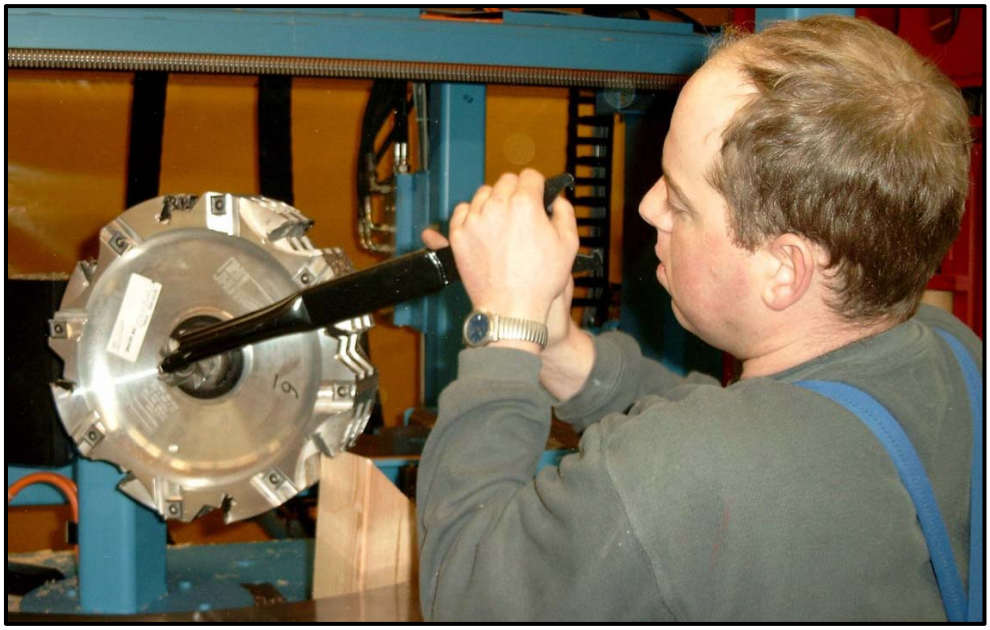
CNC Technology

Machine operator II



Development of a collection of reference materials containing course templates and course materials with the goal to include the latest CNC technology in the area of Wood Building & Construction

Establishment of a Centre of Competence for the Carpenter and Wood Building Profession through extension of the Centre for Carpenters in Kassel, Germany

BUNDESBILDUNGSZENTRUM DES ZIMMERER- UND AUSBAUGEWERBES bubiza.de
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Additional remarks with regard to configuration, work processes and possible disruptions for the machine operator

Positioning wagons

Work pieces can be fed into the machine as a stack of boards if the programmed processes allow for it (e.g. no jack rafter cuts).

If the work processes for the stack of boards require horizontal drilling, the horizontal drilling support would repeatedly drill holes at different heights. Caution! If the pieces differ in thickness the drill holes would be placed incorrectly as the machine bases those on the reference cross-section as programmed. Such a deviation might be tolerable for one piece however, through the stacking the error will be multiplied. Therefore, if required, correct the cross section and the placement of the drilling holes in the SPCP based on the actual measurements.

Is the cross section not square (e.g. beams not true to size, chamfers) it is possible that smaller indentation caused by the corrugation occur through the higher pressure on the surface. If necessary rotate the visible side of the work piece towards the fence. That is where the positioning wagons have an even surface and won't score the lumber.

If a bowed work piece is clamped only at the back end by the positioning wagon the other end might protrude beyond the out-feed fence. When the other positioning wagon moves to clamp the work piece it could result in a collision. Due to the fact that the positioning wagon jaw is wedge-shaped the work piece could split. Through the splitting of the work piece, the forces that hit the positioning wagon as a result of the crash are decreased. It is easier to replace the work piece. Such a collision can be avoided by correctly placing bowed pieces on the machine table or even better through avoiding substandard raw materials.

Logs may need to be fed manually as the feeding clamps may not be able to hold the piece securely. In addition, try to avoid rotations for the same reason.

Caution when ejecting the completed round work piece. A piece with a rectangular cross section remains in position, a log however may roll off the table and onto the floor.

When processing a work piece lengthwise, e.g. slots and rabbets slipping between the positioning wagons and the work piece may occur. This would be indicated by an incorrect placement of the process step that follows the machining of the slot or rabbet. The SPCP automatically moves work processes that may experience slipping to the very end which means that no other steps will follow. Should there still be issues in this regard, try to influence the result by selecting "Fixed Order". "Fixed Order" should only be used after careful consideration as this command has a significant impact on the overall processing and therefore, can lead to a crash when used incorrectly. "Fixed Order" should never include split cuts and also in general use it as rarely as possible.

When processing short work pieces switch off the hold-down clamps on the operator console as in the worst case scenario the work piece might fall off the table (no support from underneath).

Saw

If the beam has been pre-trimmed prior to loading the machine the saw cut at the front end can be eliminated. Enter in the machine data (d) →*operations* → *saw* → *perform a 90° sawcut* → *only behind* This significantly increases the processing speed. However, by eliminating the saw cut in the front (and without zero set measurement) deviations in length of up to one mm can result as the work piece is defined solely by the zero set beam.

A higher accuracy with regard to the length will be achieved when selecting instead of „ only behind" "always ". It is possible to select an initial cut off at the back end of the work piece that is less than 6 mm with the result that there is no waste piece, only shavings. In this case the ejector can be disabled. This can be achieved by turning the "Clear front off-cuts" switch to the "off" position at the operator console. In practice however, the machine operator often decides to increase the cut off measurement because of knots or other defects. In this case the waste piece could be thrown by the positioning wagon into the universal mill. This could have extremely serious effects. The decision to switch off the cut off ejector has to be considered carefully. The machine operator has to be aware of possible fatal consequences.

If there are mainly short cut-off pieces it might be better to remove the support plate in the saw aggregate. The waste piece could then just fall down without the necessity for a cut off ejector. This has to be entered in the machine data (d) → *saw* → *open saw table*. This leads to a considerable advantage in processing speed.

It has to be considered, that extremely short work pieces may need to be processed that be left on the saw table as the positioning wagon on the right hand side can't clamp it. Those pieces would end in the waste bin via the table opening.

The cut-off ejector behind the saw can be blocked by small waste pieces which get stuck in the slot of the saw. In this cause remove the off cut manually and press "Start".

A change in tool geometry caused by sharpening has to be corrected in the machine data (d) with the required offset value.

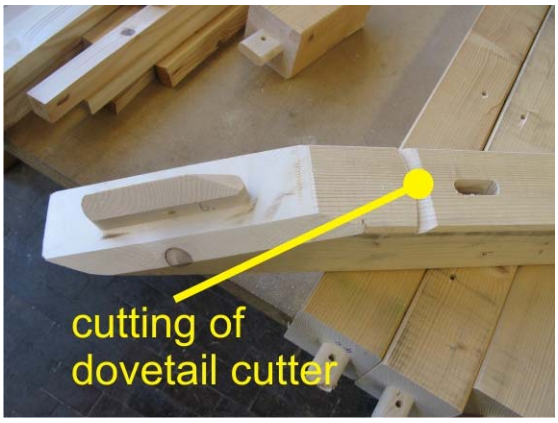
Universal Mill

Milling Head

The machine operator has to ensure that there is a good balance between fit and easy assembly when processing joints. Before starting the processing of a larger batch of tenons and mortises several sample pieces should be produced and if necessary the settings should be adjusted in the machine data (d).

A big advantage of the milling head is the fact that the tool geometry does not change as the scoring knives always have the same measurement. Therefore, the milling head can be used to check other tools that may change their geometry by processing a complex work piece like a bird's mouth hip rafter. Is there a variance in height between the segments processed by the milling head and the end mill the machine data (d) has to be corrected by the value of the offset for the front edge of the end mill.

The dovetail cutter which has been installed on the universal mill can disturb the processing of pointed tenons with the milling head. Such work pieces cannot be processed without removal of the dovetail cutter and subsequent changing of the machine data (d).



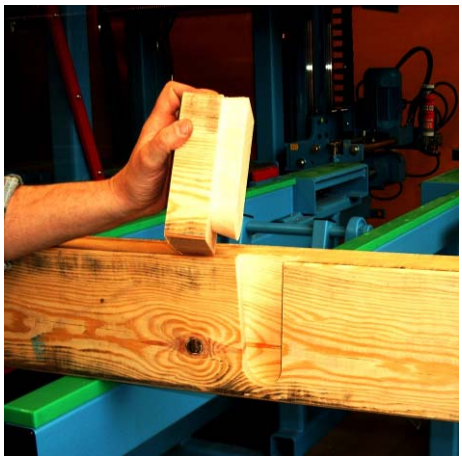
When the following error message is displayed during the processing of a chamfer “No clamping points found near process” the selection of tools should be switched from “automatic” to “Saw”. The crash shown in the picture on the right could have been avoided with the setting described above.

When processing work pieces with a small cross section there may be vibrations during processing which may lead to excessive tear out by the end mill due to the fact that the end mill is not chip limited. This could ultimately lead to the destruction of the work piece.

When processing profiled ends include an offset in the design. This pre-work will minimize tear out in the segment where the end mill will emerge. The picture on the right shows a large tear out which was caused by vibration and the missing offset in the design.

Dovetail Cutter

To achieve a good fit for dovetail joints (tight/easy to assemble) produce a couple of sample pieces and adjust any deviations in the machine data (d) – offset value. This is done by the machine operator. The settings on the office PC are not transferred with a job to the machine.

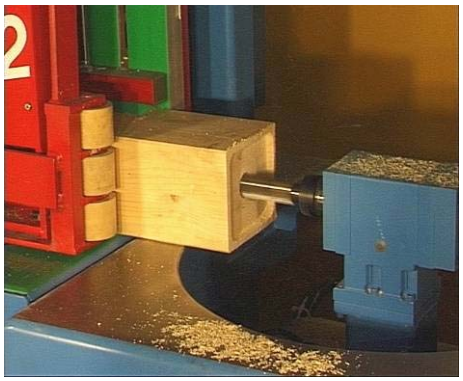


If the setting for the dovetail cutter is → *machine data (d)* → *operations* → *Dove tail mortises on fence side* → *Yes* there could be two additional rotations required but the fit will be better.

Dovetail cutters with scoring knives do not change their geometry as a result of sharpening. Mind the labelling when using corrugated knives. Change A, B and C and place at the position marked on the mill.

End mill (EM)

One of the course participants reported a problem with the mounting of an outrigger. When the fully automated joinery machine was still new the spikes of the outrigger could have been easily screwed into the wood. In the course of time however, this became harder and harder until the post split apart when the spike was screwed in. What could have caused this?

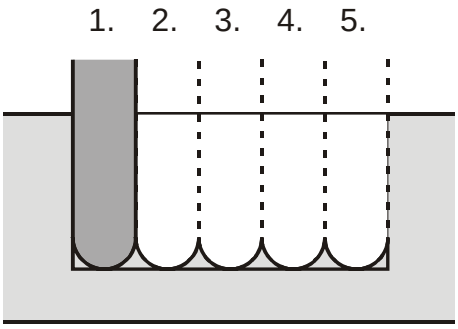


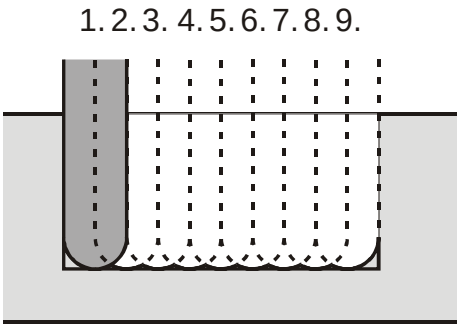
In very rare cases the lock nut of the end mill can get wedged. The end mill cannot be loosened in a case like this and after consultation with the hotline has to be dismantled. After that the bearing with the broken thread has to be removed with a special tool (shown below) and replaced with a new one.

Slot cutter

A change in tool geometry as a result of sharpening has to be adjusted on the machine in machine data (d).

The so called „Wavecrest“ which is caused by the round cutting shape at the bottom of the slot (drawing on the right) can be minimized by changing the setting in the machine data (d) → *operations* → *overlap slot strokes* → *Yes*. This causes the work piece to be moved by half a cut width and results in an overall increased cutting depth. However, the processing takes longer (drawing below).





If a slot needs to be cut with a sword that is less wide than the slot the sword has to cut several times moving upwards until the programmed width is reached. A thin sword will bend during the second, higher cut and has a tendency to move toward the already processed area. Therefore, the width of the slot is smaller at the bottom than at the edge. This phenomenon can be avoided by selecting the proper sword. Another cause for the bending of the sword could be a knot in the wood.