# SURFACE GRINDING MACHINE

## CNC 8065

User manual (·G· model).

Ref: 2602

FAGOR AUTOMATION

**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. Translations of this manual will be labeled with the text "TRANSLATION OF THE ORIGINAL MANUAL".

**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.

FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC resulting from any of the safety elements being disabled.

**HARDWARE EXPANSIONS.**

FAGOR AUTOMATION shall not be held responsible for any personal injuries or physical damage caused or suffered by the CNC resulting from any hardware manipulation by personnel unauthorized by Fagor Automation.

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

**COMPUTER VIRUSES.**

FAGOR AUTOMATION guarantees that the software installed contains no computer viruses. It is up to the user to keep the unit virus free in order to guarantee its proper operation. Computer viruses at the CNC may cause it to malfunction.

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.

**DUAL-USE PRODUCTS.**

Products manufactured by FAGOR AUTOMATION since April 1st 2014 will include "-MDU" in their identification if they are included on the list of dual-use products according to regulation UE 428/2009 and require an export license depending on destination.

FAGOR AUTOMATION



The information described in this manual may be subject to changes due to technical modifications. Fagor Automation reserves the right to change the contents of this manual without prior notice.



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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# BASIC CONCEPTS.

1

## 1.1 General concepts.

In the world of surface grinding machines, there are different models and cycles to be performed depending on 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.

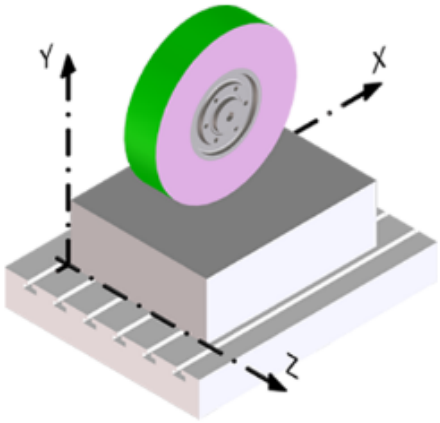
It also includes the option for the manufacturer to develop its own cycles, for better customer service.

The user must take into account the cutting conditions, table feedrate, grinding wheel rotation and dressing in order to achieve good grinding precision.

For the cycles developed and explained in this manual, the specific screens and cycles for the surface grinding machine 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.

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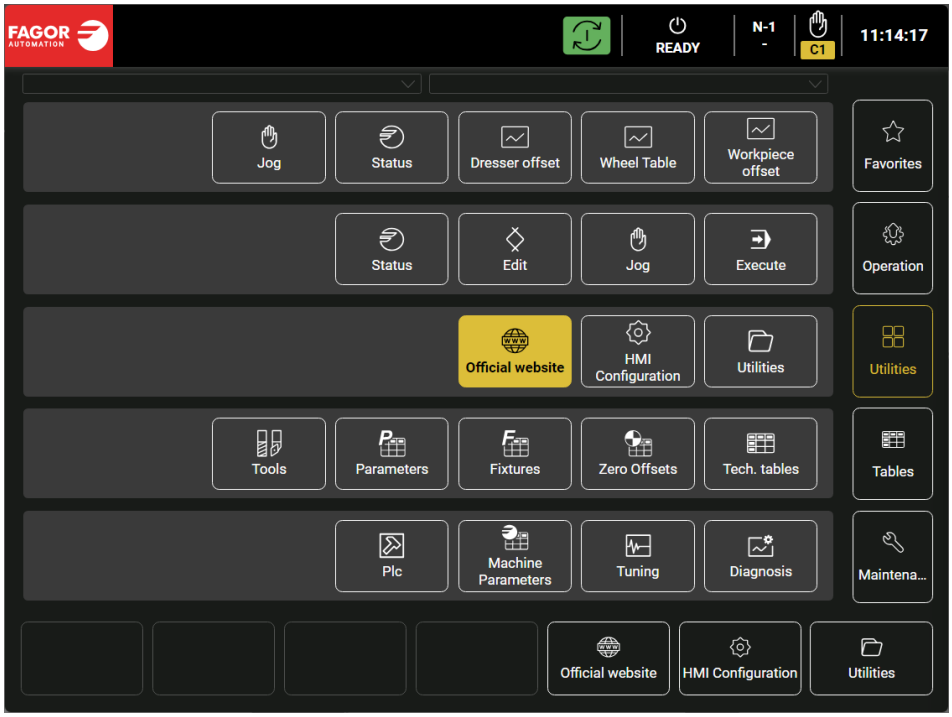
# BASIC OPERATIONS.

2

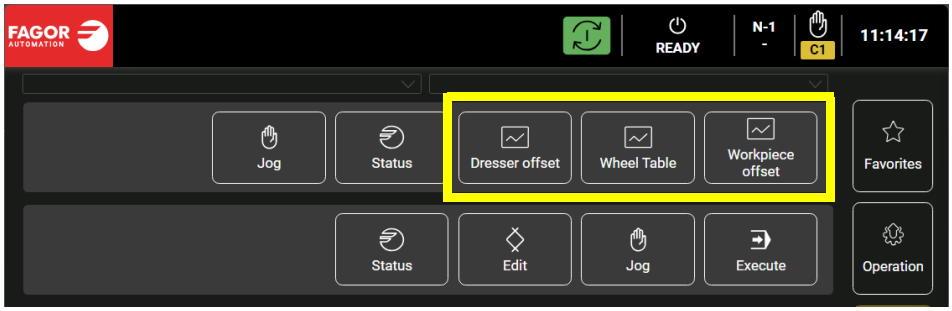
## 2.1 Main screen.

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.
- Surface grinder cycles. See chapter *"4 SURFACE GRINDER CYCLES."*.

## 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.**

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.

### 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".

## 2.3 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.

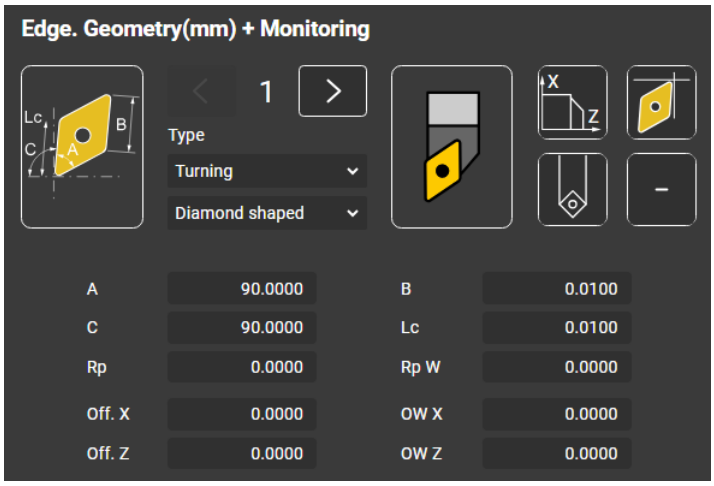
*CNC tools T1 to T11 are reserved by the machine manufacturer as tools for the grinder. Tools from T1 to T10 are reserved for dressers and tool T11 for the active grinding wheel.*

B Basic tool information.

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

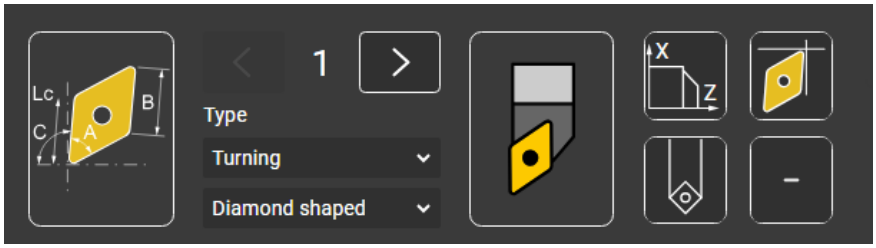
C Tool geometry.

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.

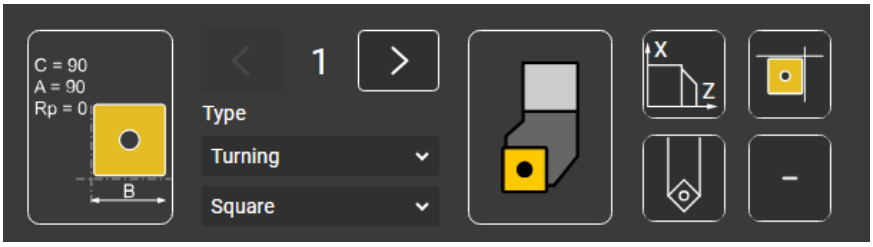


Any type of turning tool (rhombic, square or round) can be used to define the geometry of the dresser.

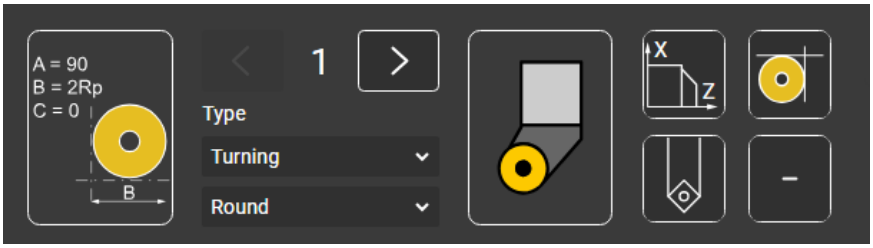
- Rhomboid tool.




- 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.

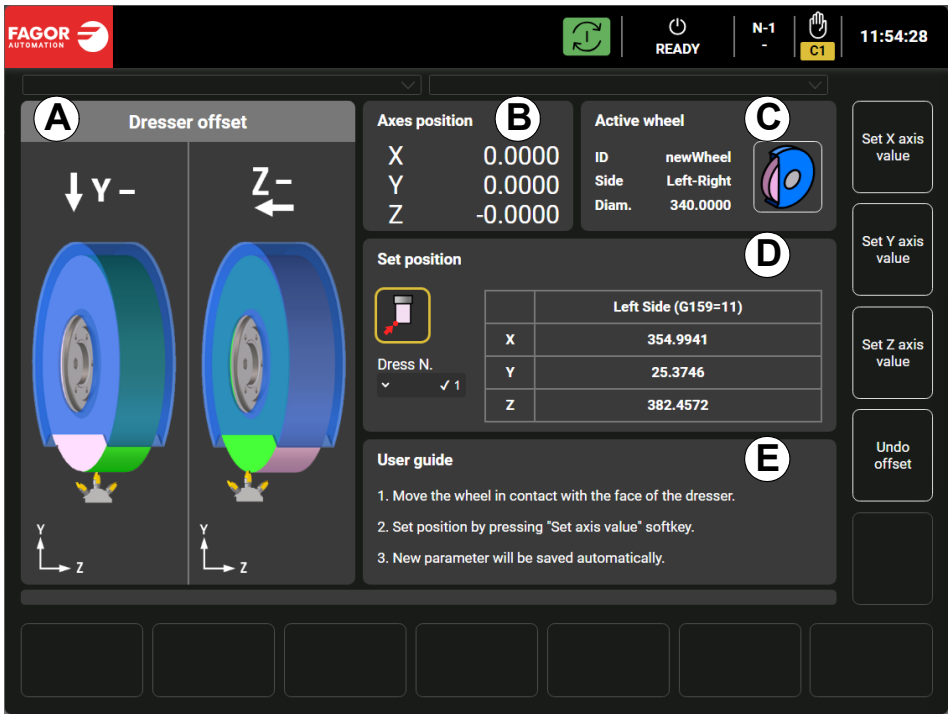
The two tips of a dresser (left and right side of the wheel) are defined in a single T in the tool table, each tip on an offset. The location codes must be defined as shown below.

- 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, Y and Z axes relative to the active origin.

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).*

**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:

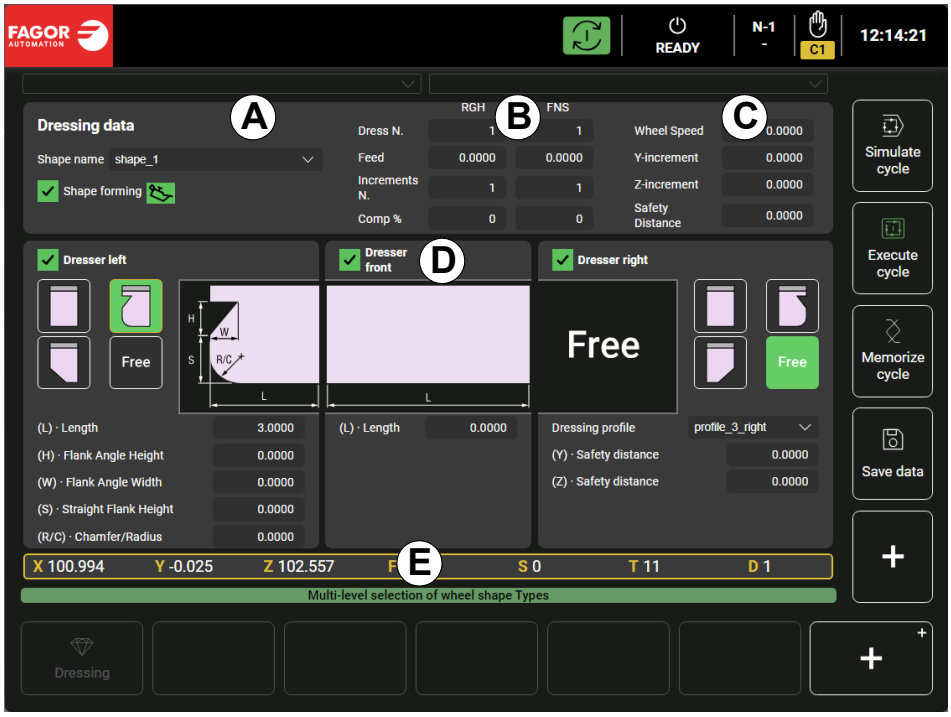
1. On the main screen, press the "Dresser Offset" button.
2. The following message will appear: Press START to confirm.
3. Press [START] to execute the offset change subroutine G159=11 or G159=12.
4. If you would like to capture the dresser-wheel zero on the opposite side to that indicated by the side 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 dresser (there will be sparks) on the X, Y 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, the [Save Y axis value] softkey or [F11] to store the Y position, or the [Save-Z axis value] softkey or [F10] to store the Z position, and press [START].
8. Once the position has been memorized, remove the axis so that the other axes can be memorized in the same way. It does not matter on which axis this operation is performed first.
9. After memorizing the position on the three 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.

## 2.5 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 [5 Dressing] from the drop-down menu. This cycle can also be accessed from the "Wheels Table" screen by pressing the [Modeling cycle] or [F1] softkey.




### *Description of the Modeling or Dressing data:*

A Dressing data.

- **Shape name:** Name of the program containing the wheel shape.
- **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.

C Other Dressing information.

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

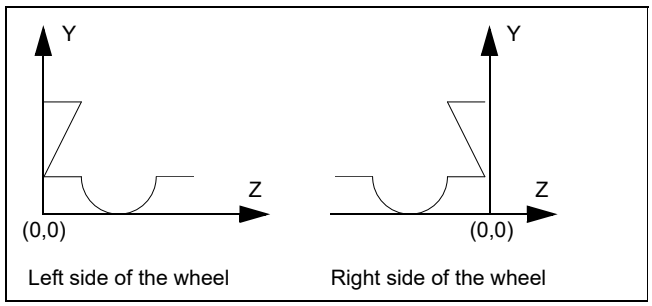
(S) - Straight flank height

(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:




(Y) - 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.

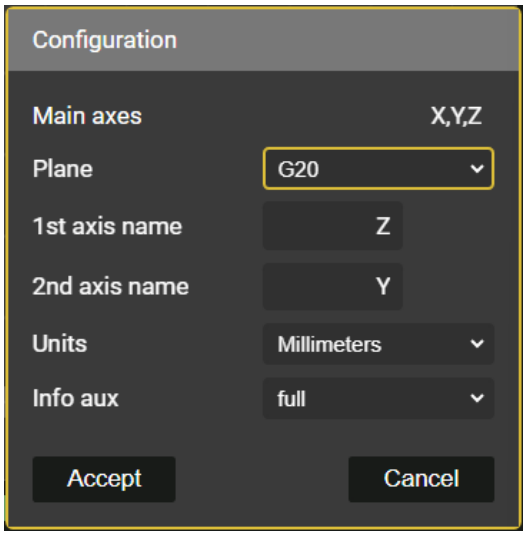
To edit an existing "Free" profile, follow these steps:

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.




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.

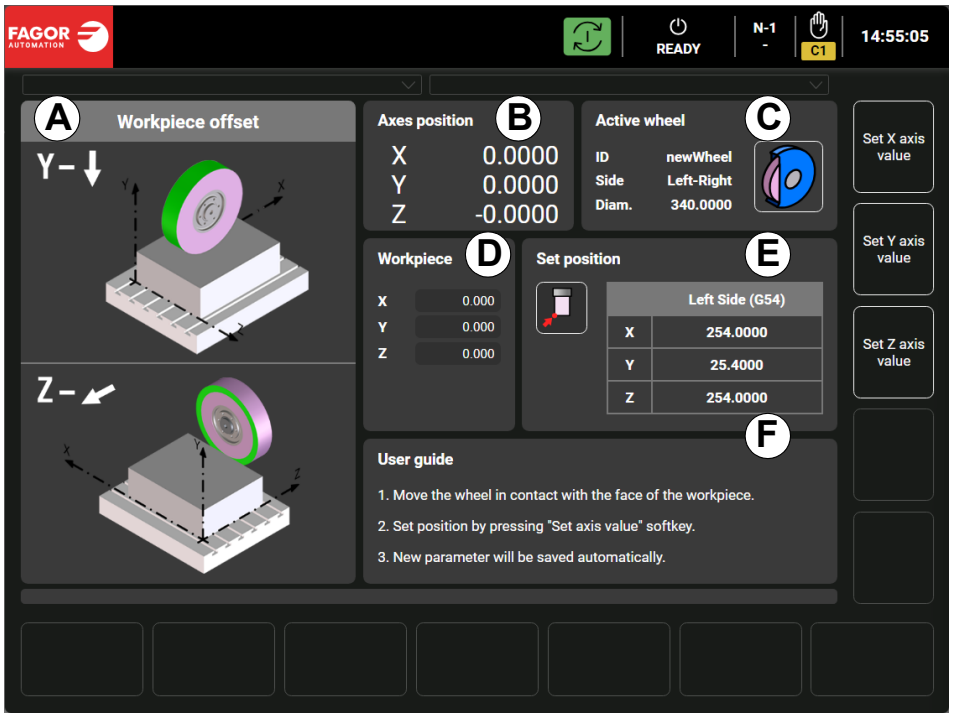
Once the dressing data has been entered and saved, it can be executed or simulated directly from the same screen.

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).




### *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, Y and Z axes relative to the active origin.

C **Active wheel:** Basic information about the active wheel.

D **Workpiece:** Part dimensions.

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, Y 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, the [Store Y-axis value] softkey or [F11] to save the Y position, or the [Store Z-axis value] softkey or [F10] to save the Z position.
7. Once the position has been memorized on one axis, remove the axis so that the other axes can be memorized in the same way. It does not matter on which axis this operation is performed first.
8. Once the position has been memorized on all three axes, remove the axis and measure the part on all three axes.
9. Enter the measured value in the Part (D) window for each axis and press ENTER.
10. After all steps have been completed, the position save window (E) will show the position saved in the origin G54 or G55 and the axes position window (B) will show the coordinate with the newly activated offset.

# CYCLE EDITING.

3

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.

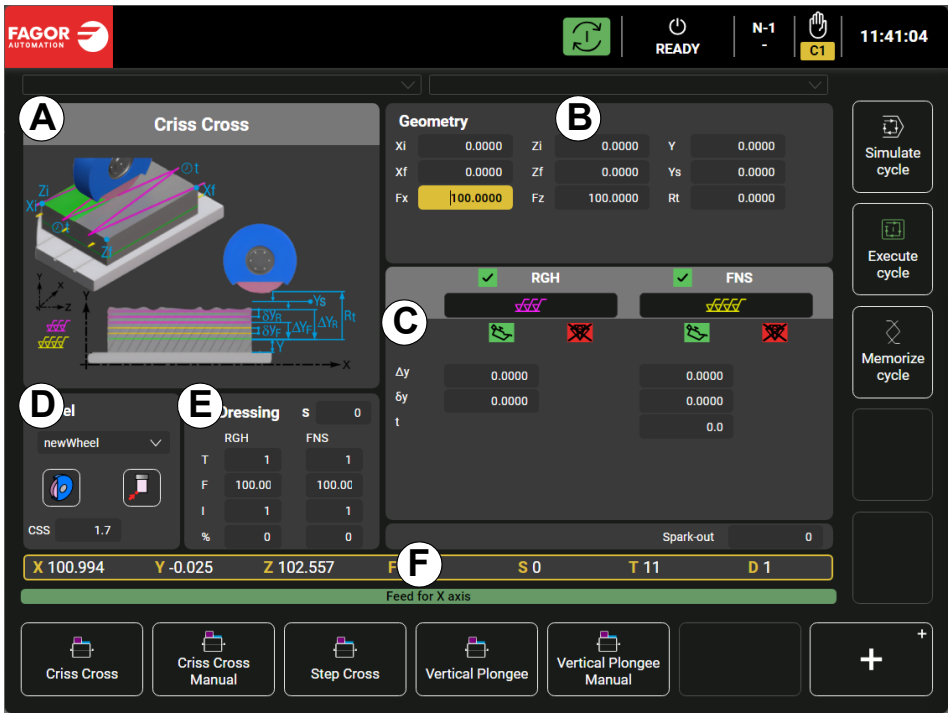
## 3.1 Access to grinder cycles.

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 option [4. Grinding cycles]. All available grinding cycles are displayed in the horizontal softkey menu.
4. Press the softkey corresponding to 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 Selection of the different machining phases and conditions.

D Data of the wheel to be used for the machining cycle.

E Dressing data.

F 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.

## 3.4 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 option [4. Grinding cycles]. All available linear grinding cycles are displayed in the horizontal softkey menu.
6. Press the softkey corresponding to 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.

Execution or simulation of a program with grinder cycles.

FAGOR AUTOMATION

CNC 8065

REF: 2602

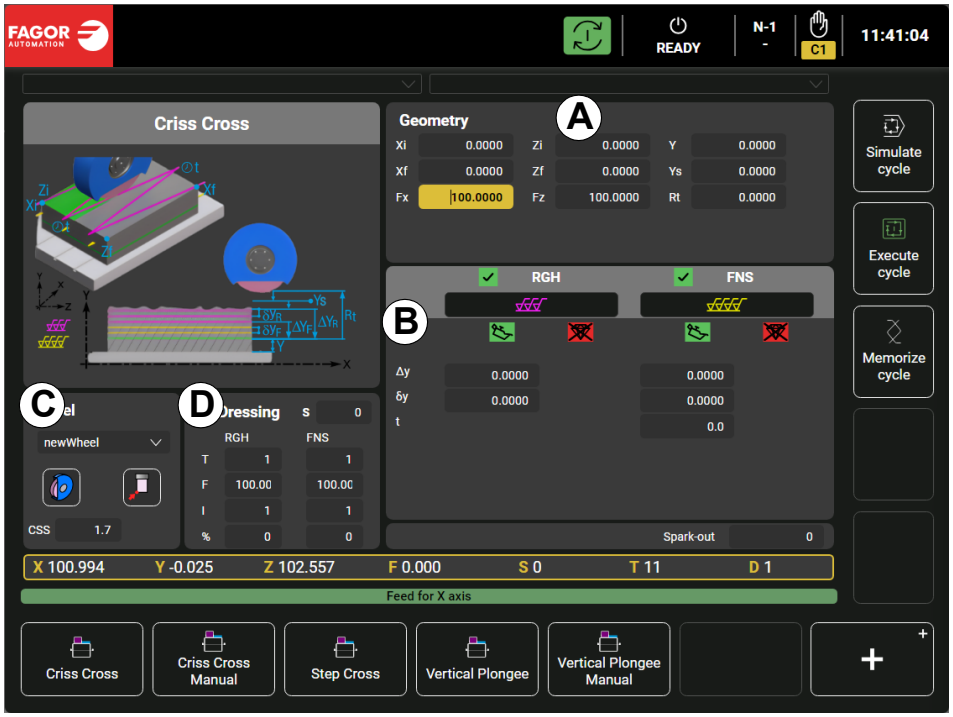
# SURFACE GRINDER CYCLES.

4

## 4.1 Criss Cross.

In this cycle, the back and forth movement on Z and the penetration movement on X are independent and the width of the wheel is considered to be smaller than the surface to be ground.

To access this cycle, after entering the grinding cycles, press the [Criss Cross] softkey or [F1].




### *Meaning of the cycle variables.*

A Geometry.

Xi = Initial position on the X-axis.

Xf = Final position on the X-axis.

Fx = Feedrate for the X-axis.

Zi = Initial position on the Z-axis.

Zf = Final position on the Z-axis.

Fz = Feedrate for Z-axis.

Y = Final position on the Y-axis.

Ys = Safety approach position on the Y-axis before the cycle.

Rt = Retraction position on the Y-axis after the cycle.

B Selection of phases and machining conditions.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

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

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

$\Delta y$ = Stock allowance to be ground on the Y-axis during this phase.

$\delta y$ = Y-axis increment on each pass of the phase.

t = Dwell.

C Wheel data.

Wheel name.

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, the default data will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for finishing.

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

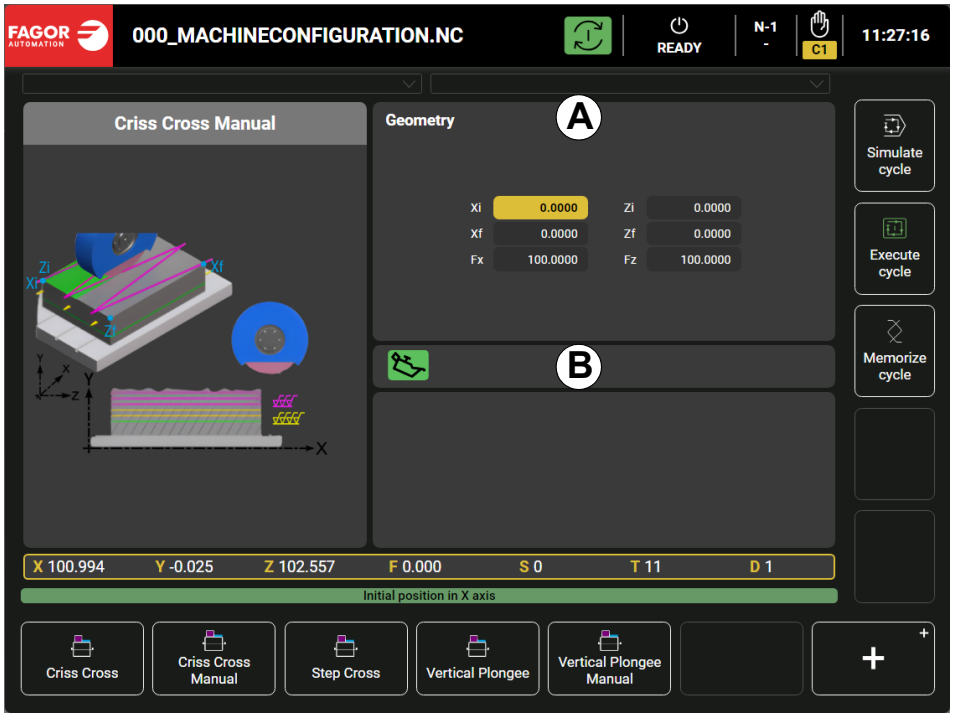
I = Number of dressing passes for the operation.

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

## 4.2 Criss Cross Manual.

This cycle is the same as the previous cycle (Criss Cross), but the movement on the Y-axis is performed manually, i.e. by means of a handwheel.

To access this cycle, after entering the grinding cycles, press the [Criss Cross] softkey or [F2].




### *Meaning of the cycle variables.*

A Geometry.

Xi = Initial position on the X-axis.

Xf = Final position on the X-axis.

Fx = Feedrate for the X-axis.

Zi = Initial position on the Z-axis.

Zf = Final position on the Z-axis.

Fz = Feedrate for Z-axis.

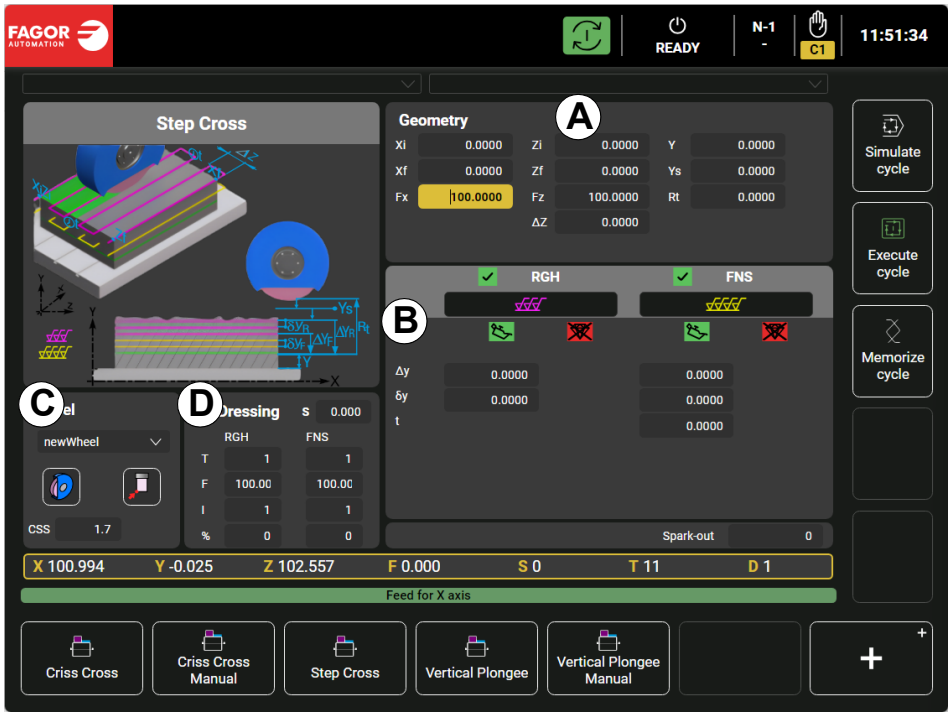
B Machining conditions.

 Turns the coolant on.

## 4.3 Step Cross.

This cycle consists of the grinding of a part larger than the wheel.

To access this cycle, after entering the grinding cycles, press the [Step Cross] softkey or [F3].




### *Meaning of the cycle variables.*

A Geometry.

- Xi = Initial position on the X-axis.
- Xf = Final position on the X-axis.
- Fx = Feedrate for the X-axis.
- Zi = Initial position on the Z-axis.
- Zf = Final position on the Z-axis.
- Fz = Feedrate for Z-axis.
- ΔZ = Step in Z.
- Y = Final position on the Y-axis.
- Ys = Safety approach position on the Y-axis before the cycle.
- Rt = Retraction position on the Y-axis after the cycle.

B Selection of phases and machining conditions.

- RGH = Activates/deactivates the Roughing phase.
- FNS = Activates/deactivates the Finishing phase.
- Activates the coolant during the phase for which it is selected.
- Selects whether it is necessary to carry out the dressing operation during the phase in which it is selected.
- Δy = Stock allowance to be ground on the Y-axis during this phase.
- δy = Y-axis increment on each pass of the phase.
- t = Dwell.

C Wheel data.

Wheel name.

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, the default data will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for finishing.

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

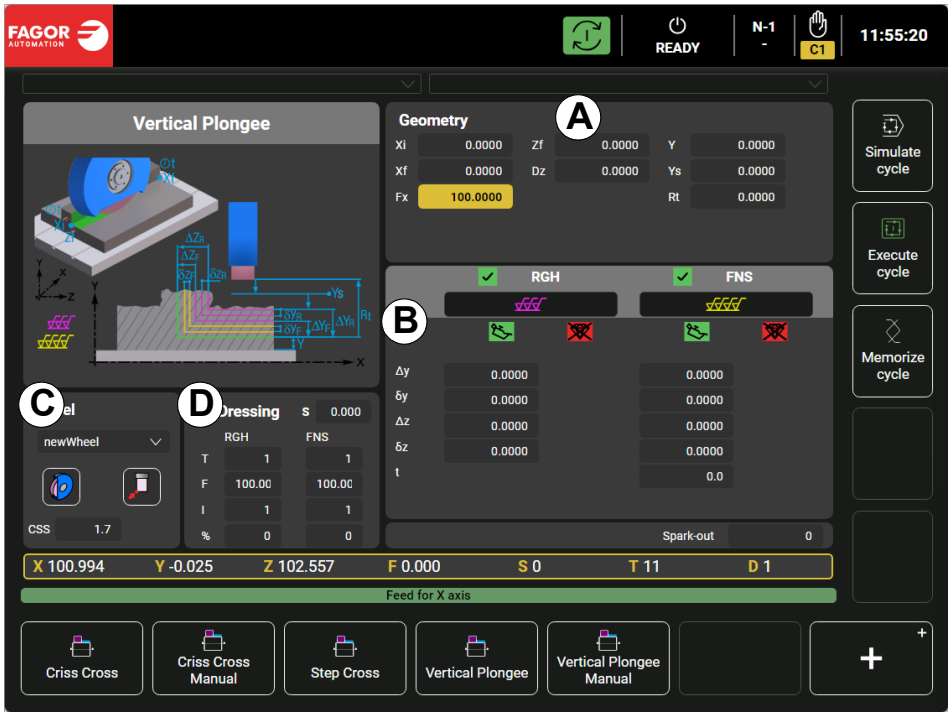
I = Number of dressing passes for the operation.

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

## 4.4 Vertical Plunge.

This cycle consists of performing a plunge on the Y and Z axes.

To access this cycle, after entering the grinding cycles, press the [Vertical Plunge] softkey or [F4].




### *Meaning of the cycle variables.*

A Geometry.

Xi = Initial position on the X-axis.

Xf = Final position on the X-axis.

Fx = Feedrate for the X-axis.

Zf = Final position on the Z-axis.

Dz = Safety distance on the Z-axis.

Y = Final position on the Y-axis.

Ys = Safety approach position on the Y-axis before the cycle.

Rt = Retraction position on the Y-axis after the cycle.

B Selection of phases and machining conditions.

RGH = Activates/deactivates the Roughing phase.

FNS = Activates/deactivates the Finishing phase.

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

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

Δy = Stock allowance to be ground on the Y-axis during this phase.

δy = Y-axis increment on each pass of the phase.

Δz = Stock allowance on Z to be ground in the phase.

δz = Z-axis increment in each phase pass.

If programmed in roughing and finishing, the sign must be the same for both phases. If programmed with a negative sign, machining will be performed using the right side of the wheel.

t = Dwell.

C Wheel data.

Wheel name.

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, the default data will be used to perform the dressing.

If enabled, the RGH column will be used for roughing and the FNS column for finishing.

s = Wheel speed for dressing.

T = Dresser number for the operation.

F = Dressing feedrate for the operation.

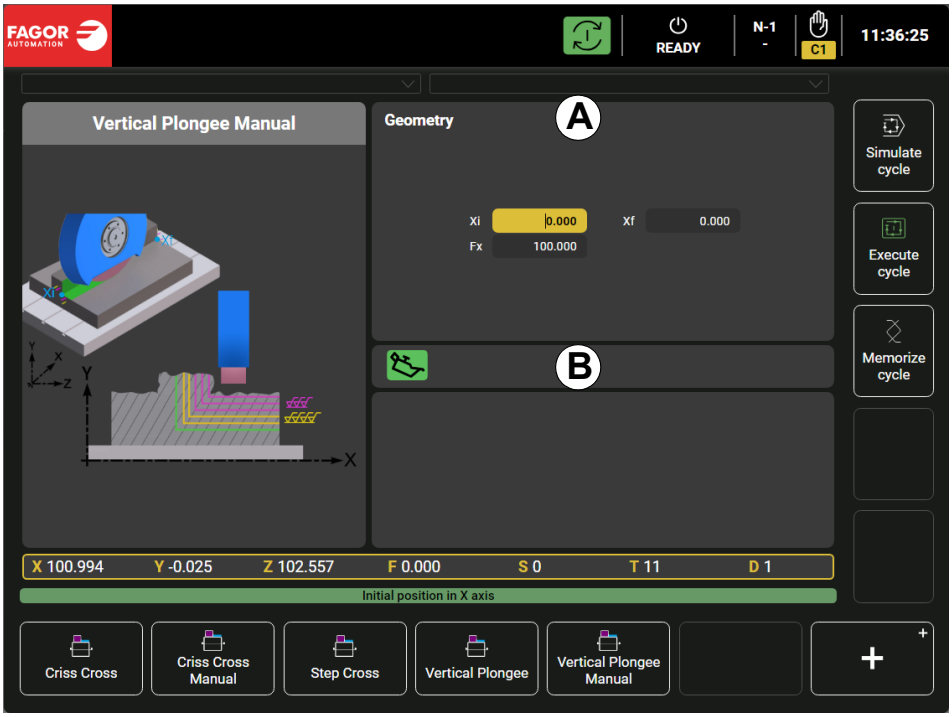
I = Number of dressing passes for the operation.

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

## 4.5 Vertical Plunge Manual.

This cycle is the same as the previous cycle (Vertical Plunge), but the movement on the Y-axis is done manually, i.e. by means of a handwheel.

To access this cycle, after entering the grinding cycles, press the [Vertical Plunge Manual] softkey or [F5].




### *Meaning of the cycle variables.*

A Geometry.

Xi = Initial position on the X-axis.

Fx = Feedrate for the X-axis.

Xf = Final position on the X-axis.

B Machining conditions.

 Turns the coolant on.

# GRINDING WHEEL VARIABLE.

5

## 5.1 List of variables from the technological tables.

The technological table variables for the tangential surface grinder are shown below.

### 5.1.1 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)<br>2 (External)<br>3 (Internal)<br>4 (Facing) | Wheel type. |
| V.TT.SIDE | Enum | 1 (None)<br>2 (Left)<br>3 (Right)<br>4 (Left + Right) | Permitted sides of the grinding wheel. |
| V.TT.SHAPEN | Text | | "Shape" – diamond pattern associated with the default grinding wheel |

### 5.1.2 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. |

### 5.1.3 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)<br>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)<br>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. |

### 5.1.4 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 | Y position for the grinding wheel change. |
| V.TT.MAGAZINE_ZCHANGE | Numeric | mm - inch | Z position for the grinding wheel change. |

### 5.1.5 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_DRESSLEFTYC | Numeric | mm - inch | Y offset of the grinding wheel origin on the left side with the diamond. Permanent value. |
| V.TT.DRESSOFFSET_DRESSLEFTYF | Numeric | mm - inch | Y 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_DRESSRIGHTYC | Numeric | mm - inch | Y offset of the grinding wheel origin on the right side with the diamond. Permanent value. |
| V.TT.DRESSOFFSET_DRESSRIGHTYF | Numeric | mm - inch | Y 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)<br>2 (Yes) | Stored offset of the grinding wheel on the left side after diamond dressing. |
| V.TT.DRESSOFFSET_RIGHTOFFSETDONE | Enum | 1 (No)<br>2 (Yes) | Stored offset of the grinding wheel on the right side after diamond dressing. |

### 5.1.6 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_PIECELEFTYC | Numeric | mm - inch | Y offset of the grinding wheel origin on the left side with the workpiece. Permanent value. |
| V.TT.PIECEOFFSET_PIECELEFTYF | Numeric | mm - inch | Y 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_PIECERIGHTYC | Numeric | mm - inch | Y offset of the grinding wheel origin on the right side with the workpiece. Permanent value. |
| V.TT.PIECEOFFSET_PIECERIGHTYF | Numeric | mm - inch | Y 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. |

## User notes:

## User notes:

FAGOR AUTOMATION

CNC 8065

REF: 2602

## User notes:

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