

# CYLINDRICAL GRINDER

**CNC 8065**

User manual (·G· model).

Ref: 2602

**FAGOR**  
AUTOMATION



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#### TRANSLATION OF THE ORIGINAL MANUAL.

This manual is a translation of the original manual. This manual, as well as the documents derived from it, have been drafted in Spanish. In the event of any contradictions between the document in Spanish and its translations, the wording in the Spanish version shall prevail. The original manual will be labeled with the text "ORIGINAL MANUAL".

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#### MACHINE SAFETY.

It is up to the machine manufacturer to make sure that the safety of the machine is enabled in order to prevent personal injury and damage to the CNC or to the products connected to it. On start-up and while validating CNC parameters, it checks the status of the following safety elements. If any of them is disabled, the CNC shows the following warning message.

- Feedback alarm for analog axes.
- Software limits for analog and sercos linear axes.
- Following error monitoring for analog and sercos axes (except the spindle) both at the CNC and at the drives.
- Tendency test on analog axes.

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If the CNC hardware is modified by personnel unauthorized by Fagor Automation, it will no longer be under warranty.

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FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC due a computer virus in the system.

If a computer virus is found in the system, the unit will no longer be under warranty.

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#### DUAL-USE PRODUCTS.

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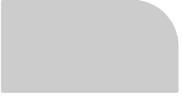
It is possible that CNC can execute more functions than those described in its associated documentation; however, Fagor Automation does not guarantee the validity of those applications. Therefore, except under the express permission from Fagor Automation, any CNC application that is not described in the documentation must be considered as "impossible". In any case, Fagor Automation shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC if it is used in any way other than as explained in the related documentation.

The content of this manual and its validity for the product described here has been verified. Even so, involuntary errors are possible, hence no absolute match is guaranteed. However, the contents of this document are regularly checked and updated implementing the necessary corrections in a later edition. We appreciate your suggestions for improvement.

The examples described in this manual are for learning purposes. Before using them in industrial applications, they must be properly adapted making sure that the safety regulations are fully met.

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## CNC 8065

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# BASIC CONCEPTS.

# 1

## 1.1 General concepts.

In the world of cylindrical grinders, there are different models and cycles to be run according to the parts to be ground.

Fagor offers a series of simple cycles to the market that cover a large percentage of the requirements of the parts to be ground.

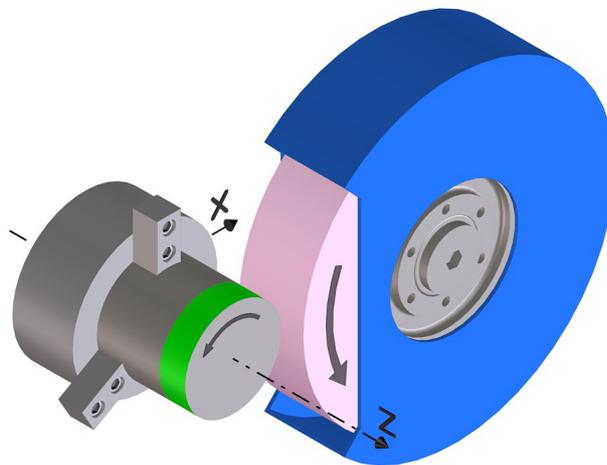
It also includes the option for the manufacturer to develop its own cycles, for better customer service.

It is important for the user to consider the cutting conditions, the work head spindle turning movement and the wheel and dressing turning movement in order to achieve precise grinding.

For the cycles developed and explained in this manual, the specific screens and cycles for the cylindrical grinder must be available.

## 1.2 Configuration of the machine axes.

The following image shows the configuration of the grinding machine axes.



1.

**BASIC CONCEPTS.**

Configuration of the machine axes.



CNC 8065

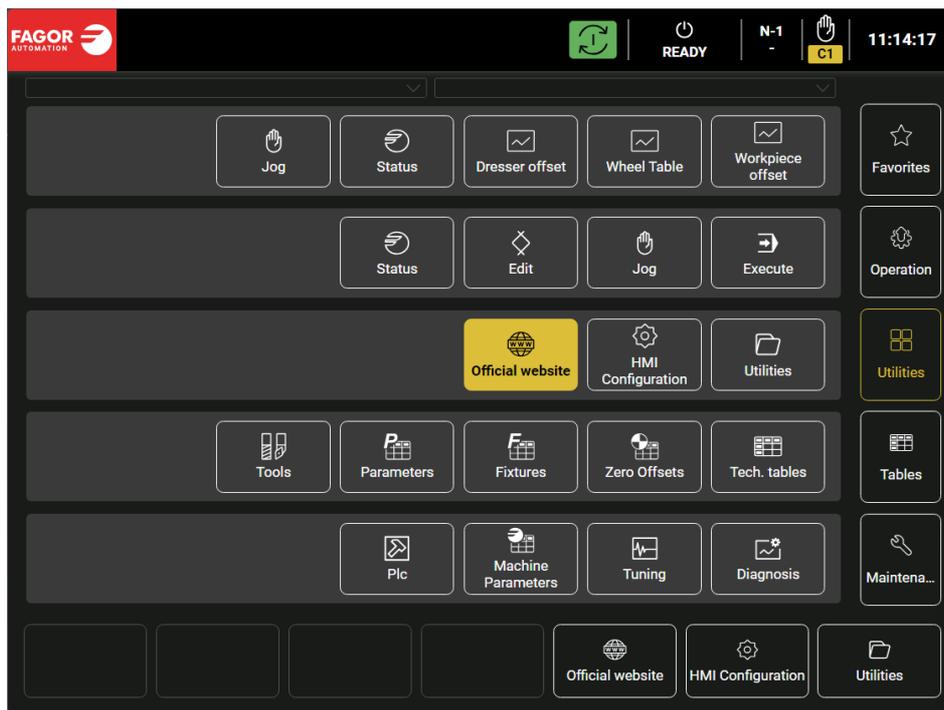
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# BASIC OPERATIONS.

# 2

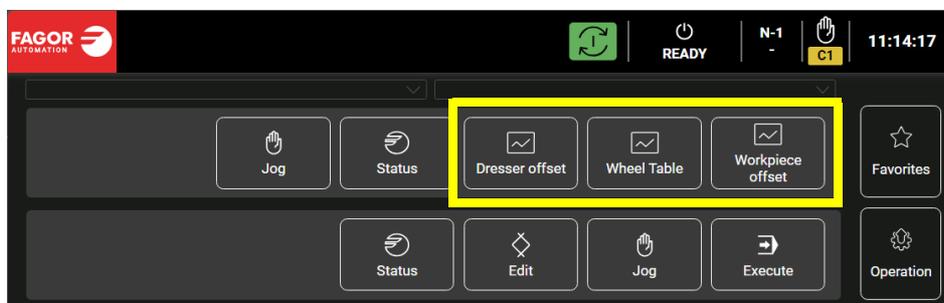
## 2.1 Main screen.

The main screen can be accessed from any screen by clicking on the red box in the upper left corner. This screen provides access to any of the CNC work screens.



The main screen has three specific screens for grinding machines.

- Workpiece Offset.
- Dresser Offset.
- Wheel Table.

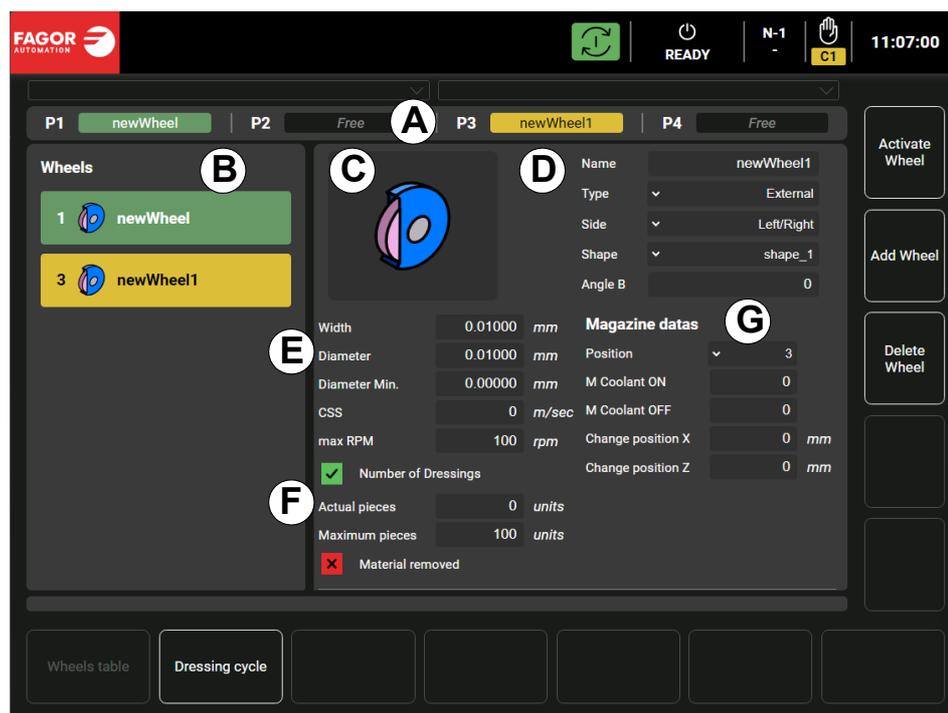


In addition to these three screens, the CNC also has a series of screens and cycles specifically for grinders.

- Modeling or dressing cycle.
- Tools. This scree is important for configuring the wheels and dressers.
- Cylindrical grinder cycles (external and internal).

## 2.2 Wheel Table.

This screen displays the available wheels together with all their data and characteristics. This screen also allows users to add or remove wheels, as well as activate the desired wheel.



### Description of the data on the Wheel Table screen.

#### A Wheel position window.

- **P1, P2, P3, P4:** Indicate the wheel in each position in the magazine. Magazine positions that do not have a wheel are shown as free. This window only appears if the machine has a magazine.

The active wheel will be highlighted in green and the wheel shown on the screen will be highlighted in yellow.

#### B Wheel selection window.

- **Wheels:** Allows the user to select the wheel to be displayed on the screen. When selecting a wheel, it will be highlighted in yellow in both this window and the window above (A), indicating its position in the magazine.

#### C Graphical representation of the wheel.

#### D Wheel data.

- **Name:** Wheel name.
- **Type:** Wheel type.
- **Side:** Sides of the wheel that can be worked on.
- **Shape:** Shape of the wheel and dressing conditions.
- **Angle B:** Wheel inclination angle.

#### E Wheel dimensions and cutting conditions.

- **Width:** Wheel width.
- **Diameter:** Wheel diameter.
- **Diameter Min.:** Minimum wheel diameter with which machining is possible.
- **CSS:** Constant cutting speed in m/s.
- **Max RPM:** Maximum wheel speed in rpm.

#### F Frequency at which dressing should be performed.

- **By number of operations achieved.**
  - Actual pieces.
  - Maximum pieces.
- **By amount of material removed.**

2.

BASIC OPERATIONS.  
Wheel Table.

- G** Magazine data (only displayed if the machine has a magazine).
- **Position:** Position of the magazine where the wheel is located.
  - **M Coolant ON:** M function that activates the coolant.
  - **M Coolant OFF:** M function that deactivates the coolant.
  - **Change position X:** Tool change position on the X axis.
  - **Change position Z:** Tool change position on the Z axis.

### 2.2.1 Activate wheel.

Follow these steps to activate the desired wheel:

- 1 On the 'Wheel table' screen, select the desired wheel in the wheel selection window (B) and press the vertical [Activate wheel] softkey or [F12].
- 2 The message 'Press START to activate wheel' will appear.
- 3 Press [START] and the wheel change subroutine will be executed.
- 4 Once the wheel change subroutine has been executed, the following message will appear in the top left window: "Press START to execute wheel change".
- 5 Press [START] and the wheel change will be executed.
- 6 Check that the newly activated wheel is highlighted in green in both the wheel position window (A) and the wheel selection window (B).

### 2.2.2 Add wheel.

Follow these steps to add a wheel:

- 1 On the "Wheel table" screen, press the vertical [Add wheel] softkey or [F11]. The new wheel will be highlighted in yellow in the wheel selection window (B).
- 2 Enter the name you want to give the wheel along with the wheel details.
- 3 In the Magazine Data area (G), select one of the positions that appear as "Free" in the wheel position window (A). This step only needs to be performed if the machine has a magazine; otherwise, leave the position set to 0.
- 4 Once the name and position of the wheel have been defined, enter the rest of the data on the screen.

### 2.2.3 Delete wheel.



To delete a wheel, you must ensure that the wheel you want to delete is not the active wheel. If you would like to delete the active wheel, you must first deactivate it. To do this, select another wheel and set it as the active wheel. See "[2.2.1 Activate wheel.](#)" on page 9.

Follow these steps to delete a wheel:

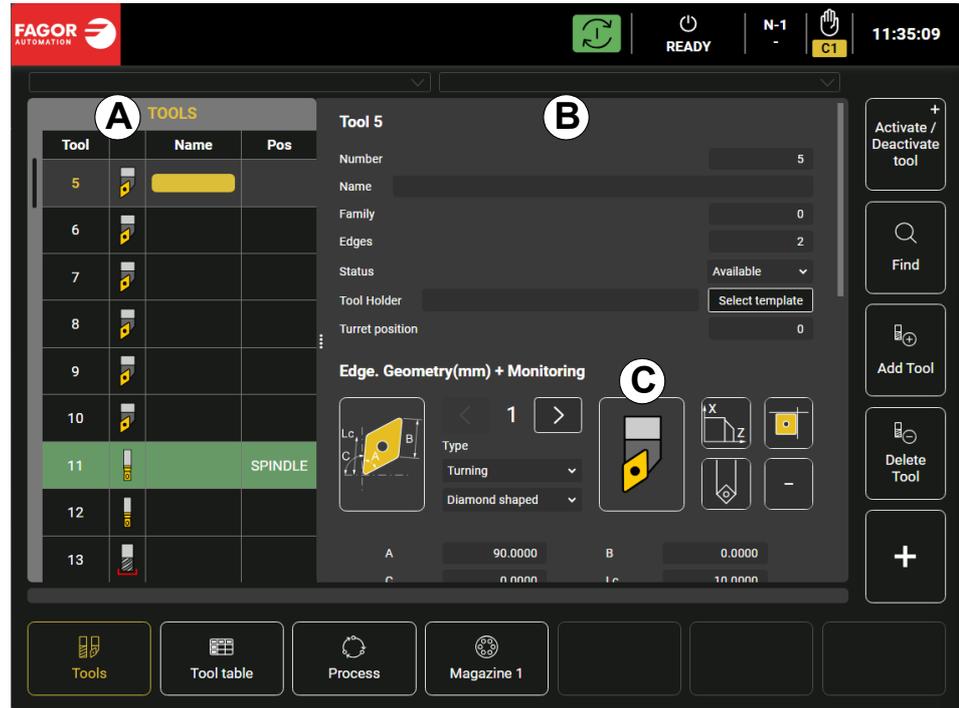
- 1 On the "Wheel Table" screen, select the wheel to be deleted in the wheel selection window (B).
- 2 Press the [Delete wheel] softkey or [F10]. The selected wheel will disappear from both the wheel selection window (B) and the wheel position window (A), and its position will be displayed as "Free".

## 2.

## 2.3 Tools.

The tools screen allows users to configure the dressers that will be used to dress the wheels. It is very important to enter the data and location code correctly.

Press the "Tools" button on the main screen to access the Tools screen.



### A Tools.

List of available tools showing the tool number, a graphic representation of the tool, the tool name and its position in the magazine.



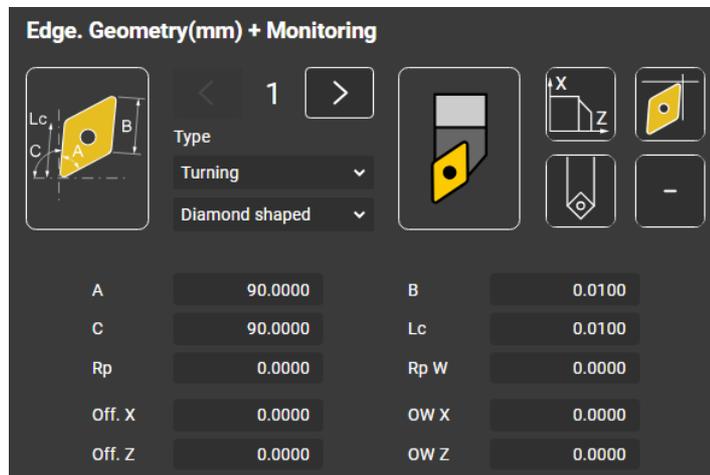
*CNC tools T1 to T11 are reserved by the machine manufacturer as tools for the grinder. Tools from T1 to T10 are reserved for dressers and tool T11 for the active grinding wheel.*

### B Basic tool information.

It allows you to define basic information about the tool, such as name, tool number, family, correctors, status, etc.

### C Tool geometry.

It allows you to define the type of tool, as well as its geometry and location code. This information is very important when selecting the dressers for the wheels.



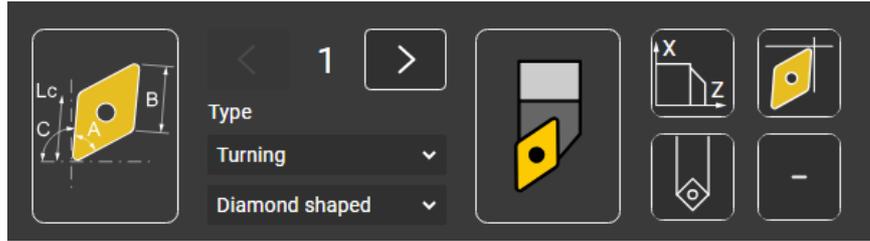
# 2.

## BASIC OPERATIONS.

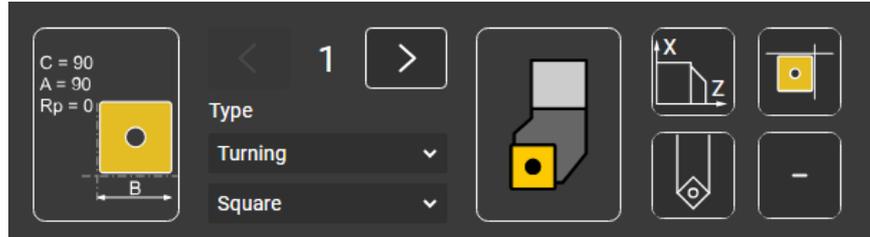
Tools.

Any type of turning tool (rhombic, square or round) can be used to define the geometry of the dresser.

- Rhomboid tool.



- Square tool.



- Round tool.



The icon indicating the orientation of the axes must be as follows:



The orientation of the axes must be as shown in this icon.

The two tips of a dresser (left and right side of the wheel) are defined in a single T in the tool table, each tip on an offset.



*It should be noted that the location codes for defining dresser tips do not follow the logic of lathe tools. The location codes must be defined as shown below.*

- Corrector D1 for the dresser tip on the left side of the wheel must always have the location code F7.

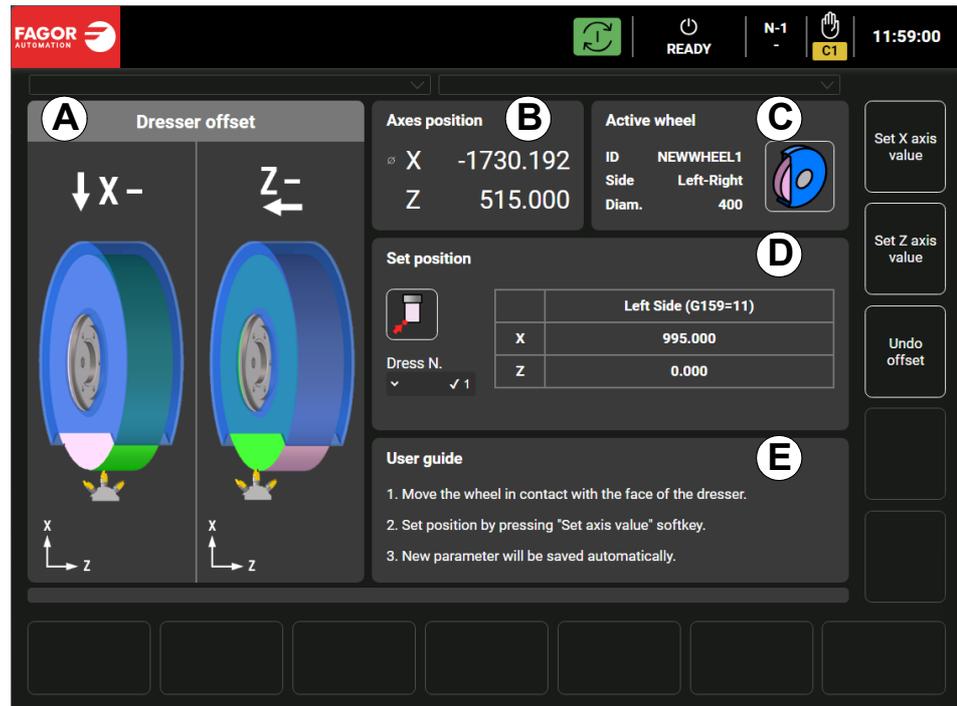


- Corrector D2 for the dresser tip on the right side of the wheel must always have location code F5.



## 2.4 Dresser Offset.

Grinder wheels must be dressed regularly to maintain the correct profile and thus ensure proper grinding. On this screen, it is possible to capture the zero points of the wheel with respect to the dresser (Dresser offset).



### Description of the data on the Dresser Offset screen.

- A Graphic representation:** Displays the selected wheel, dresser and axes.
- B Axes position:** Current position of the X and Z axes relative to the active origin. The position of the X axis is shown in diameters.
- C Active wheel:** Basic information about the active wheel.
- D Set position:** Position saved at origin G159=11 or G159=12.



Icon that allows the user to select the side of the wheel on which the dresser-wheel zero capture is to be made.

This icon will only display the options available based on the grinding wheel settings. The "Side" parameter in the grinding wheel table indicates which sides of the grinding wheel can be used for working.

- Left: Only allows you to select the left side.
- Right: Only allows you to select the right side.
- Left + Right: Allows you to select the desired side.

The origin where the position is saved changes when clicking on the icon and changing sides.

- Left side: G159=11.
- Right side: G159=12.



When capturing the dresser-wheel zero, take the largest diameter of the wheel and the part of the wheel furthest to the left (G159=11) or furthest to the right (G159=12).

# 2.

BASIC OPERATIONS.  
Dresser Offset.

**Dress N.:** Allows the user to select the dresser in which the origin is stored.

- If the selected dresser has a ✓, it means that it has a dresser-wheel zero stored. All the dressers referenced have a ✓.
- This dresser wheel zero can be deleted using the [Delete Offset] softkey.
- If the dresser-wheel zero is deleted from a dresser, the ✓ of that dresser disappears.
- To perform a dressing operation, the dresser used must have a stored dresser-wheel zero reference; otherwise, the CNC will display an error and dressing will not be possible.

**E User guide:** Basic instructions for capturing the dresser-wheel zero.



*Each of the wheels available in the machine's magazine has its offsets (G159=11, G159=12) stored in the technology tables and are updated when the wheel is activated.*

### 2.4.1 Process for capturing the dresser-wheel zero.

The process for capturing the dresser-wheel zero is as follows:

- 1 On the main screen, press the "Dresser Offset" button.
- 2 The following message will appear: Press START to confirm.
- 3 Press [START] to execute the offset change subroutine G159=11 or G159=12.
- 4 If you would like to capture the dresser-wheel zero on the opposite side to that indicated by the side selection icon (window D), press the icon and then press [START]. The icon and the selected G (G159=11 or G159=12) will be displayed in the window.
- 5 Select the dresser with which you want to capture the dresser-wheel zero and press [START].
- 6 With the wheel in motion, move until contact is made with the diamond (there will be sparks) on the X or Z-axis.
- 7 When the wheel is in contact with the dresser, press the [Save X-axis value] softkey or [F12] to store the X position, or the [Save-Z axis value] softkey or [F11] to store the Z position, and press [START].
- 8 Once the position has been stored, remove the axis so that the other axis can be stored in the same way. It does not matter on which axis this operation is performed first.
- 9 After storing the position on both axes, the saved position will be displayed in the save position window (D) at origin G159=11 or G159=12, and the axes position window (B) will show the coordinate with the newly activated offset.

## 2.

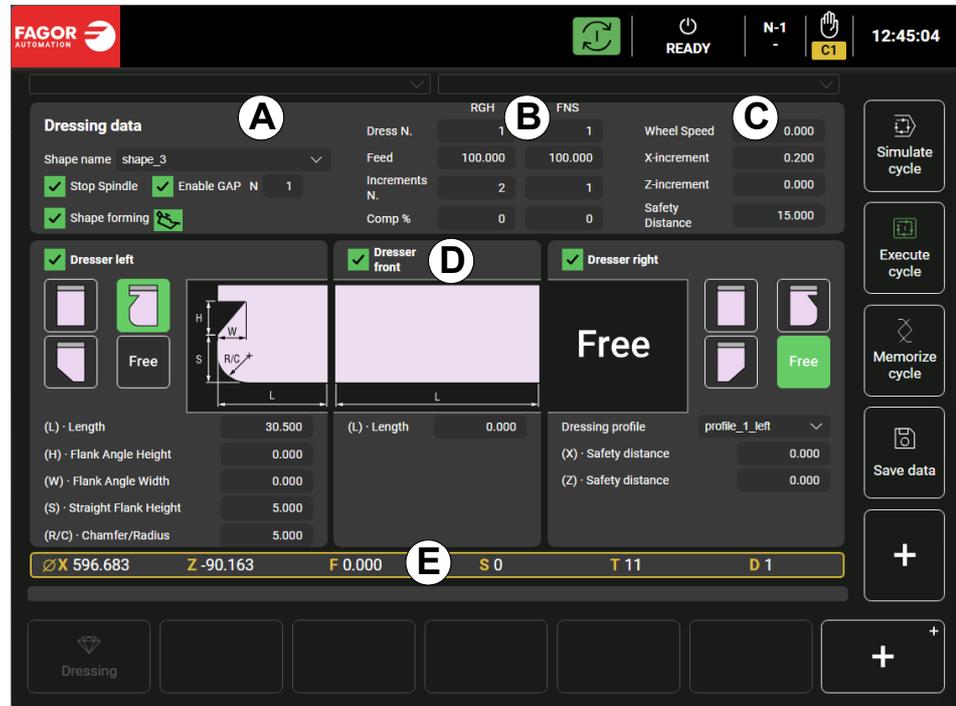
## 2.5 Modeling or dressing cycle.

Grinder wheels must be dressed regularly to maintain the correct profile and thus ensure proper grinding. This screen allows the user to perform the dressing or profiling of the wheels available on the machine.



The CNC automatically updates the part origins on each side after the diamond dressing.

To access the modeling or dressing cycle, start from the "Edit" screen and press the [Cycles] softkey or [F5], then select [Dressing]. This cycle can also be accessed from the "Wheels Table" screen by pressing the [Modeling cycle] softkey.



### Description of the Modeling or Dressing data:

#### A Dressing data.

- **Shape name:** Name of the program containing the wheel shape.
- **Stop spindle:** Workpiece spindle stop activated or deactivated during diamond dressing. This prevents vibrations during diamond cutting.
- **Enable GAP:** GAP enabled/disabled. GAP is a cycle performed before roughing that calculates the dimensions of the part using acoustic signals.
- **N:** GAP program number for diamond dressing.
- **Profile shape:** Initial profile shape for new wheel (only if run from outside a grinding cycle).



Enable coolant during dressing.

#### B Data from the RGH and FNS columns.



- When the dressing is performed without accessing from a grinding cycle, the data in the RGH column of the modeling or dressing cycle will be used.
- When dressing is executed after accessing from a grinding cycle, if access is made before roughing, the data in the RGH column will be used.
- If dressing is executed after accessing from a grinding cycle and after roughing has been performed, the data in the FNS column will be used.

- **Dress N.:** Dresser to be used.
- **Feedrate:** Dressing progress.
- **Increments N.:** Number of dressing passes.
- **Comp %:** Percentage of wheel flailing during dressing.

# 2.

BASIC OPERATIONS.  
Modeling or dressing cycle.

C Other Dressing information.

- **Vel. Wheel:** Wheel velocity for dressing.
- **X increment:** Front dressing pass increment.
- **Z increment:** Lateral dressing pass increment.
- **Safety distance:** Incremental X return position.

D Data on the left, front and right sides of the wheel.



This icons allow the user to select the shape of the wheel for dressing on each part of the wheel. The front will always be straight, and only the length (L) needs to be entered.

Depending on the form selected, the data to be entered will appear.



Data to be entered:  
(L) - Length



Data to be entered:  
(L) - Length  
(B) - Inclination angle  
(A) - Width inclination

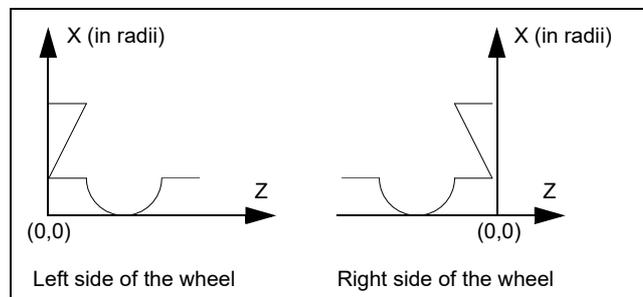


Data to be entered:  
(L) - Length  
(H) - Flank angle height  
(W) - Flank angle width  
(S) - Straight flank height  
(R/C) - Chamfer/Radius



Data to be entered:  
Dressing profile: Select a profile created with the geometry editor.

The profiles must be created with the axes as shown in the following example:



(X) - Safety Distance  
(Z) - Safety Distance

E Machine status information.

2.5.1 Save data from a modeling or dressing process.

Whenever any data is modified on the modeling or dressing screen, press the [Save data] softkey or [F9] for the changes to take effect.

2.5.2 Create or delete a Shape.

- To create a new shape, enter the desired name in "Shape name" and press the [Save data] softkey or [F9].
- To delete an existing shape, select the desired shape in "Shape Name", press the vertical [+] softkey or [F8] and then press the vertical [Delete Shape] softkey or [F11].

### 2.5.3 Edit an existing "Free" profile.

To edit an existing "Free" profile, follow these steps:

- 1 Select the profile to be edited from the "Dressing Profile" list.
- 2 Press the "RECALL" key to access the geometry editor.
- 3 Modify the profile and then press the [Finish] softkey or [F6] to finish.
- 4 Press the [Save data] softkey or [F9].

### 2.5.4 Edit a new "Free" profile.

Follow these steps to edit a new "Free" profile:

- 1 Enter the name of the new profile in "Dressing Profile".
- 2 Press the "RECALL" key to access the geometry editor.
- 3 Press the [Settings] softkey or [F7] and fill in the settings data as shown in the following image. As shown in the image, the symbol of diameter for the X-axis must be disabled.

Configuration	
Main axes	X,Z
Plane	G18 ▾
1st axis name	Z
2nd axis name	X Ø
Units	Millimeters ▾
Info aux	full ▾
<input type="button" value="Accept"/> <input type="button" value="Cancel"/>	

- 4 Edit the desired profile.
- 5 To finish, press the [End] softkey or [F6].
- 6 Press the [Save data] softkey or [F9].

### 2.5.5 Simulate or perform a dressing operation.

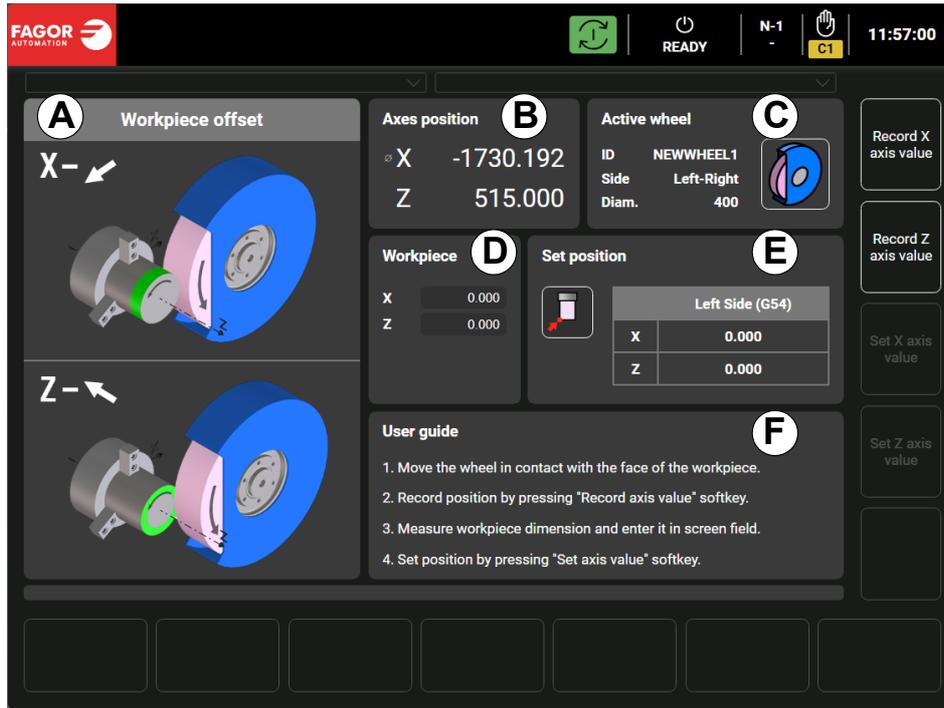
Once the dressing data has been entered and saved, it can be executed or simulated directly from the same screen.

Follow these steps to perform or simulate a dressing operation:

- If you would like to simulate the dressing operation, press the [Simulate cycle] soft key or [F12]. The CNC will take you to the simulation screen. To simulate the dressing operation, press the [Start simulation] softkey or [F12].
- If you would like to perform a dressing operation, press the [Execute cycle] softkey or [F11]. Press [START] to execute the cycle. The CNC will take you to the execution screen and execute the cycle.

## 2.6 Workpiece Offset.

On this screen, it is possible to capture the zero points of the wheel with respect to the workpiece (workpiece offset).



**2.**  
**BASIC OPERATIONS.**  
 Workpiece Offset.

### Description of the data on the Workpiece Offset screen.

- A Graphic representation:** Displays the wheel, workpiece and selected axes.
- B Axes position:** Current position of the X and Z axes relative to the active origin. The position of the X axis is shown in diameters.
- C Active wheel:** Basic information about the active wheel.
- D Workpiece:** Part dimensions. The X coordinate is indicated in diameters.
- E Set position:** Position saved at origin G54 or G55.



Icon that allows the user to select the side of the wheel on which to capture the workpiece-wheel zero.

This icon will only display the options available based on the grinding wheel settings. The “Side” parameter in the grinding wheel table indicates which sides of the grinding wheel can be used for working.

- Left: Only allows you to select the left side.
- Right: Only allows you to select the right side.
- Left + Right: Allows you to select the desired side.

The origin where the position is saved changes when clicking on the icon and changing sides.

- Left side: G54 or G159=1.
- Right side: G55 or G159=2.

- F User guide:** Basic instructions for capturing the zero workpiece-wheel.



Each of the wheels available in the machine's magazine has its offsets (G54, G55) stored in the technology tables and are updated when the wheel is activated.

## 2.6.1 Process for capturing the workpiece-wheel zero.

The process for capturing the workpiece-wheel zero is as follows:

- 1 On the main screen, press the "Workpiece Offset" button.
- 2 The following message will appear: Press START to confirm.
- 3 Press [START] to execute the offset change subroutine G54 or G55.
- 4 If you would like to capture the workpiece-wheel zero on the opposite side to that indicated by the side selection icon (window E), press the icon and then press [START]. The icon and the selected G (G54 or G55) will be displayed in the window.
- 5 With the wheel in motion, move until contact is made with the part (there will be sparks) on the X- or Z-axis.
- 6 When the wheel is in contact with the workpiece, press the [Store X-axis value] softkey or [F12] to save the X position, or the [Store Z-axis value] softkey or [F11] to save the Z position.
- 7 Once the position has been stored, remove the axis so that the other axis can be stored in the same way. It does not matter on which axis this operation is performed first.
- 8 Once they have been stored on both axes, remove the axis and measure the workpiece on both axes.
- 9 Enter the measured value in the Part (D) window for each axis and press ENTER. Remember that the value in diameters must be entered for the X-axis.
- 10 Save the position by pressing the softkey [Store X-axis value] or [F10] for the X axis and [Store Z-axis value] or [F9] for the Z axis, and press [RUN].

After storing the position on both axes, the saved position will be displayed in the save position window (D) at origin G54 or G55, and the axes position window (B) will show the coordinate with the newly activated offset.

# 2.

**BASIC OPERATIONS.**  
Workpiece Offset.

All cycles can be simulated or executed individually as a single cycle by pressing the vertical [Simulate cycle] or [Execute cycle] softkeys on the screen for the desired cycle.

They can also be stored in a program by pressing the vertical [Memorize cycle] softkey and inserting the stored cycle in the desired line of the program being edited. Once this is done, the selected program can be simulated or executed.

## 3.1 Access to grinder cycles.

Follow these steps to access the grinder cycles:

- 1 On the main screen, press the "Edit" button to access the program editing screen.
- 2 Once on the "Edit" screen, press the [Cycles] softkey or [F5] and the available cycle options will be displayed.
- 3 Select the option [External cylindrical grinding cycles] or [Internal cylindrical grinding cycles]. The horizontal softkeys menu displays all available cylindrical grinding cycles, grouped by grinding type.
- 4 Press the softkey corresponding to the desired grinding type and then select the desired cycle.

### 3.2 Cycle editing.

Once the desired cycle has been accessed, edit the cycle by filling in the fields displayed on the screen and selecting the desired options using the available icons.



#### Description of the cycle data:

- A Graphic representation of the cycle.
- B Cycle geometry data.
- C Measuring cycle (only displayed if a measuring device is present).
- D Selection of the different machining phases and conditions.
- E Data of the wheel to be used for the machining cycle.
- F Dressing data.
- G Machine status information.

### 3.3 Simulation or execution of a cycle.

Once the desired cycle has been accessed, it can be executed or simulated directly from the cycle screen.

Follow these steps to execute or simulate a cycle:

- 1 Access the cycle you want to execute or simulate.
- 2 Complete the cycle data.
- 3 Simulate or execute the cycle.
  - If you would like to simulate the cycle, press the [Simulate cycle] softkey or [F12]. The CNC will take you to the simulation screen. To simulate the cycle, press the [Start simulation] softkey or [F12].
  - If you would like to execute the cycle, press the [Execute cycle] softkey or [F11]. Press [START] to execute the cycle. The CNC will take you to the execution screen and execute the cycle.

# 3.

**CYCLE EDITING.**  
Cycle editing.

### 3.4 Inserting a grinder cycle into a program.

The CNC allows the user to insert one or more cycles into a program, and then execute or simulate this program.

Follow the steps below to insert a cycle into a program:

- 1 On the main screen, press the "Edit" button to access the program editing screen.
- 2 From the "Edit" screen, press the [Select program] softkey or [F1].
- 3 Press option [1. Explorer] and select the desired program or create a new one.
- 4 Once inside the desired program, press the [Cycles] softkey or [F5] to display the available cycle options.
- 5 Select the option [External cylindrical grinding cycles] or [Internal cylindrical grinding cycles]. The horizontal softkeys menu displays all available cylindrical grinding cycles, grouped by grinding type.
- 6 Press the softkey corresponding to the grinding type and select the desired cycle.
- 7 Complete the cycle data.
- 8 After filling in the cycle data, press the [Store] softkey or [F10]. The CNC will then display the "Edit" screen.
- 9 Select the line in which to insert the cycle and press the [F9] softkey. This softkey displays the name of the cycle just stored.

### 3.5 Execution or simulation of a program with grinder cycles.

- 1 Once the program has been edited with the desired cycles, it will be possible to simulate or execute the program from this screen. The [Simulate program] and [Execute program] softkeys are available for this purpose.
- 2 Simulate or execute the program.
  - If you would like to simulate the program, press the [Simulate program] softkey or [F12]. The CNC will take you to the simulation screen. To simulate the program, press the [Start simulation] softkey or [F12].
  - If you would like to execute the program, press the [Execute program] softkey or [F11]. Press [START] to execute the program. The CNC will take you to the execution screen and execute the program.

3.

CYCLE EDITING.

Inserting a grinder cycle into a program.

# 3.

## **CYCLE EDITING.**

Execution or simulation of a program with grinder cycles.



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# CYLINDRICAL GRINDING CYCLES (EXTERNAL).

# 4

## 4.1 Plongee.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Plongee], and press [Plongee] in the drop-down menu.



### Meaning of the cycle variables.

#### A Geometry.

- $\varnothing$  = Final diameter.
- Z = Z position for performing the plongee (left side or right side).
- S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

Fx = X-axis feedrate for the phase.

t = Waiting time after phase completion.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2 \cdot \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2 \cdot \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

## 4.

## CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Plongee.

## 4.2 Plongee & Shoulder.

This cycle consists of performing a plongee and a shoulder cycle on the cylindrical grinder.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Plongee], and press [Plongee + Shoulder] in the drop-down menu.



# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Plongee & Shoulder.

### Meaning of the cycle variables.

#### A Geometry.

- $\varnothing$  = Final diameter.
- Z = Z position for performing the plongee (left side or right side).
- $\Delta Z$  = Stock of material to be ground on Z (shoulder).
- S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

#### B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

- Set = Program number with set point for the measuring device.
- St. = Additional travel if the final diameter increases without contacting the gauge.
- Wpos = Position of the measuring device to measure the part.
- Win = Position of the measuring device for safe forward/reverse feedrate.

## 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Plongee & Shoulder.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

Fx = X-axis feedrate for the phase.

t = Waiting time after phase completion.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2 \cdot \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2 \cdot \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

### 4.3 Reciprocating.

This cycle consists of grinding a workpiece that is larger than the wheel.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Reciprocating], and press [Reciprocating] in the drop-down menu.



# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Reciprocating.

#### Meaning of the cycle variables.

##### A Geometry.

- ∅ = Final diameter.
- Z1 = Z position of the workpiece (right side).
- Z2 = Z position of the workpiece (left side).
- The green background indicates that you want to start the cycle in that position (Z1 or Z2).
- The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.
- S = Rotation speed of the workpiece.
- t1 = Waiting time after pass movement from Z2 to Z1.
- t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.



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## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Select whether it is necessary to carry out the dressing operation during the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

## 4.

## CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Reciprocating.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to  $(2 \cdot \Delta x)$ , it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From  $(2 \cdot \Delta x)$  to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

**4.**

**CYLINDRICAL GRINDING CYCLES (EXTERNAL).**

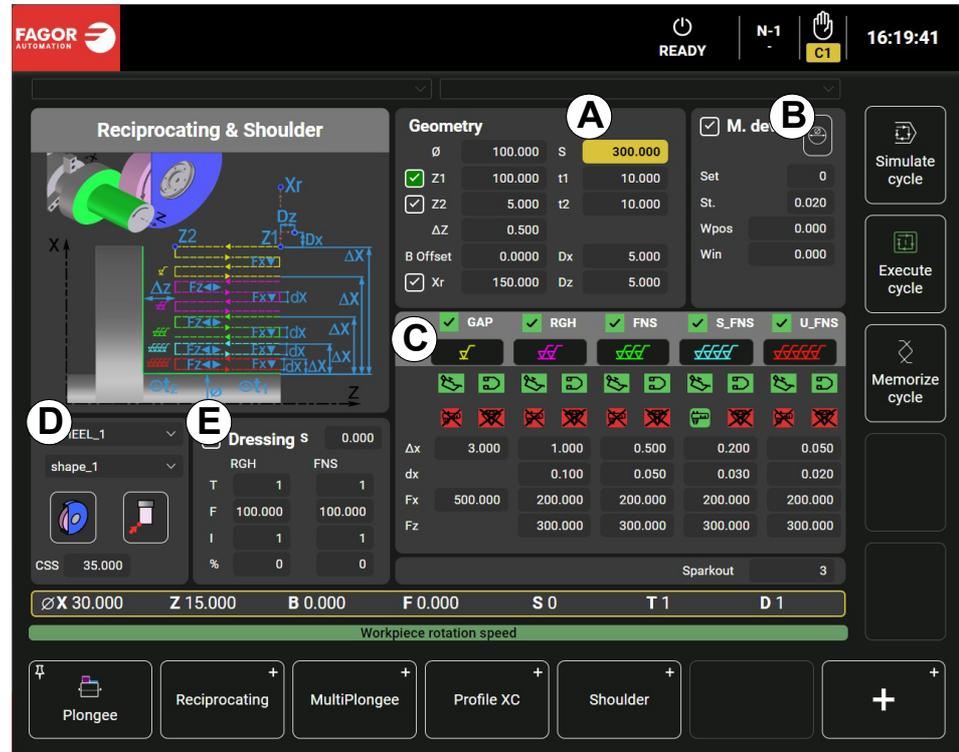
Reciprocating.

## 4.4 Reciprocating & Shoulder.

This cycle consists of grinding a workpiece larger than the wheel and a shoulder cycle on the cylindrical grinder.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Reciprocating], and press [Reciprocating + Shoulder] in the drop-down menu.

4. CYLINDRICAL GRINDING CYCLES (EXTERNAL). Reciprocating & Shoulder.



### Meaning of the cycle variables.

#### A Geometry.

∅ = Final diameter.

Z1 = Z position of the workpiece (right side).

Z2 = Z position of the workpiece (left side).



The green background indicates that you want to start the cycle in that position (Z1 or Z2).



The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.

ΔZ = Stock of material to be ground on Z (shoulder).

S = Rotation speed of the workpiece.

t1 = Waiting time after pass movement from Z2 to Z1.

t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.

**B** M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

**C** Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Select whether it is necessary to carry out the dressing operation during the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

**D** Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

**E** Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**4.**

**CYLINDRICAL GRINDING CYCLES (EXTERNAL).**

Reciprocating & Shoulder.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2^* \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2^* \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

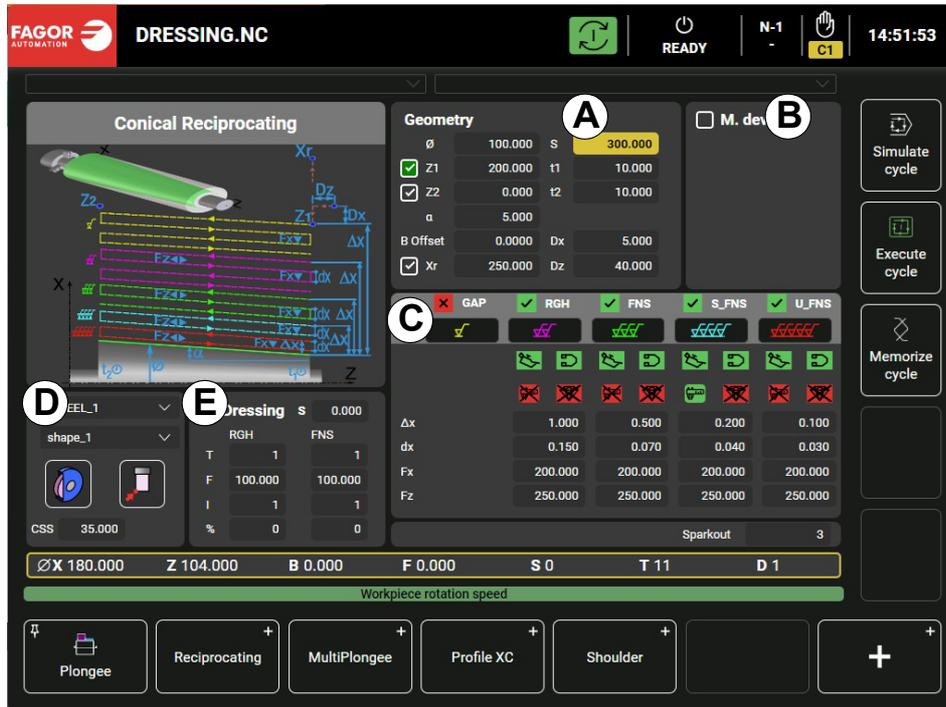
**4.****CYLINDRICAL GRINDING CYCLES (EXTERNAL).**

Reciprocating &amp; Shoulder.

## 4.5 Conical Reciprocating.

To perform this cycle, the wheel width must be indicated as accurately as possible in order to achieve the best precision on the smallest diameter neck.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Reciprocating], and press [Reciprocating Conic] in the drop-down menu.



**4.**  
**CYLINDRICAL GRINDING CYCLES (EXTERNAL).**  
 Conical Reciprocating.

### Meaning of the cycle variables.

#### A Geometry.

- $\varnothing$  = Final diameter (the largest diameter of the cone).
- Z1 = Z position of the workpiece (right side).
- Z2 = Z position of the workpiece (left side).
- The green background indicates that you want to start the cycle in that position (Z1 or Z2).
- The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.
- $\alpha$  = Angle of the workpiece in degrees.
  - Positive angle: Z2 greater than Z1.
  - Negative angle: Z1 greater than Z2.
- S = Rotation speed of the workpiece.
- t1 = Waiting time after pass movement from Z2 to Z1.
- t2 = Waiting time after pass movement from Z1 to Z2.
- B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.



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## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

## 4.

## CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Conical Reciprocating.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to  $(2 \cdot \Delta x)$ , it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From  $(2 \cdot \Delta x)$  to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Conical Reciprocating.

## 4.6 Rolling.

The paired convex and concave curved rollers are used during lamination and to feed materials such as paper, plastic, etc.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Reciprocating], and press [Roller Crowning] in the drop-down menu.



### Meaning of the cycle variables.

#### A Geometry.

Ø = Final diameter.

Z1 = Z position of the workpiece (right side).

Z2 = Z position of the workpiece (left side).

The green background indicates that you want to start the cycle in that position (Z1 or Z2).

The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.

S = Rotation speed of the workpiece.

t1 = Waiting time after pass movement from Z2 to Z1.

t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.

# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Rolling.

**B** Rolling Shape.



Shape angle of the crowned roller.



Roller shape (concave or convex).

A = Maximum crown deflection in radius.

**C** Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Select whether it is necessary to carry out the dressing operation during the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

**D** Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

**E** Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2^* \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2^* \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Rolling.

## 4.7 Multiplongee.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Multiplongee], and press [Multiplongee] in the drop-down menu.



4.  
 CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
 Multiplongee.

### Meaning of the cycle variables.

#### A Geometry.

$\varnothing$  = Final diameter.

Z1 = Z position of the workpiece (right side).

Z2 = Z position of the workpiece (left side).



The green background indicates that you want to start the cycle in that position (Z1 or Z2).



The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.

Inc.Z = Increment on the Z-axis for multiplongee cutting in the roughing phase.

S = Rotation speed of the workpiece.

t1 = Waiting time after pass movement from Z2 to Z1.

t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.



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REF: 2602

## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

## 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Multiplongee.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to  $(2 \cdot \Delta x)$ , it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From  $(2 \cdot \Delta x)$  to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Multiplongee.

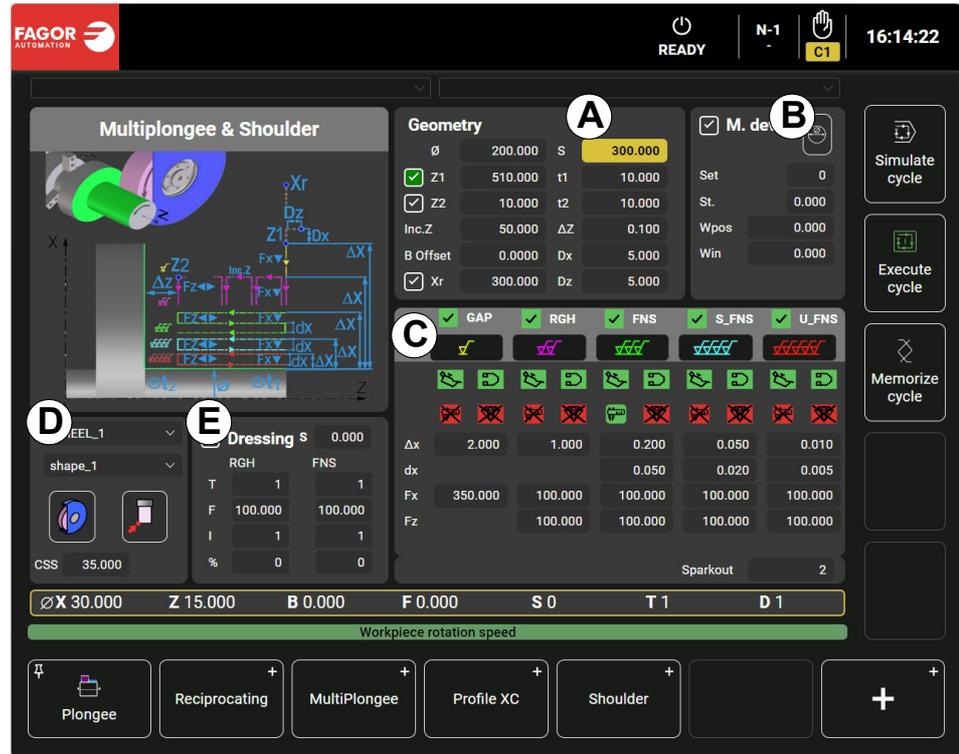
## 4.8 Multiplongee & Shoulder.

This cycle consists of performing a multiplongee and a shoulder cycle on the cylindrical grinder.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Multiplongee], and press [Multiplongee + Shoulder] in the drop-down menu.

# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Multiplongee & Shoulder.



### Meaning of the cycle variables.

#### A Geometry.

$\emptyset$  = Final diameter.

Z1 = Z position of the workpiece (right side).

Z2 = Z position of the workpiece (left side).



The green background indicates that you want to start the cycle in that position (Z1 or Z2).



The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.

Inc.Z= Increment on the Z-axis for multiplongee cutting in the roughing phase.

S = Rotation speed of the workpiece.

t1 = Waiting time after pass movement from Z2 to Z1.

t2 = Waiting time after pass movement from Z1 to Z2.

$\Delta Z$  = Stock of material to be ground on Z (shoulder).

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

**B** M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

- Set = Program number with set point for the measuring device.
- St. = Additional travel if the final diameter increases without contacting the gauge.
- Wpos = Position of the measuring device to measure the part.
- Win = Position of the measuring device for safe forward/reverse feedrate.

**C** Selection of phases and machining conditions.

- GAP = Enables/disables the GAP phase.
- RGH = Activates/deactivates the Roughing phase.
- FNS = Activates/deactivates the Finishing phase.
- S\_FNS = Enables/disables the Super Finish phase.
- U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

- $\Delta x$  = Initial excess material in the phase (in radii).
- dx = Increase in the X-axis in each phase pass (in radii).
- Fx = X-axis feedrate for the phase.
- Fz = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

**D** Wheel data.

- Wheel name.
- Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

**E** Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

- s = Wheel speed for dressing.
- T = Dresser number for the operation.
- F = Dressing feedrate for the operation.
- I = Number of dressing passes for the operation.
- % = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2^* \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2^* \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Multiplongee &amp; Shoulder.

## 4.9 Plongee XC.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [XC Profile], and press [XC Plongee] in the drop-down menu.



# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL):  
Plongee XC.

### Meaning of the cycle variables.

#### A Geometry.

Profile = XC profile for machining the workpiece.

C Offset = Position of the C axis as the origin point of the XC plane.

Z = Z position of the workpiece for plunging.

F = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.

#### B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

Fx = X-axis feedrate for the phase.

t = Number of turns after roughing.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

## 4.

## CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Plongee XC.

**Basic operation.**

- The options GAP, manual measurement and dressing are available. Before going to dressing or carrying out the manual measurement, the wheel withdraws to Dx while the part rotates making the profile. When it gets to Dx, the profile stops.
- GAP is performed while the part rotates following the profile.
- When the part rotates with pattern repeat, in the first turn, the % FEEDRATE is applied to the profile rotation.
- Starting from the part's second rotation, the rotation feedrate of the part with pattern repeat can be changed using the "+" "-" keys, changing the % override of the spindle.
- The % FEEDRATE is applied to the wheel penetrations and reciprocating in Z.
- The single block % FEEDRATE works for wheel penetrations in X and reciprocating movements in Z. They are not applied to part rotation with pattern repeat.
- Cycle interruption once the part rotates following the profile:
  - Pressing STOP once does not make the next move in X (it does not interrupt the current movement being executed). It interrupts the current movement in Z.
  - Pressing STOP a second time also withdraws X to the safety distance Dx, while the part rotates following the profile.
  - At this point, you can press RESET to abort the cycle without the wheel being in contact with the part, or press START to approach Dx and continue the cycle execution.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Plongee XC.

## 4.10 Reciprocating XC.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [XC Profile], and press [XC Reciprocating] in the drop-down menu.



### Meaning of the cycle variables.

#### A Geometry.

Profile = XC profile for machining the workpiece.

C Offset = Position of the C axis as the origin point of the XC plane.

Z1 = Z position of the workpiece (right side).

Z2 = Z position of the workpiece (left side).



The green background indicates that you want to start the cycle in that position (Z1 or Z2).



The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.

F = Rotation speed of the workpiece.

t1 = Waiting time after pass movement from Z2 to Z1.

t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.

# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Reciprocating XC.

B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

$dx$  = Increase in the X-axis in each phase pass (in radii).

$F_x$  = X-axis feedrate for the phase.

$F_z$  = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



*Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.*

D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- The options GAP, manual measurement and dressing are available. Before going to dressing or carrying out the manual measurement, the wheel withdraws to Dx while the part rotates making the profile. When it gets to Dx, the profile stops.
- GAP is performed while the part rotates following the profile.
- When the part rotates with pattern repeat, in the first turn, the % FEEDRATE is applied to the profile rotation.
- Starting from the part's second rotation, the rotation feedrate of the part with pattern repeat can be changed using the "+" "-" keys, changing the % override of the spindle.
- The % FEEDRATE is applied to the wheel penetrations and reciprocating in Z.
- The single block % FEEDRATE works for wheel penetrations in X and reciprocating movements in Z. They are not applied to part rotation with pattern repeat.
- Cycle interruption once the part rotates following the profile:
  - Pressing STOP once does not make the next move in X (it does not interrupt the current movement being executed). It interrupts the current movement in Z.
  - Pressing STOP a second time also withdraws X to the safety distance Dx, while the part rotates following the profile.
  - At this point, you can press RESET to abort the cycle without the wheel being in contact with the part, or press START to approach Dx and continue the cycle execution.

## 4.

## CYLINDRICAL GRINDING CYCLES (EXTERNAL).

Reciprocating XC.

## 4.11 Shoulder.

To access this cycle, after entering the external cylindrical grinding cycles, press the softkey [Shoulder], and press [Shoulder] in the drop-down menu.



# 4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).  
Shoulder.

### Meaning of the cycle variables.

#### A Geometry.

- $\varnothing$  = Final diameter.
- Z = Z position for performing the plongee (left side or right side).
- S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

**B Selection of phases and machining conditions.**

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta z$  = Initial excess material in the phase (in radii).

Fz = Z-axis feedrate for the phase.

t = Waiting time after phase completion.

**C Wheel data.**

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

**D Dressing data.**

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2 \cdot \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2 \cdot \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

4.

CYLINDRICAL GRINDING CYCLES (EXTERNAL).

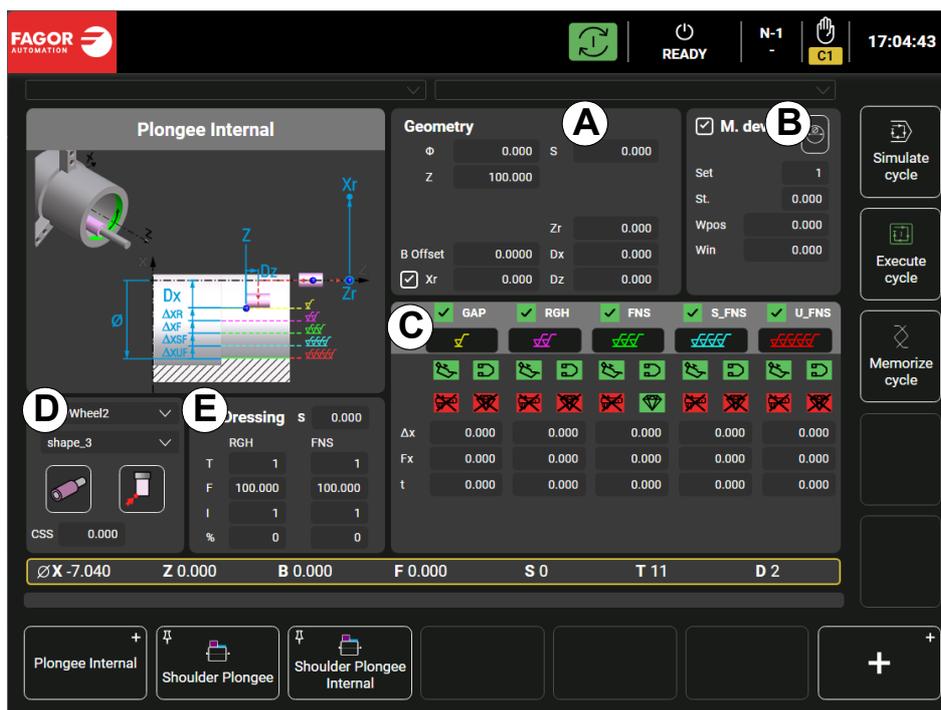
Shoulder.

# CYLINDRICAL GRINDING CYCLES (INTERNAL).

# 5

## 5.1 Internal plongeé.

To access this cycle, after entering the internal cylindrical grinding cycles, press the softkey [Internal Plongeé], and press [Internal Plongeé] in the drop-down menu.



### Meaning of the cycle variables.

#### A Geometry.

- $\varnothing$  = Final diameter.
- Z = Z position for performing the plongeé (left side or right side).
- S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Zr = Safety position in Z for approach or withdrawal.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

## 5.

CYLINDRICAL GRINDING CYCLES (INTERNAL).  
Internal plongeé.

## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta x$  = Initial excess material in the phase (in radii).

Fx = X-axis feedrate for the phase.

t = Waiting time after phase completion.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

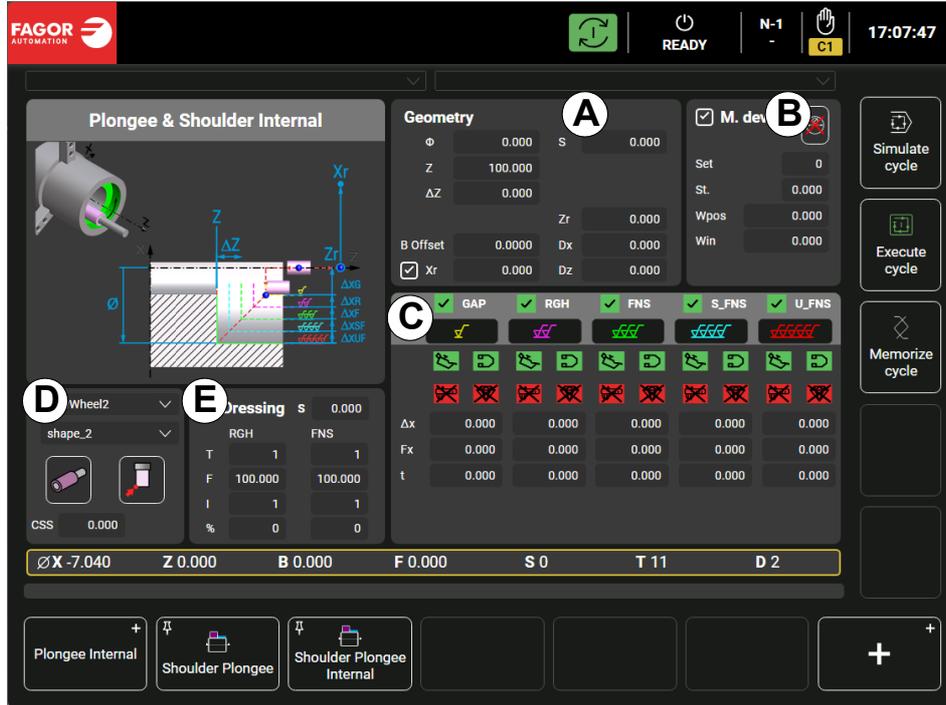
**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2 * \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2 * \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of (V.P.FAPPROACH+Fx)/2.
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

## 5.2 Internal Plongee + shoulder.

This cycle consists of performing a plongee and a shoulder cycle on the cylindrical grinder.

To access this cycle, after entering the internal cylindrical grinding cycles, press the softkey [Internal Plongee], and press [Plongee + Internal shoulder] in the drop-down menu.



# 5.

**CYLINDRICAL GRINDING CYCLES (INTERNAL).**  
Internal Plongee + shoulder.

### Meaning of the cycle variables.

#### A Geometry.

- Ø = Final diameter.
- Z = Z position for performing the plongee (left side or right side).
- ΔZ = Stock of material to be ground on Z (shoulder).
- S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Zr = Safety position in Z for approach or withdrawal.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.

#### B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

- Set = Program number with set point for the measuring device.
- St. = Additional travel if the final diameter increases without contacting the gauge.
- Wpos = Position of the measuring device to measure the part.
- Win = Position of the measuring device for safe forward/reverse feedrate.

## 5.

## CYLINDRICAL GRINDING CYCLES (INTERNAL).

Internal Plongee + shoulder.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

 $\Delta x$  = Initial excess material in the phase (in radii).

Fx = X-axis feedrate for the phase.

t = Waiting time after phase completion.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

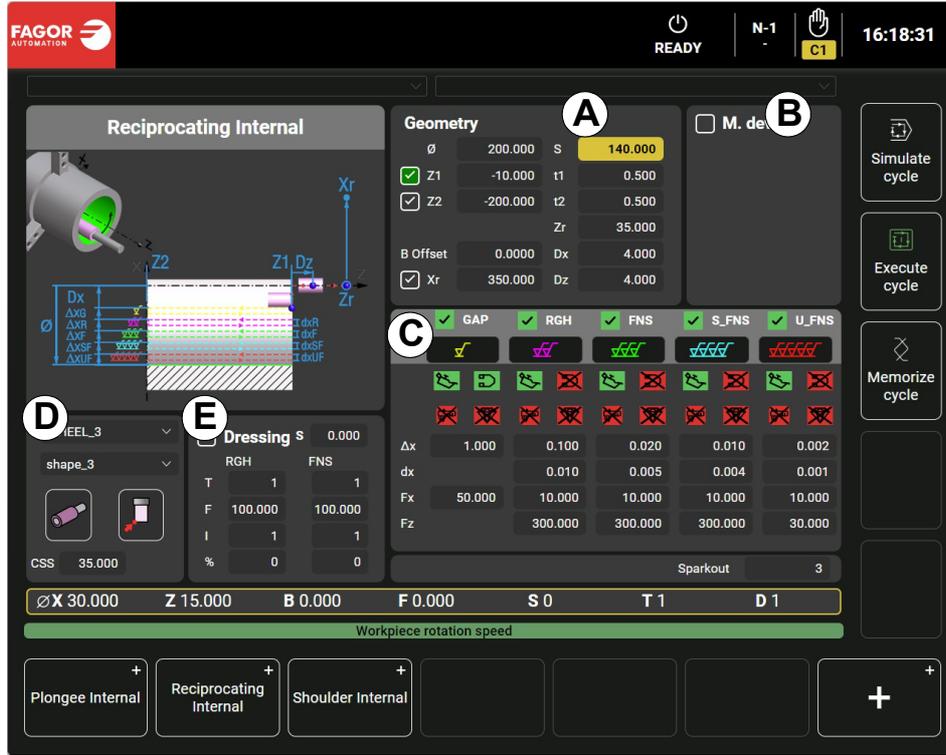
**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to ( $2 \cdot \Delta x$ ), it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From ( $2 \cdot \Delta x$ ) to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

### 5.3 Internal reciprocating movement.

This cycle consists of grinding a workpiece that is larger than the wheel.

To access this cycle, after entering the internal cylindrical grinding cycles, press the softkey [Internal reciprocating], and press [Internal reciprocating] in the drop-down menu.



**5.**  
**CYLINDRICAL GRINDING CYCLES (INTERNAL).**  
 Internal reciprocating movement.

#### Meaning of the cycle variables.

##### A Geometry.

- ∅ = Final diameter.
- Z1 = Z position of the workpiece (right side).
- Z2 = Z position of the workpiece (left side).
- The green background indicates that you want to start the cycle in that position (Z1 or Z2).
- The ✓ indicates that you want to deepen at that point. It can be in Z1, in Z2, or in both. At point Z which is not selected, the wheel is moved to Dx to approach the selected Z and perform the deepening at that point.
- S = Rotation speed of the workpiece.
- t1 = Waiting time after pass movement from Z2 to Z1.
- t2 = Waiting time after pass movement from Z1 to Z2.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

- Xr = Withdrawal position at the end of the cycle.
- Zr = Safety position in Z for approach or withdrawal.
- Dx = Safety distance on X, before activating the machining conditions.
- Dz = Safety distance on Z, before activating the machining conditions.



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## 5.

## CYLINDRICAL GRINDING CYCLES (INTERNAL).

Internal reciprocating movement.

## B M. device (only displayed if there is a measuring device).



Runs the compensation recalculation when the final position is reached.

Set = Program number with set point for the measuring device.

St. = Additional travel if the final diameter increases without contacting the gauge.

Wpos = Position of the measuring device to measure the part.

Win = Position of the measuring device for safe forward/reverse feedrate.

## C Selection of phases and machining conditions.

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Select whether it is necessary to carry out the dressing operation during the phase in which it is selected.

 $\Delta x$  = Initial excess material in the phase (in radii).

dx = Increase in the X-axis in each phase pass (in radii).

Fx = X-axis feedrate for the phase.

Fz = Z-axis feedrate for the phase.

Sparkout = Number of sparks to be performed in the last programmed phase. It also applies in the case of calling for tool inspection, before performing the inspection.



Sparks are final passes without cutting depth that compensate for the elastic deflection of the machine to ensure dimensional accuracy. They are used to remove the last few microns of material and achieve an optimal surface finish (mirror finish) by releasing the pressure between the grinding wheel and the part.

## D Wheel data.

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

## E Dressing data.

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to  $(2 \cdot \Delta x)$ , it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From  $(2 \cdot \Delta x)$  to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + F_x)/2$ .
- All of the above will happen as long as FAPPROACH is greater than  $F_x$ . If not, everything takes place at a feedrate of  $F_x$ .

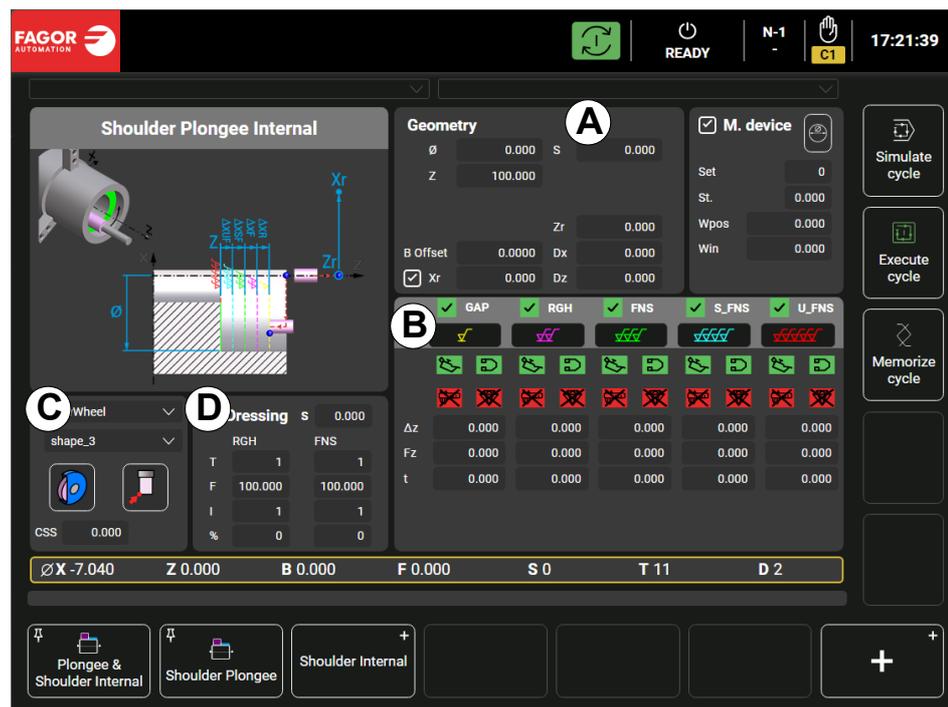
**5.**

**CYLINDRICAL GRINDING CYCLES (INTERNAL).**

Internal reciprocating movement.

## 5.4 Internal shoulder.

To access this cycle, after entering the internal cylindrical grinding cycles, press the softkey [Internal shoulder], and press [Internal shoulder] in the drop-down menu.



### Meaning of the cycle variables.

#### A Geometry.

$\emptyset$  = Final diameter.

Z = Z position for performing the plongee (left side or right side).

S = Rotation speed of the workpiece.

B Offset = Correction of wheel inclination angle B. This angle is incremental with respect to the position set by the machine manufacturer in the grinding wheel table.



The B axis of the cylindrical grinding machine is the axis of rotation of the grinding wheel head. While the X and Z axes move the grinding wheel back and forth or side to side, the B axis allows the head to rotate on its own vertical axis, changing the angle of attack of the grinding wheel relative to the part.

This axis is essential for parts with complex geometries that require extreme precision without having to move the part from its position. One example could be cone grinding, where the grinding wheel can be tilted to machine conical surfaces at a precise angle.

Xr = Withdrawal position at the end of the cycle.

Zr = Safety position in Z for approach or withdrawal.

Dx = Safety distance on X, before activating the machining conditions.

Dz = Safety distance on Z, before activating the machining conditions.

# 5.

CYLINDRICAL GRINDING CYCLES (INTERNAL).  
Internal shoulder.

**B Selection of phases and machining conditions.**

GAP = Enables/disables the GAP phase.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

S\_FNS = Enables/disables the Super Finish phase.

U\_FNS = Enables/disables the Ultra-Finish phase.



Activates the coolant during the phase for which it is selected.



The center rest is used in the phase in which it is selected.



Performs a measurement inspection after the phase in which it is selected.



Perform a dressing before the phase in which it is selected.

$\Delta z$  = Initial excess material in the phase (in radii).

Fz = Z-axis feedrate for the phase.

t = Waiting time after phase completion.

**C Wheel data.**

Wheel name.

Wheel shape.



Graphical representation of the wheel.



Side of the wheel on which the machining is performed.

CSS = Constant surface speed.

**D Dressing data.**

If not enabled via the , the default data (data entered in the modeling or dressing cycle) will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for the three finishes (FNS, S\_FNS, and U\_FNS).

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

I = Number of dressing passes for the operation.

% = Compensation for wheel flailing (in percent) for the operation.

**Basic operation.**

- At the beginning of the cycle, the wheel moves to the safety distance (Dx, Dz) in G00.
- At this point, the rotation of the part, the grinding wheel, and the coolant are activated.
- The approach movement from Dx to the corresponding  $\Delta x$  is carried out in two sections to make contact with the softest piece.
  - From Dx to  $(2 \cdot \Delta x)$ , it is performed at a feedrate of V.P.FAPPROACH, which is the P11018 parameter configured by the manufacturer.
  - From  $(2 \cdot \Delta x)$  to  $\Delta x$ , it is performed at a feedrate of  $(V.P.FAPPROACH + Fx)/2$ .
- All of the above will happen as long as FAPPROACH is greater than Fx. If not, everything takes place at a feedrate of Fx.

5.

CYLINDRICAL GRINDING CYCLES (INTERNAL).

Internal shoulder.

# 5.

## CYLINDRICAL GRINDING CYCLES (INTERNAL).

Internal shoulder.



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# GRINDING WHEEL VARIABLE.

# 6

## 6.1 List of variables from the technological tables.

The technological table variables for the cylindrical grinding machine are shown below.

### 6.1.1 Variable group "COMMON".

Access variable from the part program	Type	Possible values	Description
V.TT.DESC	Numeric	Integer	Descriptor index for internal use by the application.
V.TT.TYPE	Enum	1 (None) 2 (External) 3 (Internal) 4 (shoulder)	Wheel type.
V.TT.SIDE	Enum	1 (None) 2 (Left) 3 (Right) 4 (Left + Right)	Permitted sides of the grinding wheel.
V.TT.SHAPEN	Text		"Shape" – diamond pattern associated with the default grinding wheel

### 6.1.2 Variable group "GEOMETRY".

Only column 1 of the technological table is used in these variables.

Access variable from the part program	Type	Possible values	Description
V.TT.GEOMETRY_WDMIN	Numeric	mm - inch	Minimum allowed width of the grinding wheel.
V.TT.GEOMETRY_WDACT	Numeric	mm - inch	Current width of the grinding wheel.
V.TT.GEOMETRY_DIAMMIN	Numeric	mm - inch	Minimum allowed diameter of the grinding wheel.
V.TT.GEOMETRY_DIAMACT	Numeric	mm - inch	Current diameter of the grinding wheel.
V.TT.GEOMETRY_DRESSFACTOR	Numeric	%	Correction factor for the grinding wheel after diamond dressing.
V.TT.GEOMETRY_RPMMAX	Numeric	RPM	Maximum permitted RPM for the grinding wheel.
V.TT.GEOMETRY_VTC	Numeric	m/s - feet/s	Cutting speed of the grinding wheel surface.
V.TT.GEOMETRY_TOOLID	Numeric	Integer	Descriptor index for internal use by the application.
V.TT.GEOMETRY_B	Numeric	Degrees	Working tilt angle of the grinding wheel on the B-axis.

### 6.1.3 Variable group "DRESSING".

Only column 1 of the technological table is used in these variables.

Access variable from the part program	Type	Possible values	Description
V.TT.DRESSING_FORNPLUNGES	Enum	1 (No) 2 (Yes)	Use the grinding cycle counter to diamond dress the wheel.
V.TT.DRESSING_NPLUNGES	Numeric	Integer	Number of grinding cycles to be completed for diamond dressing the grinding wheel.
V.TT.DRESSING_NPLUNGESACT	Numeric	Integer	Current number of grinding cycles executed for diamond dressing the grinding wheel.
V.TT.DRESSING_FORMATERIAL	Enum	1 (No) 2 (Yes)	Use the grinding cycle counter to diamond dress the wheel.
V.TT.DRESSING_MATERIAL	Numeric	mm - inch	Total amount of material to be removed from the workpiece during grinding for diamond dressing the grinding wheel.
V.TT.DRESSING_MATERIALACT	Numeric	mm - inch	Current amount of material removed from the workpiece during grinding for diamond dressing the grinding wheel.

### 6.1.4 Variable group "MAGAZINE".

Only column 1 of the technological table is used in these variables.

Access variable from the part program	Type	Possible values	Description
V.TT.MAGAZINE_MPOSITION	Numeric	Integer	Position of the grinding wheel in the warehouse.
V.TT.MAGAZINE_MCOOLON	Numeric	Integer	M-code to activate coolant on the grinding wheel.
V.TT.MAGAZINE_MCOOLOFF	Numeric	Integer	M-code to deactivate coolant on the grinding wheel.
V.TT.MAGAZINE_YCHANGE	Numeric	mm - inch	X position for grinding wheel change.
V.TT.MAGAZINE_ZCHANGE	Numeric	mm - inch	Z position for the grinding wheel change.

# 6.

GRINDING WHEEL VARIABLE:  
List of variables from the technological tables.

### 6.1.5 Variable group "DRESSOFFSET".

The column number from 1 to 10 in the technological table stores the data for that diamond number.

Access variable from the part program	Type	Possible values	Description
V.TT.DRESSOFFSET_DRESSLEFTXC	Numeric	mm - inch	X offset of the grinding wheel origin on the left side with the diamond. Permanent value.
V.TT.DRESSOFFSET_DRESSLEFTXF	Numeric	mm - inch	X offset of the grinding wheel origin on the left side with the diamond. Temporary value for corrections.
V.TT.DRESSOFFSET_DRESSLEFTZC	Numeric	mm - inch	Z offset of the grinding wheel origin on the left side with the diamond. Permanent value.
V.TT.DRESSOFFSET_DRESSLEFTZF	Numeric	mm - inch	Z offset of the grinding wheel origin on the left side with the diamond. Temporary value for corrections.
V.TT.DRESSOFFSET_DRESSRIGHTXC	Numeric	mm - inch	X offset of the grinding wheel origin on the right side with the diamond. Permanent value.
V.TT.DRESSOFFSET_DRESSRIGHTXF	Numeric	mm - inch	X offset of the grinding wheel origin on the right side with the diamond. Temporary value for corrections.
V.TT.DRESSOFFSET_DRESSRIGHTZC	Numeric	mm - inch	Z offset of the grinding wheel origin on the right side with the diamond. Permanent value.
V.TT.DRESSOFFSET_DRESSRIGHTZF	Numeric	mm - inch	Z offset of the grinding wheel origin on the right side with the diamond. Temporary value for corrections.
V.TT.DRESSOFFSET_LEFTOFFSETDONE	Enum	1 (No) 2 (Yes)	Stored offset of the grinding wheel on the left side after diamond dressing.
V.TT.DRESSOFFSET_RIGHTOFFSETDONE	Enum	1 (No) 2 (Yes)	Stored offset of the grinding wheel on the right side after diamond dressing.

## 6.

**GRINDING WHEEL VARIABLE:**  
List of variables from the technological tables.

## 6.1.6 Variable group "PIECEOFFSET".

Only column 1 of the technological table is used in these variables.

Access variable from the part program	Type	Possible values	Description
V.TT.PIECEOFFSET_PIECELEFTXC	Numeric	mm - inch	X offset of the grinding wheel origin on the left side with the workpiece. Permanent value.
V.TT.PIECEOFFSET_PIECELEFTXF	Numeric	mm - inch	X offset of the grinding wheel origin on the left side with the workpiece. Temporary value for corrections. Initialized to 0 when diamond dressing the grinding wheel.
V.TT.PIECEOFFSET_PIECELEFTZC	Numeric	mm - inch	Z offset of the grinding wheel origin on the left side with the workpiece. Permanent value.
V.TT.PIECEOFFSET_PIECELEFTZF	Numeric	mm - inch	Z offset of the grinding wheel origin on the left side with the workpiece. Temporary value for corrections. Initialized to 0 when diamond dressing the grinding wheel.
V.TT.PIECEOFFSET_PIECERIGHTXC	Numeric	mm - inch	X offset of the grinding wheel origin on the right side with the workpiece. Permanent value.
V.TT.PIECEOFFSET_PIECERIGHTXF	Numeric	mm - inch	X offset of the grinding wheel origin on the right side with the workpiece. Temporary value for corrections. Initialized to 0 when diamond dressing the grinding wheel.
V.TT.PIECEOFFSET_PIECERIGHTZC	Numeric	mm - inch	Z offset of the grinding wheel origin on the right side with the workpiece. Permanent value.
V.TT.PIECEOFFSET_PIECERIGHTZF	Numeric	mm - inch	Z offset of the grinding wheel origin on the right side with the workpiece. Temporary value for corrections. Initialized to 0 when diamond dressing the grinding wheel.

# 6.

**GRINDING WHEEL VARIABLE:**  
List of variables from the technological tables.









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