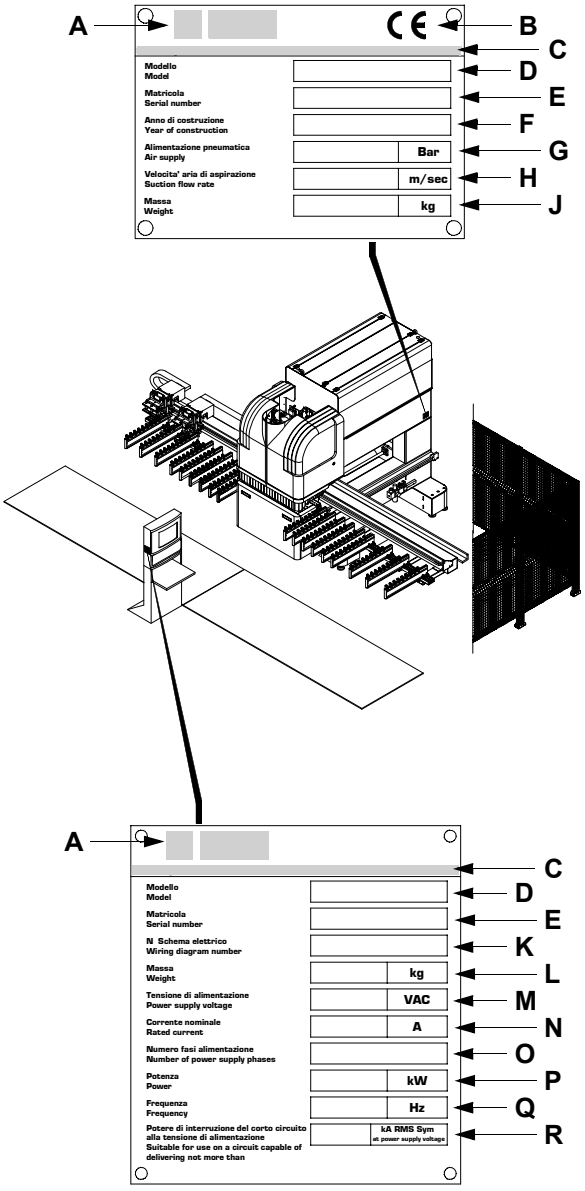
N - rated current

O - number of supply phases

P - power

Q - frequency

R - supply voltage short-circuit cut-out power.



electric system rating plate

2 Basic information

2.1 Operation of the machine

The following describes the operations performed by the machine after the machining operation has been started:

- The piece is loaded and grasped by the clamps.
- The beam with the clamps moves along the axes (X, Y) to carry the piece under the working units.
- The working units carry out the machining operations foreseen by the program.
- Once the machining operations have been completed, the beam with the clamps moves the finished piece to the unloading position*.

2.2 Axes

The machine axes are any movement (positive or negative) made in space by certain machine elements.

For an operator standing in front of the machine, the axes are positioned as shown in the figure on the following page:

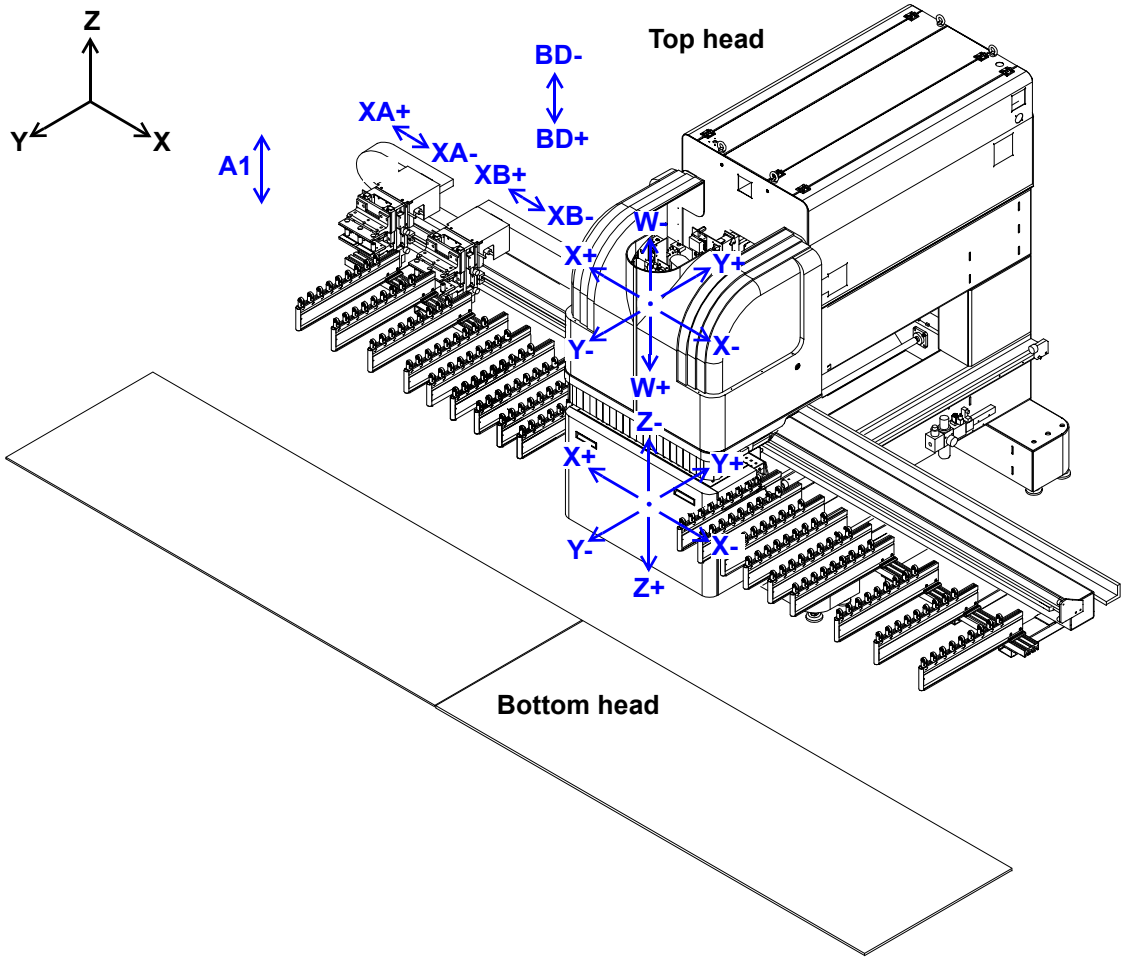
- X axis (of the two clamps) made up of the guides** located on the mobile beam; the positive direction is to the left.
- Y axis (of the whole mobile beam) made up of two guides*** located on the base of the machine, the positive direction goes from the operator towards the rear part of the machine. The further the beam moves away from the operator the higher the value.
- Z axis (of the two heads and the presser): vertical direction with positive direction downwards; for the two head Z axes and for the presser.

i The positive direction of the Y axis is the one that moves the tools away from the piece, whereas the positive direction of the X axis is always to the left, and for the Z axes it is always downwards.

* The unloading position varies according to whether or not the unloading transfer is present

** Straight guides with ball slide blocks

*** Straight guides with ball slide blocks



The following is a description of all the axes foreseen:

- XA: X axis of the left hand clamp;
- XB: X axis of the right hand clamp;
- Y: all the mobile beam (with the air table and the unloading rollers);
- Z: bottom boring head axis;
- W: top boring head axis, always in a vertical direction with positive downwards;
- BD: vertical axis of the presser table independent of the W axis
- A1: axis of the encoder connected to the left hand clamp, which serves to find the actual thickness of the panel it is locking.

i Movements along the two axes X-Y can be interpolated to machine certain profiles with the mill.
The units (boring, cutting, milling) of the two heads (top and bottom) and the top presser move along axes parallel to the Z axis.

Each axis has three microswitches:

- Positive out of limits;
- Negative out of limits;
- Zero, point from which the motor encoder starts to count.

With the exception of the XA axis, which does not have a negative out of limits, and the XB axis which has no positive out of limits.

2.3 Movement of axes in manual mode

During tooling it might be useful, or in some cases even essential, to move one of the machine axes. To do this, use the JOG selector on the axis control button pad after selecting the axis you require. For further information, please see the Software user's manual.

2.4 Variation of the axis speed of movement

The speed is varied manually, by modifying the relevant value in a special field on the manual commands page in the numerical control software.
The operator can access and modify the "slow manual speed" value, which is the standard speed of movement for the axes. The operator cannot activate the axes at "fast manual speed" because use of this mode is restricted to qualified personnel.
For further information, please see the Software user's manual.

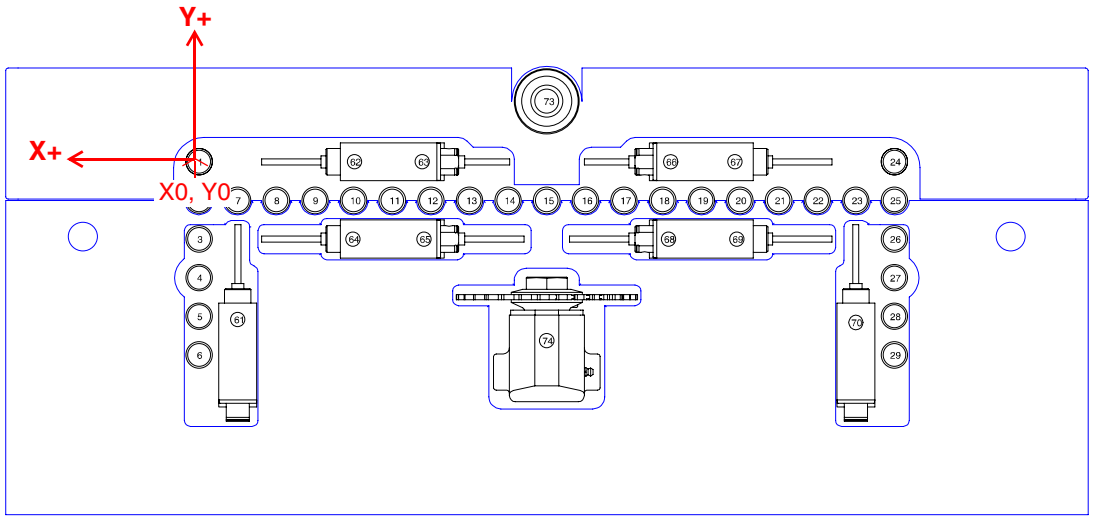
Variation of the axis speed of movement is usually carried out when testing a program, so as to select a suitable speed for the type of material being machined, or to allow closer observation of the movements performed by axes at particularly critical points of the program.

2.5 Origins

The machine origin, or “absolute origin” (0) is a pre-set point that is used as a reference when establishing the position of an element on the machine, and it is the main reference for the X, Y and Z axes. The machine also has “working origins”, which allow the exact position of the piece to be established.

Absolute origin(0)

The absolute origin (0) is used as a base origin when setting the working origins; as regards the X and Y axes, it is an imaginary point located in correspondence with the first boring spindle on the left (for both the heads: top and bottom) and is set by the manufacturer during testing of the machine.
As regards the Z axis, on the other hand, the absolute origin is not given by the position of that spindle (as its position varies), but by the position of the fixed bottom air table. This table actually marks the zero position: the value increases when moving downwards and decreases when moving upwards.

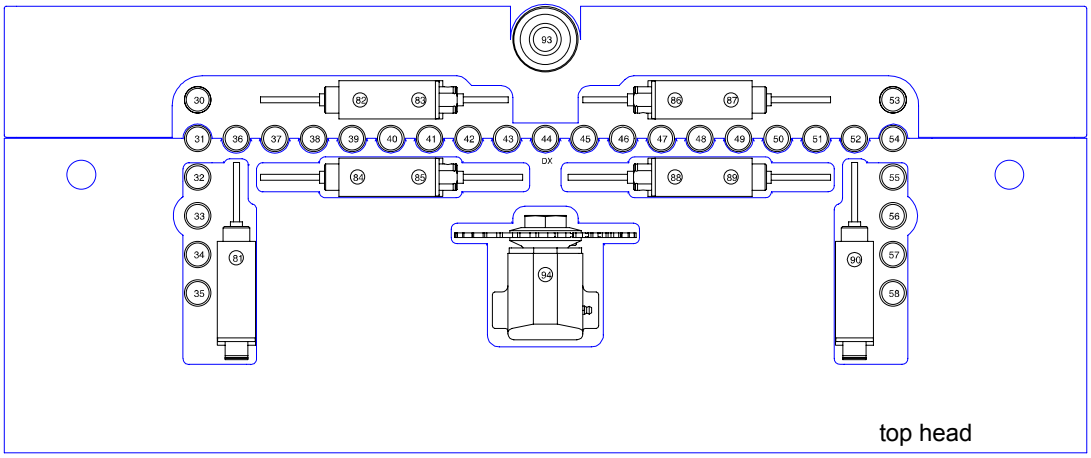


Working origins

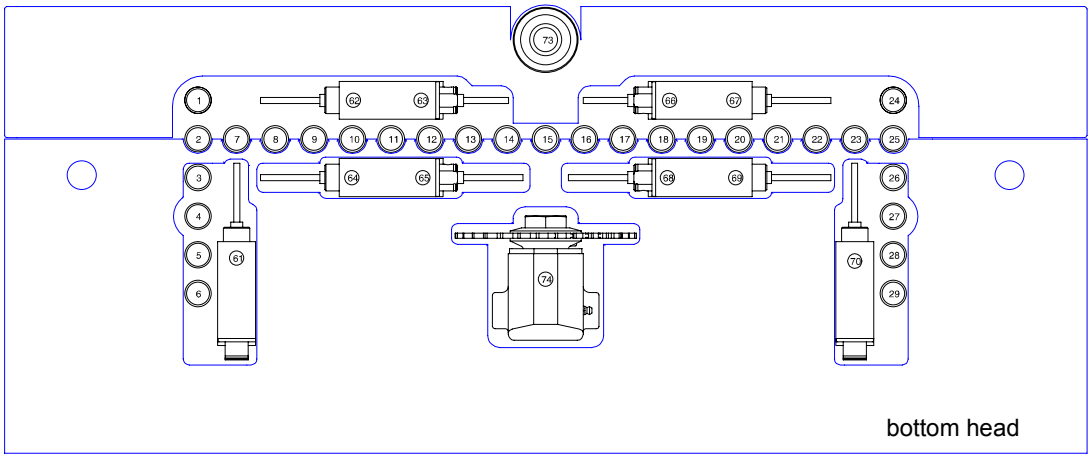
The working origins correspond to the piece positioning stops, located on the machine’s work table.

2.6 Information on the spindle direction of rotation

In each of the boring units, the spindles are driven by two motors using a gear transmission; this means that even spindles that have not been fitted with a tool will still be driven during machining operations.



top head

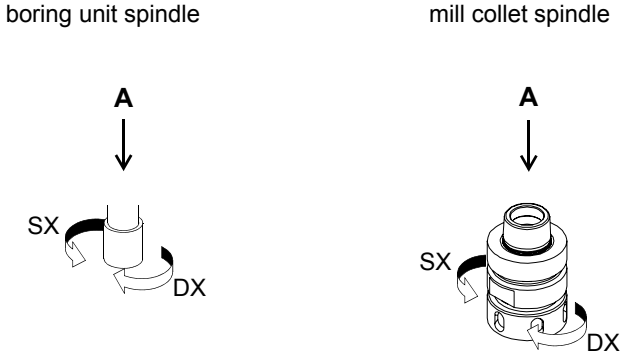


bottom head

Definition of a right or left spindle

The definition of “right spindle” (DX) is given to a spindle that rotates in a clockwise direction, while “left” (SX) is used for a spindle that rotates in an anticlockwise direction.

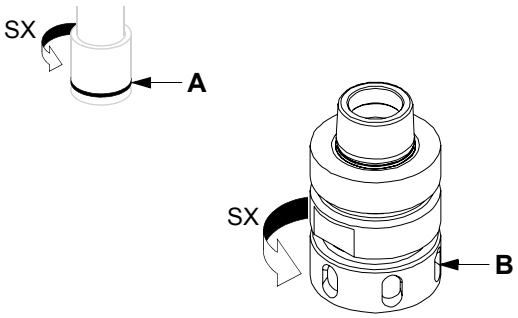
To define the direction of rotation of a spindle, you must look at it from direction **A**, as indicated in the figure below.



Determining the spindle direction of rotation

There are conventions that enable quick determination of spindle rotation direction:

- A groove on the outside of the spindle (ref. **A**), indicates that it is a left spindle.
- The direction in which the ring nut or flange locking the tool screws on is always opposite to the direction of rotation of the spindle.
- If the direction of the ring nut thread (ref. **B**) is to the left, then the mill collet spindle is left too.



3 Uses foreseen

3.1 How to use the machine

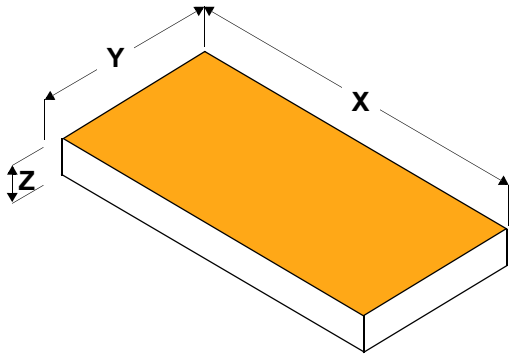
The machine has been designed to carry out boring, milling and cutting operations on the piece with the aid of a software (see paragraph 3.3 “Machining operations foreseen”). The machine must only be used by one operator.

According to the versions of the machine, the piece loading and unloading operations may be carried out manually by the operator or automatically using an infeed/outfeed conveyor belt.

As regards the characteristics of the materials to be used, always comply with the specifications given in paragraph 3.2 “Characteristics and dimensions of machinable materials”.

3.2 Characteristics and dimensions of machinable materials

The machine can be used to process panels made of: chipboard, MDF (medium density fibres), fibre panes, etc. with the following dimensions:



	X	Y	Z
Manual loading - min (mm)	90	70	8
Automatic loading - min (mm)	250	130	8
Manual/automatic loading - max (mm)	3000	1000	60

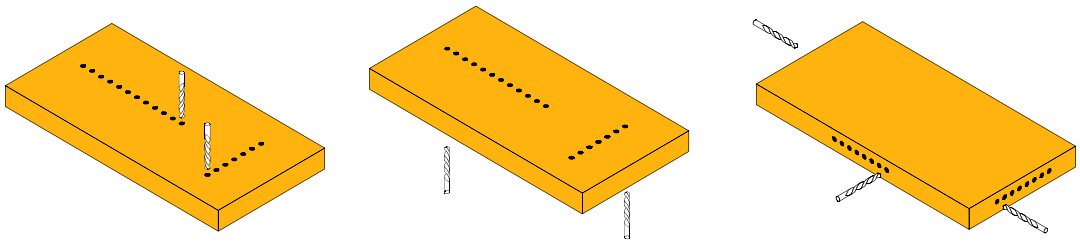
i It is also possible to machine two pieces on top of each other, providing that their overall thickness is lower than or equal to the maximum thickness allowed

i It is only possible to machine panels with minimum dimensions of 90x70 mm when the machine is used in pendular mode: the panel is unloaded in the same position in which it was loaded, using the air table. It cannot be unloaded onto the roller table because it is too small and would fall off.

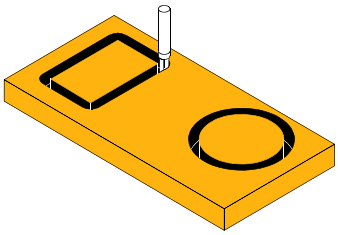
3.3 Machining operations foreseen

All the machining operations that can be carried out by the machine are described and illustrated below. Some of them can only be carried out using optional units.

- Vertical and horizontal boring operations.

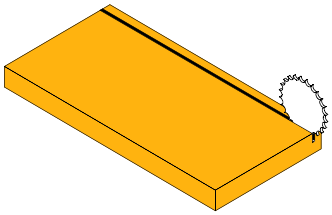


- Vertical milling for grooves carried out by special mills fitted to the electrospindle.



i The electrospindle mill allows to create hollowed out areas without waste, for example, creating a window of a desired shape, removing all the material from the contour with the exception of a thin layer that holds the cut part and the rest of the piece together. After removing the cut part, the panel can be inserted into the machine again to finish off the window.

- Grooves to carry out back channels using a circular blade.



3.4 Staff qualifications

For a better definition of the field of intervention and relative qualifications of staff, as well as to facilitate reading and understanding of this manual, staff are classified as follows:

Operator: Qualified and authorised person, responsible for operating the machine with guards in place, using the controls located on the button pad, and for loading and/or unloading the material to be machined

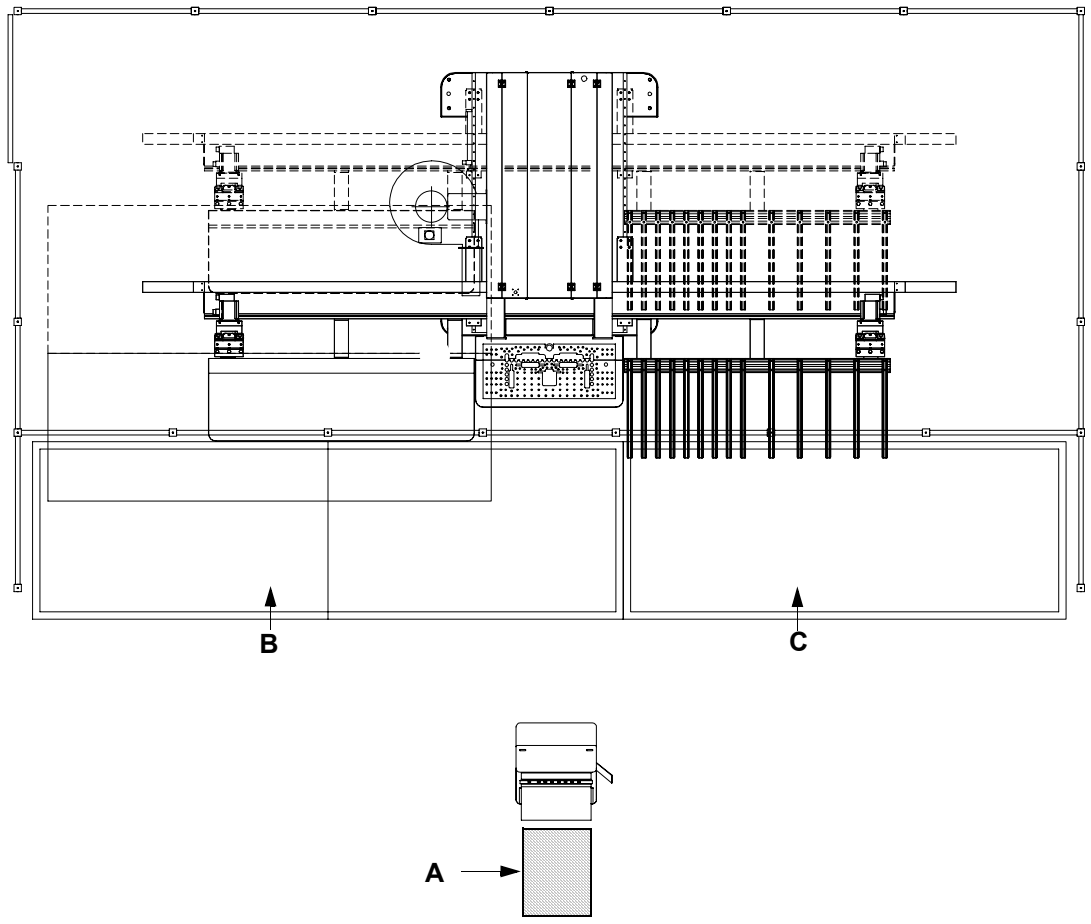
Mechanical maintenance technician: Qualified and authorised technician capable of installing, repairing and performing planned and/or special maintenance operations on mechanical equipment.

Electrical maintenance technician: Qualified and authorised technician capable of installing, repairing and performing planned and/or special maintenance operations on electrical equipment.

3.5 Work area

The areas in which the operator has to stand during operation of the machine, in order to operate and control the command devices and load/unload the piece, are the following:

top view



A - Area in front of the control panel

B - Panel loading area

C - Panel unloading area

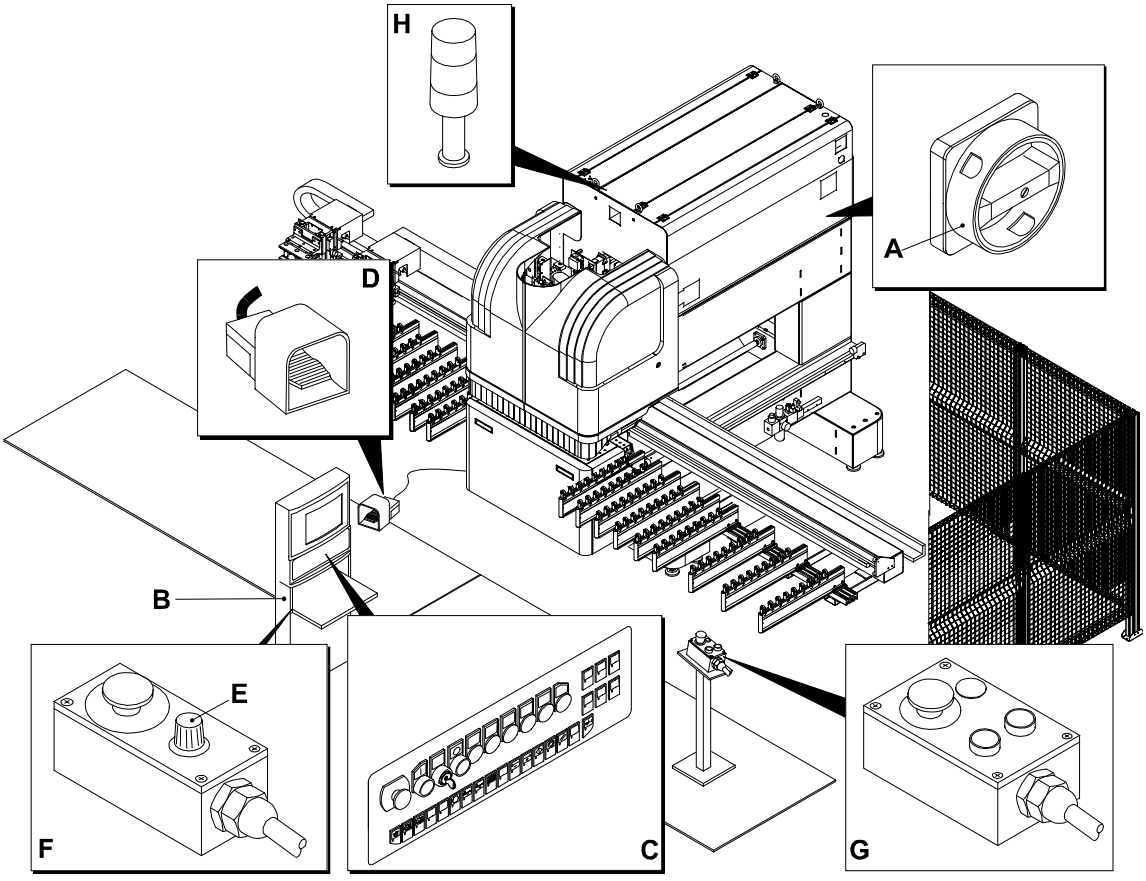
3.6 Danger area

The danger area is the whole of the area occupied by moving parts during the machining operation and it is adequately protected by suitable safety devices.

4 Controls and indicator devices

This chapter contains a description of the controls and indicator devices present on the machine. The first paragraph identifies the areas in which the controls are located.

4.1 Location of controls and indicators



A - Main switch; a detailed description is given on page 40

B - **NC numerical control command unit**; this consists of a Personal Computer (PC), complete with monitor and keyboard, which, using the special integrated software, allows the machining operations and movement of the machine axes to be managed. For further information, please consult the documentation provided with the PC and the Software User's Manual.

C - Main control panel: a detailed description is given on page 41

D - Panel locking pedal; allows the locking clamps to be activated after the piece has been positioned.

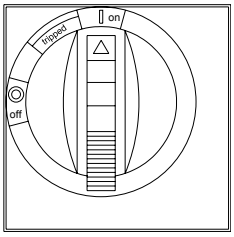
E - Override; used to change the speed of movement of the axes.

F - Machine axis control button pad: a detailed description is given on page 44.

G - Mobile button pad to start machining; a detailed description is given on page 45.

H - Flashing indicator light; a detailed description is given on page 45.

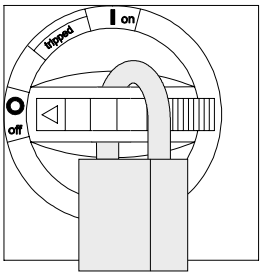
4.2 Main switch



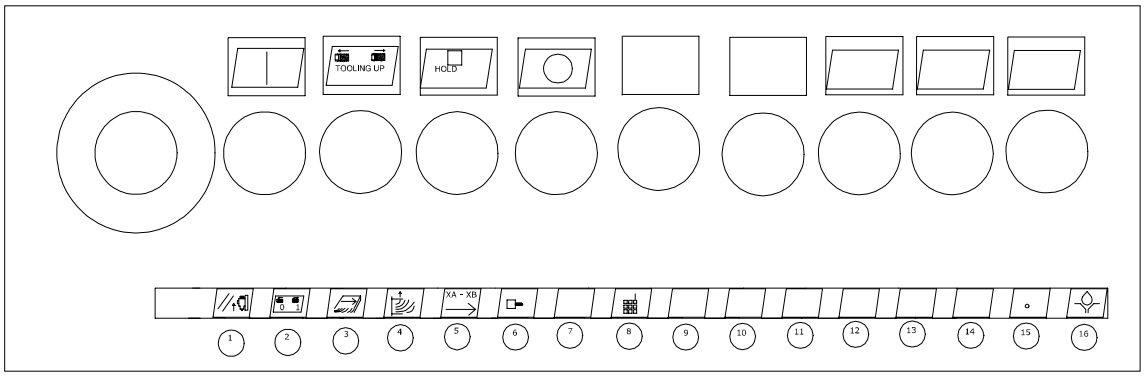
The main switch is used to switch on or cut off the power supply. Turn this switch to “0-off” to carry out maintenance or repair operations in total safety.
0-off = power off.
1-on = power on.
tripped = the switch automatically trips to this position in the event of a short-circuit. To restore power, first turn the switch to 0-off and then to 1-on.

⚠ **With the switch set to 0-off, the terminals to which the power wires are connected are also energised. The capacitors remain energised for a few minutes after the switch is set to 0-off.**

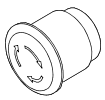
⚠ **Lock this switch so that power cannot be accidentally restored during machining.**



4.3 Main control panel



First row, from left to right:



Emergency (red mushroom head button): used to stop the machine immediately; to restore the machine to normal operation, turn in the direction indicated by the arrows.

To avoid wear in the button mechanisms, it should not be used for purposes other than those indicated (e.g. before turning the machine off).

Auxiliary start (luminous green button): used to supply power to the machine's drive elements.

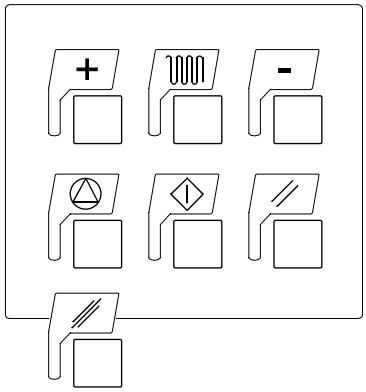
Tooling (key selector): in the rest position this is for normal operation of the machine, so the emergency chain can be reset. When the selector is turned to the "Tooling" position an emergency is triggered in the machine, leaving only certain devices under power, for example the solenoid valves activating raising/lowering of the spindles, the blade, the slots and opening of the curtain guards to allow access to the tool area. All the other devices are disabled, under no circumstances will it be possible to turn the spindles.

Hold (Luminous orange button) relates to the conveyors: using this button it is possible to stop any conveyors in the machine or start them moving again. Press the button to stop the conveyors, press it again and release to change the mode and start the conveyors moving again.

Normal stop (black button): used to cut the power supply to the drive elements.

5 plugs: close off an equivalent number of free positions.

Keyboard to the right of the control panel



(from left to right, from the top down):

Jog +: this key is used to move an axis selected using the software in the positive direction.

Speed key: this is located between Jog + and Jog – and is used (in combination with + or –) to select high speed of movement for the axes; for example, if + is pressed alone, the axis will move in the positive direction at slow speed, whereas if + and the central key are pressed simultaneously the axis will move at high speed.

Jog –: this key is used to move an axis selected using the software in the negative direction.

Stop (red key): this is used to stop the machine axes. Press this key during normal operation to restart the machining operation from the point at which it was stopped, without altering anything.

Start (green key), used to start the machine.

Reset (white key): with the machine in emergency, this allows all the moving elements to be restored to normal operation; the machine performs all the checks necessary to return to the initial situation.

Clear (blue key): used to delete the errors that appear in the relevant software window.

The second row contains the blue keys that are associated with certain machine functions (from left to right):

1 **Reset slot** key: used to move the mill slots to the rest position; (if one of the mill slots remains in the active position the machine will not be able to carry out any further movement).

2 **Tooling cycle** key: used to move the two Z axes and the presser to a position that allows access (with the hands or with tools) to the spindles in order to replace or add tool bits. This operation is essential, because there are a number of machine parts in the area, so that the bottom head is lowered, the top head is raised and the presser moves downwards until it approaches the fixed presser, so as to increase the available space (between the presser and the top head).

3 **Panel unload cycle** key: allows a panel that has been left between the machining heads following an emergency stop or a power cut to be removed with ease. In these cases, when the machining operation is stopped with a panel (held by the clamps) between the machining heads, the tools are inserted in the panel and it is therefore rather difficult for the operator to extract it in the conventional way using the various controls in JOG mode. When this button is pressed, all the operations required to extract the tools are carried out automatically. The panel is released automatically and then moved to the unloading position, allowing the operator to pick it up without difficulty .

4 **Open clamps** key; commands the clamps to open and is used, for example, when a panel is locked. (The machine does not carry out any type of control, but simply opens the clamps).

i The above key only works if the axes have been reset, if there are no problems and if the machine can be restored to normal operation. However, if for any reason the machine is turned off with the panel locked, it will not be possible to use this cycle when restarting, because the axes have not been reset and therefore the machine will not be able to move them. When this button is pressed the machine simply opens the clamps so that the operator is free to remove the panel.

5 **Gantry Axes** key: used to enable gantry mode for the two clamps, which binds the two axes to each other: when one is moved, the second will copy the movement of the first. This is used when a panel left locked between the two clamps and it is difficult (if not impossible) to move one clamp at a time in JOG mode: in this mode the operator can move the two clamps simultaneously in manual.
When this mode is enabled the light on the key will turn on.

i To select one of the two clamps, open a special software window (showing the positions) in which there is a check box for manual movements.
Select the axis to be moved and use the JOG + and JOG - keys on the control panel keyboard to select the positive or negative direction or high speed.

6 **Request operator intervention** key: if a movement is not carried out during the machining cycle, after a maximum time limit an error will be printed and the light on the button and the orange indicator light above the machine will light up to indicate the problem to the operator.
By pressing this key once the operator informs the machine that he is aware of the problem, and that the machine must try to carry out the operation again.

i If the problem is serious and the machine is unable to continue the cycle, the operator can set the machine to emergency mode and then unload the panel (either automatically, by running the panel unload cycle, or manually).
If, on the other hand, the operator checks and finds everything in order, press the key again to make the machine repeat the operation that caused the original error (the light on the key will switch off). If the operation is repeated successfully the light on the key will remain turned off; if the machine still does not operate properly the light on the key will come on again.

7 **Customised cycle** key: this runs a fixed customised cycle, and is used by testing technicians when setting up the machine; it is possible to write axis movement steps so that the machine carries out certain operations, which can be called up by pressing this key. It is not used by the operator.

8 **Standard output** key: when this key is pressed the machine creates a file containing “strings” of information relating to the operations performed or in progress. The data is only recorded for the time the key is enabled: when the key is pressed the relevant indicator light turns on, showing that the machine is saving the data. When the key is pressed again the light turns off and the machine stops recording data.

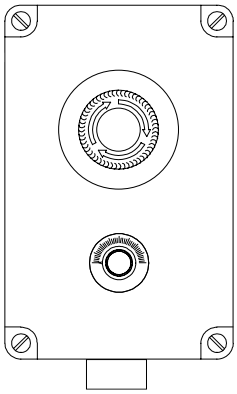
15 **Warm-up heads** key: used to bring the two operating sections up to temperature.

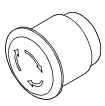
16 **Lubrication** key: used to carry out lubrication of the axes, enabling the grease pump connected to the lubrication system.
The key remains lit throughout the lubrication process, and when the lubrication cycle ends it turns off by itself.

i The machine has an automatic lubrication system (the software foresees automatic distribution of grease to the various moving devices after a certain number of working hours).

The other keys are not used.

4.4 Button pad controlling the machine axes

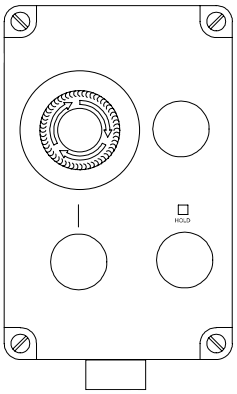




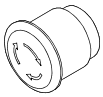
Emergency (red mushroom head button): used to stop the machine immediately; to restore the machine to normal operation, turn in the direction indicated by the arrows.

Axis Potentiometer (Override) ; used to vary the percentage value for the programmed speed of movement of the machine axes.

4.5 Mobile button pad



This button pad is located on the mobile control panel, which is positioned on the side of the machine from which the operator loads the piece. It contains the following control devices:

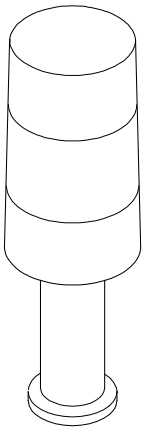


Emergency (red mushroom head button): used to stop the machine immediately; to restore the machine to normal operation, turn in the direction indicated by the arrows.

Hold (Luminous orange button) relates to the conveyors: using this button it is possible to stop any conveyors in the machine or start them moving again. Press the button to stop the conveyors, press it again and release to change the mode and start the conveyors moving again.

Start cycle (green button), used to start the machine's working cycle.

4.6 Flashing indicator light



This is located over the machine, and is made up of three lights (from the top down):

- Red: this lights up when the machine is in emergency mode, i.e. when a mushroom head emergency button has been pressed or when a serious problem has occurred in the machine and an emergency has been triggered.
- Orange: this lights up when a less serious problem occurs, an error is printed or the orange indicator light comes on; this indicates that an error is currently occurring on the machine.
- Green: when this indicator is lit it means that the machine is working normally, and there are no errors or emergencies.

Uses

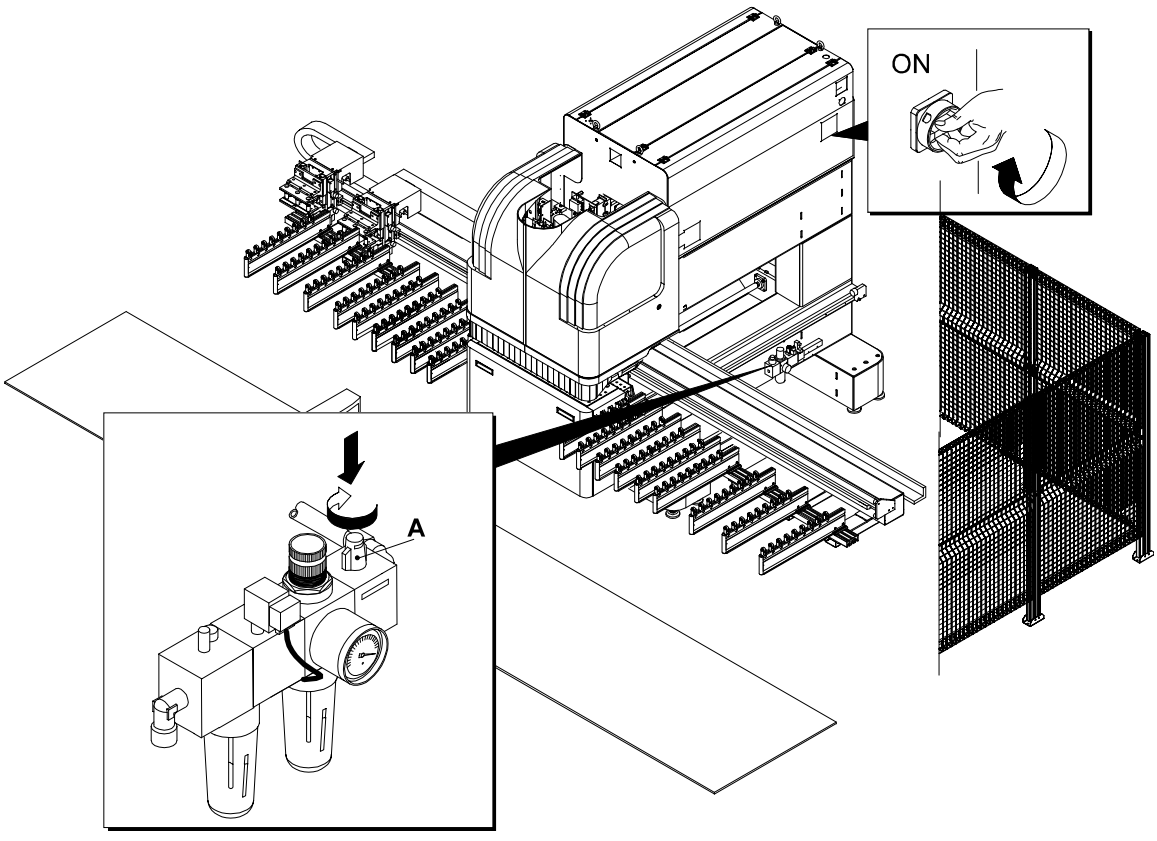
5 Standard uses

5.1 Start-up of the machine

1. Check that the doors in the safety fence (if foreseen) are closed.
2. Check that all the emergency stop devices have been disabled.
3. Bring the main factory pneumatic system up to pressure and open the cut-out valve by pressing knob **A** and turning it in a clockwise direction. The system is fitted with a pressure gauge that indicates when the system is up to pressure.
4. Start the chip suction system to which the machine is connected, making sure that the connection pipe cut-out valve is open.

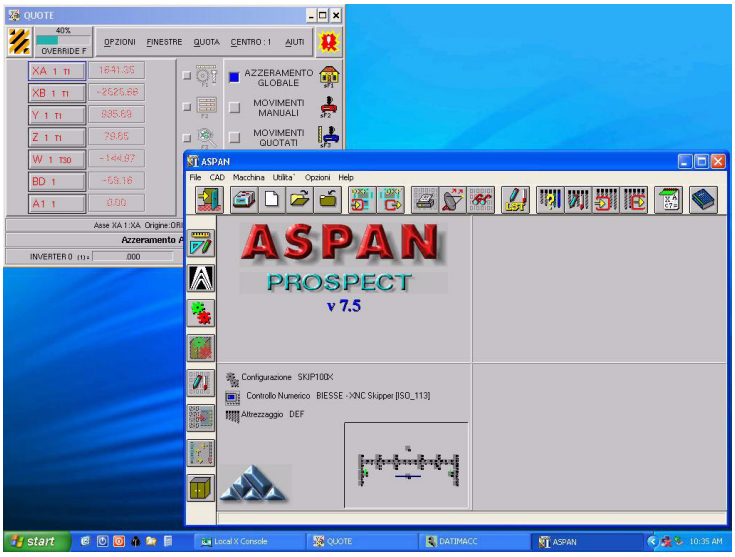
i The air table fan (if fitted) is turned on automatically when the machine is started up.

5. Turn the main switch to position 1 (ON). In this way, power is supplied to the auxiliary devices and the PC is powered.



6. When the machine is turned on, the PC also turns on automatically, and in just a few moments the software is ready for use.

7. Wait a few seconds for the HMI to start up, allowing control of the machine, display of the alarms, and start of the machining programs. (With CAD-CAM it is possible to modify the geometry of the panel and to create the program).



8. Before using the machine it must be calibrated or the axes must be reset (see paragraph 5.2).

9. Run a machining head warm-up cycle.

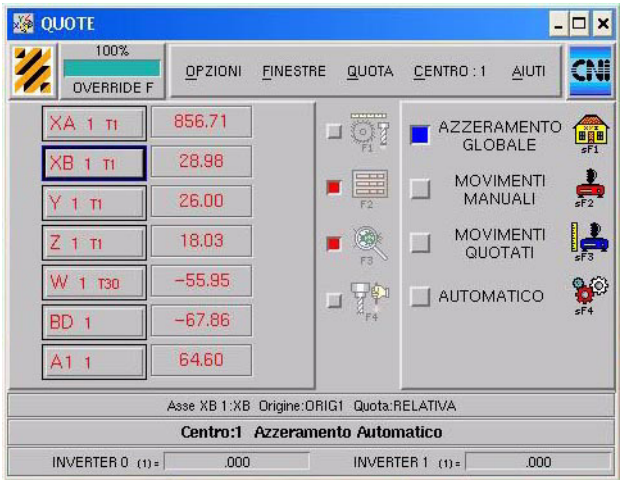
i When it is started up the machine automatically sets itself to reset mode. Once the reset has been completed, the machine will set itself to automatic mode.
At this point the operator can run the program and then press the start button.

i Manual/automatic operating mode is selected using the software icons. Basically speaking, this is an application in which the positions of all the machine axes are displayed. This application also contains 4 selectors used to set reset, jog movement, positioned movement or automatic mode.

5.2 Resetting the machine axes

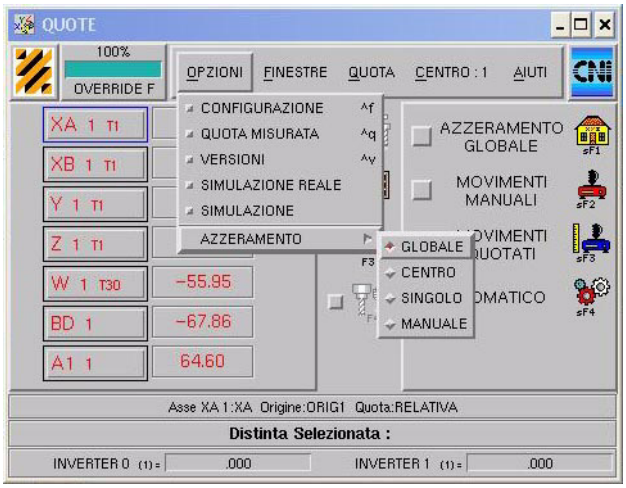
To reset the machine axes, proceed as follows:

- Check whether or not reset mode has been selected in the software application POSITIONS (which manages the positions of the axes and the operating modes).



- Before resetting the axes, it is necessary to carry out the machine reset procedure by pressing first the STOP button (red button) on the button pad and then the RESET button (white button); the machine commences the reset cycle and once this cycle has been completed it is possible to carry out the axis reset cycle.
- Basically speaking, the axis reset cycle is carried out quite simply (if reset mode has been enabled) by pressing the START button on the control panel.
- With reset mode enabled, once the alarms have disappeared, press the green START button to start resetting the machine. All the axes will move: the top head (W-axis) upwards, the presser (BD-axis) upwards, the bottom head (Z-axis) downwards, the left clamp (XA-axis) to the far left, the Y-axis beam all the way back, the right clamp (XB) all the way to the right. This is the machine's "detect origin" or reset position.

i You can select whether to reset one axis at a time or all the axes simultaneously, according to which mode has been selected in the application; if the user does not change the settings, the machine will by default reset all the axes.
To select a different mode, open the “POSITIONS” page and select the item “OPTIONS” .



A drop-down menu appears containing the item “RESET” and in this menu it is possible to select one of the following options:

- GLOBAL: resets all the axes;

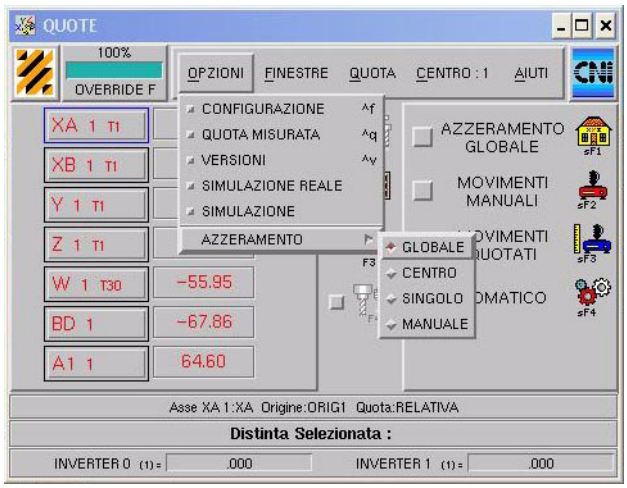
- CENTRE: resets a single centre on the machine; if the machine has a number of centres it is possible to reset certain groups of axes only;

- SINGLE: resets the selected axis only (selected in the left hand part of the menu, where there is a list of axes);

- MANUAL: to perform the reset in manual mode. For use by authorised personnel only.

⚠ The latter mode is extremely dangerous, as it is possible to cause a collision between interfering axes: in theory it is the operator who informs the machine of the position at which

the axis to be reset is located, and the machine will always take this position to be valid, even if it is wrong.



For further information, please refer to the Software user's manual.

Once the global reset cycle has been completed the machine will automatically set to automatic mode. The machine is now ready to start working.

5.3 Machining head warm-up cycles

When starting up at the beginning of the day it is recommended that you run a short warm-up cycle for the two electrospindles on the machining heads, in order to improve boring precision.
Due to the high number of spindles it is, in fact, necessary to take into account the variation in distance between the spindles (approximately 3/100 between two adjacent spindles) due to thermal dilation, which gives an overall error of approximately 3/10 over the whole length of the head.

For this reason, the software contains a special warm-up cycle, run using a special key, which the machine carries out for a set period of time. When the cycle has been completed a message is displayed to indicate cycle complete.
Basically speaking, a program is run that involves boring from above and from below; the machine automatically turns the two heads on, sets the override* to zero and then works for 10 minutes so that the heads come up to temperature.
The warm-up cycle is carried out with the head motors turning at working speed.

The machine can be used without carrying out the warm-up cycle; however in this case the boring tolerances would be different from those found when the head is warm (for example, in the case of System 32 bores the pitch will not be 32 mm but a different value).

* (set to 0 to reset the axis speed, it does not interfere with the spindle rotation speed).

5.4 Stopping the machine functions

The machine can be stopped in various ways:

- **Normal stop**; when the STOP button is pressed the machine cycle does not stop completely, but is suspended temporarily: at this point the user has two options:
  - to press the START button and command the machine to restart operations from the point at which it had stopped;
  - to press the RESET button and terminate the program being run.

When the STOP button is pressed while the machine is working, the axes with tools rotating in the piece are stopped; it is not advisable to leave the machine in this state for a long time, as the tools continue to turn, rubbing against the material. If START is pressed the machine will start up again, and the axes will start to turn once more.

If the RESET button is pressed, the program is terminated, the machine stops at the point in which it finds itself, with the tools in the piece, but the spindles stop turning. The panel is left in this position and it will be necessary to extract it using the automatic PANEL UNLOAD cycle button, or by means of the manual procedure using the OPEN CLAMPS button.
In the former case, with the machine fully restored and with no programs running, simply press the button: the indicator light will turn on and the unloading cycle will start, with all the operations it foresees.

- **Ordinary stop**; disables the axes (equivalent to emergency mode).
- **Emergency stop**; this type of stop is carried out when it is necessary to block operation of the machine immediately. To stop the machine in this way, simply press the nearest "Emergency" button.

  When the emergency button is pressed while the machine is operating, power is cut off from the auxiliary elements, all cycle enables and the start-up of any devices that may still be enabled are blocked and, above all, power to the axis drives and other moving parts of the machine is cut and all moving parts are stopped at maximum braking current. The machine is stopped and rapidly put into a state of safety.

  An identical situation occurs if, during machining operations, somebody stands on one of the two contact mats.

The contact mats are always enabled, even in MANUAL mode an emergency will be triggered in the machine if they are stepped on.
In TOOLING mode, on the other hand, the mats are disabled because the machine is in a state of emergency in any case.

5.5 Restoring machine functions

If the machine has stopped suddenly, whether intentionally or accidentally, follow the procedures given below to restore it to normal operation.

- If the stoppage has been caused by a power cut, the machine will turn off and it will be necessary to repeat the start-up procedure, perform the reset again and load the panel.
- If an emergency stop has been commanded using one of the mushroom head buttons, proceed as follows:

  - restore the emergency button to its normal state (by turning it in the direction indicated by the arrows);

  - press the green button (the light must come on) to close the emergency line. If the light does not come on, this means there are electrical problems (mushroom-head button on, heat sensor triggered, etc.) or there is no air supply;

  - check that everything is as it should be;

  - press STOP and RESET, after which the machine will restore all the elements that had been activated to their rest positions. Once this phase has been completed the machine is ready to start working again.
- When the machine is restored it will be in one of two conditions:

  - if there is no panel locked, the machine is ready to start a new machining operation;

  - if a panel is locked in the machine it must be unloaded before a new program is started, using the panel unload button. If this procedure is not carried out and the START button is pressed for the new panel the machine will indicate that it is not possible to run a new program without first unloading the previous panel. The user will always be informed of what must be done.
- If the electrical cut-out devices have been triggered due to a fault it will be necessary to open the electric panel and reset the devices that have triggered by lifting up the levers, after first determining what it was that caused the cut-out to trip.

5.6 Turning the machine off

To turn the machine off, proceed as follows:

- If the machine is not working, if no program of reset operation is running, or if no other operation is being performed, select the machine shutdown option from the Windows software (option: shutdown system)
- If the machine is working, press STOP/RESET to interrupt the current program, i.e. the machining operation. Select Unload Panel, remove the panel from the machine and then start the machine shutdown procedure.

i Before selecting shutdown from the computer, first it is best to set the machine to emergency mode by pressing the black button.

- Turn the machine's main switch to position 0 and lock it if necessary, then turn the switch in the main factory system.
- Turn off the chip removal device.

- The air cushion fans, if there are any, will switch off automatically.
- Close the pneumatic circuit at the point in which it connects to the main factory system.
- Drain and lock the pneumatic circuit using the cut-out valve, and lock it if necessary.

5.7 Data backup

5.7.1 Introduction

The Backup operation is used to create a safety copy of the machine data, the PLC data and the editor configuration data (Aspan). Various procedures are foreseen on the control, and these are used to copy various groups of files. At the present time there are 6 procedures:

- **Full Backup**: copies all the NC configuration files, the PLC configuration files, the Aspan configuration and the Aspan tool magazine;
- **Data Backup**: copies the machine data, the PLC tables configuration, the fixed cycles and the folder containing the log files;
- **Program Backup**: only copies the folder holding the ISO programs for the NC (the whole of folder d_xnc\p_p);
- **Aspan Backup**: copies the whole Aspan configuration and the tool magazine configuration;
- **Skipper Conf Backup**: this backup is more for internal use. It copies the folders confdata, install, lingue in d_xnc, and the PLC;
- **Skipper Data Backup**: this backup is also for internal use. It copies these folders- cicli, dati, figure, iconcni, var, tls and wrb (all in d_xnc).

It is recommended that you perform a **Full Backup** at least once a month, and in any case always before using any updates that may be received from Biesse. Each time programs are added or modified you should perform a **Program Backup**. If you have to send the machine data to Biesse, use **Data Backup** unless otherwise indicated, or better still perform a **Full Backup**.

Should it be necessary to reinstall the entire NC software, the **Full Backup** is the only safety copy that ensures the machine is properly restored to the state it was in before reinstallation. For this reason it is recommended that you maintain an up-to-date **Full Backup**. If you do not have an up-to-date Backup there is no guarantee that the machine will be properly restored.

The customer is responsible for performing Backup operations.

The various Backup procedures are contained in a group of programs that can be accessed from the menu **Start ‡All programs ‡ Backup WNC**. This group contains the 6 procedures listed above.

All files generated using these procedures are saved in a common folder **c:\Backup WNC**. The file will have the same name as the Backup procedure selected, plus a number suffix indicating both the date and the time at which the Backup was carried out.

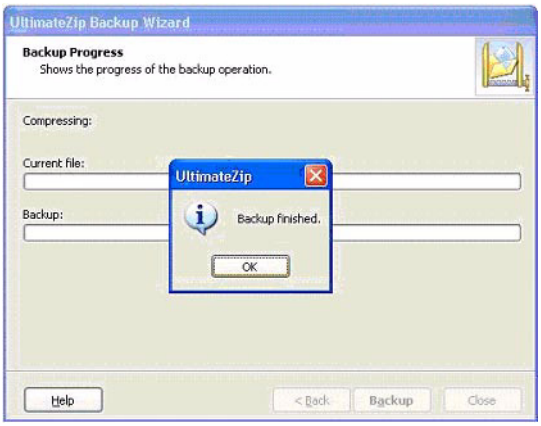
Once it has been performed, the Backup can be copied via a network to a server for storage, or transferred to a floppy disk. If the size of the file prevents it from being copied to a single floppy

disk, a procedure is provided that will split the archive into a number of parts, which can then be copied to separate floppy disks.

5.7.2 Creation of the Backup

Select the backup you wish to perform, the procedure starts, and the following window is displayed.

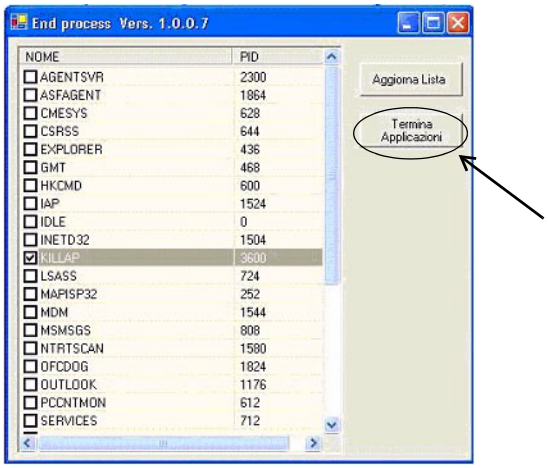
Confirm the operation by clicking on **Backup**. Wait until the operations have been completed, during which time a **ZIP** file containing all the files of the type foreseen by the selection will be created. When the file has been created, the next window will be displayed:



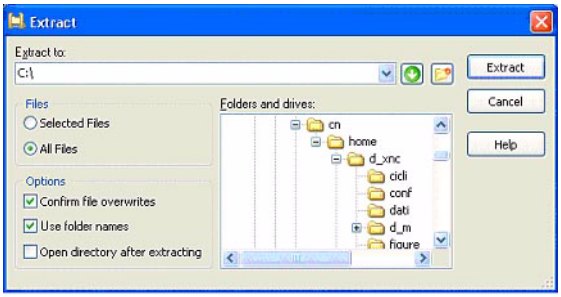
5.7.3 Restore operation

Before carrying out the **Restore** operation, the NC must be disabled.

First of all the machine must be set to emergency, then from the menu **Start ‡All programs ‡ WRT** select **Kill WRT**. In the application that opens, click on the button **Terminate Applications:**



Once you have identified the file you wish to restore, double-click on it. The application **UltimateZip** will be run. Click on the **Extract** button, or use the menu **Actions ‡ Extract.** Before confirming the restore operation make sure that the extraction parameters have been set correctly. The extraction folder must always be ***c:*** and the **Confirm file overwrite** and **Use folder Names** flags must be enabled, as illustrated in the figure.



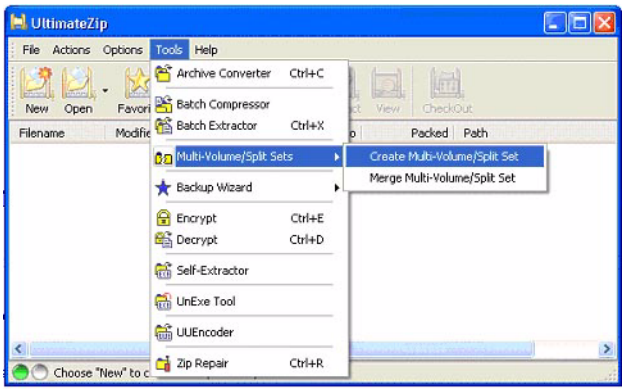
Once you have made sure the selections are correct, press **Extract**, and wait until the operations have been completed.

After the Restore has been completed it is necessary to reboot the PC.

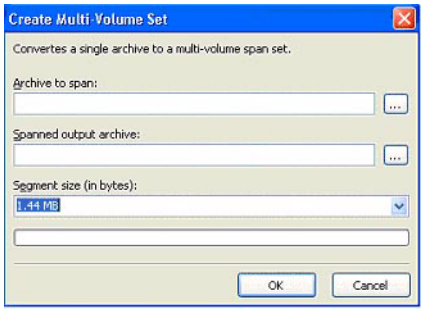
5.7.4 Procedure to Divide an Archive into a number of files to be copied to Floppy disks

If the file is too large to fit on a single floppy disk, it is possible to use the file manager to transfer the file. Otherwise it will be necessary to divide the file into a number of parts, as described below.

First of all, run UltimateZip, then select from the menu **Tools ‡ Multi volume/Split Set ‡Create**.



In the window that opens, the name of the file that is to be divided must be entered in the first line. You can use the **Browse** button on the right of the field **Archive to span**. Enter the name of the divided file (which must be different from the name in the previous field) on the second line. Select the dimensions of the files to be created in the third line. In our case this is 1.44MB.

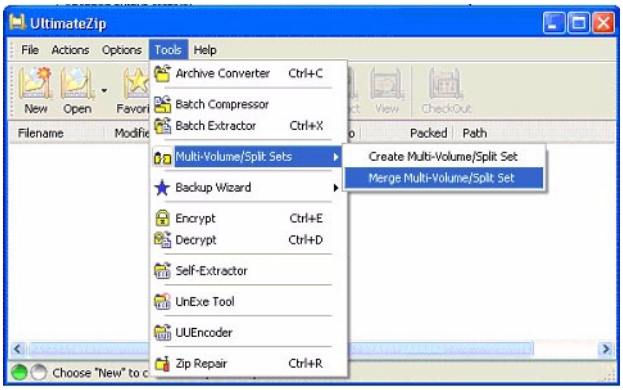


After pressing **OK** to confirm, a certain number of files will be created with extension z01, z02, z03, etc., the last of which will have the extension zip. All these files must be copied to various floppy disks using the Windows File Manager.

5.7.5 Merge procedure

Should it be necessary to rejoin the various files that were divided using the procedure described under point 5.7.4, the following merge procedure can be used.

First of all it is essential that all the divided files be copied to a single folder. Run UltimateZip, select the menu **Tools ‡ Multi Volume/sets Split** and the item **Merge**.



In the window that appears, enter the name of the last file in the set (the one with the extension zip) in the field **Spanned Archive to merge**; enter the final name for the file (which must be different from the name in the field above) in the field **Merged output archive** .

After pressing **OK** to confirm, the destination file will be generated (in the same folder as the starting files). At this point the file (with the extension zip) can be used for the restore operation.

5.8 List of PLC errors

Find below a complete list of the PLC errors that can be signalled:

- **9000 : Unknown error.** It occurs when there is no specific error number for the object that causes an error. Under normal conditions, it is not displayed.
- **9001 : Machine in emergency.** Displayed when the machine is in emergency due to an electric device.
- **9004 : Inverter Emergency.** Displayed when there is an inverter failure. To identify the failing inverter, it is necessary to check the rest of the string.
- **9005 : NC Emergency.** Usually displayed together with the 9001 PLC error. It indicates that the control is on the alert that the machine is in emergency.
- **9006 : PLC Emergency.** poor pressure. It indicates that the air pressure is below the admissible limit.
- **9007 : Slot reset required.** One of the slots does not reach the home position. It usually occurs together with some other errors that specify which slot/s is/are in home position.
- **9011 : Thermal devices KO.** Occurs when some thermal devices are not in their correct position.
- **9012 : Electrical cabinet temperature alarm.** Occurs when the electrical cabinet temperature is over the threshold. Check if the air conditioner is operating properly.

- **9015 : Error in machine data reading.** Some machine data have not been correctly programmed, or one of the values requested by the PLC is not in the table. The table and the field not found are printed together with this error.
- **9016 : Transported panel wrong dimensions.** This error occurs if, after checking dimensions, the error exceeds the maximum tolerance.
- **9017 : Panel feeding not allowed.** A panel has entered the machine but the necessary conditions for this are not present.
- **9019 : Power guards emergency.**
- **9020 : Auxiliary guards emergency.**
- **9021 : Emergency mushroom-head button on the electrical cabinet pressed.**
- **9022 : Emergency in one of the conveyor inverters.** One of the conveyor inverters has not been reset and cannot accept new commands.
- **9024 : Reset not complete. Machine locked.** Upon resetting, conditions that hinder running the program are detected. It is followed by other errors.
- **9025 : Caution! The unloading area is not empty.** For manually-operated machines, before starting a new machining operation, it is necessary to unload the previous panel.
- **9026 : Machine start-up not possible.** The mats are occupied. If you try to confirm the execution of a program after locking while pressing the start button, the mats are occupied again.
- **9027 : Machine occupied. Unload the panel.** When the machine is in emergency due to a jammed panel, it signals that the machine cannot be used unless the panel is taken out.
- **9028 : Collets/auxiliary table interference.** Tables disabled. The use of a boring spindle has been foreseen in the program and, to attain its correct operation, auxiliary tables must be used. Due to the position of the collets, they cannot be activated. It is not a "locking error" but a warning.
- **9029 : Auxiliary tables not in position.** Machine stopped. During machining, auxiliary pressers must be excluded so that collets can carry the panel to the predetermined position. However, the surface sensors at home position has not arrived within the maximum foreseen time.
- **9030 : Brake resistances KO.** One or more brake resistances are operated with thermal protection.
- **9031 : Machine in tooling phase.** The tooling selector has been turned.
- **9032: Wrong collet parking position.** Adjust the values. The specified values for collet parking positioning do not observe collet dimensions. Then, the values are adjusted, also taking into account the dimensions.
- **9033: Card formatting failed.** Displayed when the PLC starts running if a card included in the PLCMSD table is not found on the fieldbus channel.
- **9034 : Caution! The loading area is not empty**. Upon resetting, there was a panel on the loading transfer and one of the photocells was shadowed. Remove the panel and reset again.
- **9035 : Check head cover locking.** Make sure that the head cover is properly closed and that the relative input reaches the PLC.
- **9036 : Communication inputs with Kuka not reset.** Upon resetting, at least one of the inputs coming from the Kuka was not reset.

- **9037 : Communication error with RCORE.** The connection between the PLC and the process that manages the RM850 remote hand-held computer is no longer active.
- **9060 : Error in the processing centre data reading.** Some of the processing centre data are not consistent.
- **9061 : Start origin not valid.** The specified program origin is not recognised.
- **9063 : Incompatible Instructions.** If the programmed operations cannot be activated at the same time, or there is an unforeseen M.
- **9064 : Program End Without TP0.** The program ends incorrectly, or the end of some machining operation with a mill has not been communicated to the PLC.
- **9068: Processing Centre not valid for fixed cycle start.** An invalid centre or not valid machine data has been specified for the execution of a fixed cycle.
- **9080 : Drive KO.** A problem has been detected on one of the drives. It is usually related to other errors. When the machine is in emergency, this error occurs because the machine does not have adequate voltage rating.
- **9100 : Slot data reading error.** Slot data are not consistent.
- **9102 : Problem on a slot.** It indicates that a certain machining operation has not been completed. The slot where the failure has been detected is specified next to the error. This type of error occurs together with another one, which helps specify in detail the type of error detected.
- **9103 : Problem with the slot movement slide 1.** The slide 1 of the specified slot has not reached the requested position. This usually occurs together with another error that helps explain the type of error detected. Both errors are related to the additional information necessary to go back to the bottom/top operating section, the identification number of the bistable solenoid valve, spindles and sensors involved in machining.
- **9104 : Problem with the slot movement slide 2.** The slide 2 of the specified slot has not reached the requested position. This usually occurs together with another error that helps explain the type of error detected. Both errors are related to the additional information necessary to go back to the bottom/top operating section, the identification number of the bistable solenoid valve, spindles and sensors involved in machining.
- **9112 : Machining operation not possible due to vertical dimensions.** On the basis of the tools pre-set position, end of stroke and dimensions, the commanded movements are not possible. Check the data.
- **9113 : Slot motor thermal protection KO.** The thermal sensor of one of the motors signals a problem. The thermal protection input is also signalled.
- **9120 : Inverter data reading error.** The PLC data of the inverter are inconsistent.
- **9122 : Inverter Transmission Failed.** The parameters needed for machining operations are not transmitted to the inverter.
- **9123 : Inverter entry abruptly stopped.** When trying to stop the inverter, but once the braking timer expired, the rotating motor was still present.
- **9130 : Plugged Ram KO.** A problem has been detected in the plugged Ram.
- **9131 : Plugged Ram Too Small.** Data stored in the plugged RAM exceed the acceptable maximum capacity.
- **9135 : Lubrication data reading error.** The PLC lubrication data are inconsistent.

- **9137 : System Lubrication Time Expired.** If the lubrication is manual, it indicates that the time between two lubrication services has expired.
- **9138 : No Lubricant in the Circuit.** The lubrication circuit is empty.
- **9139 : Lubrication Micro Cycle Failure OK Circuit.** The lubrication cycle has not been completed. Check the pump.
- **9150 : Both sensors active.** This error occurs together with another one, and helps explain the problem detected in detail.
- **9151 : Remain in active position.** This error occurs together with another one, and helps explain the problem detected in detail.
- **9152 : Does not reach home position.** This error occurs together with another one, and helps explain the problem detected in detail.
- **9153 : Remains in rest position.** This error occurs together with another one, and helps explain the problem detected in detail.
- **9154 : Does not reach active position.** This error occurs together with another one, and helps explain the problem detected in detail.
- **9155 : Specified index not valid for BISTABLE** In the PLC data, there is a specific reference index for the bistable table, which is less than zero or larger than the maximum amount of supported bistables.
- **9156 : Home position sensor not expected.** Some bistables do not operate correctly, so when their home position is requested, the home position sensor must NOT be reached (e.g.. the collets). This error really shows this situation.
- **9157 : Active position sensor not expected.** Some bistables do not operate correctly, so when their home position is requested, the activation sensor must NOT be reached (e.g.. the collets). This error really shows this situation.
- **9160 : Loading line in emergency.** A problem has been detected on the loading line, which is now in emergency.
- **9161 : Emergency on one of the loading line inverters.** One of the loading line inverters cannot receive new commands from the PLC.
- **9162: Problem with the loading line.** This error only indicates that an error has been detected on one loading line conveyor. The true nature problem is given by the error that follows next.
- **9164 : Panel not found during unloading.** For accumulation transfers, the error occurs after the transfer completes a turn and does not find the panel.
- **9170 : Unloading line in emergency.** A problem has been detected on the unloading line, which is now in emergency.
- **9171 : Emergency on one of the unloading line inverters.** One of the unloading line inverters cannot receive new commands from the PLC.
- **9172: Problem on the unloading line.** This error only indicates that an error has been detected on one unloading line conveyor. The true nature problem is given by the error that follows next.
- **9174 : Panel not found during unloading.** For accumulation transfers, the error occurs after the transfer completes a turn and does not find the panel.
- **9200 : Fatal error in work list.** Upon executing a program, a problem has been detected in the data transfer between the NC and the PLC.

- **9201 : Start in work list with PIECES COUNTER>=QUANTITY or QUANTITY=0.** The specified program cannot be executed as the amount of machined pieces coincides with the total amount of pieces to be machined.
- **9202 : Context field value of POSITION table must be 2.** The value set in the tables Automatic –> positions -> context must be 2.
- **9210 : Program START: inconsistent data.** Updated to the correct value. For Skippers with automatic loading, the loading origin is specified as the unloading origin. Data should be modified to unload the panel at a different origin.
- **9400 : Panel out of tolerance.** After measuring piece dimension, an error exceeding the maximum acceptable tolerance is detected.
- **9800 : Fine Helpman with negative index!!** Contact the customer service.
- **9801 : Switch value not foreseen.** It occurs when trying to select an option not available in the machine and illegal machining operations are carried out. The name printed next to the error is the function inside which the error is detected. Report the error to the Customer service.

The following are all the errors associated with the errors from the 9150 to the 9154, and help identify the object on which a failure is detected:

- **9250 : Problem with conveyors.**
- **9251 : Problem with a hood.**
- **9252 : Problem with the bidirectional mill.**
- **9253 : Problem with the origin stop.**
- **9254 : Problem with the right collet.**
- **9255 : Problem with the left collet.**
- **9256 : Problem with the upper auxiliary table.**
- **9257 : Problem with the lower auxiliary table.**
- **9258 : Problem with the curtain guard.**
- **9259 : Problem with spindle activation.**

6 Carrying out machining operations

This chapter contains a description of the methods to be used and steps to be followed to carry out the machining operations foreseen.
All the information contained in this chapter is based on the assumption that the operator has started up and prepared the machine correctly and understands how to use the numerical control software correctly.

For a description of the buttons or selectors mentioned in this chapter, please see chapter 4 “Controls and indicator devices”.

6.1 Advice relating to machining operations

Before the machining operation:

- Carry out a warm-up cycle for the boring and milling units.

During the machining operation:

- Set a suitable speed of rotation and of advance.
- Periodically remove dust from the spindles of the tools that are not used for the machining operation.
- In the event of a power cut, an emergency stop or sudden stoppage of the machining operation, wait for at least 1 minute before approaching the operating section, in order to give the tools time to stop turning.
  Wait for 5/6 minutes before approaching electronic equipment, so as to allow the condensers time to discharge any residual energy.

6.2 Procedure used to carry out the machining operation

To carry out a working cycle it is necessary to:

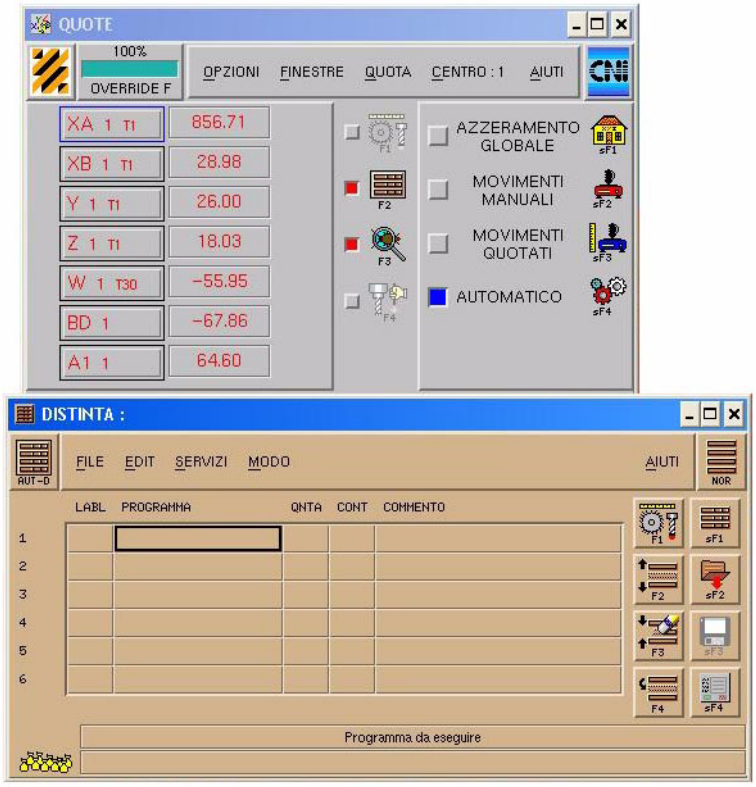
1. Tool up the machine, following the indications given in the following chapters.
2. Create a program, using the numerical control software, or open an existing program, and run it. In this regard, please see the Software user’s manual.

i Using a CAD-CAM, by simulating the piece and the machining operations it is possible to write a list of machining operations.
Check whether or not the tooling is correct, based on the program used.

3. Select the user mode: automatic (see paragraph 6.2.1) or manual (see paragraph 6.2.2)

6.2.1 Use in automatic mode

1. Assuming that the machining programs have already been loaded, open the positions page:
   - select the name of the program to be used;
   - open a job list in which to add the various programs to be run in succession;
   - load an existing job list, with all the programs to be run;



2. Press the Start software button. The machine will start to run the program and will position the axes ready to pick up the panel.
3. In particular, the machine moves the two clamps to the position foreseen by the program, disables the contact mats and lights the green light on the control panel to show the user that it is possible to enter and load the panel.
4. The operator moves onto the contact mats and loads the panel, using the clamps and one stop located over the bottom head air cushion table as a reference.

i During this phase, a check (at software level) stops the safety device from triggering, so that the contact mats do not activate and the operator is able to access the machine in order to load the piece.

5. Bring the panel up to the stops on the clamps (for the Y-axis) and on the air table (for the X-axis). The latter is a drop-down stop, which moves down beneath the level of the air table.
6. Press the pedal to fix the piece; the clamps close around the piece, exerting a slight pressure (for safety reasons).
7. If positioning is correct, leave the safety area and press the Start Cycle button on the mobile control panel: the clamps will close at high pressure.

i When it closes the clamps, the machine carries out a control on the panel thickness, using an encoder on the clamp:
- if the thickness is within the tolerance limits set in the machine data, the machine will accept the panel and will modify all boring operations based on the new height;
-

if the thickness exceeds the tolerance limits, an error is signalled and the clamps are opened again, indicating that the panel is incorrect. If the error is too large and the panel cannot be machined, the machine will not accept it.

8. If, on the other hand, positioning is not correct or the type of piece is wrong, before pressing the "Start cycle" button, press the pedal again to open the clamps and remove the piece, and then repeat the locking operation.

- The pneumatic stops on the air table are disabled.
- The presser lowers and moves to the piece transporting position.
- The units (boring, cutting, milling) on the two machining heads start to machine the piece.

6.2.2 Use in manual mode

Use of each individual mobile device on this machine in manual mode is not foreseen.
However it is possible to move each of the axes manually.

To use manual mode, proceed as follows:

1. Select the axis required on the software page.
2. Press the JOG + or JOG - keys on the Main control panel, to move the axis in the direction required.

6.3 Feeding the piece

Feeding of the piece can be:

- Manual: the beam with the clamps moves forwards to the loading position (all the way forwards), the operator rests the piece on an air cushion table or on a roller table and moves it up against the clamp pins (transversally) and against the drop-down pneumatic stop (longitudinally), which is located to the right or to the left of the machine axis, according to the version.
  The air cushion is activated by pressing the "Start cycle" button.
- Automatic: the piece is carried by an automatic loading device. A pushing device pushes it up and holds it in place along the Y-axis and a pusher holds it along the X-axis.

6.4 Starting the machining operation

To start the machining operation, simply press the "Start cycle" button on the mobile control panel. The beam with the clamps carries the piece towards the machining heads, and the machine starts to process it.

6.5 Unloading the piece

Once the machining operation has been completed, the piece is unloaded: the piece is moved off the air cushion table and is left resting on the roller table in the unloading area. This procedure is carried out both when unloading takes place manually and when unloading is automatic.

More specifically, the machine moves the panel to the unloading position. At this point:

- In the case of manual unloading: the machine brings the panel forwards by moving the Y-axis, the clamps are opened and at this point the green light on the control panel lights up to inform the operator that it is once more possible for him to move onto the contact mats and remove the panel.
  The operator moves onto the contact mats, takes the panel, and as soon as he moves off the contact mats again the machine detects the absence of the panel and returns to the loading position.
- In the case of automatic unloading, the procedure described above is not used, because all the operations are carried out automatically by the machine (using its clamps and the beam) and by the transfer, and it is not necessary to turn the green light on to allow the operator to access the contact mats.

If present, movement onto the transfer is automatic, thanks to the conveyor belts. More specifically:

1. The panel is moved to the unloading position, the beam comes forwards and the clamps open.
2. The transfer lifts up to take the panel and free the roller table. The beam moves back and returns to the loading position.
3. Simultaneously the transfer starts to move the panel towards the operator.

6.6 Suspending the machining operation

To stop the machining operation during movement of the axes (either single or interpolated) press the red “Stop” button. The machine will suspend its movements temporarily, without changing the path set in the program. When the green “Start” button is pressed the machine will start moving again from the point at which it was stopped.

Tooling

7 Preparing the operating section

Preparation, or tooling, refers to the operations required to set up the machine for a given machining operation. This chapter indicates the operations required to prepare the working units and the relative operating procedures used.

For a description of the buttons or selectors mentioned in this chapter, please see chapter 4 “Comandi e dispositivi di segnalazione”.

Before carrying out the operations described in the following paragraphs, turn the tooling selector key, remove it and ensure it remains safely in your own possession.

The tooling selector has 2 positions:
- in position 0 tooling is disabled;
- in position 1 tooling is enabled; the machine is therefore in emergency mode and the spindles are only able to lower.

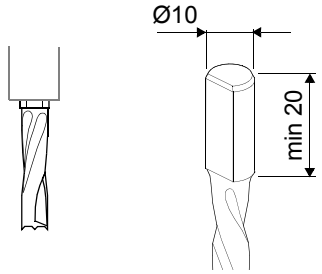
To optimise boring quality, tool up the lower boring head exactly like the upper boring head.

7.1 Information on tools

Many types of tool are available on the market. This paragraph contains information on the type of coupling and on the maximum dimensions required for tools in order for them to be used on the machine.

Boring tool

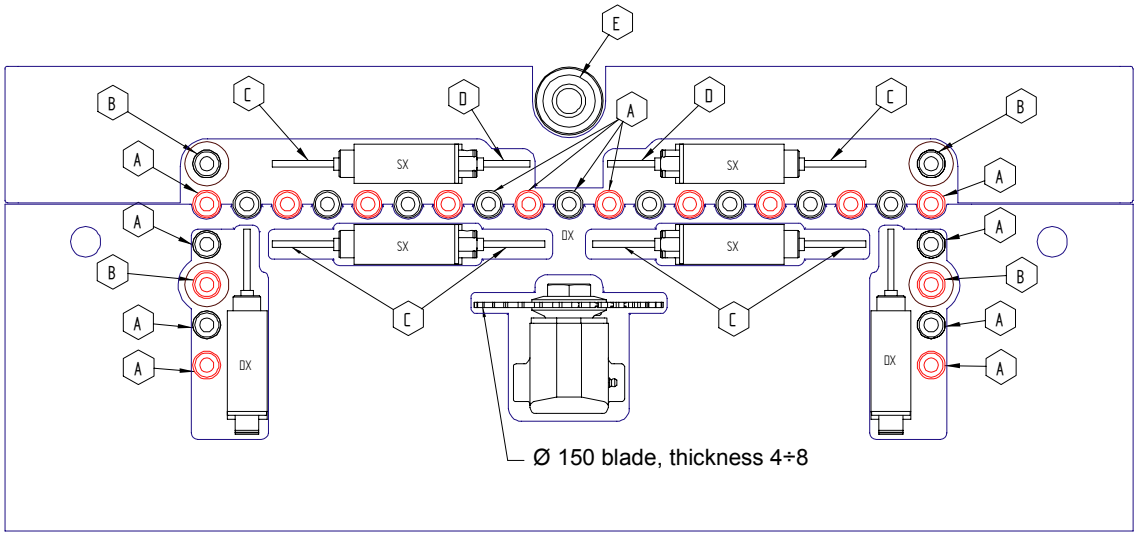
The boring tools to be used on the machine must have a cylindrical coupling with a diameter of 10 mm and a minimum length of 20 mm. The coupling must have a flat part, which is used to lock the tool on the spindle.



	Envisaged tool data			
Boring unit	**Tool length (mm)***	**max ø**	**max ø countersink (mm)**	**Max boring/ milling depth**
Vertical boring - **A**	70	22	22	35
Vertical boring - **B**	70	35	35	35
Horizontal boring - **C**	70	14	22	50
Horizontal boring - **D**	57.5	14	22	38

* Use exclusively the tools with the length specified in the table.

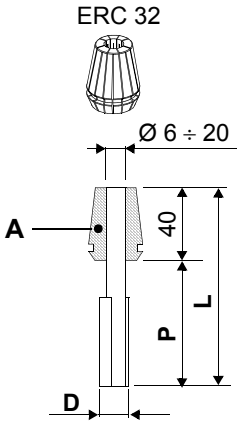
Bottom head



i Horizontal boring is tested at the machine initial testing, using ø 10 bits and locking the panel with collet XA only. In order to obtain both a correct panel locking to prevent it from moving and accurate boring operations (T=+/- 0.2 mm), **the machinable panel in Y allowed must be 400 mm max**.

Cylindrical shank milling tool

The milling tool is locked in the spindle by a collet and a locking ring nut. The tool must have a cylindrical shank. The diameter and length of the coupling vary according to the type of collet used in the spindle.



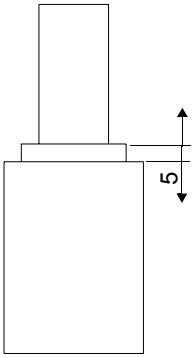
For ERC 32 type collets the diameter of the coupling is between Ø 6 and Ø 20 mm and the minimum insertion length must be 30 mm. An insertion length of 40 mm is recommended.

	Envisaged tool data			
Milling Unit	**L - Tool length (mm)**	**Max D**	**countersink max ø (mm)**	**P - Max milling depth**
Electrospindle - **F** *	100 max	40	-	55**

* See figure "Bottom head" on page 76.

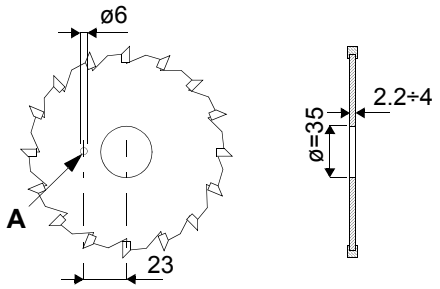
** The useful length of the mill on the electrospindle is equal to the distance between the locking ring nut and the end of the tool.

The minimum value of non-cutting tool section is illustrated below .



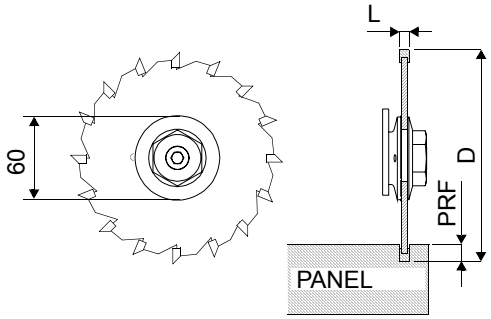
Circular blade milling tool

The circular blade milling tool is fitted in a shaft and locked using a flange. The internal opening in the blade must have a diameter of 35 mm and a thickness of between 2.2 and 4 mm. This tool must also have a bore **A,** 6 mm in diameter, for the lockpin. The axis of the antirotation pin bore must be 23 mm from the axis of the internal opening in the blade.



⚠ **Circular blade tools that do not have an antirotation pin bore (ref. A) must not be used.**

As regards diameter **D**, thickness **L** and the maximum machining depth **PRF**, strictly observe the limits indicated below. The values are expressed in millimetres.



Unit on which the tool is to be used	Max D (mm)	L (mm)	Max PRF (mm)
Milling unit	Ø 150	4 [8 max]	20 [10 max] (*)

* This value depends on the blade **L** thickness and the type of material to be machined.

7.2 Fitting the tools

To allow easy access by hand to the spindles behind the head it is necessary to move the axes to the end of stroke position, i.e. to bring the Y-axis right to the back position and to open the heads as wide as possible

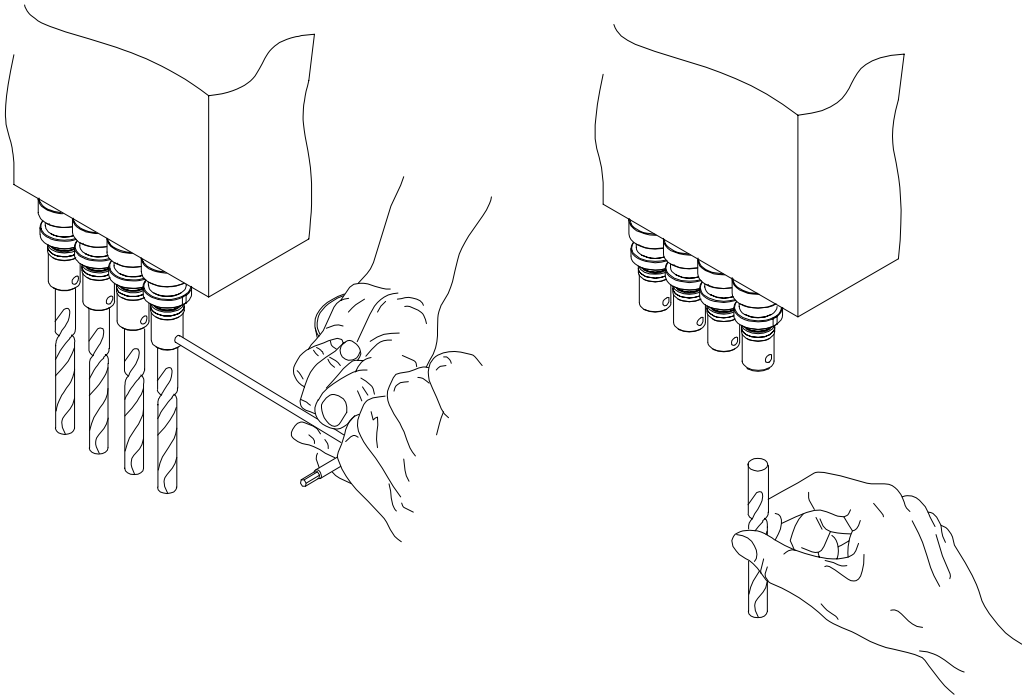
To simplify these operations, an automatic cycle has been provided in the software. Using this cycle, once the machine has been reset and restored to normal operation, it is possible to run the tooling cycle by simply pressing the relevant button. The machine carries out all movements independently (moving the Y-axis back, opening the top and bottom boring heads) and at that point the user can turn the tooling selector and commence operations.

7.2.1 Fitting the boring tools

To fit the boring tools, proceed as follows:

Use gloves.

1. Press the “Tasto Ciclo attrezzaggio” to move the heads (top/bottom) and the presser.
2. Open the casings.
3. Remove the curtain guards (top head only)
4. Take off the working area guard casing
5. Using a suitable wrench, fit the tool required.



7.2.2 Fitting the mill on the electrospindle

The electrospindle is positioned on the outer part, at the back of the head. To fit the mill, proceed as follows:

 **Use gloves.**

1. Press the “Tasto Ciclo attrezzaggio” to zero set the both heads, top and bottom, and lower the presser.
2. turn the **Tooling cycle** key operated selector to position 1 to enable the function;

Now there are two procedures to tool the electrospindle- using the “Positions” box or the “Graphic tooling” box. For the first procedure, do as follows:

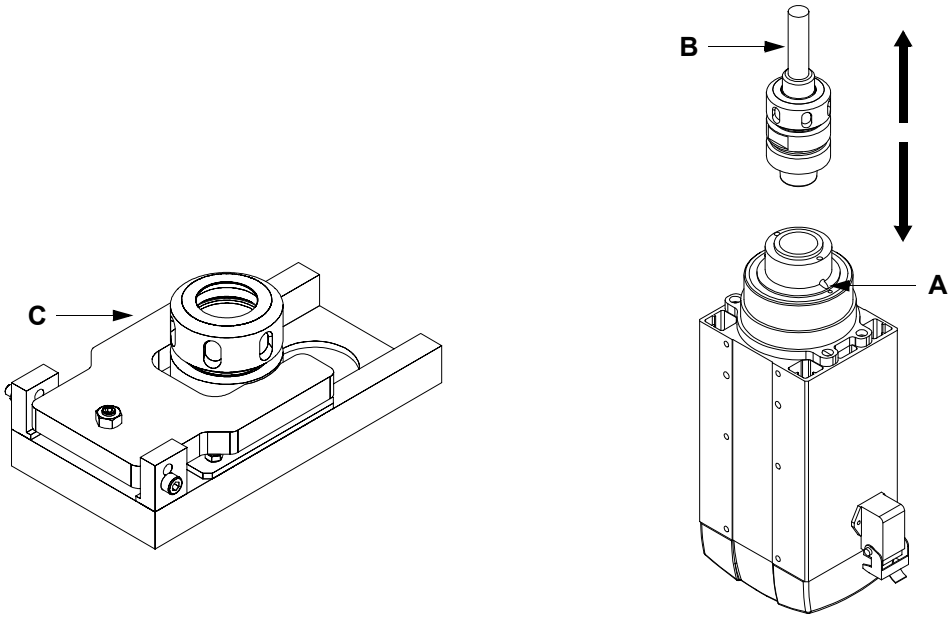
1. open the active “Positions” dialogue box and click on the **Manual movements** option and the **Spindle activation** icon (F4) to display the “Spindle activation” box. Click on the **Spindles/ Mills** option of the menu;
2. to fit the cone on the bottom electrospindle, click on the **TP1** option; to fit the cone on the top electrospindle, click on the **TP3** option.

For the second procedure, do as follows:

1. open the active “Graphic tooling” dialogue box;
2. click on the “Spindle activation” icon; place the mouse cursor on a circle and left click to view the tool description. Identify the circle corresponding to the mill and right click to move the electrospindle to its tooling position.

To fit the tool on the electrospindle:

1. clean the area around the operating section using short blasts of air;
2. stand in front of the brush of the operating unit and fit the cone plus tool **B**, previously mounted by means of the locking unit **C** supplied, on the electrospindle ring nut. Tighten the lockscrew **A** with a 4 mm Allen spanner, gently pressing and keeping the cone perfectly vertical.
3. turn the **Tooling cycle** key operated selector to position 0 to restore machine operation.



7.2.3 Fitting the cutting blade

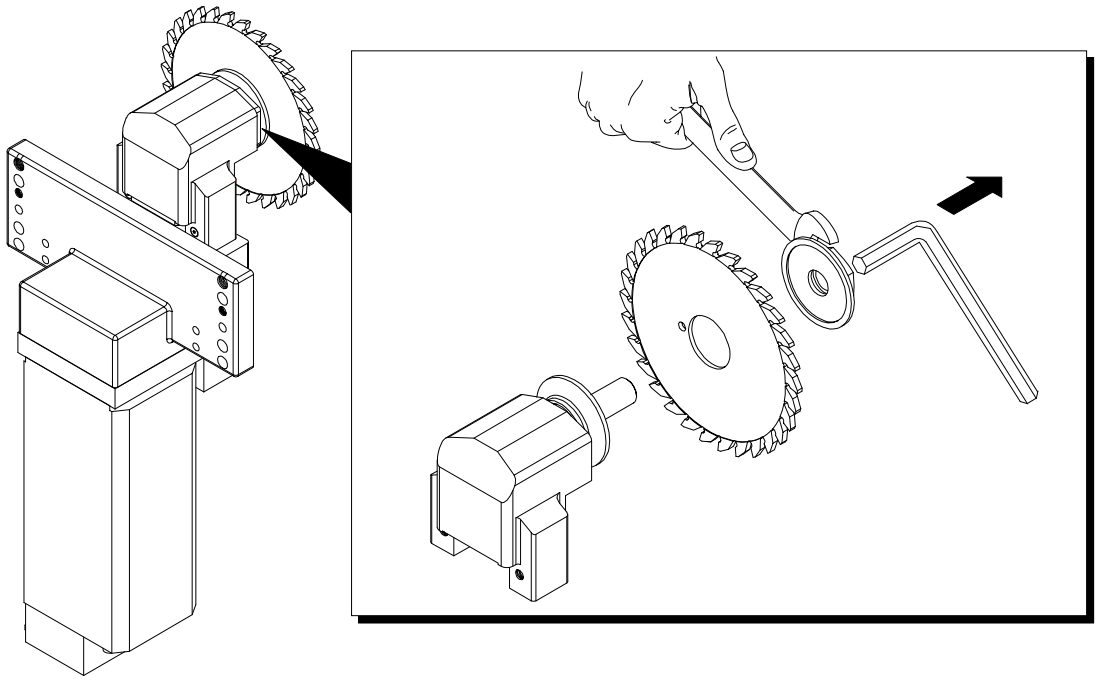
Proceed as follows:

Use gloves.

1. Press the “Tasto Ciclo attrezzaggio” to move the heads (top/bottom) and the presser.
2. Open the casings.
3. Remove the curtain guards (top head only)
4. Take off the working area guard casing
5. Insert a set screw wrench into the bore on the shaft to hold it still.
6. Loosen the nut locking the blade to the drive shaft.
7. Remove the used blade and replace it with a new one.

When inserting the blade, take care that the pin on the shaft flange is inserted correctly into the corresponding bore on the blade.

8. Tighten the lock nut.



Operations

8 Maintenance

This chapter contains information that is essential to maintain the machine in perfect working order.

Before carrying out any maintenance on the machine (unless otherwise indicated):

1. press the "Emergency" button;
2. turn the machine off, and disconnect the power supply by turning the main switch;
3. drain the air from the pneumatic system using the cut-out valve;
4. lock both the main switch and the cut-out valve, to prevent anybody from starting the machine up again.

In this way it is possible to access the machining heads and the other devices in order to carry out the necessary replacements and/or maintenance operations, in conditions of absolute safety.

8.1 General maintenance

The following table shows the general machine maintenance operations, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
Every day	"Cleaning"	83
every week	"Cleaning guides and racks"	84

Cleaning

Proper cleaning of the machine and the surrounding area makes the workplace healthier and safer, allowing easy identification of controls, indicator devices and indicator lights.

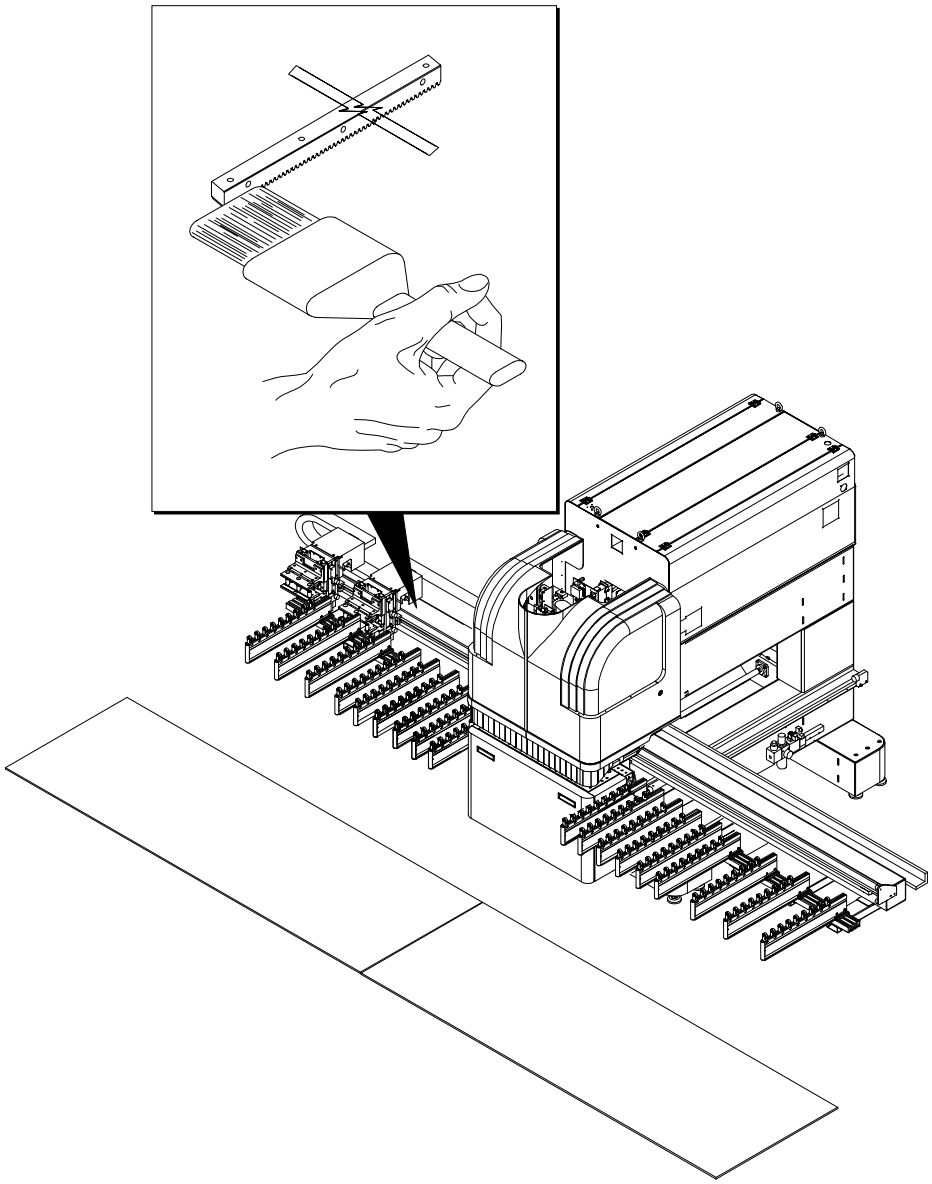
To remove all trace of sawdust, use a vacuum cleaner, if necessary using a compressor to remove fine dust, making sure you stand well clear. The chips that collect on the floor must be removed using a vacuum cleaner or brush, as they may make the floor slippery.

At the end of each shift, as well as cleaning the whole machine, make sure you also clean the drives for the boring units, the electrospindle and the cutter blades carefully.

To clean the electrical cabinet use a vacuum cleaner or soft cloth. Never use a jet of compressed air, as the dust you remove may deposit on the contacts and cause damage.

Cleaning guides and racks

Clean all the guides used to move the X, Y, Z axes, the working units and the beam with clamps, using clean, dry cloths. Clean the rack on the X axis, using a wire brush to remove particularly stubborn deposits. After cleaning, brush a thin layer of MOBILUX EP0 lubricant onto the rack, using a paintbrush.



i Do not apply an excessive amount of grease, as this would only cause excess sawdust to stick to the lubricated parts.

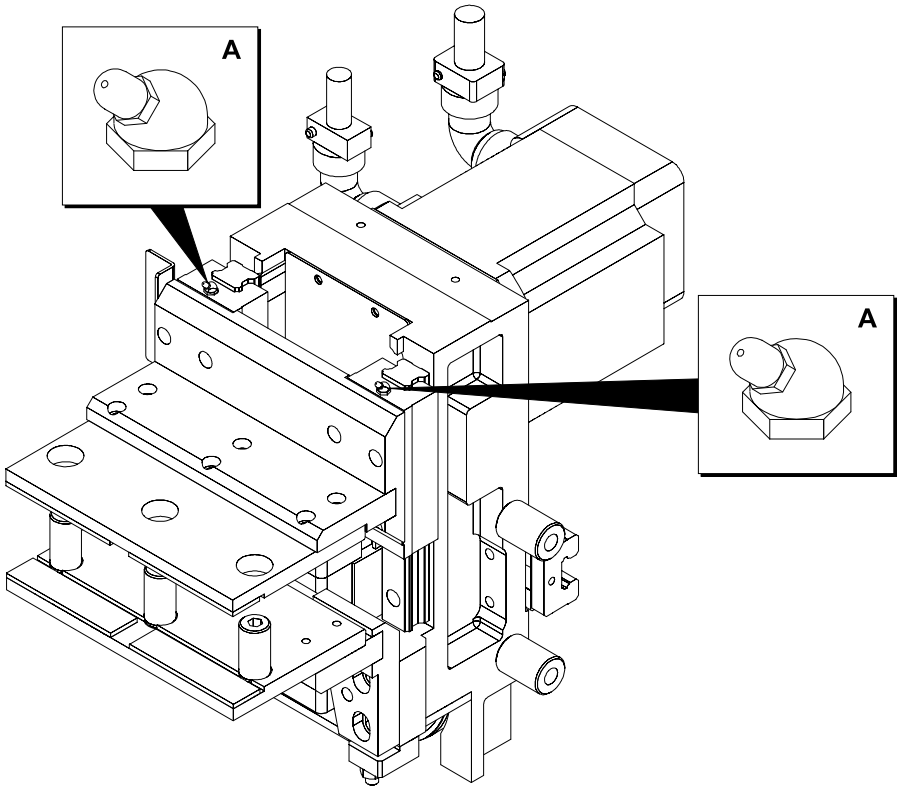
8.2 Maintenance of the clamps

The following table shows the general maintenance operations to be performed on the clamps, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
every day	“Cleaning”	
Every week	“Greasing”	85

Greasing

Greasing the clamps guarantees proper operation of the clamps themselves. The optimum amount of grease is one stroke of the pump to each greasing nipple **A**.



i Do not apply an excessive amount of grease, as this would only cause excess sawdust to stick to the lubricated parts.

8.3 Maintenance of the boring unit

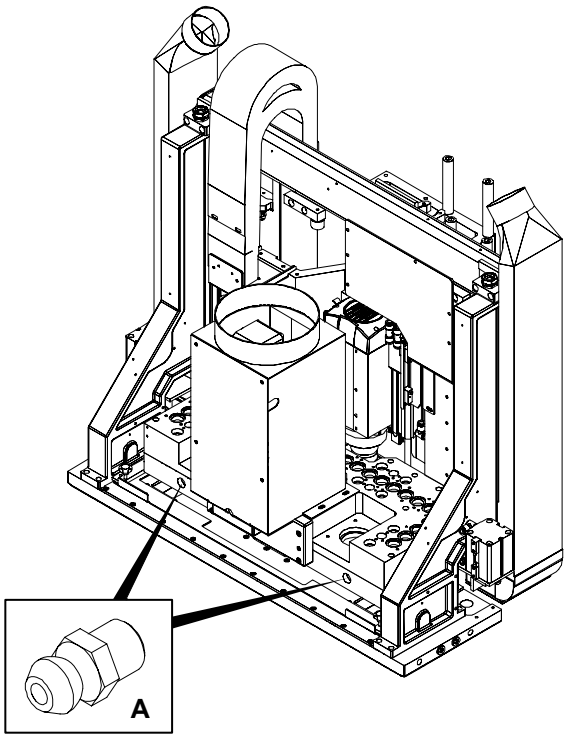
The following table shows the general maintenance operations to be performed out on the boring unit, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
Every day	“Cleaning”	
Every week	“Checking the pneumatic devices”	87
	“Lubrication of the boring unit”	86

Lubrication of the boring unit

Strictly follow the instructions below to lubricate the boring spindles fitted to the boring units:

1. Fill up the pump supplied with MOBIL TEMP SHC 100 lubricant.
2. Insert the pump into the greasing nipple **A** and pump in 8 grams (about 4 pumpings) of lubricant. Repeat the operation for each greasing nipple **A**.



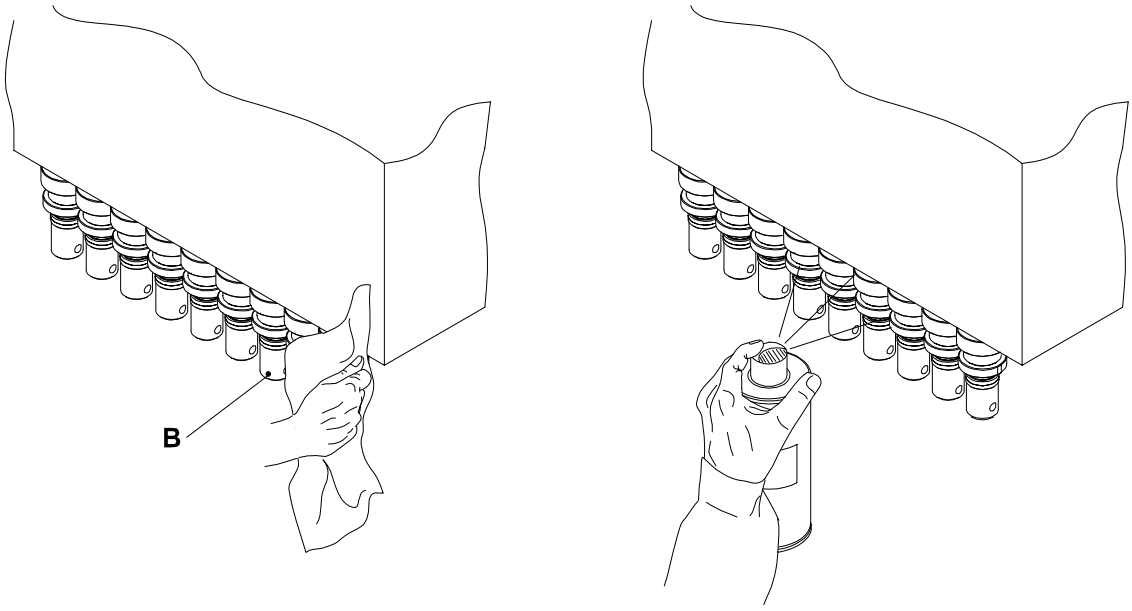
i The spindles in the machining heads turn at 4000 rpm: during operation the heads reach a temperature of approximately 65 - 70° C, and, because there is no temperature control system on the machine, it is necessary to use greases that are capable of supporting these temperatures. The recommended type of grease (MOBIL TEMP SHC 100) is indicated on a special plate fixed to the machining head.

Checking the pneumatic devices

Periodically check operation of the spindle pneumatic devices:

- Command lowering of all the spindles, using the numerical control commands (as described in chapter 4 of this manual or in the HMI Software “User manual”).
- Check the spindle sliding rod **B**, cleaning it and removing any deposits.

Apply a thin layer of Teflon spray, such as TRI-FLOW or the like, on each rod.



i If they are carried out periodically, the operations described above will prevent blockage of the spindles due to the oxidation of built-up sawdust and other powders produced by the machining operations. This type of blockage occurs above all when some of the spindles are never used.

8.4 Maintenance of the electrospindle

The following table shows the general maintenance operations to be performed on the electrospindle, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
every day	“Cleaning”	

8.5 Maintenance of the cutting unit

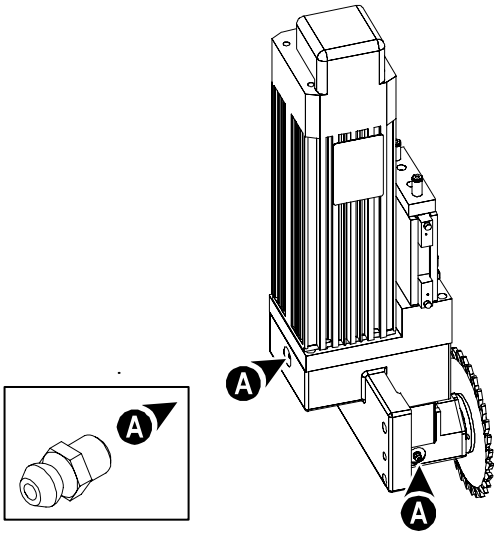
The following table shows the general maintenance operations to be performed on the cutting unit, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
every day	“Cleaning”	
every week	“Lubrication of the cutting unit”	88

Lubrication of the cutting unit

Strictly follow the instructions below to lubricate the cutting unit:

1. Fill up the pump supplied with MOBIL TEMP SHC 100 lubricant.
2. Insert the pump into the greasing nipple ***A*** and pump in 4 grams (about 2 pumpings) of lubricant. Repeat the operation for each greasing nipple ***A***.



8.6 Maintenance of the central lubrication system

The following table shows the general maintenance operations to be carried out on the lubrication system, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

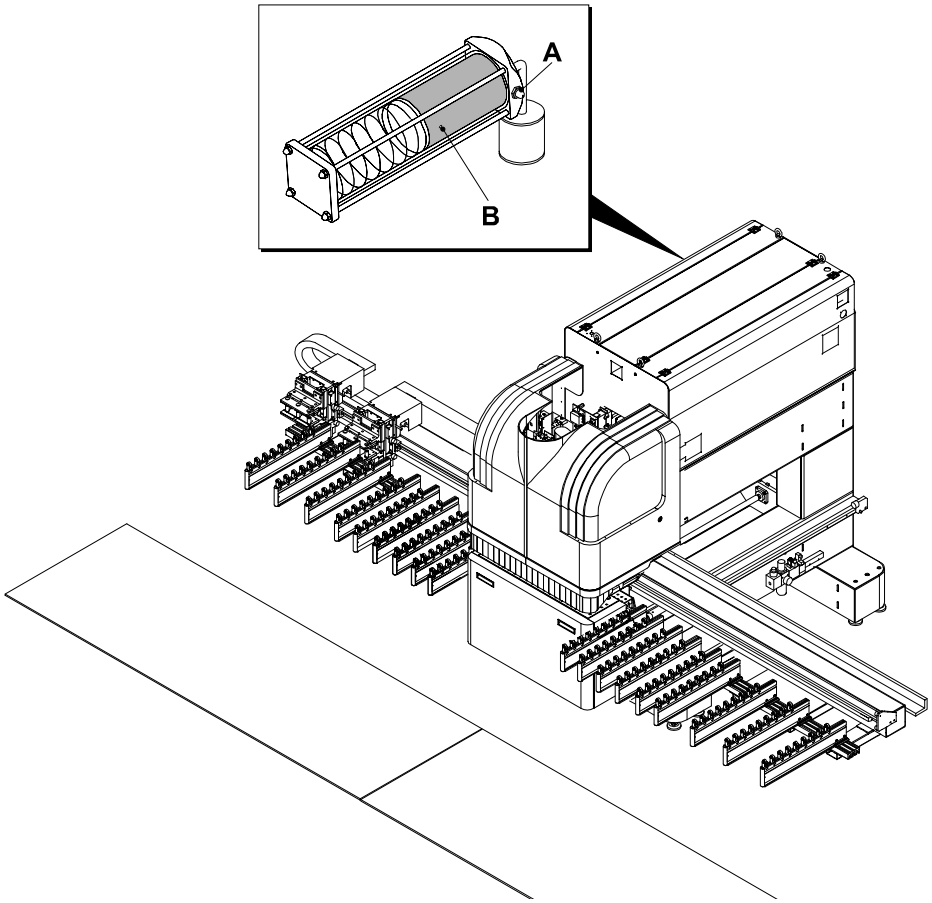
Frequency	Operation	Page
*	“Topping up the lubricant in the pump”	89

* The unit is provided with a sensor that checks the lubricant level. When the minimum level is reached, a message is displayed on the screen, advising the operator to top up the lubricant.

Topping up the lubricant in the pump

After draining the pressure from the pneumatic system, proceed as described below to top up the lubricant in the central lubrication system.

- Fill the pump provided with MOBILUX EP0 lubricant.
- Insert the pump into the greasing nipple **A** and pump in lubricant until the maximum level is reached. This is seen from the fact that lubricant starts to come out of the drainage hole **B**.



8.7 Maintenance of the FRL unit

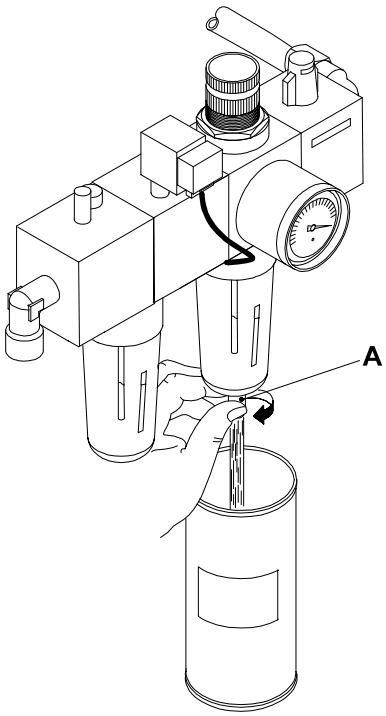
The following table shows the general maintenance operations to be performed on the FRL unit, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Operation	Page
every day	“Draining condensation”	90
every week	“Cleaning the filter”	91

Draining condensation

The FRL unit is fitted with a tank in which condensation collects. Check the amount of condensation that has formed, and if necessary drain the tank as described below.
The pneumatic system must be under pressure to carry out this operation. For this reason you must not activate the cut-out valve.

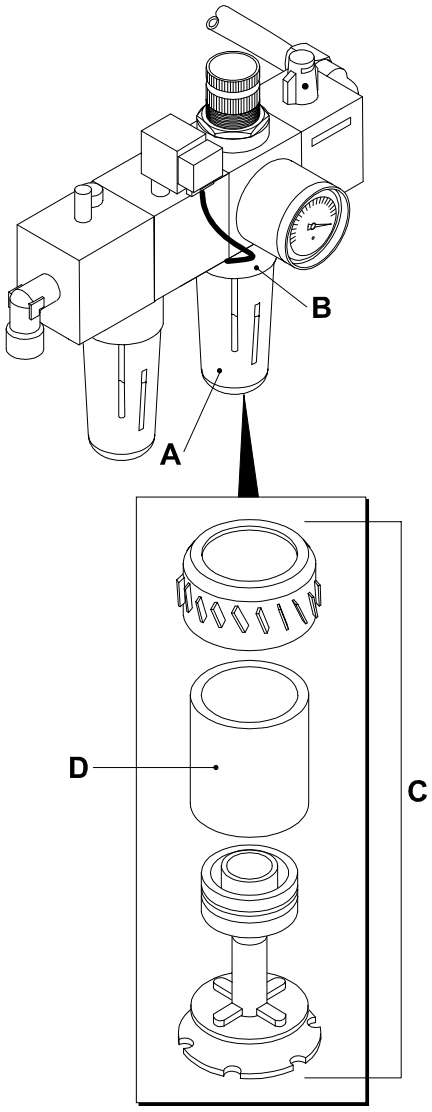
- Position a jar under the bleeder valve **A**.
- Press the bleeder valve **A** upwards, until all the condensation has drained out.



Cleaning the filter

To clean the filter, proceed as follows:

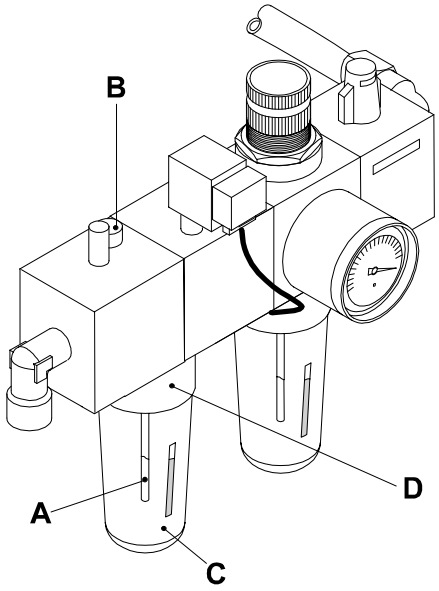
- Make sure that there is no pressure in the system; the supply pressure gauge must indicate 0 bar.
- Remove the filter cup. To do this lower lever and turn by 45° (either to the right or the left).
- Unscrew the baffle unit (ref. C).
- Extract the cartridge and clean it with soap, water and compressed air.



Checking and topping up the lubricant

Check the lubricant level in the FRL unit through the windows **A**. If the minimum level has been reached, top up as described below:

- Make sure that there is no pressure in the system; the supply pressure gauge must indicate 0 bar.
- Unfasten screw **B** or remove the lubricator cup **C** by lowering lever **D** and turning the cup by 45° (either to the right or to the left).
- Pour in MOBIL DTE 24 lubricant until maximum level is reached.
- Fasten the screw **B** or replace the lubricator cup **C**.



8.8 Summary and frequency of operations

The following table shows all the machine maintenance operations foreseen, and indicates how frequently they must be carried out. The frequency has been calculated taking into account a 5-day working week, and an 8-hour day, in normal working conditions. The Pag. column indicates the page on which the procedure to be used to carry out the operation is described, if special operations are required.

Frequency	Part involved	Operation	Page
every day	Whole machine	“Cleaning”	83
	Clamps	“Cleaning”	
	Boring unit	“Cleaning”	
	Electrospindle	“Cleaning”	
	Cutting unit	“Cleaning”	
	FRL unit	“Draining condensation”	90
every week	Whole machine	“Cleaning guides and racks”	84
	Boring unit	“Lubrication of the boring unit”	86
	Boring unit	“Checking the pneumatic devices”	87
	Cutting unit	“Lubrication of the cutting unit”	88
	FRL unit	“Cleaning the filter”	91
	FRL unit	“Checking and topping up the lubricant”	92
every month	Clamps	“Greasing”	85
*	Central lubrication system	“Topping up the lubricant in the pump”	89

* The unit is provided with a sensor that checks the lubricant level. When the minimum level is reached, a message is displayed on the screen, advising the operator to top up the lubricant.

8.9 Characteristics of lubricants

Use the same lubricants used by the manufacturer; only if they are difficult to find should equivalent types be used. Should you wish to replace the recommended lubricant with an equivalent one of different make, clean the whole of the part involved to remove any residual traces of the previous product. This is to avoid the risk of chemical reactions that might harm the machine.

Lubricants used by the constructor		Equivalents
name	**characteristics**	
MOBIL TEMP SHC 100	category: GREASE volume mass: 1.0 kg/dm3 at 15°C vapour pressure: <0.1 mm Hg, at 20°C viscosity: 87 cSt at 40°C 13 cSt at 100 °C dropping point: >260°C boiling point: >315 °C	MOBIL TEMP SHC 32
MOBILUX EP 0	category: GREASE volume mass: 0.879 kg/dm3 at 15°C vapour pressure: <0.1 mm Hg, at 20°C viscosity: 150 cSt at 40°C 11.8 cSt at 100°C dropping point: 190°C boiling point: >315°C	ESSO BEACON EP 0 KLÜBER TRIBOSTAR 0 EP* KLÜBER CENTOPLEX 0 EP**

* Italian market only

** International market

9 Special maintenance

Make sure that there is no residual glue on the panels that might dirty the work tables. Any glue on the work tables will stop the panels from sliding properly. This might cause the panels to disconnect from the clamps, with serious consequences.

10 Troubleshooting

10.1 Problems, causes and solutions

Problem	Cause	Solution
The numerical control does not turn on.	There is no electrical power supply.	Check that the machine's main power switch is turned to 1 (ON).
	A thermal cut-out switch in the wiring cabinet has triggered.	Reset the cut-out switch.
The start button on the main control panel does not light up	There are emergency devices active.	Check the emergency button.
	The bulb is broken.	Replace the bulb.

Appendices

A Safety information

The machine will work safely if it is used by qualified persons in accordance with the recommendations and instructions provided in this manual. BIESSE will not be liable for any damage to persons or properly caused by inexperienced and unqualified operators or by failure to comply with the following recommendations.

Never remove or tamper with guards and protections in order to carry out unforeseen operations, as this will result in serious risks for the operator. BIESSE declines all responsibility for damage to persons or goods resulting from incorrect use or deliberate misuse of the machine.

A.1 Lifting and moving

1. When lifting and moving the machine, either as a whole or in part, operations must always be carried out by suitably qualified and experienced personnel, using lifting devices with an adequate capacity.
2. Never stand within range of the crane when the machine is being lifted.
3. Only lift the machine as described in this manual.

A.2 Fitting

1. Installation operations must always be carried out by qualified personnel who have been authorised to do so by BIESSE.
2. Before starting work, check that the various parts of the machine are free from any physical damage caused by bumping, tearing or abrasion. Damage to electrical cables or sheathing will compromise the safety of the machine’s electrical system.

A.3 Tools

When choosing tools to be installed in the machine, the operator is advised to follow the recommendations given below.

1. Never use deformed or cracked rotating tools.
2. Check for perfect balance of rotating tools and make sure they are perfectly sharp and suitable for the work to be performed.
3. Never use tools beyond their speed limit, which is impressed on the surface of the tool or indicated in some way by the manufacturer.
4. Before installing any tool in its seating make sure that the guide and centring surfaces have no dents and are perfectly clean.
5. In each tool apply only the prescribed torque to screws, bolts, nuts and rings.
6. Always make sure that the direction of rotation of the tool is the same as that of the spindle in which it is mounted.
7. Never exceed the limits indicated in this manual or otherwise prescribed by BIESSE.

A.4 Preparation and machining

1. Wear protective clothing of the approved type (glasses, gloves, helmet and footwear).
2. Woodworking operations create dust. It is recommended, at the client's discretion, that you wear a mask with a suitable protection level.
3. Never attempt to modify the programs managing safety devices. BIESSE declines all responsibility for any damage to persons or goods resulting from unauthorised modifications of this kind.
4. The machine must be set up by one person only. Ensure that nobody else approaches the machine during setting up operations.
5. When accessing the area inside the safety fence, remove the key from the limit switch on the door, after first turning it to the right, to prevent anybody from restarting the machine. Do not turn the lock back to the rest position when the door is open, to avoid becoming trapped inside the safety fence.
6. Never leave tools on the machine when setting up has been completed.
7. Before starting work, check that there is nobody within the danger area.
8. Make sure that nothing will obstruct normal movement of the machine along the cartesian axes and that all the casings, doors and protective covers are in their proper places and securely fixed.
9. Before starting work, check to make sure that the tools installed in the machine have not been tampered with in any way.
10. Never operate the machine while under the influence of any medicine, drugs or drink that may reduce levels of vigilance and reflexes.

11. Always keep the working area clean and tidy.
12. Do not climb on the machine.
13. In the event of an unexpected power cut during machining operations the electrospindle might continue to turn. Wait for at least 30 minutes before approaching the tools fitted on the electrospindles, or check to ensure that the tool has stopped.

A.5 Maintenance

14.

A.6 Demolition

1. All operations must be carried out by qualified personnel only.
2. Turn the machine off, disconnect it from the power supply and discharge all the air from the pneumatic system.
3. Remove and put away all the tools that are in the machine.
4. Fix all parts capable of moving by inertia or by gravity.

A.7 Danger signs

The following describes and illustrates the danger signs present on the machine.

DANGER!

DANGER! Before carrying out any operations on the electrical system, make sure that the power supply has been turned off.

DANGER! Risk of crushing hands between moving mechanical parts.

A.8 General prohibition signs

Do not remove the safety devices and guards.

No access to the machine’s working area for anybody other than the person running the machine.

Do not clean or lubricate moving parts.

No smoking in the vicinity of the machine.

Do not get on the loading table.

A.9 Warning signs

Make sure that the guards and safety devices are working properly.

Immediately notify those in charge of any faults and malfunctions in the safety devices and of any dangerous situation that may come to your knowledge.

Turn off the power supply before inserting or removing plugs from the power sockets.

Wear working clothes

Wear safety footwear

Wear a safety helmet

Use gloves.

Use earplugs

A.10 Signs affixed to the machine

- The signs affixed to the machine must under no circumstances be removed.
- The signs must be clearly legible, and they must not be covered by objects of any kind.
- Damaged signs must be replaced by new ones, which are to be requested from the manufacturer.

B Technical characteristics

B.1 General information

Length of machine with guards and automatic loading pallet (version **L**) (mm):	7740
Length of machine with guards (version **L**) (mm):	7290
Length of machine with guards (version **S**) (mm):	6200
Length of machine with guards, without unloading pallet (mm):	4400
Maximum height (mm):	2500
Machine weight (kg):	2700
Pneumatic system air flow rate (Nl/min):	2250
Compressed air pressure (bar)	7 ÷ 8

B.2 Electrical characteristics

Installed power (kW):	*
Supply voltage (V)	*
Frequency (Hz)	*

* See the rating plate of the machine and/or the wiring diagrams.

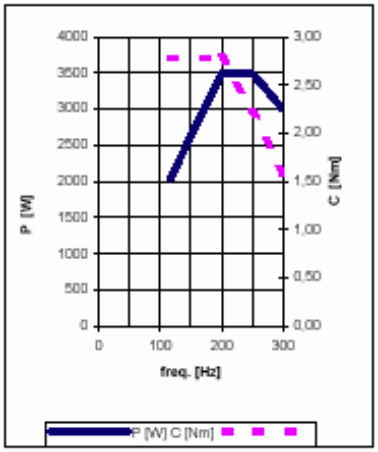
B.3 Boring unit

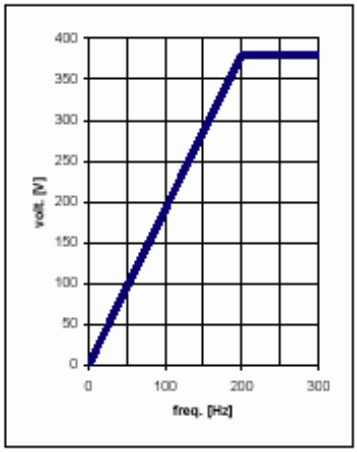
number of vertical spindles:	29+29
number of horizontal spindles on X-axis:	8+8
number of horizontal spindles on Y-axis:	2+2
Motor power for each head (kW):	2 x 1.7
Rotation speed (rpm):	4000

B.4 Electrospindle

HSD	Electrospindle model	CODE	REV.	DATE
	MT1090-100-SP-SPEC-380V-DX-12/ 18000-3.5KW	Y616109046	0	27/01/2004

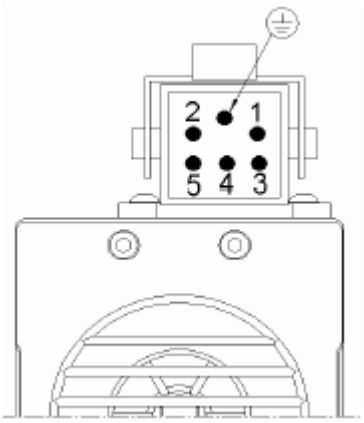
Characteristic curves





Motor data

Voltage	**V±10%**	380	380	380
Output power	**kW**	3.5	3.5	3
Rated current	**A**	8.4	8.4	8
Frequency	**Hz**	200	250	300
rpm	**rpm**	12000	15000	18000
Rated torque	**Nm**	2.8	2.2	1.6
Efficiency		0.82		
Power factor	**cos**	0.86		
Number of poles		2		
Duty type		S1		
Insulation class		F		
Cooling		Forced air circulation		
Weight	**kg**	15		
IP grade	**IP**	50		

ELECTRICAL CONNECTIONS		
	**Pin No.**	**Description**
	1	U phase
	2	V phase
	3	W phase
	4	** PTC Motor thermistor
	5	** PTC Motor thermistor
	⏚	Electrospindle earth
	** For technical specifications see the “Instruction and Use Manual”.	

OTHERS
Torque for the HSK 50D unit locking screw = 4Nm

OPTIONAL ACCESSORIES		
No.	**Description**	**Code**
1	Wheel connector kit 2	Y620000002
2	Collet locking screw	Y082000003
3	HSK collet unit	Y340900001
4		
5		

SPARE PARTS		
No.	**Description**	**Code**
1	AT/MT 1090 fan cover	Y140800001
2	AT/MT 1090 ø80 fan	Y175500001
3		
4		
5		

B.5 Cutting unit

Rotation speed (rpm):	6000
Motor power (kW):	1.7

B.6 Suction system

N° of suction mouths:	4
Diameter of top suction mouths (mm):	2 of 80
Diameter of top suction mouth (mm):	1 of 200
Diameter of bottom suction mouth (mm):	1 of 200
Speed at the mouth (m/s):	28

B.7 Numerical control

Command module:	HSD
Software:	WRT

B.8 Working field along X-, Y- and Z- axes

(Measures refer to the tool axis)

In thickness (Z)	
Horizontal bores in X and Y direction	0 ÷ 60

In length (X)	
Vertical bores	0 ÷ 3000
Horizontal bores in X direction	0 ÷ 3000
Horizontal bores in Y direction	0 ÷ 3000
Milling (with electrospindles)	0 ÷ 3000
Channels (with blade) parallel to X	0 ÷ 2250

In width (Y)	
Vertical bores	0 ÷ 1160
Vertical bores with “System 32”	32 ÷ 1032
Horizontal bores in X direction	0 ÷ 1064
Horizontal bores in Y direction	70 ÷ 1050
Milling (with electrospindles)	0 ÷ 950
Channels with blade parallel to X	112 ÷ 1112

B.9 Noise level

The correct noise level, measured from the position of the operator, is as follows:

- 79 dB (A), during boring.
- 79 dB (A), during milling.
- 83 dB (A), during milling with circular blade tool.

Noise level tests were conducted as described in: EN 31202 - ISO 7960 - prEN 848-3.
Materials worked: chipboard covered with melamine, thickness 18 mm.
Instruments: phonometer BK 2230
K_1= Background noise correction factor lower than 4 dB (A)
K_3= Background environment correction factor lower than 4 dB (A)

The noise levels indicated are output levels and do not necessarily represent safe operational levels. Although there is a relationship between output levels and exposure levels, the output levels cannot be reliably used to determine whether additional precautions are necessary or not. The factors determining the noise levels to which the operative personnel is exposed, include the length of exposure, the characteristics of the work area, as well as other sources of dust and noise, etc. i.e. the number of machines and processes concurrently operating in the vicinity. In any case, the information supplied will help the user of the machine to better assess the danger and the risks involved.

B.10 Information on machining operations

	Boring	**Milling**	**Circular blade milling**
Tool rotation speed (rpm)	4000	18000 (max)	5000 (max)
Advancement speed (rpm)	2.5 ÷ 3.5	6	2 ÷ 4
max machining operation depth (mm)	35	55	20 (*)
vertical bits to bore total length (mm)	70	-	-
horizontal bits to bore total length (mm)	57 ÷ 70	-	-
tool cutting edges length (mm)	-	10 ÷ 55 (min ÷ max)	-
tool max diameter (mm)	-	-	Ø 150

* This value depends on the blade thickness **L** (see page 78) and the type of material to be machined.

C Transport

The machine can be shipped using various forms of transport (road, rail, sea, air), and the shipping method is usually agreed with the customer at the time of purchase. The machine is divided into a number of parts for transport purposes, and this appendix contains a list of the parts to be shipped (see page 114) and their relative weight.

C.1 Warnings regarding transport and installation of the machine

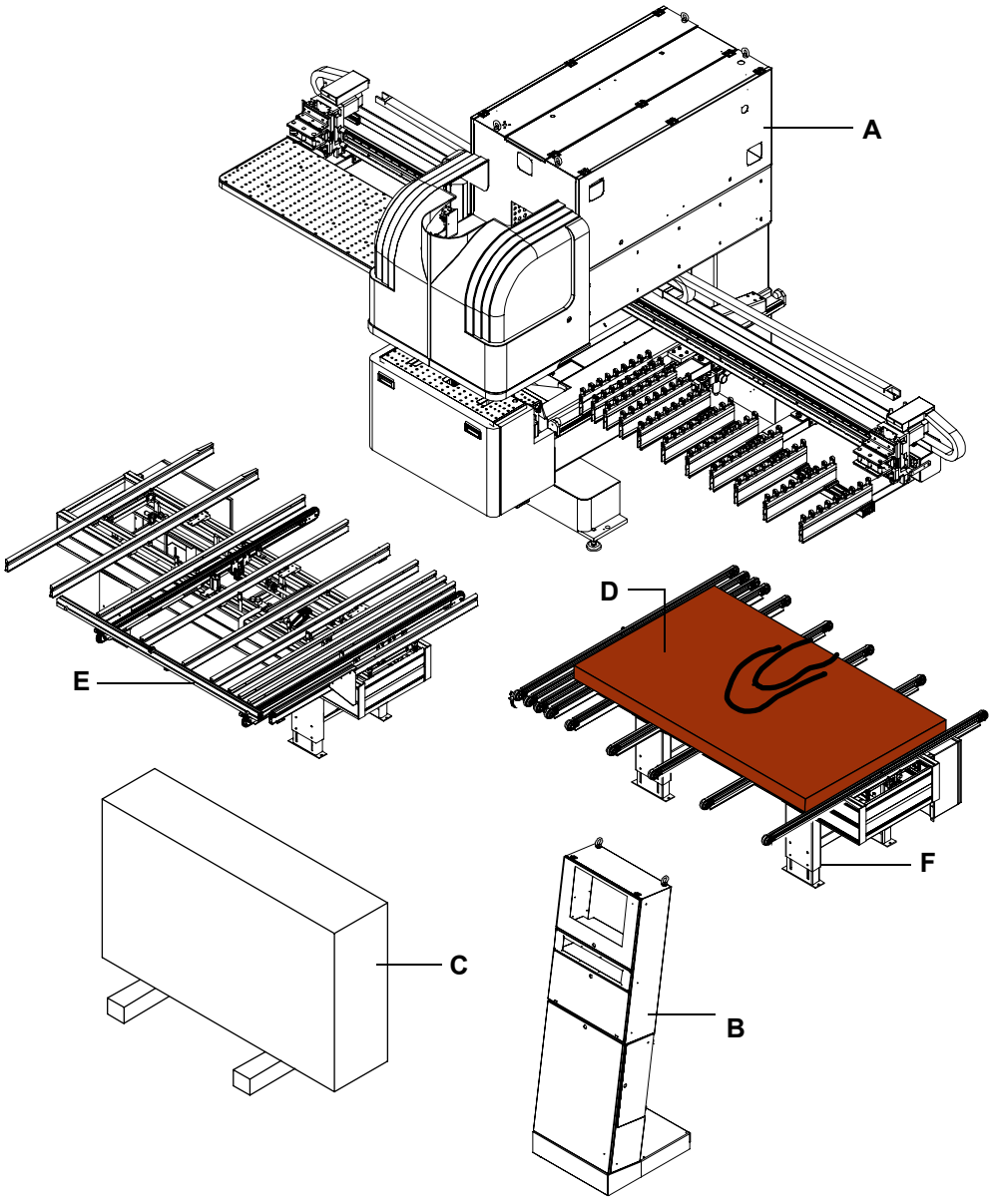
Read the following warnings carefully before proceeding:

- Lifting and moving operations required to unload the machine and transfer it to its final position, must be carried out by staff with the necessary technical experience, following the indications provided on page 115.of this appendix.
- The area in which the machine is installed must have adequate lighting and ventilation, and must be of a suitable size and equipped with points for connection of the various power systems (electrical, pneumatic ...). In this regard, please see the paragraph “Machine layout, connection points and working dimensions” on page 119. The systems to which the machine is to be connected and the area in which it is located must fulfil the requirements set down on page 123.
- Assembly, levelling and connection of the machine is the sole responsibility of BIESSE service department staff. Do not remove the packing, open any cases of additional material, and above all do not turn the machine on without the consent of trained and experienced staff.
- Machine installation is the sole responsibility of BIESSE customer service staff.

C.2 Parts to be transported

The parts to be transported are as follows:

Part of the machine	Dimensions (mm)	Weight (kg)
A - Machine (without flashing light)	4720x2275x2200	2700
B - Operator control panel	600x600x1800	75
C- Guards: panels and uprights	2200x1300x500	260
D -Contact mats	2050x1250x100	100
E - Loading pallet	2500x2270x970	420
F - Unloading pallet	2505x2070x905	350

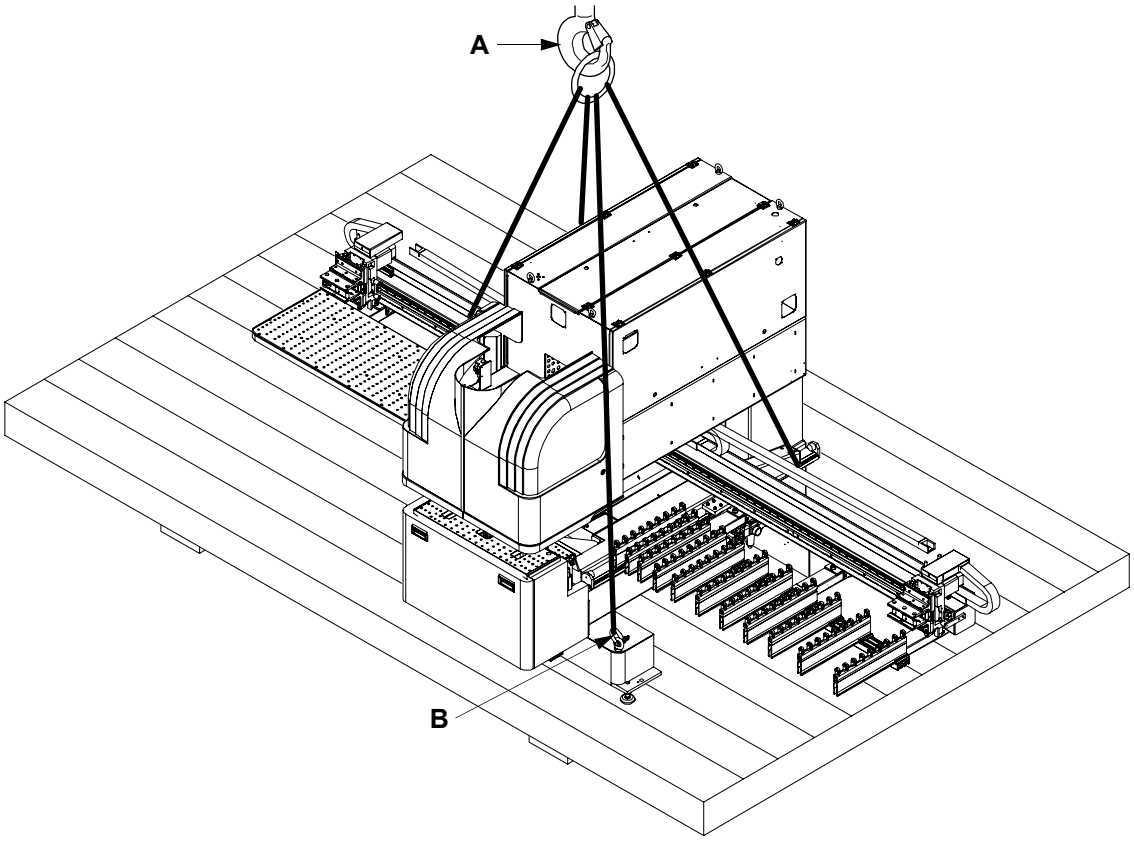


C.3 Machine hoisting and unloading onto/from an Open-Top vehicle

The procedure to hoist and unload the machine and each of its parts onto/from an Open Top vehicle is illustrated and described below. Use the hoisting ropes supplied for lifting operations.

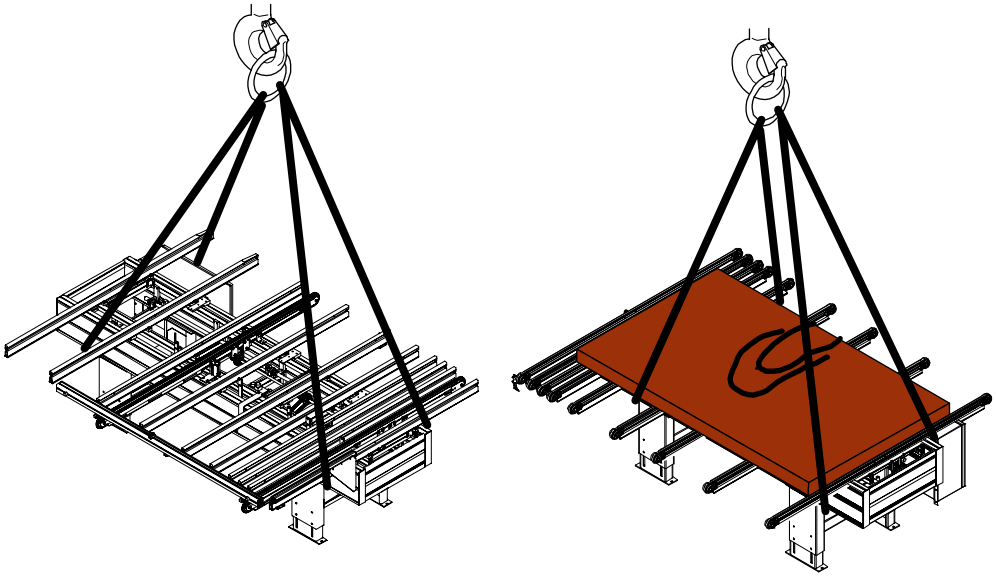
i Before moving the machine and its parts, remove the wooden wedges that keep them fixed to lorry base.

1. Fully uncover the truck completely and lift the machine using a bridge crane and fasten the hoisting ropes anchored to the four eye bolts **B** to the hook **A**. Take out the lifted machine from the lorry.

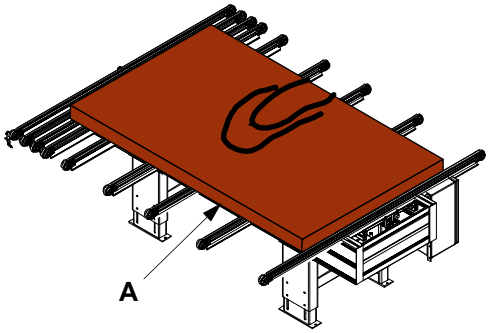


2. If the machine is fitted with an external transformer (only for countries with voltage other than 380 V, 400 V or 415 V), the transformer must be located near the lorry door and lifted by a lift truck to be unloaded from the lorry.

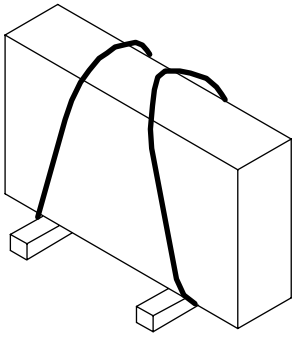
3. If the machine is equipped with a loading and/or unloading pallet, this pallet must be lifted with hoisting ropes and operating a bridge crane to take it out from the lorry.



Once the loading pallet is unloaded, lift and unload the wooden container **A**, housing the contact mats with the aid of a lift truck.



4. If there is a box containing the perimeter guards, this box must be lifted from the truck with hoisting ropes and operating with a bridge crane to take it out from the truck.

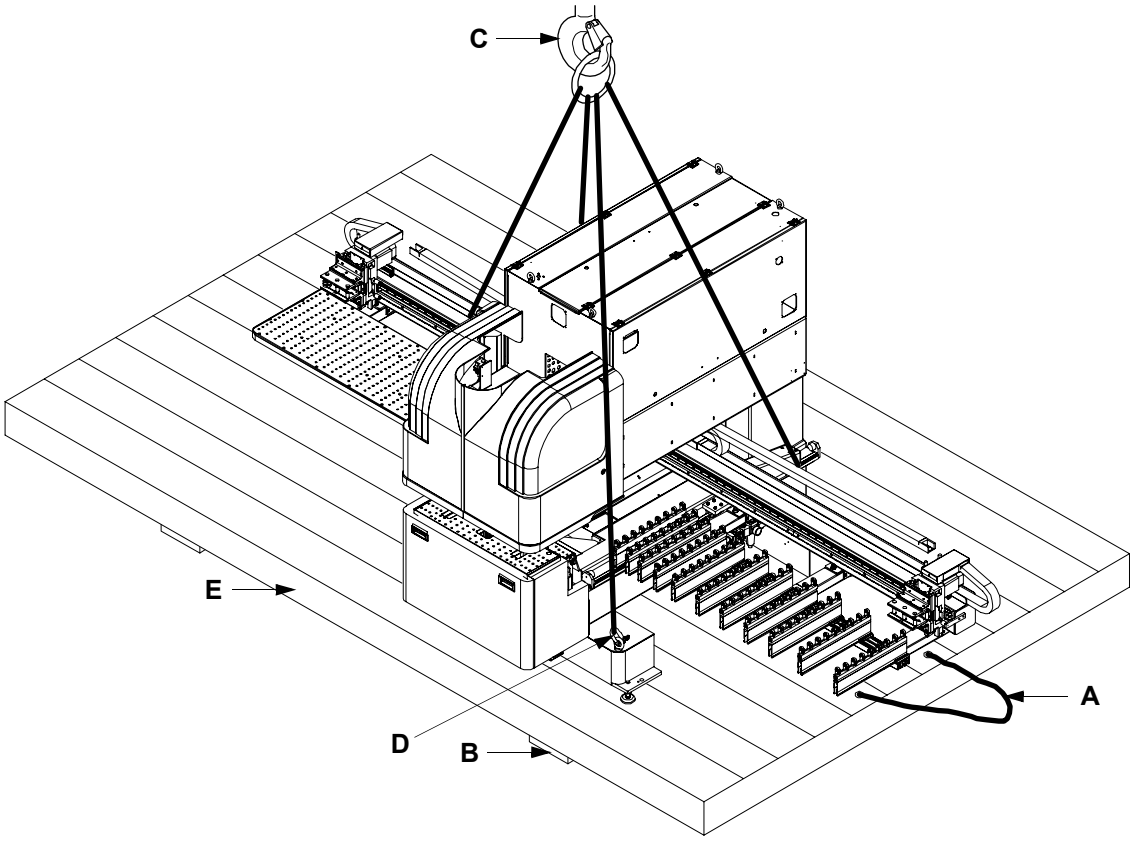


C.4 Machine hoisting and unloading onto/from a High-Cube container

The procedure to hoist and unload the machine and each of its parts onto/from a High-Cube container is illustrated and described below. Use the hoisting ropes supplied for lifting operations.

i Before moving the machine and its parts, remove the wooden block that keep them fixed to the HC base.

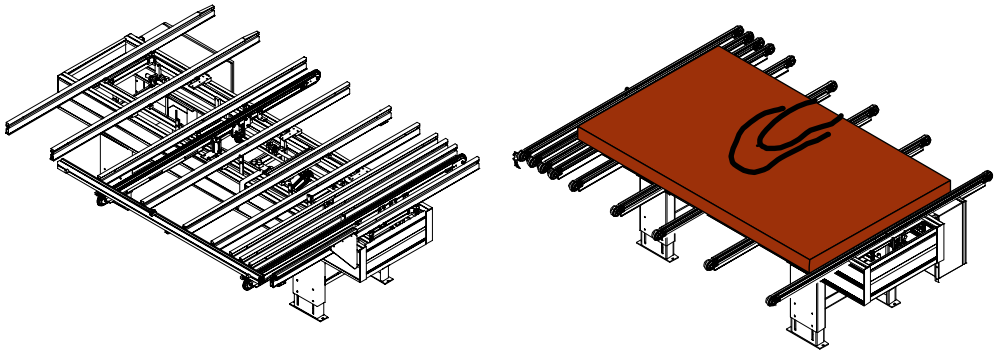
1. Fasten the double rope **A** anchored to the wooden base **E** on which the Skipper is located to a lift truck and pull the machine out of the HC until the plate **B** is aligned with the HC door. Now, hoist the machine with a bridge crane, fastening the hoisting rope anchored to the four eye bolts **D** to the hook **C**. Take out the machine lifted from the HC with the aid of a lift truck, fitting the forks under the base **E**.



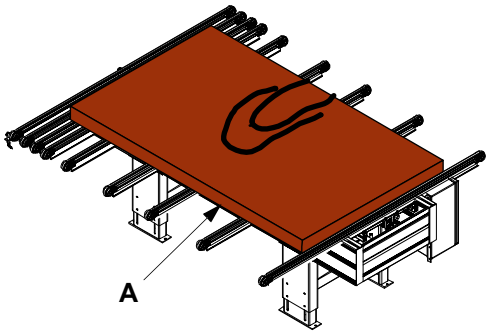
⚠ **Do not pull the machine beyond the point where the B plate is located to avoid the risk of imbalance; thus, also preventing the machine from falling to the ground.**

2. If the machine is fitted with an outer transformer (only in countries with voltage other than 380 V, 400 V or 415 V), the transformer must be located near the HC door and lifted by a lift truck to be unloaded from the lorry.

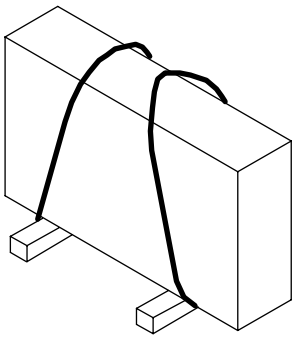
3. If the machine is equipped with a loading and/or unloading pallet, this pallet must be located near the HC door and lifted by a lift truck to take it out of the container. The loading/unloading pallets are equipped with green slides placed under the pallet legs to facilitate pulling.



Once the loading pallet is unloaded, lift and unload the wood container **A**, housing the contact mats with the aid of a lift truck.

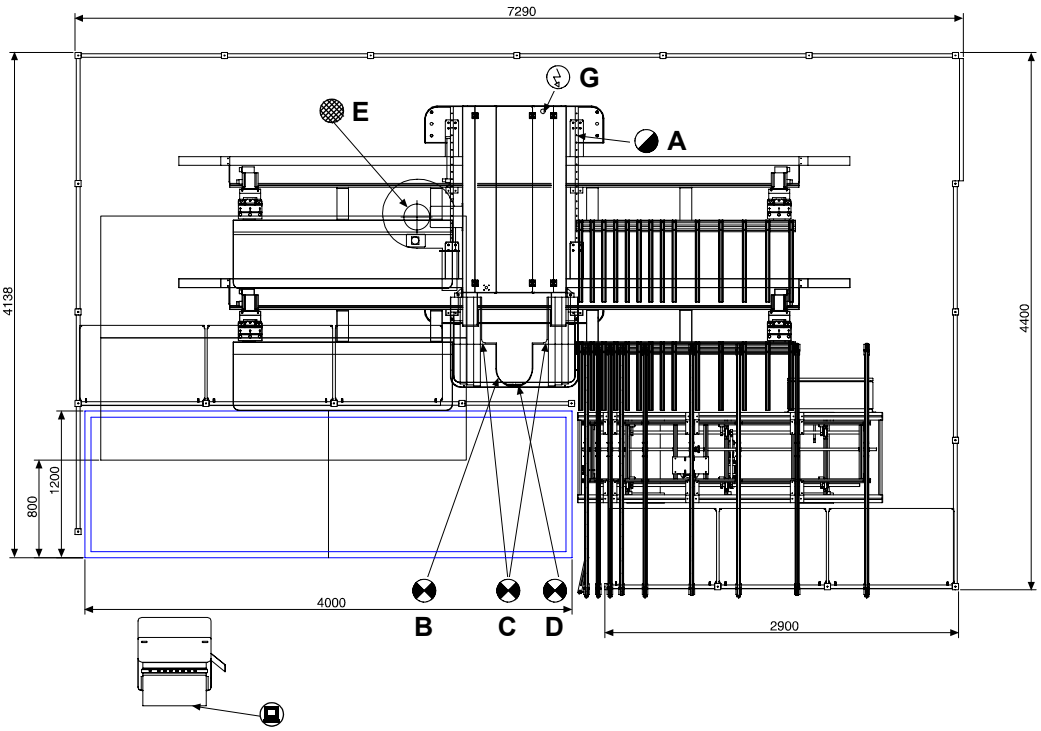


4. If there is a box containing the perimeter guards, this box must be placed near the HC door with the aid of a transpallet. Hoist the box with a lift truck to take it out of the container.

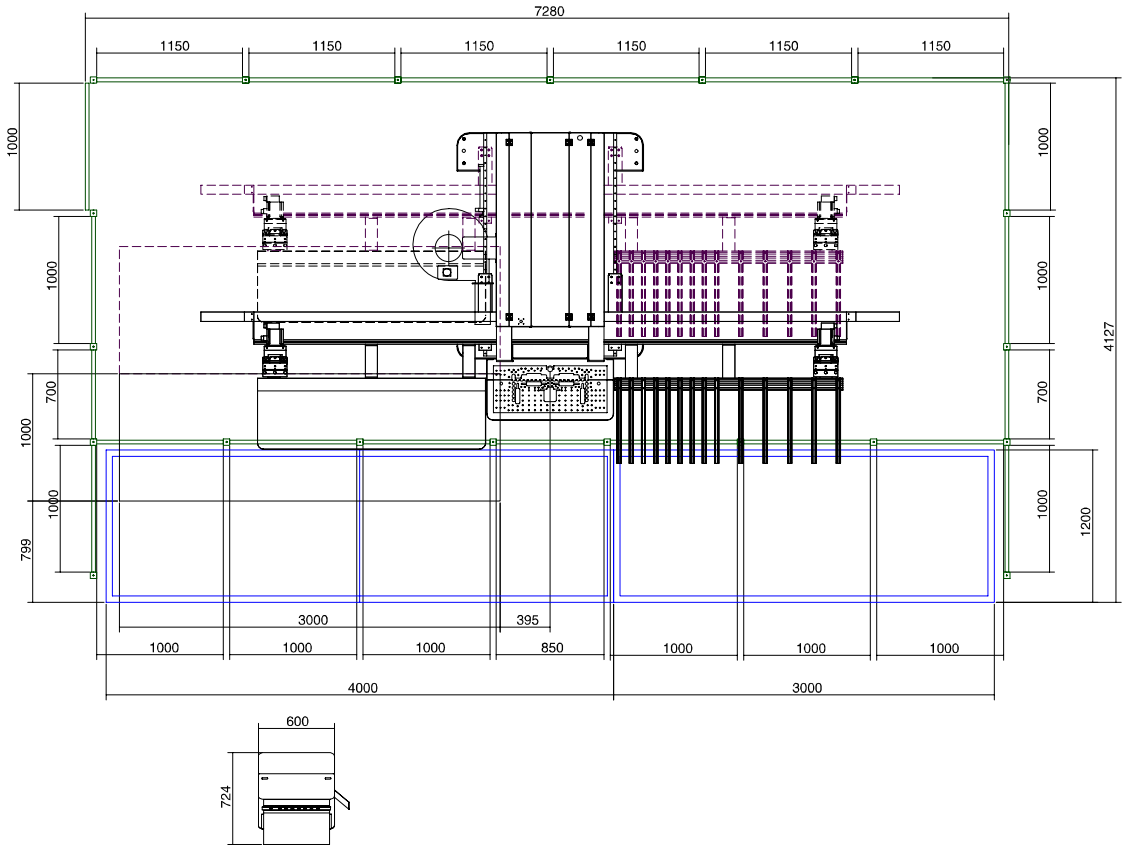


D Fitting

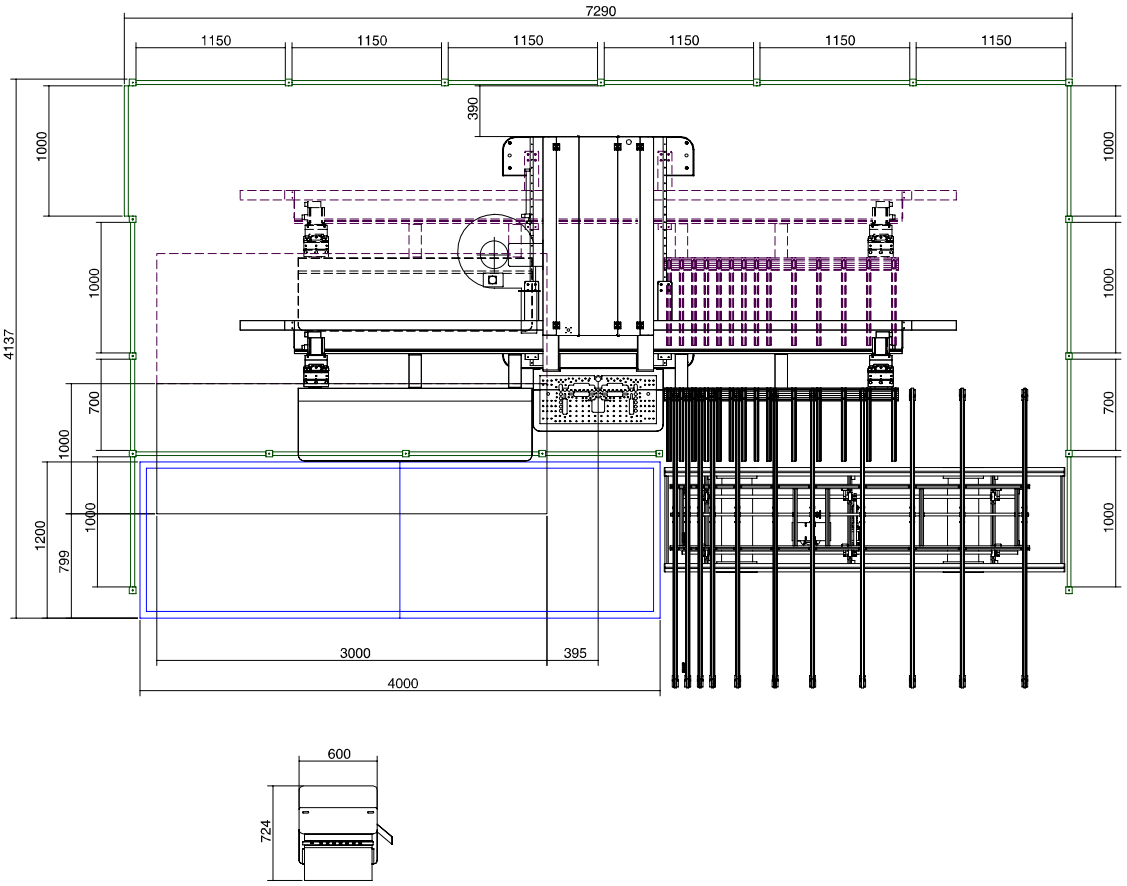
D.1 Machine layout, connection points and working dimensions



D.1.1



D.1.2


7290
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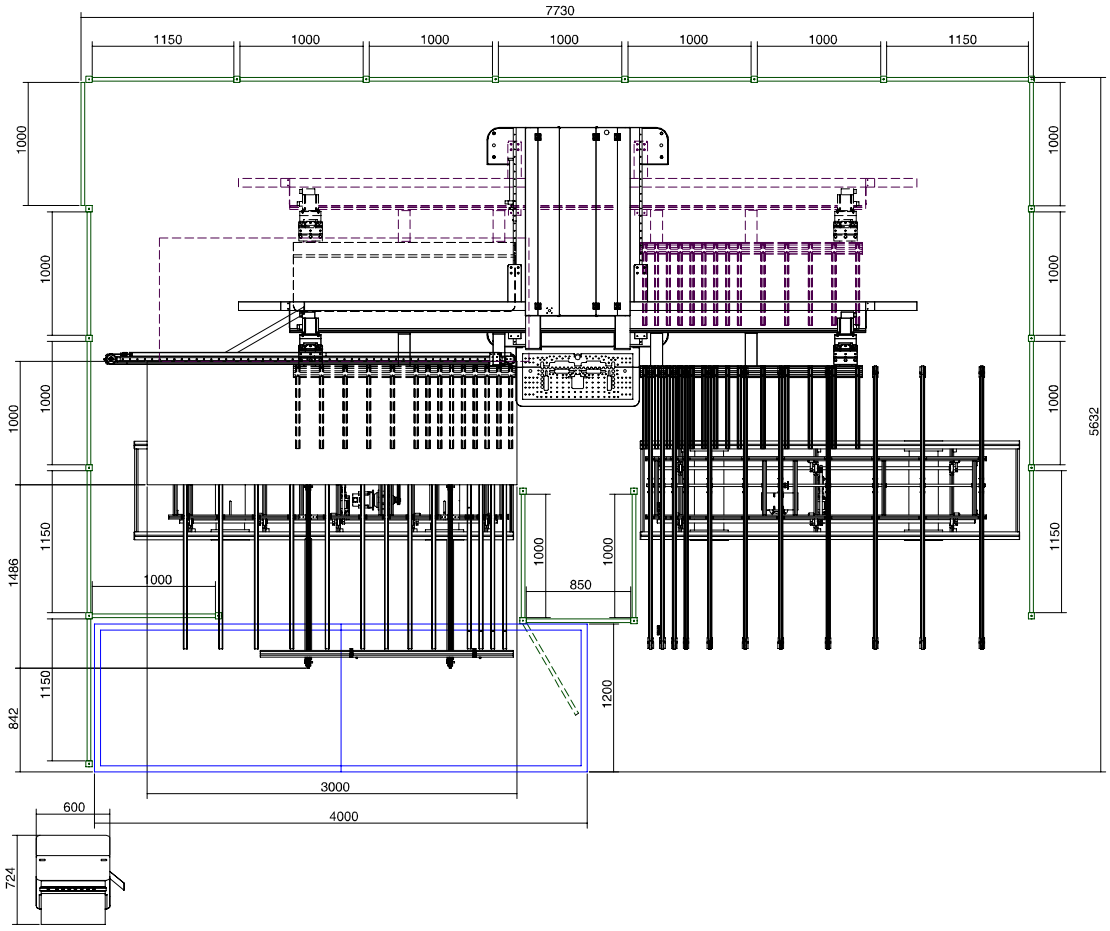
4000

600
724

D.1.3



D.2 Installation area requirements

The following describes the basic requirements both for the various systems to which the machine must be connected and for environmental conditions in the place of installation.

Electric system requirements

The quality of the electric system must guarantee the basic requirements listed in the following standards: CEI 60204-1, IEC 204-1, unless otherwise agreed with the client.

- Supply voltage: (see rating plate) tolerance ± 10%
- Frequency of power supplied: (see rating plate) tolerance ± 2%
- Maximum absorbed power: (see rating plate)
- Harmonic distortion: from second to fifth < 10% + from sixth to thirtieth < 2%
- Voltage imbalance in three-phase power supply: < 2%
- Pulse rate: duration of under 1.5 ms and < than 200% of the supply voltage
- Voltage breaks: duration < 3 ms; period > 1 second
- Voltage drops: value < 20% of peak supply voltage; period > 1 second
- The system must comply with the following standards: CEI 64-8, IEC 364

No differential type protection is foreseen for the machine's electric system. The choice of differential protection must not contrast with current legal requirement, local regulations or the characteristics of the factory and machine electric system.
Bear in mind the following machine characteristics to ensure you make the correct choice:

1. Electromagnetic disturbance protection devices (mains filter and screening) may produce high frequency leakage current sand pulse leakage currents exceeding 30 mA.
   The 30 mA differential switches may not guarantee continuous operation under all conditions.
2. The machine may be subject to earth faults even with direct current (IEC 755).
   If this is not in contrast with local laws or the characteristics of the system, it is recommended that you fit differential switches with adjustable currents and trip times, of the type that are not influenced by high frequencies.

For supply voltages of up to 400 V, the electrical cabinet is equipped with a main automatic trip switch for short-circuit currents of up to 10 KA R.M.S. or peaks of 17 KA.

For connection voltages greater than 415 V, the knife switch is capable of supporting short-circuit currents of up to 5 KA.

If the presumed short-circuit current at the supply points is higher, it must be limited.

Connection cable

The cable that connects the machine to the power supply must be shielded or pass through a metal duct to reduce electromagnetic interference. The shielding or duct must be earthed and the minimum cross-section of the connection cable is: 70 mm^2 (220 V - 230 V), 25 mm^2 (400 V)

Installed electrical power

The machine is equipped with numerous electrical components and therefore, to find out the installed power, consult the identification plate. (see page 25).

Pneumatic system requirements

The pneumatic system must guarantee a supply pressure of 7 bar.

Suction system requirements

The suction system, if there is one, must be permanently connected to the machine and operate with it, and must provide a constant minimum flow speed of 28 m/s.

⚠ ***Insufficient system performance can damage health.***

A guillotine valve type device must be provided on the pipe connecting the suction system to the machine, so that the machine can be cut off when necessary from the main system. This valve must be in an easily accessible position and in full view of the operator.

Flooring requirements

Vertical forces

- Maximum load per foot: 1300 kg.

Levelling

- Maximum flatness error for floor: 25 mm/m (not cumulable).
- Maximum slope of floor in any direction: 0.4%.

Environmental requirements

The area in which the machine is installed must conform to the following requirements:

- Temperature: between 0 and +35 °C (with air conditioner between 0 and +50 °C).
- Maximum relative humidity: 90% (without condensation).
- Maximum altitude: 1000 m (unless otherwise agreed with the customer).

E Decommissioning - Demolition

The machine uses lubricating oil and grease. To neutralize the lubricant fluids which remain attached to parts of the machine and cannot be re-used, use degradable solvents of an approved type. For evacuation of recoverable lubricant fluids empty the tanks and deliver the fluids to the local authority in charge of disposal. Any batteries, accumulators, buffer batteries for electronic cards and conditioners that may be found in the machine must also be disposed of in a suitable manner.

When the machine reaches the end of its technical working life it must be totally decommissioned so that it can no longer be used for the purposes for which it was designed and built. This procedure allows for re-use of the parts and raw materials contained in the machine. If any parts are used again it must be for purposes other than those for which the machine was originally constructed.

BIESSE declines all liability for damage to persons of things that may derive from any secondary use of single parts of the machine for functions or assemblies other than those originally contemplated. BIESSE recognises no implicit or explicit suitability for specific purposes of any parts of the machine which are used again after final decommissioning in view of demolition.

F Client servicing

F.1 Customer service department

The whole structure forms an integrated, highly efficient network that can be contacted by the user for any requests, information, advice or news that may be needed.
The service department includes technicians with full knowledge of the models produced, gained either during training in our factory or as a result of working experience. They are also available for on-site consultancy.

The Authorised BIESSE Service Centres are listed in the InDocs CD-rom.

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