



Turning your world

APPLICATIONS **BROACHING**

INTRO

It is quite usual that we find features like internal and external keyways, hexagons or torx in our drawings. Sometimes these are done in a separate operation in a standalone broaching machine or they are simply subcontracted. Anyhow, in some cases, there is tooling that allows you to perform these operations in your CMZ lathe.

Broaching operations can be done in different ways, mainly depending on the type of tool and toolholder used:

- **Broaching tool using a fixed toolholder:** Tool and spindle are static, only Z axis motion is used int the cutting process with very shallow passes.
- **Broaching tool using a live slotting toolholder:** Tool has a Z traverse motion through the live toolholder and the spindle is static. Very shallow passes have to be programmed.
- **Wobble broaching or Rotary broaching:** The spindle is rotating and the tool is mounted with a slight angle in a holder that rotates free. When the tool touches the part, the tool engages and creates the feature. This process is only valid for feature like internal hexagons or torx.

Broaching can be done in all CMZ series. Depending on the size of the feature and the tolerances required Y axis may be required and if a slotting toolholder is used live tooling is compulsory.

BROACHING IN A LATHE

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Broaching operations can be done in different ways, mainly depending on the type of tool and toolholder used:

BROACHING USING A FIXED TOOLHOLDER

It is the simplest way to perform broaching in a lathe, no live tooling or Y axis is required. If tolerances or feature size is big Y axis is recommended both to achieve the tolerance and to use a smaller tool to make a bigger feature.

In this case, the broaching tools is mounted in a standard boring toolholder and a bushing. CMZ can supply internal turning toolholders as well as bushing to mount the broaching tool.



Several shallow passes have to be done until the required X dimension is achieved. To ease the programming only in internal features CMZ has a special macro, M385.

EXPLANATION FOR M385

M385 X_I_Z_B_F_U_;

- X End diameter of the feature (absolute X coordinate)
- I Initial diameter of the key-holder (absolute X coordinate)
- F Feedrate of the movement of the tool (mm/min)
- Z Length of the key-holder in the direction of Z axis (absolute Z coordinate)
- B Initial position in Z axis (absolute Z coordinate)
- U Depth of the pass in X axis (in diameter)

!

iNOTE! Before this cycle is executed, the spindle and the driven tool must be stopped.

B argument must be an initial position outside the piece.

If any of the arguments of this cycle is wrong, the alarm 3012 ILLEGAL COMMAND will be displayed.

The example consists of a preturned Ø20mm to make one single keyway with a depth of 15mm and height Ø23mm using a static toolholder and depth of cut 0.05mm.

T0101 (Broaching tool)

M5 (Stop spindle)

M80 (Activate C axis)

G28H0 (Find C axis origin)

M85 (Stop live tool)

G0X20Z10C0 (Approximation without slotting movement)

M385X23I20U0.1B10F100Z-15 (Broaching cycle) (Cutting conditions will depend on the material)

!

iNOTE! If a feature wider than the insert is required, or the tolerance is precise, Y axis can also be used to do several passes.

BROACHING USING A SLOTTING LIVE TOOLHOLDER

A different approach that allows you to make the broaching faster is the use of live slotting toolholders.

Different toolholders suppliers offer compatible products for all our machine series.

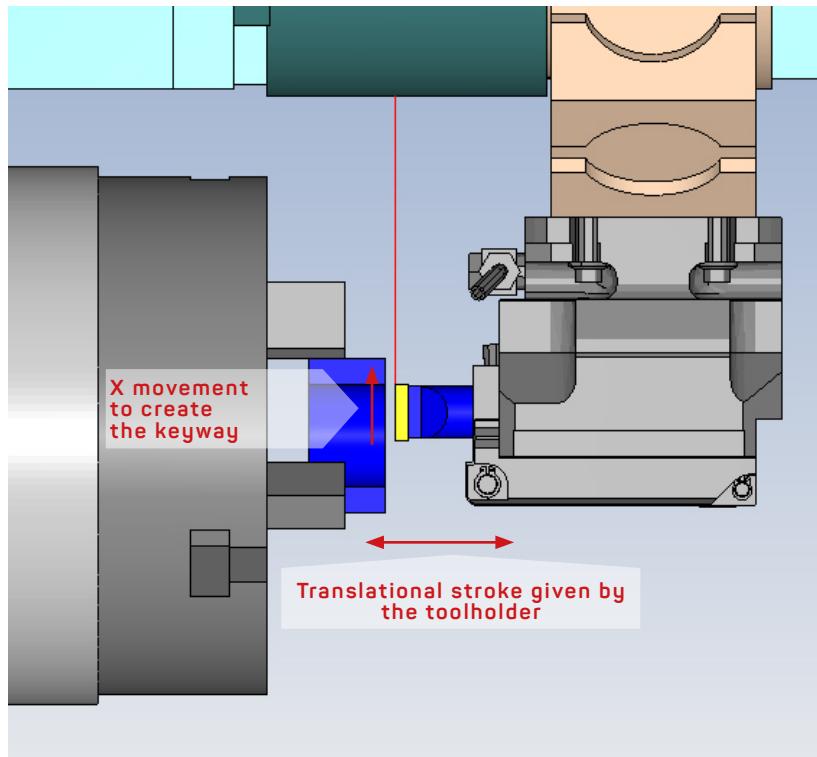
These toolholders convert the rotational movement of the live tool into a translational stroke and also due to a special mechanism the tool is only in contact during the machining direction as it lifts the tool in the return; maximising tool life. Different strokes are available in the market up to a maximum of 50.



Image courtesy of MT Marchetti

PROGRAMMING

As the toolholder is giving the stroke only the movement in X axis needs to be programmed.



The example consists of a preturned Ø20mm to make one single keyway with a depth of 15mm and height Ø23mm using a toolholder with a stroke of 25mm.

T0101 (Broaching tool)

M80 (Activate C axis)

G28H0 (Find C axis origin)

G0X20Z10C0 (Approximation without slotting movement)

G97G98S1000M83

G0X23F30 (X movement until the programmed dimension, cutting conditions will depend on the material)



!NOTE! If a feature wider than the insert is required, or the tolerance is precise, Y axis can also be used to do several passes.

WOBBLE BROACHING OR ROTARY BROACHING

Wobble/rotary broaching. This process is used mainly for internal hexagons or torx. In this case, the tool is a combination of a carbide tool that is mounted with a specific inclination into a holder that allows a free movement of the tool. The shaft of the holder has to be mounted into an internal turning toolholder.

The machining process is simple, while the spindle is rotating the tool approaches and when it contacts the part the tool starts rotating and pushing to generate the shape. No Y axis is needed for this process.



The example consists of an internal torx.

T0101 (Rotary broach)

G97S800M3

G0X0Z2

G99G1Z1F0.2

G1Z-5F0.04 (Cutting conditions will depend on the material)

G1Z2F0.2

M5

It is clear that any of these options will take longer than a dedicated machine but it allows to finish the part in one setup. Lubrication is also key to this process.

TA SERIES



Z400 MODEL



Z640 MODEL



Z1100 MODEL

TX SERIES



Y3 MODEL



Y2 QUATRO MODEL

TD SERIES



Z800 MODEL



Z1350 MODEL



Z2200 MODEL



Z3200 MODEL

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