ROBOJOB
SIMPLY ROBOTIZING CNC

Instruction manual

Turn Assist

Version 3.2.x

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Contents

1. Introduction

This document contains the explanation about the use of the TURN ASSIST interface developed by RoboJob. How the program should be used in order to successfully set to work will be explained step by step. It is therefore advisable to first go carefully through this manual before starting work. Although the user doesn't need all of this information in order to work with the system, this manual describes all the aspects of the interface in great detail.
Certain settings will have been made beforehand by RoboJob. How this was done is also described in this manual.

The IPC (Industrial Personal Computer), as shown in fig. 1.1, is equipped with a Touch Screen. The user will then be able to enter the necessary data with a finger or with a stylus pen (fig. 1.3). The Fanuc Teach Pendant (operating console of the robot) is supplied on the IPC pillar (fig. 1.2). This operating console however, will not be applicable to the user. It is only used to operate the robot manually and RoboJob will therefore need this when putting the system into operation.

Figure 1.1: IPC pillar

Figure 1.2: Fanuc teach pendant

Figure 1.3: Stylus pen

2 Workflow screen

After the start-up of the Mill-Assist programme, the following screen appears:

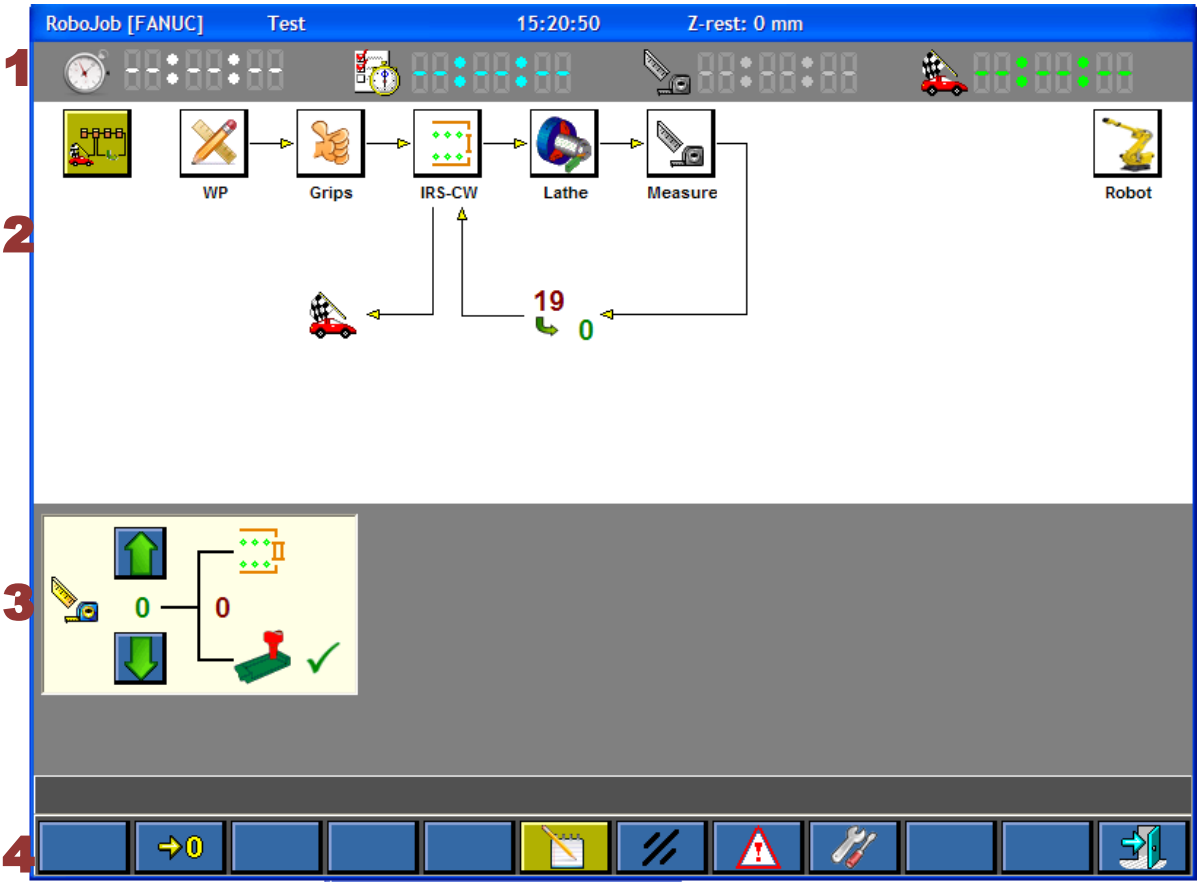


Figure 2.1: Workflow screen

We call this screen the workflow screen. This screen can be subdivided into **four sections.** These **four sections** are also used for most of the other screens. Where these screens are located is further described in the manual.
At the top are some more useful data:

- RoboJob [Fanuc] : RoboJob with Fanuc robot
- Test: Name/number of the current workpiece
- 15:20:50; The present time
- Z-rest: 0 mm; Linear distance still to be moved in the Z direction until the end position is reached.

2.1 Section 1

During the operation of the program, this section will display information about the cycle times.

Figure 2.2: Section 1

Format: hr:mm:ss

Indication of the cycle time.
After each cycle, the cycle time that has elapsed is displayed here. The software also measures the cycle time again and updates this after each cycle.

Format: hr:mm:ss

Indication of elapsed time in the current cycle.

Format: hr:mm:ss

Here, the time is indicated that has yet to elapse until the next measurement. This happens only if the user has indicated that an interim measurement is to be carried out.

Format: hr:mm:ss

Here, the time still remaining is indicated, showing how long the run has to go. The calculation is based on the previous cycle time, multiplied by the still to be produced components of the series, minus the already elapsed time of the current cycle.

Since the user may interrupt, speed up or slow down the movement of the robot at any time, it could be that these values differ from cycle to cycle. A reliable estimate of the time can thus only be obtained if the system is able to continuously work uninterrupted at the same speed on the set batch.

2.2 Section 2 (Workflow)

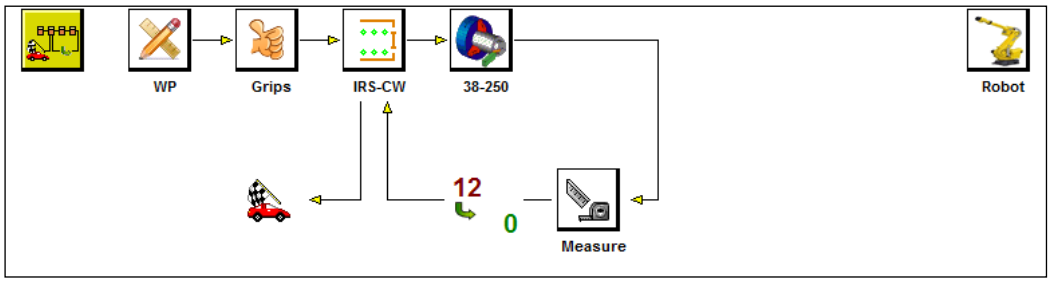


Figure 2.3: Section 2

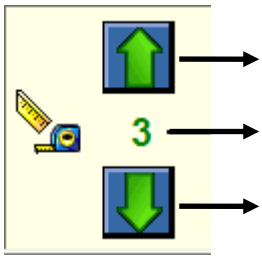
The second section gives an overview of the various workflow steps. It also provides an overview of how the user has to 'walk' through the software in order to fill in all the necessary data. This is called the so-called workflow and is easy to follow by means of the arrows in the diagram in fig. 2.3. The active sub-screen will be coloured dark yellow in the menu tree. Thus in the case of fig. 2.3 this is the workflow screen.
As shown above, the user will first have to fill in the data on "WP" (Work Piece), then on the 'Grips', after that on the 'IRC-CW', and then on the Lathe and finally Measurement (Meetgegevens). It is important that the subsequent screens are also completed in this sequence, because the software data from previous screens are used in the following sub-screen. The right hand side of the screen is further provided with a 'Robot' icon. No data should be entered here, but in that sub-screen the user will be able to manually operate limited parts of the robot (this is discussed later in detail).

2.3 Section 3 (Settings on the measurement)

Figure 2.4: Section 3

Section 3 contains specific information per sub-screen. This sub-screen is discussed in the following chapters.

In the workflow screen, in section 3, the user is able to enter as to whether or not a measurement should be done (see fig. 2.4).
By clicking on the green arrows, they can enter after how many pieces a measurement should be done. To the right of the picture they can specify whether the measurement should be in the machine or IRS -CW . The selection is done by pressing these icons. Next to the chosen selection, a symbol ✓ appears.

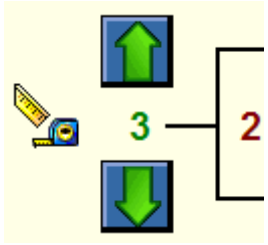


Press this soft key in order to reduce the measurement frequency by 1.

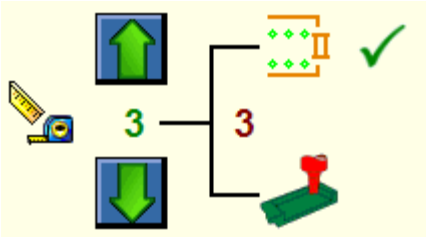
Measurement frequency

Press this soft key in order to increase the measurement frequency by 1.

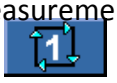
If the measurement frequency is as much as the number of components of the run, one cannot increase beyond this; there is therefore no longer a green arrow in this soft key.

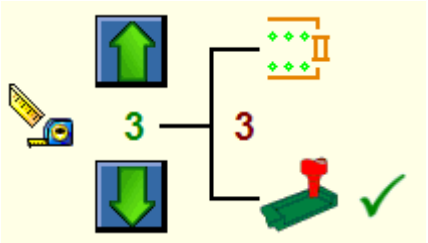


Number of components already done in this series. In this example, the run will be automatically interrupted at the next component in order to be able to make a measurement.



<u>Measurement on the IRS-CW.</u>

In this example where the measurement frequency of 3 is entered, the robot will pick up the 3rd component from the machine and set it aside on the IRS-CW. If there are components that still have to be made in this batch, the robot will load and start the machine. The blue indicator light above the IPC pole will blink, this to indicate to the operator that he has to come and make a measurement.
Once the measurement is complete, the user can continue the program by clicking on the function key 



<u>Measurement in the machine.</u>

In this example, where the measurement frequency of 3 is entered, the robot will not pick up the component from the machine upon termination of the CNC program. The blue indicator light above the IPC pillar will still blink, this to indicate to the operator that he has to come and make a measurement. After the measurement, the finished part must still remain in the machine so that the robot can go to pick up this component. Once the measurement is complete, the user can continue the program by clicking on the function key. 

2.4 Section 4 (Function keys)

Figure 2.5: Section 4

Section 4 contains the function keys. The function keys also have another meaning per sub-screen. They will also be discussed in detail when discussing the sub-screens.

When starting up the RoboJob TURN ASSIST program, we enter the workflow screen. Here we see that there are six function keys available:

Reset measurement

This function key is a reset button for the number of finished workpieces before a measurement must be done.
E.g. Suppose the user enters into the software that the machine has to produce 10 workpieces before a measurement must be carried out. If he then, for one reason or another, carried out a measurement after 8 pieces, then in some cases it is not necessary for the machine to be shut down again for a measurement after the 2 following pieces. The counter is reset by pressing this button so that the machine will produce a further 10 units before the measurement has to be carried out.

Edit mode

This function key allows the user to specify whether or not he is in edit mode. As described later in this manual, this function key appears in all the sub-screens. The purpose of this key is that the user cannot change any data while the system is automatically working.
When this key is inactive  , the user will not be able to enter any more data into the software. Certain function keys will also not be visible when this key is inactive. When one is in edit mode,  this function key has a dark yellow background.

Reset alarm

A reset request is made by using this function key. Without resetting the alarms, the robot will not want to continue for safety reasons. The alarms are always displayed in the toolbar just above the function keys. If they do not disappear after pressing the reset button, this means that they have not yet been resolved. This function key is also available in other sub-screens.

Alarms overview

The toolbar just above the function keys only shows the alarm with the highest priority. At this moment however, no other alarms may be active. These are displayed in a separate screen that is activated by clicking on this key. This function key is also available in all the sub-screens. At the end of this manual an overview is provided of the potentially occurring alarms and their solutions.

Configuration

After clicking on this function key, the software shows the screen with the settings (fig. 2.6).
It's important to know that this function key may only be selected if the function key for selecting the edit mode is active  .

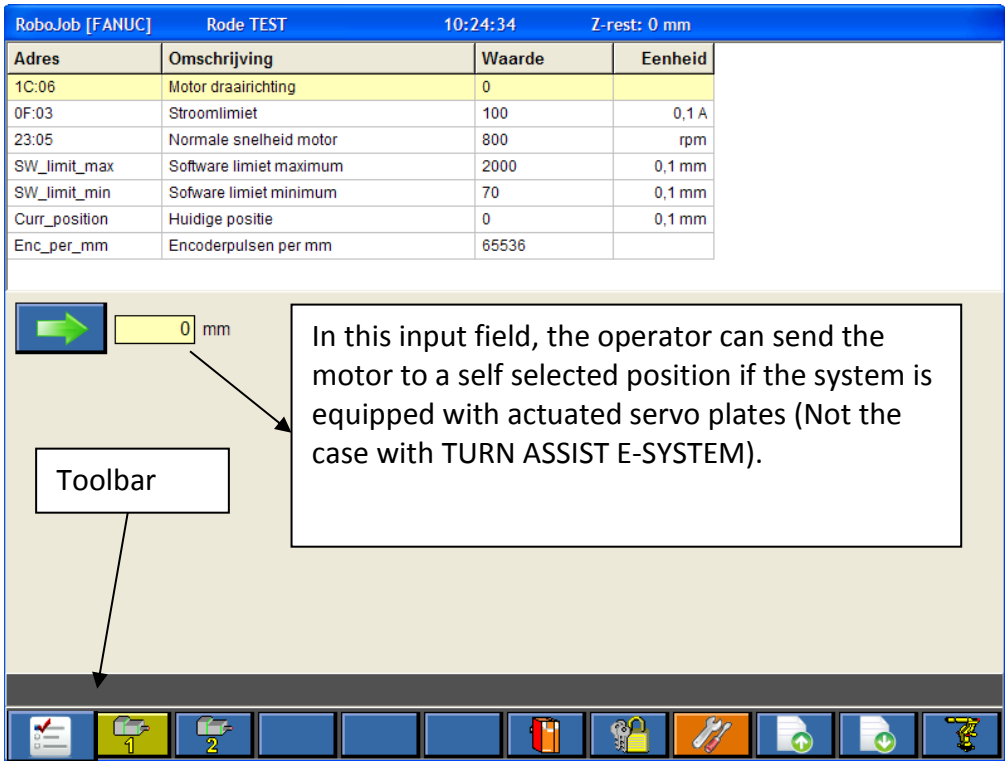


Figure 2.6: Configuration screen

License settings of the system

Gives an overview of the available options.

Data on Motor 1 (This motor drives IRS-CW-plate I)

This key is selected by default when the user enters the configuration screen.
The screen here displays certain data on Motor 1. RoboJob uses this screen during installation. This screen is thus not important for the user.

Data on Motor 2 (This motor drives IRS-CW-plate II)

When this function key is selected, data will be given on Motor 2.
These data are also not relevant for the user and will only be used by RoboJob.

Machine-dependent settings

Not relevant for the user. These settings are entered by RoboJob and should never be modified by the user! This in order to prevent erroneous operation of the system. The majority of settings may only be changed after entering the password

Password

A password first has to be entered in order to change the motor settings.

Back to the Workflow screen.

It is noticed that the workflow area has disappeared in the configuration screen. This function key must be pressed in order to return to the workflow screen. This is the same function key that was selected to go from the workflow screen to the configuration screen.

Changing the page

If the table on the data, for example for the motors, becomes larger in the future, the user can go from one page to another by using these function keys. Currently these function keys are not used.

Configuration in relation to the robot

Finally we come to the last function key for the settings of the robot.
It is important to make a differentiation here, between a system with **‘dockable grippers’** and the system with **‘fixed’ grippers**.
This differentiation is important because the software will show different function keys depending on which system is installed.

Installation with ‘dockable’ grippers

Figure 2.7: Dockable grippers

Figure 2.8: Gripper magazine

With this installation, the robot will be able to exchange its grippers. It will set aside the grippers that are not used in a gripper magazine, as shown in fig. 2.8.
If this configuration was opted for, then the configuration screen looks like that in fig. 2.9

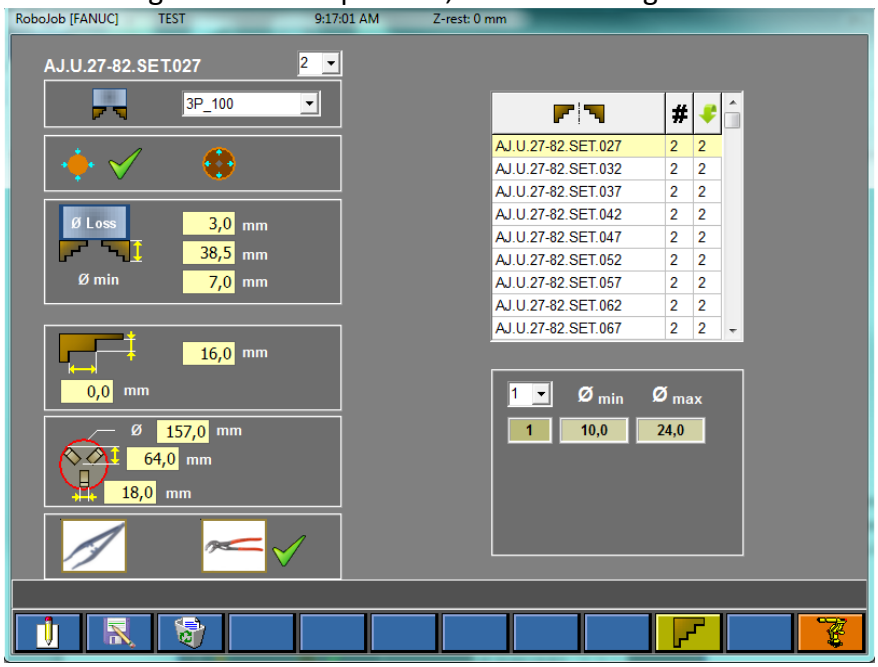


Figure 2.9: Robot Configuration-screen with Gripper magazine

Since the robot can exchange its grippers, it has to know which grippers are all available. In order to then calculate which jaws are required to grip the components, the user must first enter which jaws this installation has available.
These configurations are entered here. By default, the user enters the screen that is shown in fig. 2.9.
This is the screen where the data on the jaws are entered.
The table in fig. 2.10 indicates which jaws are currently already saved in the database. On installation, RoboJob will save already ordered jaws in this database. If the customer wants to have other jaws later, he can simply add these to the database.

	#	
J3P.125.I022.3.20.08.S	1	1
J3P.125.I042.3.20.08.S	1	1
J3P.125.I141.2.18.08.S	1	1
J3P.125.U007.1.20.24.H	1	1
J3P.125.U027.1.20.24.H	1	1
J3P.125.U047.2.20.08.H	1	1
J3P.125.U047.2.20.08.S	1	1
J3P.125.U067.2.20.08.H	1	1
J3P.125.U067.2.20.08.S	1	1

Figure 2.10: Jaws' database

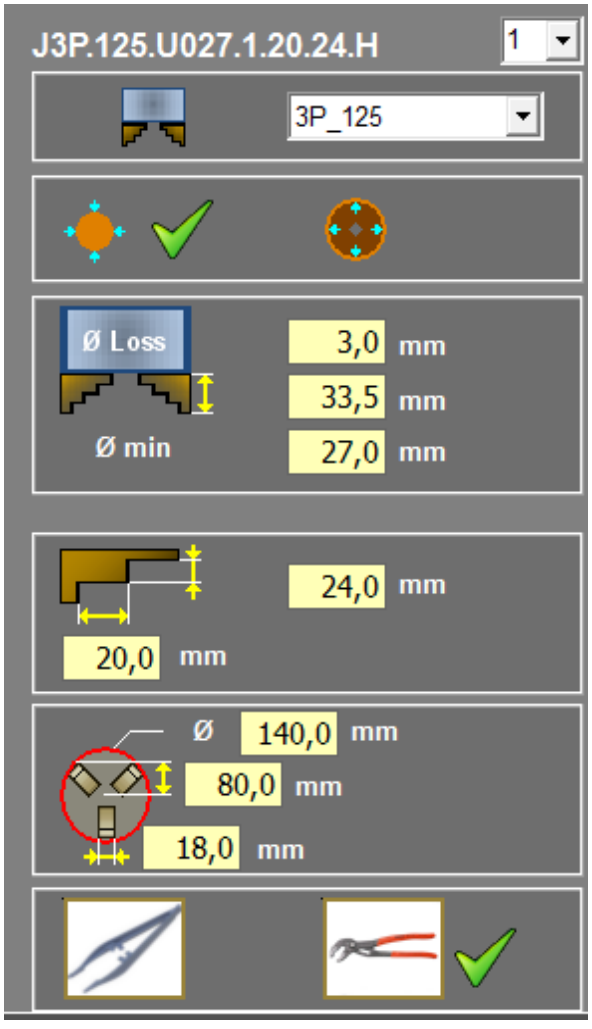
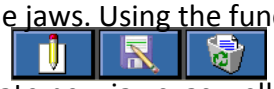


Figure 2.11: Jaw properties

The input fields displayed in fig. 2:11 are used to enter data on the jaws. Using the function keys,  the user can create new jaws, as well as make and delete a copy of existing ones.
When entering a new jaw into the database, it is important that the name of the jaw is entered correctly.
For the example from fig. 2.11:
J3P.125.U027.1.20.24.H

- J3P stands for Jaw 3 Points (three point jaw)
- After that comes a full stop (.)
- 125 is the size of the base onto which the jaws are clicked (sub-gripper) (80, 100 or 125 currently)
- I = Internal , U = External
- 027 is the smallest graspable diameter in mm.
- Next comes a full stop yet again (.)
- 1 stands for the number of steps (this may be 2, 3 or 4)
- Then a full stop comes back again (.)
- 20 is the measurement of the length of the pressure area in mm
- Back to a full stop (.)
- 24 is the step height in mm.
- Again a full stop (.)
- S = Soft /H = Hard jaw.

Here's an example of what data has to be entered about the jaws, on the basis of the figures below.

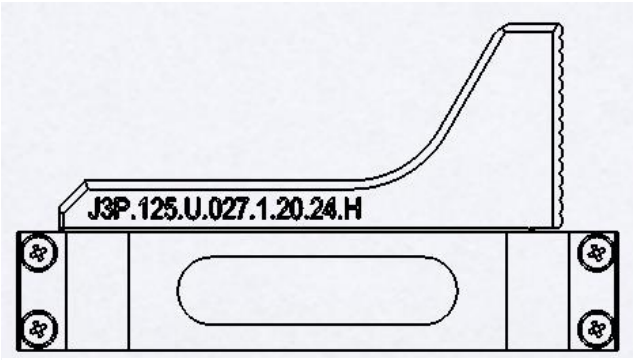


Figure 2.12: J3P.125.U.027.1.20.24.H

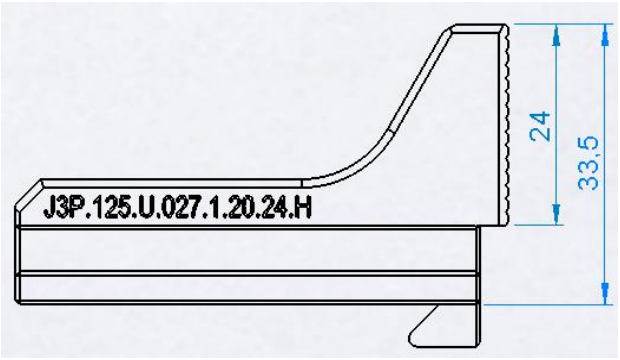
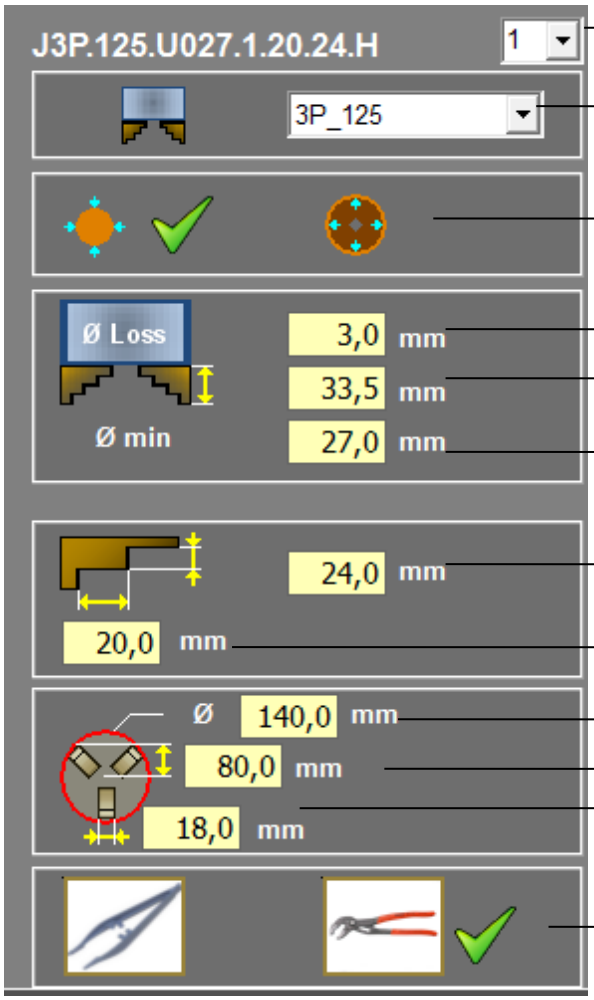


Figure 2.13: J3P.125.U027.1.20.24.H



→ The number of sets that one has of this type.

→ The type of (sub) gripper on to which the jaws are clicked. **J3P.125**.U.027.1.20.24.H

→ External or internal grippers.
J3P.125.**U**.027.1.20.24.H

→ The end-clearance provided (standard 3 mm)

→ The height of the Jaw. !See fig. 2.12 and 2.13 How this should be measured!

→ De minimum grip diameter
J3P.125.U.**027**.1.20.24.H

→ The height of the gripper - see fig. 2.13
J3P.125.U.027.1.20.**24**.H

→ The length of the pressure area
J3P.125.U.027.1.**20**.24.H

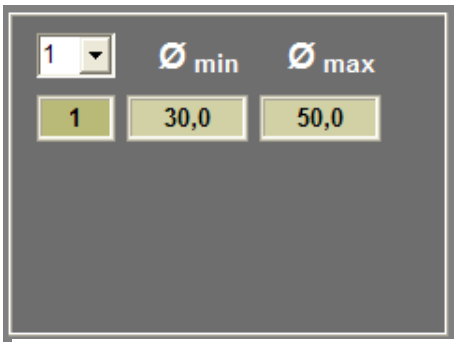
→ The outer circle defined around the jaws

→ Interference value for stacking

→ The jaw width

→ Hard or soft jaws
J3P.125.U.027.1.20.24.**H**

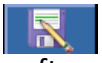
Figure 2.14: Jaw properties



Finally, in this box (Fig. 2.15) the number of steps for this jaw must be selected.
On the basis of the number of steps entered, the software will automatically show what reach this jaw is able to grip.
J3P.125.U.027.1.20.24.H

Figure 2.15: Jaw range

The data changed are automatically saved in the database.



A copy of the current jaw can be made by clicking on this function key. The TURN ASSIST software will display the soft keyboard in “jaw copy" mode (visible above the yellow entry bar) (fig. 2.16).

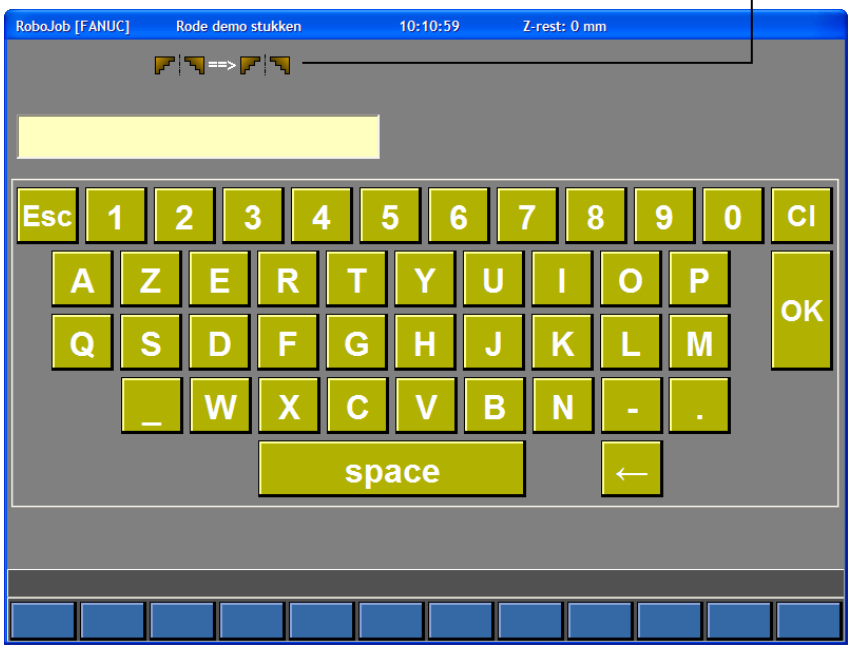


Figure 2.16: Soft key board in jaw copy mode

Pressing the Esc-soft key takes you back to the jaw configuration screen. By using the soft keys on the soft keyboard one can enter the name of the new jaw. By pressing the 'enter' soft key the new jaw is saved in the database and you then return to the jaw configuration screen.
If the jaw name entered already exists in the database, when the 'enter' soft key is pressed, an error message is received: "name is already in the database". One can then enter a new name, or press the Esc soft key to exit this screen and return to the jaw configuration screen.
Depending on what type of keyboard has been set, an AZERTY / QWERTY or QWERTZ keyboard will be displayed.

For the installation wherein the robot is able to exchange its grippers (‘dock’), there are two additional function keys available as opposed to the installation with fixed grippers.

 &

When clicking on the first function key,  the software gives an overview of the Gripper magazine (fig. 2.17).

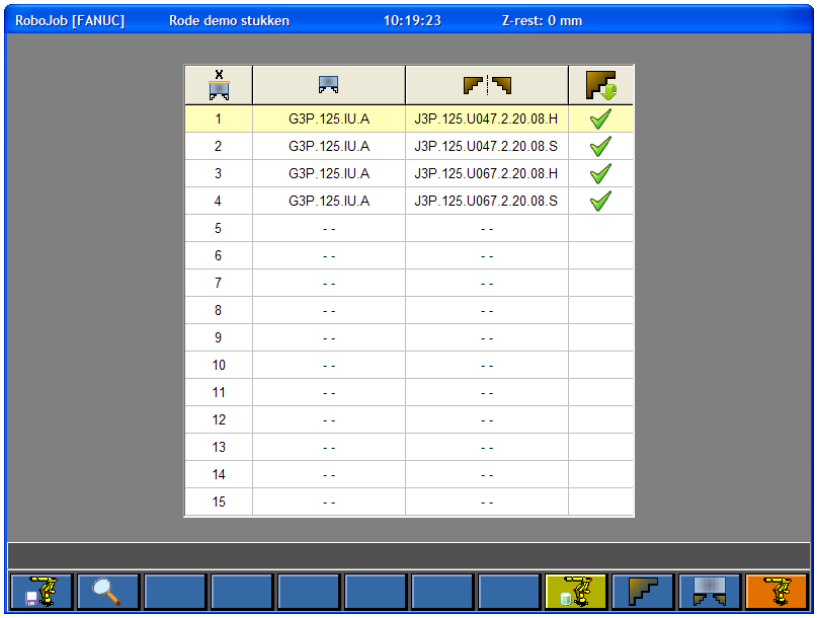


Figure 2.17: Gripper magazine screen

All the grippers are shown here with their respective jaws. Initially it may be that this list is not complete. This list may then be supplemented by clicking on  .

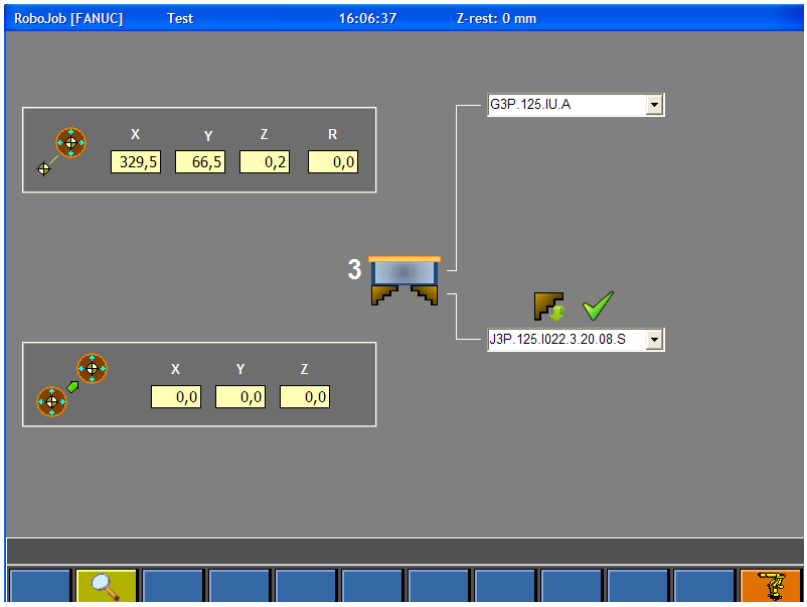


Figure 2.18: Adding gripper to the gripper magazine

When you click on this function key, the screen shown in fig. 2.18 appears.
On the right of the screen at the top, the sub-gripper may be clicked on plus the jaws that may be at the bottom, and have not yet been assigned to another sub-gripper. If necessary you can also click here if the jaws are firmly mounted on the gripper or are manually interchangeable via the quick change system. The data to the left are the dock and undock positions of the gripper.

In order to return to the previous screen the same symbol (that is now highlighted in dark yellow) should be selected.
The second function key that will only be shown with the interchangeable grippers is: 
Here, the user can enter data about the sub-gripper (this is the base gripper onto which the jaws are attached). Since RoboJob enters these values during installation, the user should not pay too much attention to these. Yet the significance of this screen is briefly explained here.

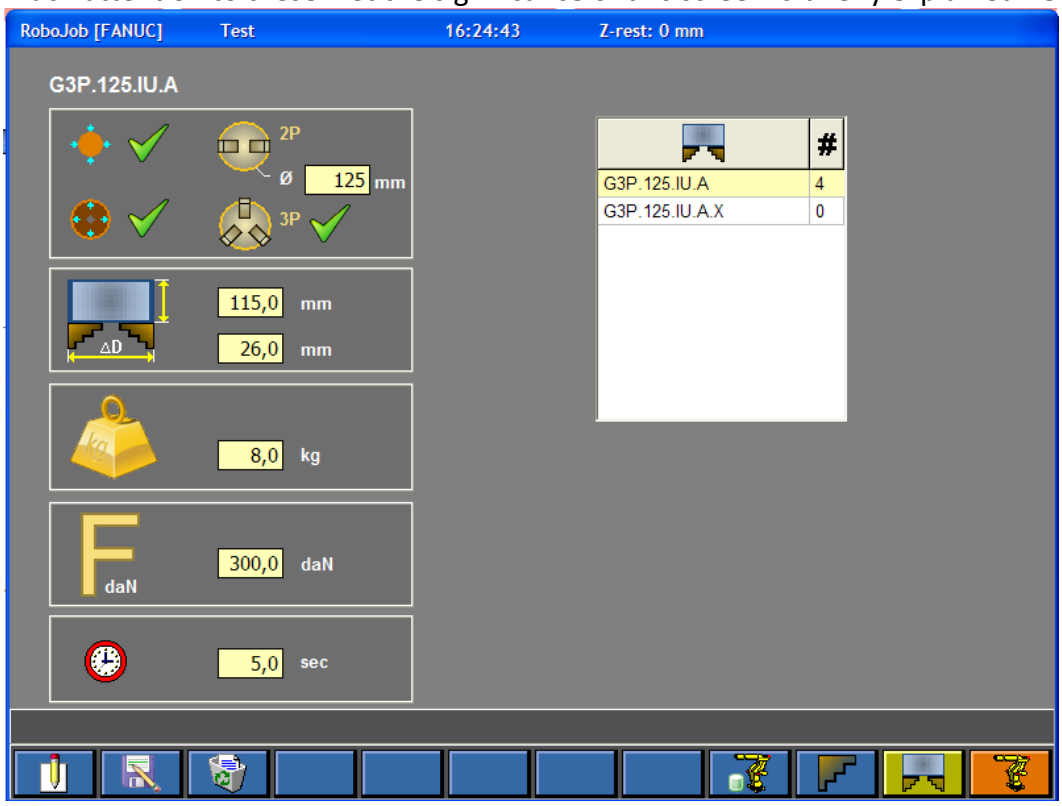


Figure 2.19: Sub-gripper properties 1

The right hand part of fig 19.2 shows what sub-grippers there are as well as how many there are currently already assigned to the database. The properties of the sub-gripper are entered in the left hand part. At the top left-hand side we indicate whether this gripper can be used as an inner or outer one or as both. Here you can also select whether it concerns a two or a three-point gripper. In the second box, some dimensions of the sub-gripper are entered. The third box is reserved for the weight. The maximum gripping force is then set. Finally, it should be entered as to how long it takes before the gripper goes from open to closed or vice versa.
Now that all the data about the robot has been set, one can leave the robot configuration screen by clicking on the following function key: 

Installation without ‘dockable’ grippers

If no interchangeable grippers are used, the settings are basically identical to those wherein there are interchangeable grippers. The only difference is that the function keys

 **&** 

will not be visible. The reason for this is that no Gripper Magazine will be installed if the grippers are still not interchangeable.
Since RoboJob, on installation, rigidly connects two grippers to the robot flange, the information about the sub-gripper will no longer apply. These are constant values that no longer change in the future.
The user must still define the jaws, because these can still be exchanged. The software will rely on this information to determine later which jaws are to be placed on which gripper. Further details are given in the chapter about the grippers.

You can exit the configuration screen by clicking on the configuration function key. 

Exiting the program

The last function key of the workflow screen is a key that is used to exit the program. This function key will only be visible when the edit mode is active. 

3. WP-SUB-SCREEN (Workpiece)

3.1 Sections 1 and 2 are the same as for the workflow screen

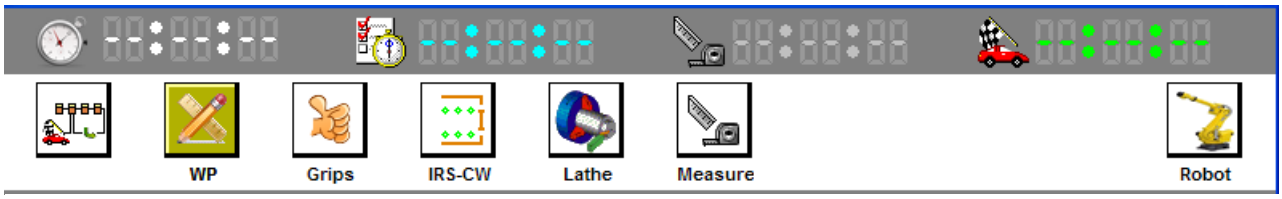


Figure 3.1: Section 1 & section 2

If you click on the icon  in the tool bar, the screen shown in fig. 3.2 appears.

3.2 Section 3 (Set-up screen)

Operation without the rod

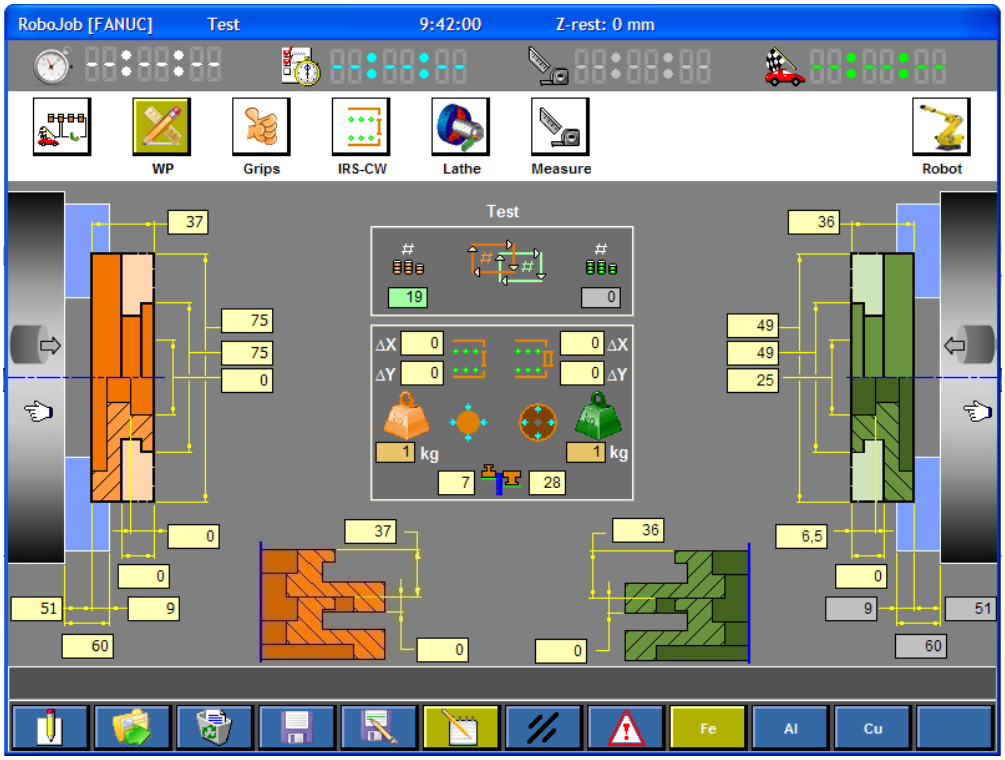


Figure 3.2: WP set-up data

This screen lists all of the data which are relevant to be able to enter a correct operation by the robot. The software needs this information to calculate the appropriate grippers and to transport the workpiece in and out of the machine in the right way.

The user will have to enter the correct dimensions for the rough products as well as for the finished product. As colour convention the TURN ASSIST program uses a red colour for rough products and a green colour for the finished products.

The left-hand part or the screen is reserved for the data of the rough material. The right-hand part for the finished material. This selection hand shows in which spindle the material is located in the CNC Machine. By clicking on this symbol, either the left-hand or right-hand spindle may be selected. If the machine is only equipped with one spindle then clicking the selection hand has no effect, and the selection is always to the left.

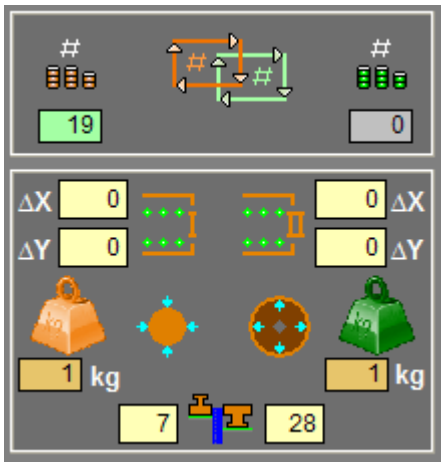
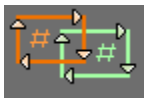


Figure 3.3: WP Data

In the middle part of the screen a number of other important items still need to be set.

Here, the user must indicate how many pieces are to be produced.

The software will continuously update this field, and shows how many units have been produced.



or

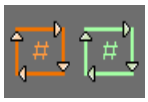


Figure 3.4: double cycle

Figure 3.5: single cycle

Based on this icon, the user can select a single or double cycle. When a double cycle is selected (fig. 3.4) then when unloading the machine, the robot will already take along a new rough workpiece. This way, he can operate the machine the fastest by directly loading the rough material into the machine. If however, the double cycle is not possible for certain reasons, then the robot will first lay the finished product on the IRS-CW and then take hold of the raw material and load it into the machine. If the workpieces are too heavy, then the software will not allow the double cycle to be selected.

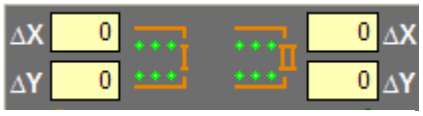


Figure 3.6: X/Y Compensation

On the basis of fig. 3.6, an X / Y compensation may be entered for the position on the IRS-CW. For each workpiece, the TURN ASSIST software calculates where it should be placed onto or removed from the IRS-CW. With this, round pieces are always aligned against the IRS-CW-pillars. If the pieces are not circular shaped, then the user can enter a compensation himself so that the robot can still place the pieces in the right position.

By default, the raw pieces are placed at the front of the IRS-CW and the finished pieces on the furthest IRS-CW-plate. If the user wants this the other way round, he can do this by clicking on the following icon: 

One can also opt to eject the finished products into a receptacle bin which must be placed on the IRS-CW. This is useful if the diameter of the components is too small to be placed between the poles of the IRS-CW. This option is selected by clicking on the following icon: 

The TURN ASSIST software will then indicate that the unloading will take place into the receptacle bin:

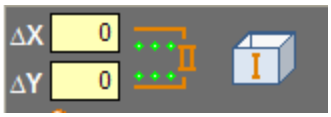


Figure 3.7: Working with receptacle bin

In this case, we see that the raw materials are to be placed on the second IRS-CW-plate, since the receptacle bin is placed on the first IRS-CW-plate.

Working with a receptacle bin is only possibly with the TURN ASSIST SYSTEM with actuated plates. Currently this is not yet possible for the TURN ASSIST-E-SYSTEM.

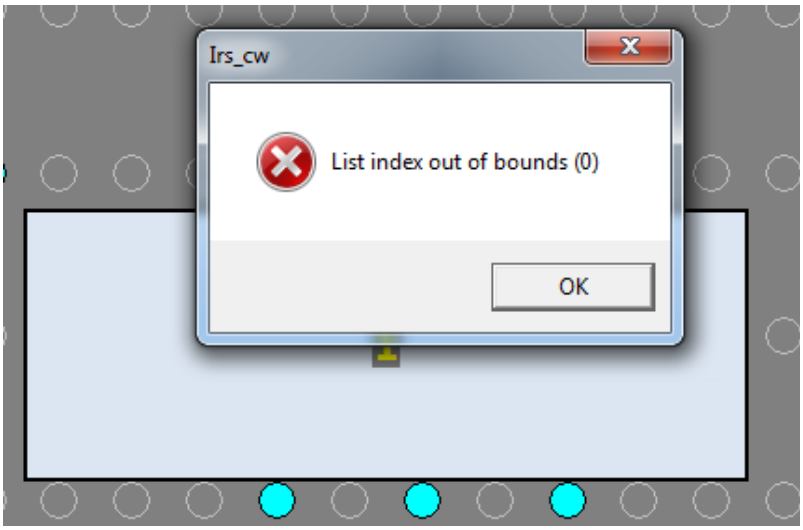
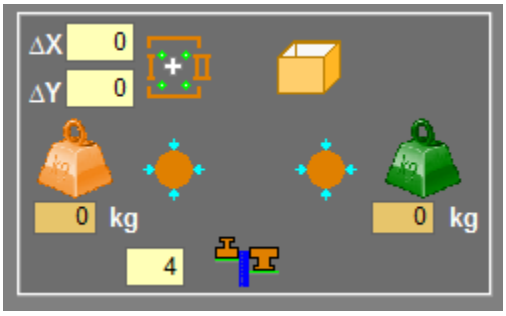


Figure 3.8: Out of bounds index list

If the operator selects a measurement on the TURN ASSIST in the mode that the finished products should be dropped into a container, an error message will occur (fig 3.8).
The reason that this error occurs is because the software wants to show the measurement icon where the last finished workpiece was placed on the IRS-CW (in case the workpieces were placed on the IRS-CW). Due to the fact that in this case we drop the workpieces into a container, there will be no clear position as to where the finished workpiece lies.
(The finished products may also be placed on a pallet, see chapter 9 - Pallet option).

Another option is to drop the finished product into a container located outside the stacker. This option creates double capacity where both zone 1 and zone 2 can now be used for placing rough components. This selection is made by means of the following icon selection:



The software then indicates that the rough workpieces may be placed on zones 1+2. 

A further aspect is weight input. For the robot, it is essential that it knows how much the workpieces weigh. The user can enter this both for the rough as well as the finished material on the basis on the following icons.

Note that red here again concerns the rough workpiece and green the finished product.
A second way of carrying out the weight determination is by means of a selection of one of the function keys.
On the right-hand side at the bottom, three function keys have been reserved to indicate which material it will concern.

The software will now calculate how much the pieces weigh on the basis of the dimensioning. If the sum of rough and finished product exceeds the permissible value, the TURN ASSIST software will then opt for a "single cycle" so that the robot will not be overloaded. This weight input must be completed, partly because otherwise no account of will be taken of deflection of the Robot Arm and on the other hand to determine if the total weight is not too much for the motors of the IRS-CW. The motors that drive the IRS-CW plates can drive up to 300 kg. If the total weight exceeds 300 kg then the TURN ASSIST software will display an error message (fig 3.8).

Figure 3.8: IRS plate overweight error message

Using these icons, the user selects whether the product should be taken with an internal or an external gripper.

Here the user must enter the end-stop length of both the rough and the finished workpieces against the pillars of the IRS-CW. It is not possible to enter a smaller size than the minimum construction height. This value is a given, which is in the Motor configuration and is entered by RoboJob.
If too small a size is entered, this will be shown on the basis of an error message (fig. 3.9). Since the TURN ASSIST SYSTEM BASIC SYSTEM does not have driven servo plates, these icons will not be displayed at the interface of a TURN ASSIST BASIC SYSTEM.

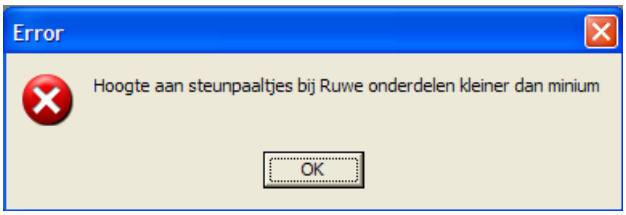


Figure 3.9: Entry of height of the support pillars is too small

If the workpieces, either rough or finished, fit together, then this is set at the bottom of the screen using the following figure:

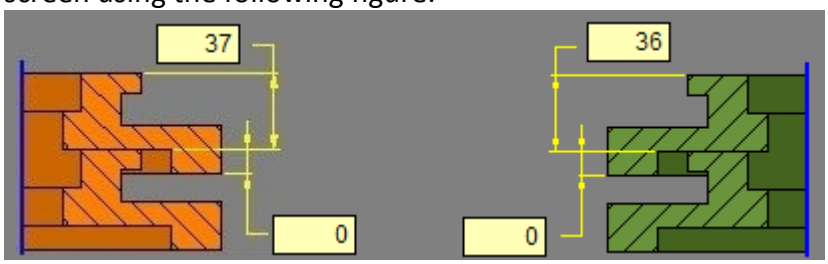


Figure 3.10: Interlocking workpieces

Working with a Bar (with or without Bar Feeder)

Sometimes the CNC machine may be provided with a rod. In this case the robot will not have to pick up rough workpieces on the IRS-CW. For the operation with the rod, the TURN ASSIST software currently provides three variants.

First rod work variant

The first variant is obtained by clicking on the following icon in the WP sub-menu screen for data of the **rough** workpiece.  This is the icon for the rod and is inactive by default.

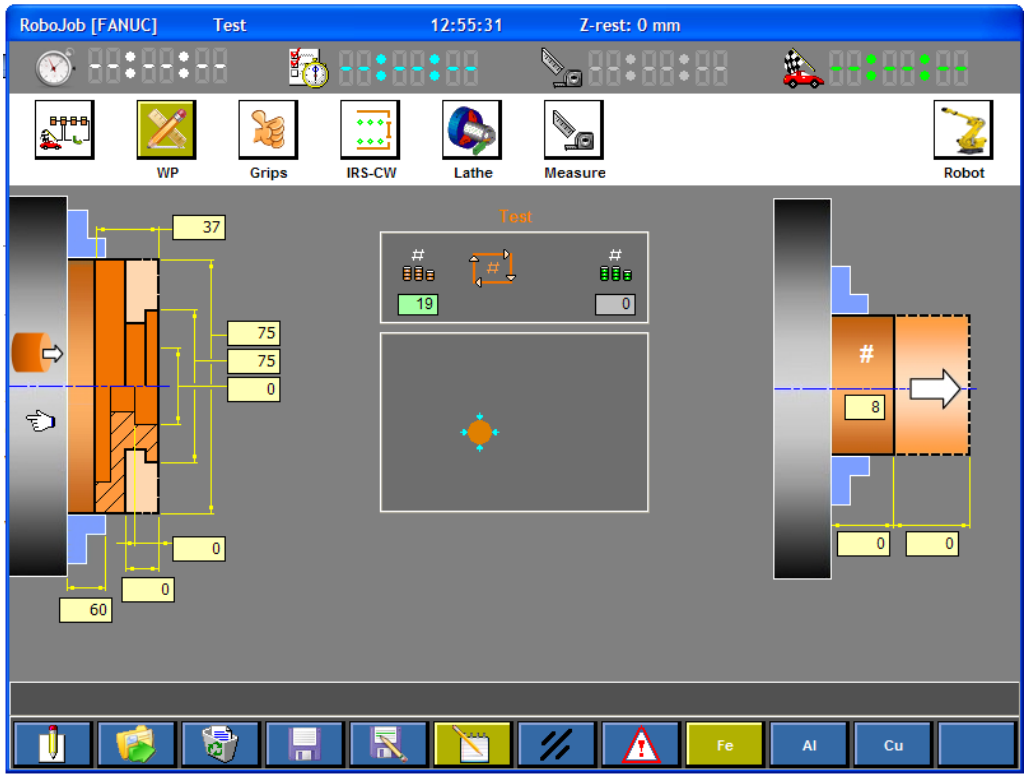


Figure 3.11: First rod work variant

This variant will be used if the machine is equipped with a Part Catcher and if a rod is being processed. Some machines are not equipped with a Bar Feeder. In this case the robot will only be used to remove the rod from the spindle.

It should be noted that the data here are shown in red because here it only concerns rough material. These option is currently still in the design phase and thus cannot be used for the time being.

Second rod work variant

In order to go to the second variant, the user must first go to the screen of the first variant, as explained above. He should then click twice on  likewise for the data on the rough workpiece as shown opposite in fig. 3.11. When  is clicked on twice, a new icon appears here: 

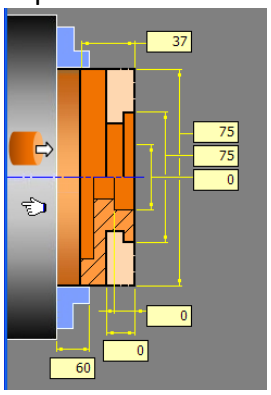


Figure 3.12

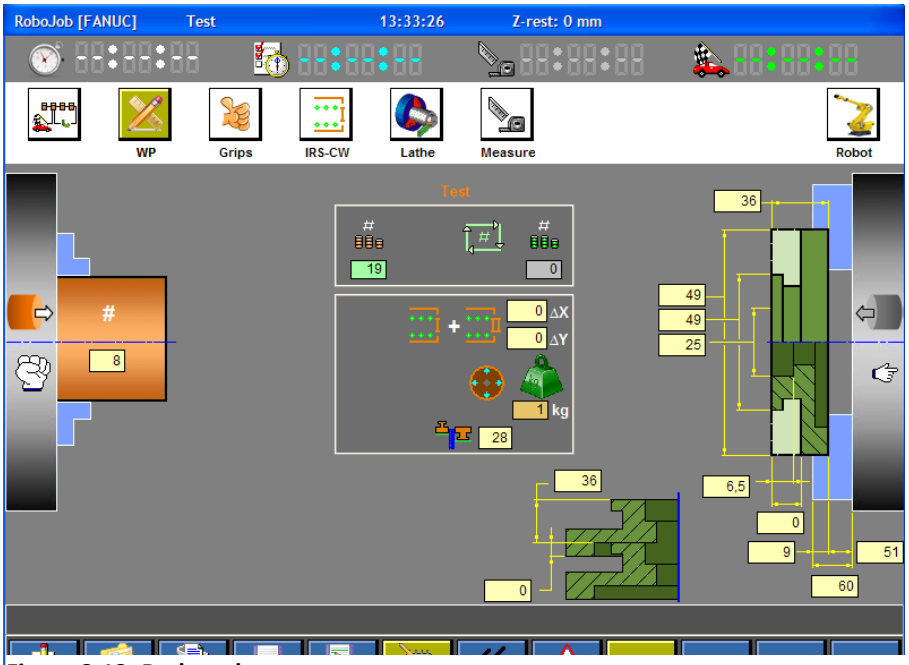


Figure 3.13: Rod work

Figure 3.13 shows the screen display. Note that the rough workpiece data are not shown. This is normal since this variant assumes that the rod is operated by means of a Bar Feeder or in another way. Thus the robot will only have to concentrate on the finished product.

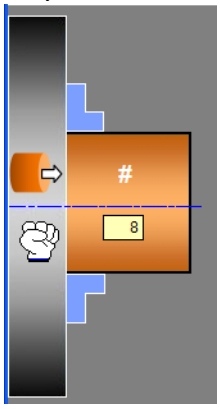
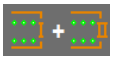
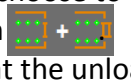


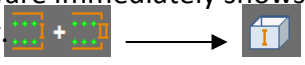
Figure 3.14

The user only has to enter how many pieces can be produced from one rod. This figure may safely differ from the number of pieces to be produced. The software indicates when the rod has been reprocessed. The blue lamp will blink (see chapter 7, interaction with the user) and the user will have to insert a new rod.

The data that has to be completed for the finished product is still done in the same way as for operating without a rod.

Note that the robot can now load products both on position 1 and on position 2 on the IRS-CW, since there are now no rough workpieces on the IRS-CW-plate. 

Here too, one can choose to place the finished pieces into a container. This is done by clicking on 

The software immediately shows that the unloading of the workpieces is being done into a container. 

Third rod work variant

The third variant is obtained by clicking on the following icon  in the WP screen for data of the **finished** workpiece. This is the icon for the rod and is inactive by default. The following screen is displayed:

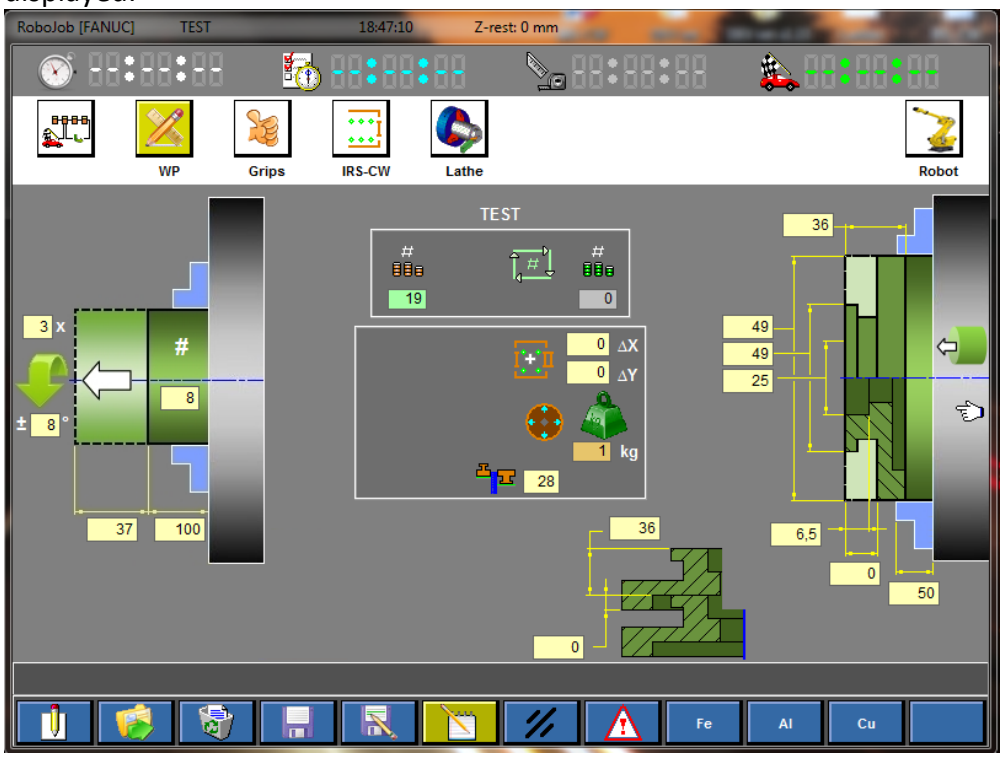
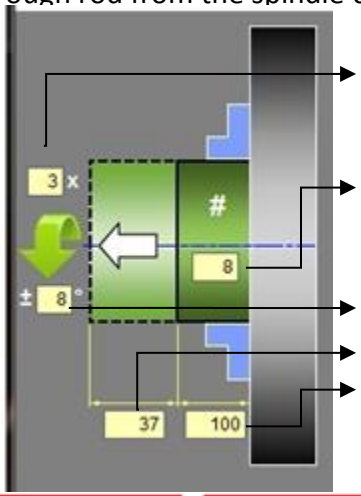


Figure 3.15: Third rod work variant

With this variant, the robot will grip the finished workpiece, then pull it to a desired size from the jaw plate, to then break off the rod afterwards. For this, the product must first be mechanically almost cut away so that the break-off forces on the robot are minimal.
We recommend cutting off up to Ø4 mm -Ø6 mm, this is to experimentally test how much, depending on the material type.
Since the robot needs no knowledge about the rough product, the operator also doesn't need to enter any dimensions for the rough product. However, he can select the number of levels the breaking off cycle will have to be carried out and how many times this cycle is repeated. These values may differ from material to material. Also the extent to which the robot has to draw the rough rod from the spindle can be set by the operator.



- Number of times that the breaking off cycle must be repeated. (Start here high (e.g. 10) and then see when the material breaks off effectively in order to set the correct value afterwards. Number of workpieces from one rod.
- The level of degrees that have to be broken off (8°-12°)
- The extent to which the robot has to pull the rod
- Dimension of the finished product w.r.t. the jaw plate.

3.3 Section 4 (Function keys)

The following is an overview of the function keys for the WP (Workpiece) sub-menu. 

New

A new setting can be created using this function key. This button has to be pressed for a few seconds however, in order to be effectively activated. This prevents all data from being deleted by accidentally pressing this key.
When this key is pressed for a few seconds, all the data will be initialized to 0. The gripper-type for both the rough and the finished component is selected as external by default.

Open

Using this function key, programs that have already been saved may be opened.

Delete

This function key deletes the program called up. This key also has to be pressed for a few seconds in order to be activated.

Save

Changes to a program already stored are saved using this function key.

Save as

Via this function key one can file the present component under a new name. Afterwards, you can then make the necessary changes. The soft keyboard will appear in "workpiece copy" mode.

Edit mode, reset, alarms

The function keys have already been discussed in Chapter 2 for the function keys of the workflow screen. Their function is the same in this screen. (pages 10 & 11)

Material selection

These function keys are used to indicate which material is being processed. Based on these materials, the TURN ASSIST will calculate how much both the rough and the finished products weigh. If one makes a weight input oneself, none of the function keys will be selected.

4. Grippers - SUB-SCREEN

4.1 Sections 1 and 2 are the same as for the workflow screen

Figure 4.1: Section 1 & section 2

4.2 Section 3 (Set-up screen)

Please note that here, a differentiation must also be made must between a system with and without Gripper magazine. In this manual, first the gripper sub-screen is explained on the basis of a system with Gripper magazine and then without Gripper magazine.
If you click on the icon 

in the tool bar, the screen shown in fig. 4.2 appears

With Gripper magazine

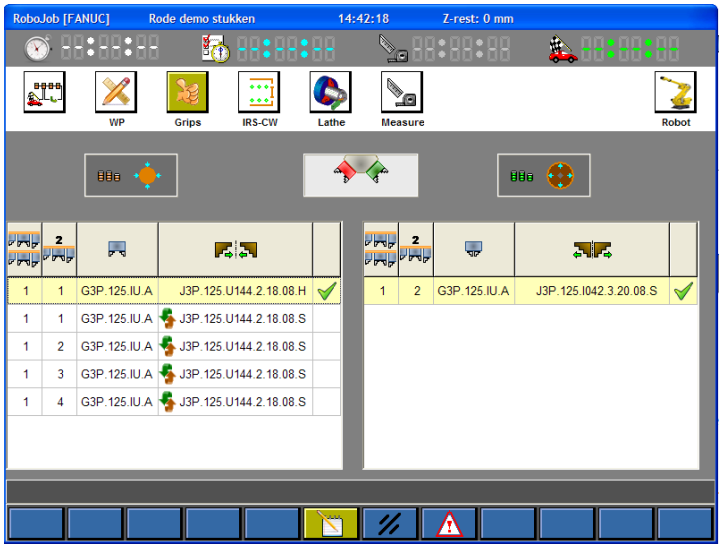


Figure 4.2: Gripper sub-screen with Gripper magazine

This screen provides information about the selection of the grippers. Based on which grippers and jaws are available in the database (see pages 12 –17) and on the dimensions of the workpieces (see Chapter 3) the TURN ASSIST software will propose all the possibilities for the way of gripping. The software will make a default proposal for the gripper to be used, with associated jaws  .... This proposal can of course be 'overruled' by means of selecting another option. In fig. 4.2 we see that the software for the rough component shows five possibilities. The first column  indicates the Gripper magazine. If one Gripper magazine is used, this will remain one. The second column ...  .indicates the sub-gripper number. This sub-gripper number itself can be set on the basis of the dip-switch which is provided on each dockable sub-gripper, as indicated in fig. 4.3.

Figure 4.3: Dip Switch for setting the subgripper number

The third column shows the name of the sub-gripper. Finally, the fourth column shows the name of the jaw. In the fourth column is the icon in each case for the last four proposals. This means that with the selection of one of these four, an exchange of jaws will have to take place. The TURN ASSIST software keeps track of which jaws are positioned on which grippers. If for some reason the user has placed other jaws on a gripper, he can enter this into the Gripper magazine configuration screen (see page 15).
The checkmark indicates which selection is active.
In the Gripper sub-screen you can also optionally change from an internal to an external gripper, and vice versa by clicking on the symbols & that are situated above the tables.

COMMENTS

If the same jaw is available both for the rough as well as for the finished products, and one only has one set of these, then if one makes this jaw selection for the rough component, the TURN ASSIST software will show the A/B check box. A/B By checking that, one makes the configuration that one is going to take the rough and the finished part using the same selected jaw. The right-hand table will not be visible because it only operates with sub-gripper A.

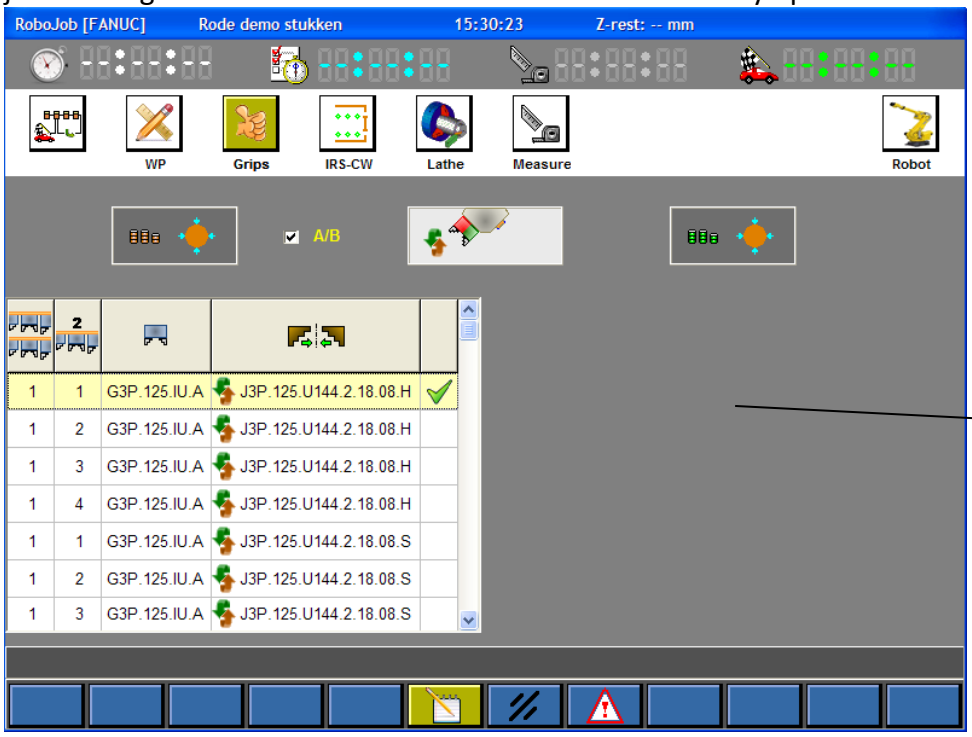


Figure 4.4

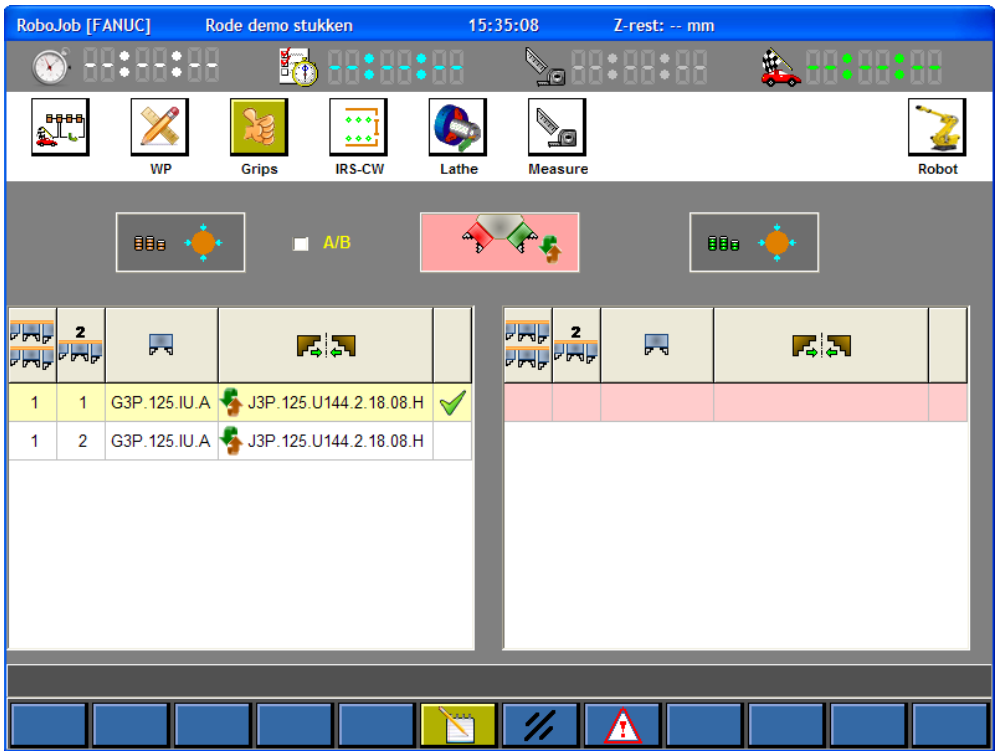
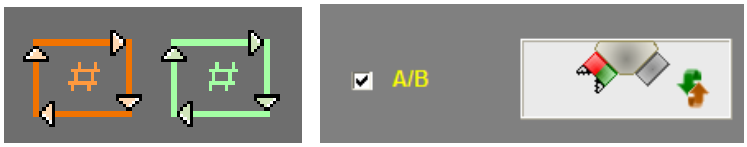


Figure 4.5

In the above case, the red coloured fields indicate that an error has occurred, because in this example, no gripper is available for the finished products.
Note that on the screen the check box shows: 

By selecting this box, the user indicates that he wants to use the existing jaws for both the rough and for the finished product. Since there is only one set of these jaws available, a "double cycle" will therefore not be possible. The software takes this into account and therefore corrects this, both in the WP sub-screen and the Gripper submenu screen.



Without Gripper magazine

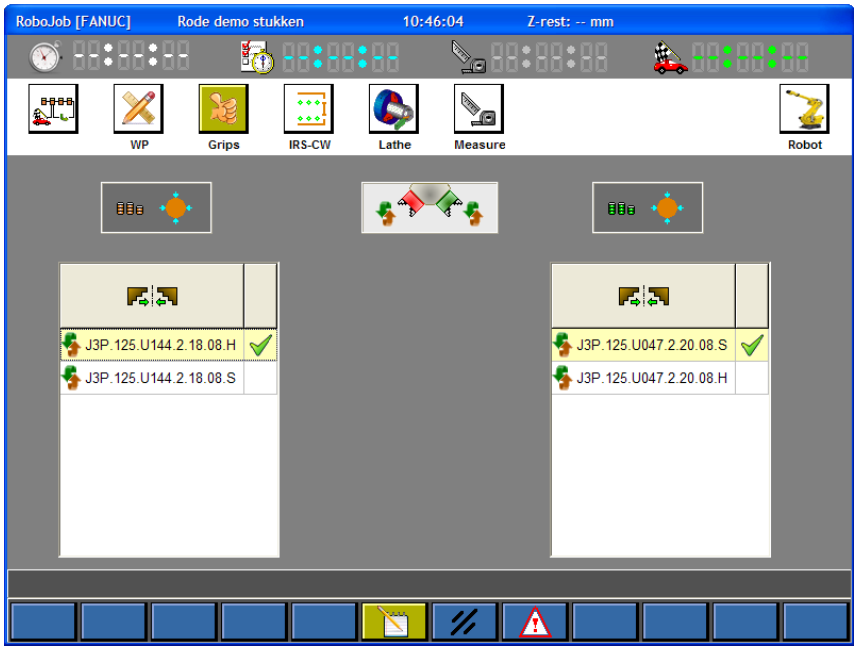


Figure 4.6: Gripper sub-screen without Gripper magazine

In case one works without the Gripper magazine, the Gripper sub-screen 

looks like that shown in fig. 4.6. Note that some columns then become invisible with respect to the screen that is displayed for an installation with Gripper magazine as in fig. 4.2.
This is also logical because the data about the Gripper Magazine and the sub-grippers is no longer relevant. The robot can now no longer exchange grippers. Some of the jaws are exchangeable. This is therefore the only thing the user needs to select in this screen.

COMMENTS
Also in this case it may be that the user only has one set of particular jaws. If you want to use this set for both the rough and for the finished product, you will again be able to select the check box 

as was explained on pages 27 & 28.

4.3 Section 4 (Function keys)

In the Gripper sub-screen 

there are only three function keys available.

Edit mode, reset, alarms

These function keys have already been discussed in Chapter 2 for the function keys of the workflow screen. Their function is the same in this screen. (pages 10 & 11)

5. IRS-CW SUB-SCREEN (IRS-CW)

5.1 Sections 1 and 2 are the same as for the workflow screen

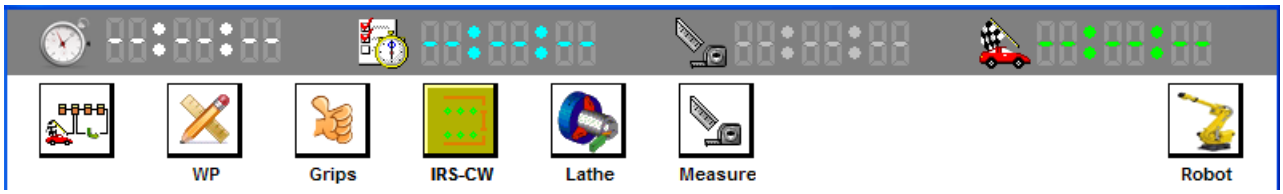


Figure 5.1: Section 1 & section 2

5.2 Section 3 (Set-up screen)

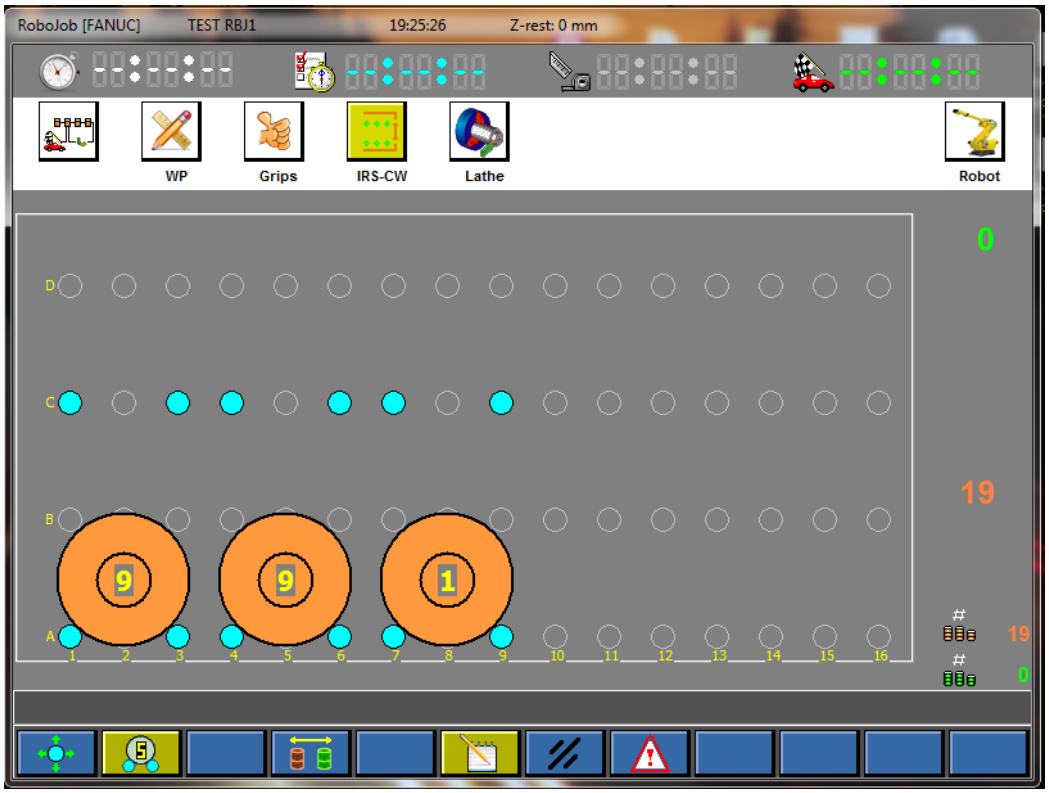


Figure 5.2: TURN ASSIST sub-screen

This sub-screen displays the IRS-CW graphically. The TURN ASSIST software now has all the necessary information and in this screen, will show the user how to set the IRS-CW.

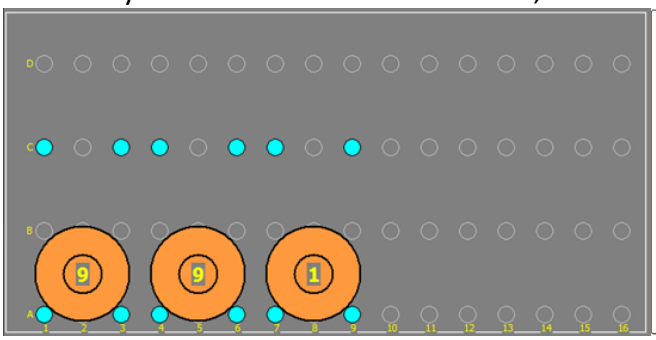


Figure 5.3: IRC-CW graphic display

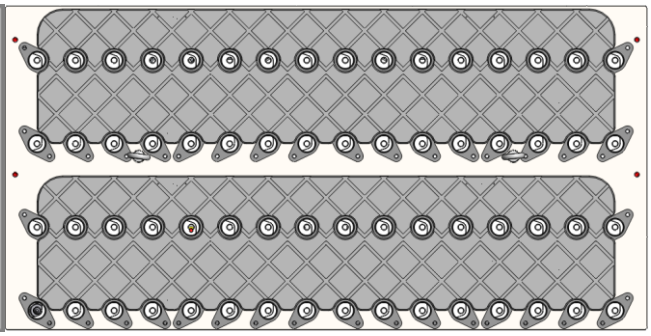


Figure 5.4: Actual IRC-CW

In fig. 5.3 and 5.4 it is clear that the IRS-CW sub-screen is a simplified representation of the IRS-CW as it looks in reality.
With the  symbol the software shows where the IRS-CW support pillars must be positioned. In the case of fig. 5.2 this is on positions A1, A4, A5, A8, A9, A12, C1, C3, C5, C7, C9, C11. The IRS-CW support pillars are to be found on the front of the IRS-CW as shown in fig. 5.5 (bottom right).

The IRS-CW support pillars can be easily inserted into the holes provided. This is only possible if the pillars are not clamped. In the event that the pillars are clamped, the user can simply unclamp these first by clicking on the first function key. 
Note that this first function key is only visible if the edit key is active. 

Figure 5.5: IRC CW with views of IRS-CW support pillars

When all the pillars indicated are on the IRS-CW, the rough workpieces can now be positioned on the IRS-CW. How and where these rough workpieces should be positioned on the IRS-CW is also displayed graphically by the software.

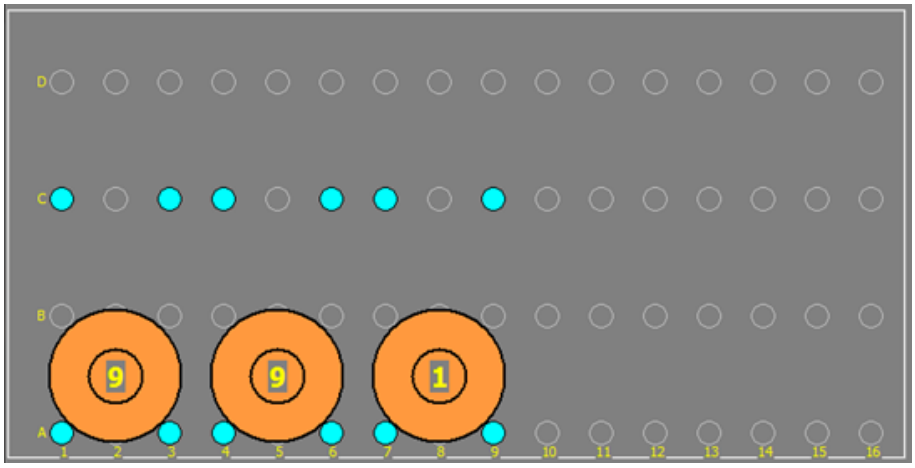
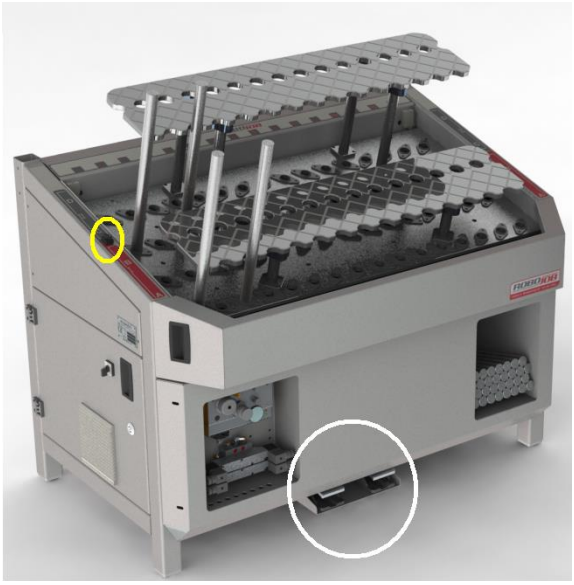


Figure 5.6: IRC-CW graphic display

In the case of fig. 5.6 for example, seven workpieces must be positioned between support pillars A1 and A4, also seven between the support pillars A5 and A8 and finally another five workpieces between support pillars A9 and A12.

If one has the "Foot pedals" option, then the IRS-CW is equipped with two pedals (indicated in the white circle in fig. 5.7). The IRS-CW plates can also be manually controlled, which makes working with heavier workpieces easier.



In order to select which IRS-CW plate has to be operated by the foot pedals, we make use of the selector switch, indicated in the yellow circle in fig. 5.7.

Figure 5.7: Designation of the use of the foot pedals under the IRS-CW

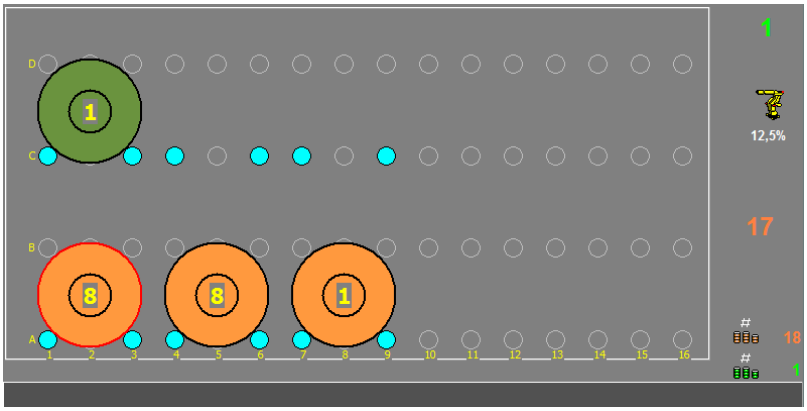
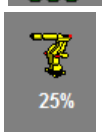


Figure 5.8: TURN ASSIST graphic view

To the right in the IRS-CW sub-screen, some numbers are displayed.

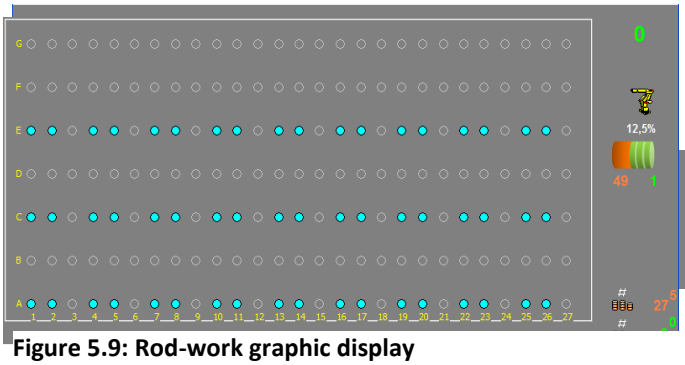
The yellow numbers indicate the number of workpieces that are currently on the IRS-CW. In the example from fig. 5.8, there is one product (usually finished) on the second IRS-CW plate, and there are 16 products (usually rough) on the first IRS-CW plate.

These numbers indicate the status of the rough and finished products. In this example, there are still eighteen rough pieces to be processed, and there is already one finished piece. Note that again red corresponds to rough and green to finished.

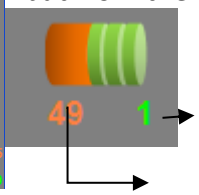


The speed of the robot is shown here. In this example it's 25% of the programmed speed.

Also in the case where it has been entered in the WP sub-screen that the rod is being processed, this will be shown in the IRS-CW sub-screen.



Note that no rough workpieces are shown here. This makes sense because the rough workpieces no longer come from the IRS-CW but from the rod.



Number of workpieces that have already been made from the rod

Number of workpieces that can still be made from the rod.

Figure 5.9: Rod-work graphic display

5.2 Section 4 (Function keys)

1) When the edit mode is activated  , there are five function keys available.

Clamping or unclamping of the IRS-CW support pillars Icon is dependent on whether the pillars are clamped or unclamped

For the system to be set, the IRS-CW must be provided with support pillars. These can only be placed in the IRS-CW if they are unclamped. The user can unclamp and clamp the pillars via this function key. Note that these function keys are not available with a TURN ASSIST-BASIC-SYSTEM as this does not possess actuated plates.

Clamping the support pillars.

Unclamping the support pillars.

Making the quantity of rough and finished products visible or invisible

This function key allows the quantity of workpieces to be made visible or invisible as illustrated in fig. 5.10 and 5.11.

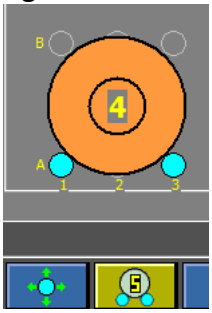


Figure 5.10: Number of workpieces is visible

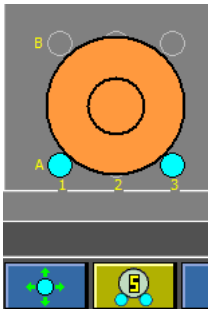


Figure 5.11: Number of workpieces is invisible

Edit mode, reset, alarms

These function keys have already been discussed in Chapter 2 for the function keys of the workflow screen. Their function is the same in this screen. (pages 10 & 11)

2) When the edit mode is inactive  ***, another function key becomes available.***

Set up IRS-CW plates

Using this function key, the TURN ASSIST software will set the IRS-CW plates to the correct height. Note that we are now no longer in the edit mode. As soon as this function key is pressed, a following function key immediately appears. This function key is also unavailable with a TURN ASSIST-BASIC-SYSTEM.
At a certain moment, the IRS-CW-plates will have reached their target height. The system is now fully ready to be started. This is made clear by two function keys reappearing: 

STOP

This function key is a stop button. It is used to stop a set program. The following notification appears when this key is clicked on:

Here, the user has yet to confirm whether he actually wants to stop. In case the stop button was accidentally pressed, he can still reverse this by pressing on cancel 

Start Cycle

This function key starts the system.

Stacking or laying longitudinally

With the TURN ASSIST-BASIC-SYSTEM there is a limited possibility for stacking. This is only possible if the diameter of the components is larger than the diameter of the gripper. The reason for this is to avoid collision between the gripper and the support pillars. If stacking is possible, the user can select this by making use of the following icons in the IRS-CW sub-screen:

For the TURN ASSIST-180 or 250-SYSTEM with actuated IRS-CW-plates, on the basis of this function key, one can determine whether the software divides the stacks into columns or rows. In this way, products that also cannot be stacked are automatically loaded by placing them in a single row on the IRS-CW, for example.

Comments

In the event that the user selects the IRS-CW-sub-screen while no suitable grippers are yet present, either for the rough as well as for the finished product, the software will indicate this with the aid of an alarm. (figs. 5.12 and 5.13) In this case, the function key  will also not be visible so that the cycle also cannot be started.

Figure 5.12: No Gripper for rough components

Figure 5.13: No Gripper for finished components

In the case of a Turn-Assist-E without servo motors, the start button is immediately shown.

6. Lathe sub-screen

6.1 Sections 1 and 2 are the same as for the workflow screen

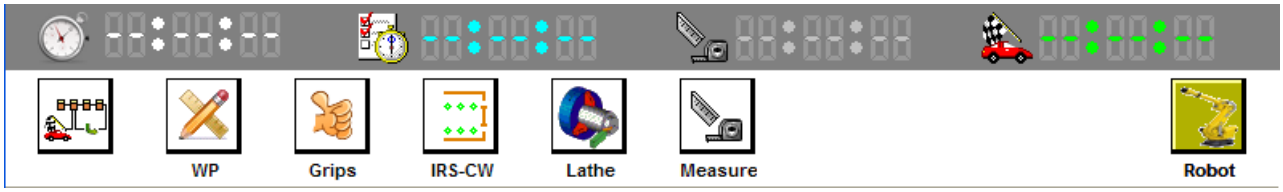


Figure 6.1: Section 1 & section 2

6.2 Section 3

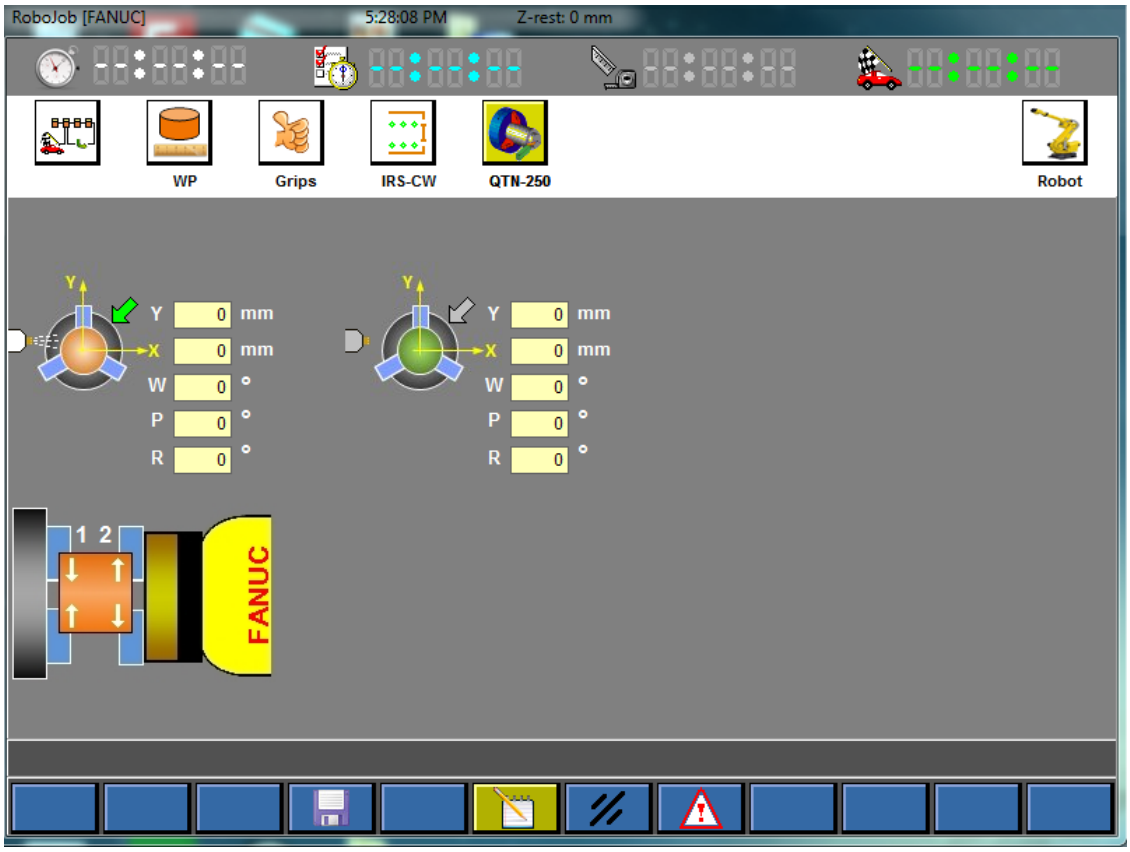


Figure 6.2: Lathe sub-screen

In this sub-screen, the operator can enter a compensation in the machine. This is necessary if the robot has to load or unload the workpieces from the centre of the jaw plate. For both the rough (Red icon) and the finished products (green icon), the operator can compensate in both the X and Y direction, as well as entering W, P, R rotation. It is also possible to indicate if an Airblow and/or Orient signal must be sent to the machine. In the example above, both signals have been activated for the loading strategy, but deactivated for the unloading of the machine. The operator can then select the way in which the workpiece is to be taken over by the machine. Either the machine jaws close first before the robot gripper unclamps, or the robot gripper jaws open before the machine jaws clamp. If for example, a spring system is mounted on the robot grippers, the robot gripper will first need to open in order to push the workpiece against the machine jaw stop.

6.2 Section 4 (Function keys)

Edit mode, reset, alarms

These function keys have already been discussed in Chapter 2 for the function keys of the workflow screen. Their function is the same in this screen. (pages 10 & 11)

Save

Changes to a program already stored are saved using this function key.

7. Robot sub-screen

7.1 Sections 1 and 2 are the same as for the workflow screen

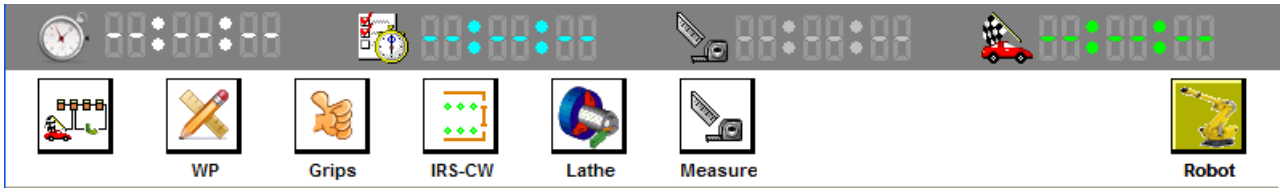


Figure 7.1: Section 1 & section 2

If the user clicks on the icon 

, the screen shown in fig. 6.2 appears.

7.2 Section 3 (Robot command screen)

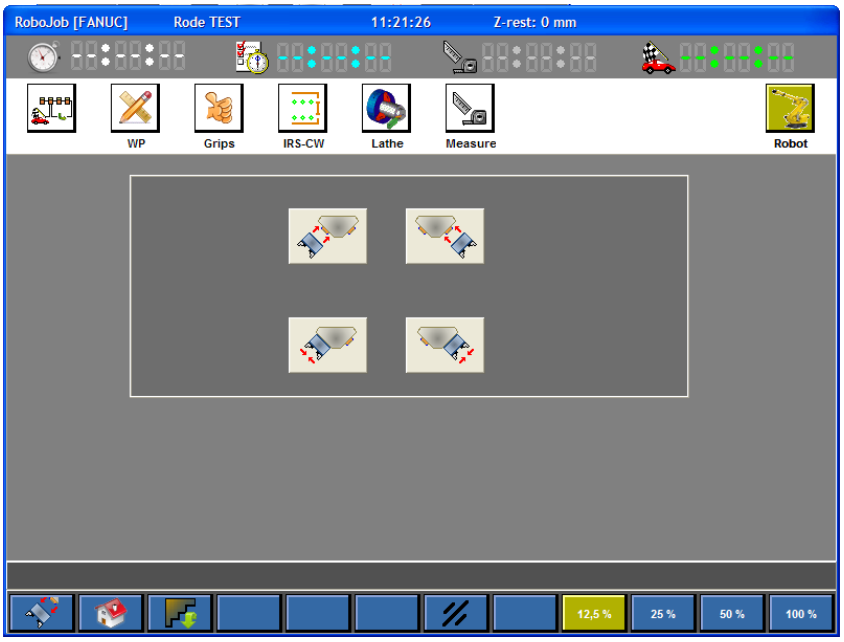


Figure 7.2: Robot sub-screen

In this screen, various items may be directly commanded to the robot.

	‘‘Undocking’ of the ‘sub-gripper’ A. (if available)
	‘Unclamping’ of the ‘sub-gripper’ A
	‘Undocking’ of the ‘sub-gripper’ B. (if available)
	‘Unclamping’ of the ‘sub-gripper’ B.

7.3 Section 4 (Function keys)

Currently, eight function keys are available in the robot sub-menu screen.

Tool change

By clicking on this function key, the robot will carry out a ‘Tool Change’. This icon is only active if the grippers can be exchanged.

Home

After selecting the 'Home' function key, the robot will move to its ‘Home’ position.
This is only possible if no other programs are in progress. In order to send the robot to its ‘Home’ position, the user must first interrupt the program via the STOP button 

.

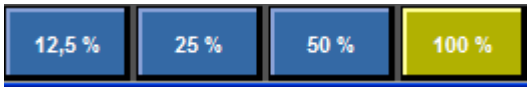
Jaw change

Finally, when this function key is selected, the robot goes to the position for a jaw change.

Reset

This function key has already been discussed in Chapter 2 for the function keys of the workflow screen. Their function is the same in this screen. (page 9)

Robot speed



Using these function keys, the user can select the desired robot speed. Please note that the TURN ASSIST software will still adjust this speed on the basis of the weight of the workpieces.

8. Automatic operation

8.1 Conditions

If the operator has completed the workflow of the TURN ASSIST program, and has finally started the program in the IRS-CW sub-screen via function key  , the cycle will only be started if certain conditions are met.
These conditions may differ from machine to machine.
A list of possible conditions follows here:

- The machine must be in automatic mode.
- The machine may not give a cycle finish signal.
- The shafts of the machine must be in their 'HOME' position.

The automatic operation will only start if all the necessary conditions are fulfilled.

8.2 Z-rest

During automatic operation, the TURN ASSIST program provides useful information to the operator. Z-rest is an example of this. This value shows how many mm the robot still has to move linearly until it reaches its end goal. This end goal may be a place on the IRS-CW, as well as the place in the machine where the robot has to load and unload the product.
In this way the user can check that everything is set up properly.
As shown in fig. 7.1, the information about the above can be found in blue title bar.

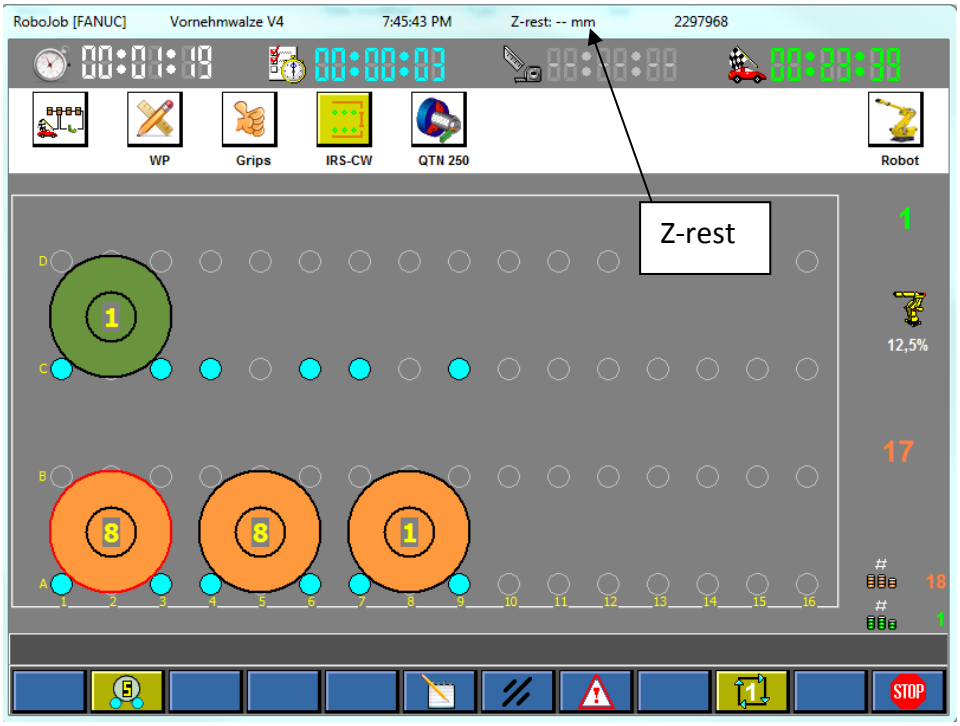


Figure 8.1: Workflow screen

8.3 Intervention by the user

The user is able to interrupt the program at any moment during automatic operation. However, this may be done in different ways.

A first way is to interrupt and stop the entire TURN ASSIST program. As was explained earlier in this manual, this can be done with the aid of the function key 

. The TURN ASSIST software will ask for confirmation after clicking on this function key (fig. 8.2).

Figure 8.2: Confirmation of program stop

The entire program will only be stopped if the user accepts this confirmation. Note that in this case the robot also remains in the position where it is located at that moment. It will not automatically return to its 'Home' position. If this is required, the robot can be returned to its 'home' position by clicking on the function key in the robot sub-screen. 

To start a new job, the adjustment data should be checked. Next the IRS-CW plates must be reset using the following function key. 

A second way of interruption is via 'Robot Run' & 'Robot Hold' push buttons that are located next to the IPC screen. (fig. 8.3)

Figure 8.3: IPC pillar, Robot Hold, Robot Run, Emergency Stop

One can only control the movement of the robot using these two push buttons, By pressing the 'Robot Hold' push button the robot will not move further. Then when the 'Robot Run' push button is pressed, the robot continues its movement.

Finally the TURN ASSIST program will be interrupted for safety reasons. If the safety doors are opened or if the emergency stop is pressed, the robot will not carry out any movement.
The emergency stop is located above the 'Robot Run' & 'Robot Hold' push buttons as clarified in fig. 8.3.
When the safety circuit is interrupted, the TURN ASSIST software will then generate an alarm. The program can therefore only be continued if the safety circuit is no longer broken. For this, the operator must reset the available alarm and then press the 'Robot Run' push button.

9. Pallet option

9.1. Main menu layout

If the pallet option is integrated into the TURN ASSIST system, the workflow menu will look slightly different, as shown in Figure 9.1.

Figure 9.1: Main menu with pallet option

An additional icon  is added to the workflow menu. This additional sub-screen is explained further in this manual.

9.2 WP sub-screen

In the WP sub-screen the user can now choose to place the finished workpieces on the pallet. As explained in figure 3.7 on page 21, the user can make a selection as to where the finished products must be set aside.
If the operator clicks on the icon  , a scroll-down menu will appear as shown in figure 9.2.

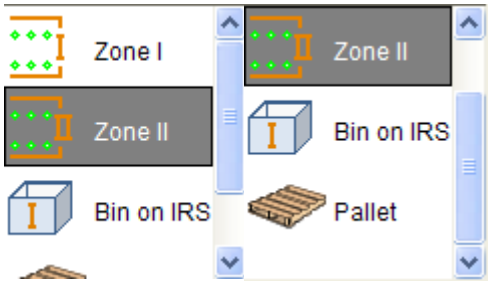


Figure 9.2: Scroll down menu (pallet option)

If the pallet is selected, the robot will then automatically set aside the finished products on the pallet. Next, the TURN ASSIST software will be able to place the rough products on both IRS-CW plate 1 and IRS-CW plate 2, as shown in figure 9.3 
The laying height against the IRS-CW plates must then only be entered for the rough products.

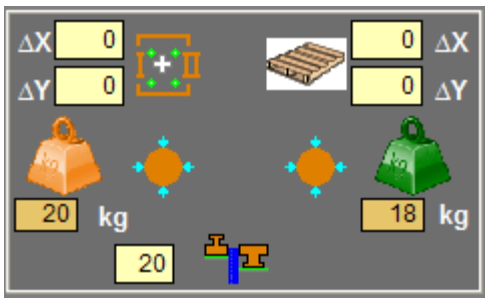


Figure 9.3: Scroll down menu (pallet option)

9.3 Pallet Sub-screen

The Pallet Sub-screen is an additional sub-screen that appears when the user, in the WP sub-screen, selects for the finished products to be set aside on a pallet. This screen looks like that shown in figure 9.4.

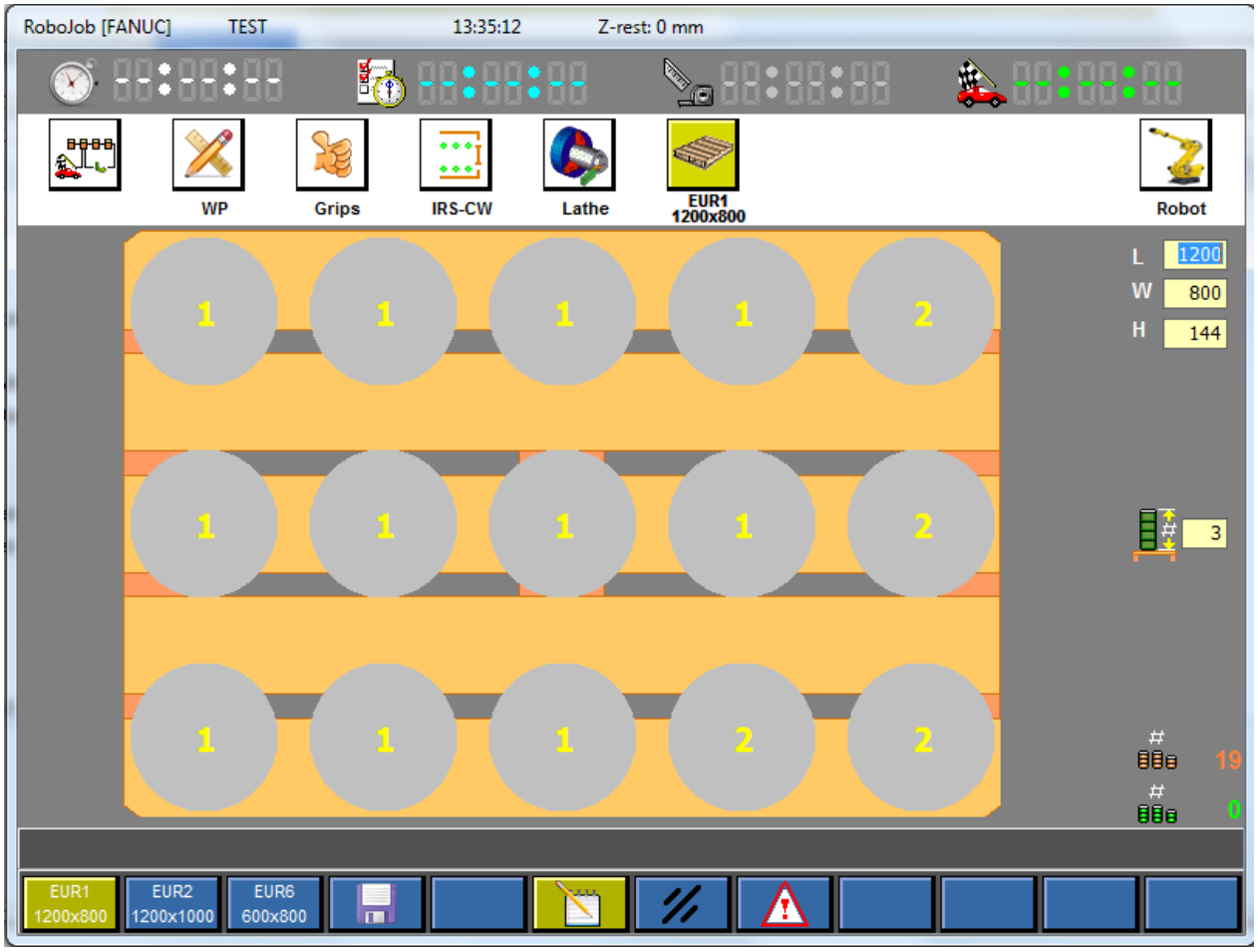
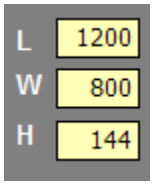


Figure 9.4: Pallet Sub-screen

In this screen, the software graphically shows where the finished products will be set aside on the pallet. This grid is mathematically determined and cannot be entered arbitrarily.

These function keys determine which Euro-pallet will be used. Next, the operator can save the selection of this pallet, and this way the software will link this selected pallet to the workpiece. If the operator prefers to place another pallet, he can enter the pallet dimensions himself at the top right in the Pallet sub-screen in the input fields of figure 9.5.



If these data have then been filled in, the software shows graphically how the pallet will look, and in what way the finished products will be stacked on this pallet.

Figure 9.5: Random pallet entry fields.

The stacking height of the pallet may be specified as desired, but with a safety maximum that is determined on installation of the system. The desired height is expressed in the number of stacked workpieces.

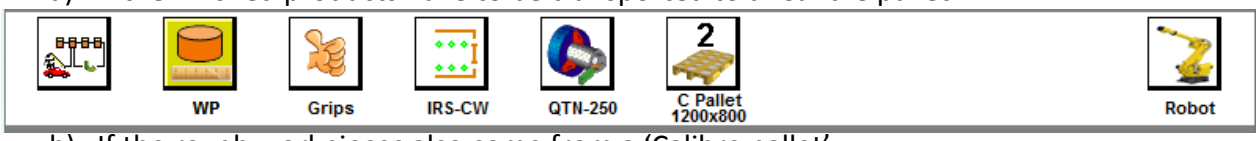
Figure 9.6: Workpiece stack height on the pallet

12. Pallet Calibre Option

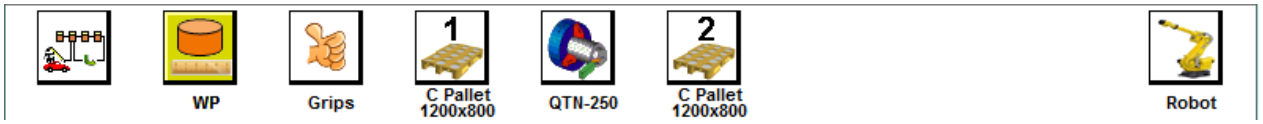
12.1. Main menu layout

If the Pallet calibre option is integrated into the TURN ASSIST system, it is possible to configure a pallet yourself. As a result, the robot can set aside finished workpieces on pre-defined positions. Depending on the type of installation, there is also the possibility of collecting rough workpieces from a pre-defined pallet.
The workflow menu will then look like this:

a) If the finished products have to be transported to a 'Calibre pallet'.

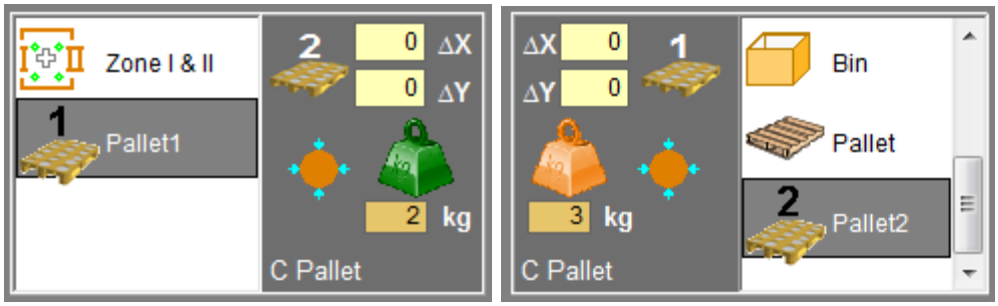


b) If the rough workpieces also come from a 'Calibre pallet':



12.2 Pallet calibre selection and sub-menus

As mentioned above, the selection of where the raw and finished products are to be found is still shown in the WP sub-screen:



Here it is noticeable that now both Zone 1 and Zone 2 may be used for the feed of rough products, or via the Calibre pallet if that is opted for here.
In the latter case it still has to be decided which calibre pallet is selected (the creation of this type of pallet is further described in this manual.)
This selection appears the moment a calibre pallet is selected via a scroll down menu.

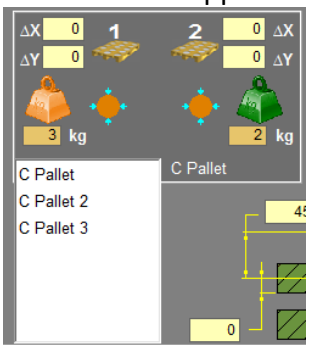


Figure 12.1: Pallet Calibre Selection

The moment a specific ‘calibre pallet' is selected, the name is automatically displayed in the workflow menu, together with the edge dimensions that are configured for this calibre pallet (figure 12.2). Further, in the workflow screen the measurement icon will also be adapted to the calibre pallet.

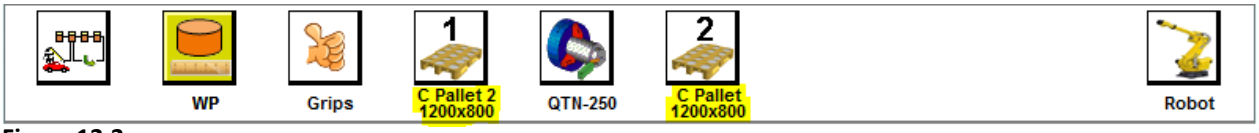


Figure 12.2

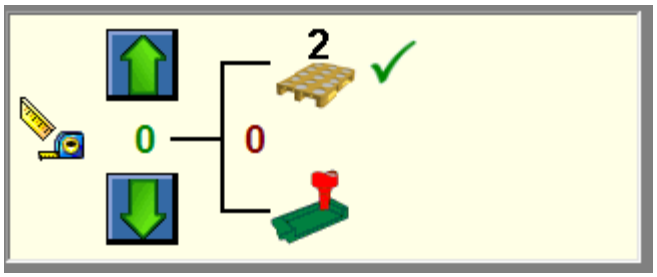
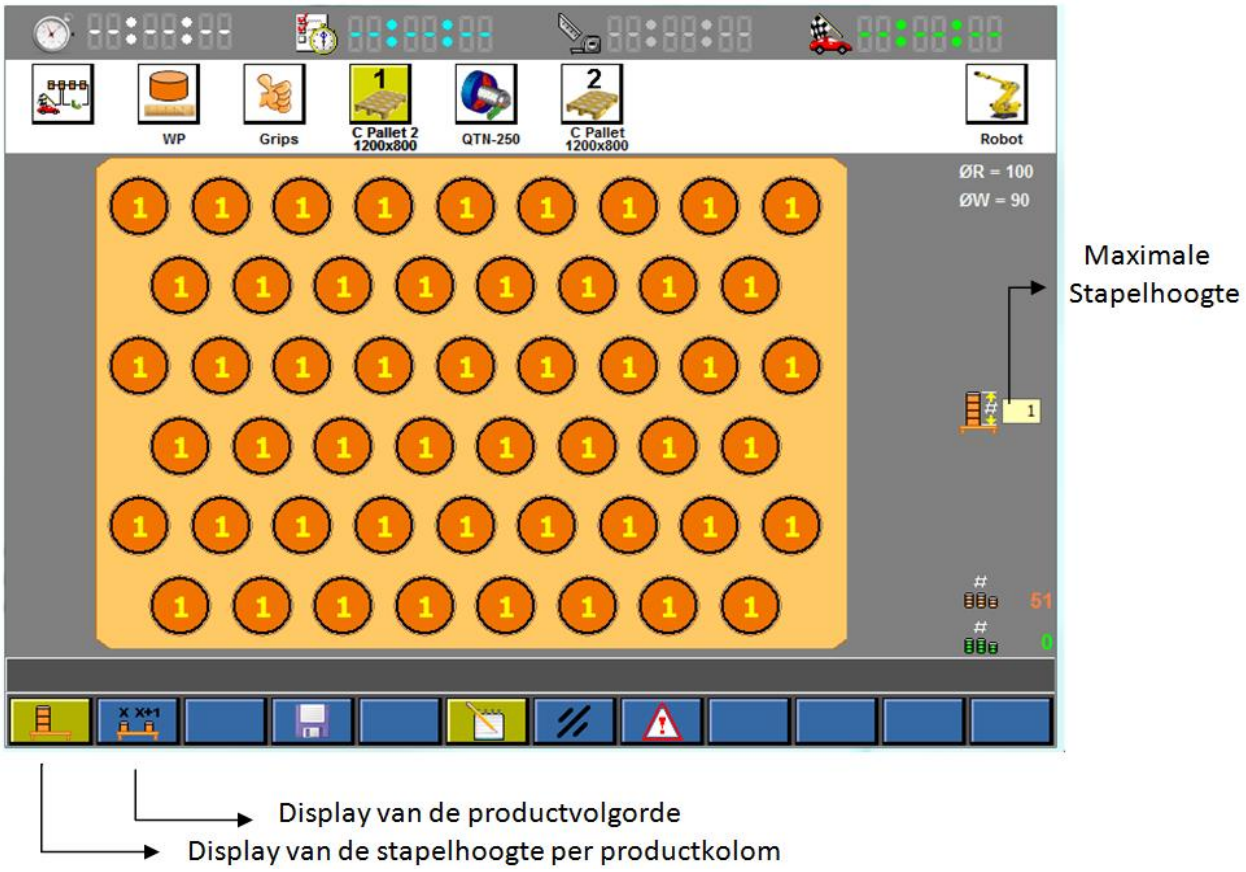


Figure 12.3: Measurement icon linked to the set aside position on calibre pallet.

Identical in the case where the products come from stacker, the overview is graphically displayed in these sub-screens, with their specific function keys:



Display of the product sequence
Display of the stack height per product column

Figure 12.4: Calibre pallet overview and function keys

12.3 Creation of calibre pallets

The calibre pallets are user-specific pallets. The user can thus determine the positions where the products are positioned by creating a calibre pallet.
These calibre pallets are created/configured in the configuration screen, which may be opened via the workflow screen. (fig 12.5)

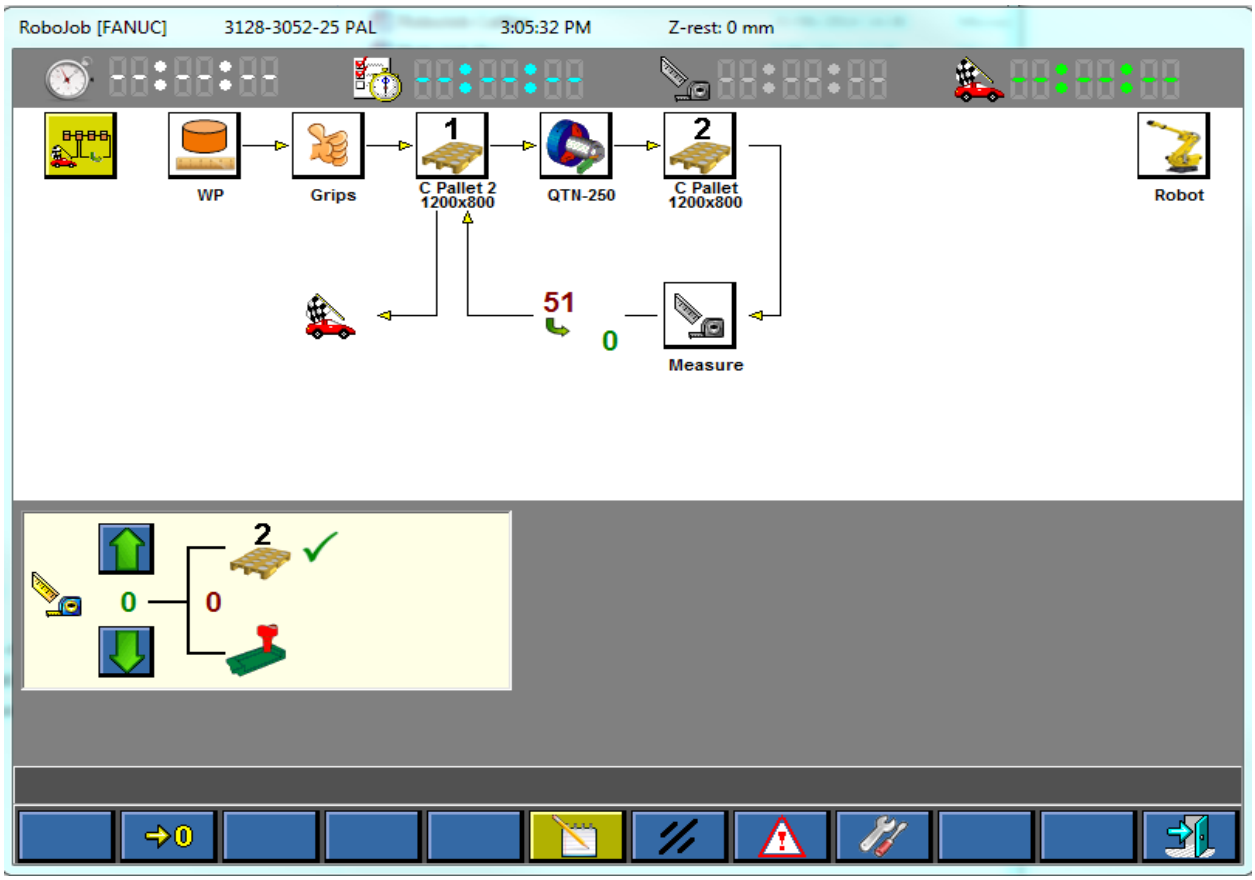


Figure 12.5: Workflow screen

When the configuration screen is opened, a new function key now appears: that of the calibre pallets. (fig. 12.6)

Figure 12.6: Calibre pallet function keys

This function key  opens the settings screen with respect to the calibre pallets and looks like that shown in figure 12-7.

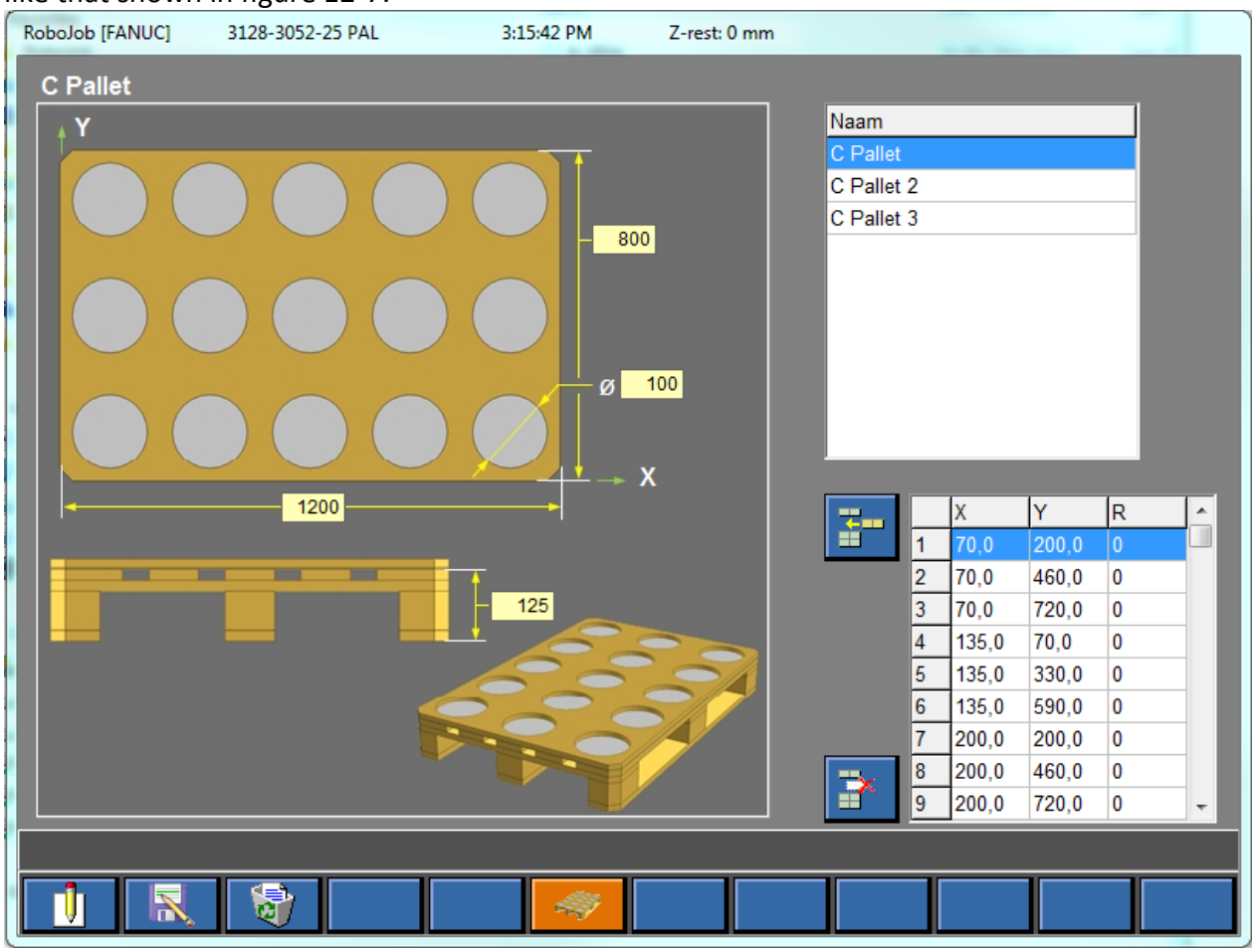


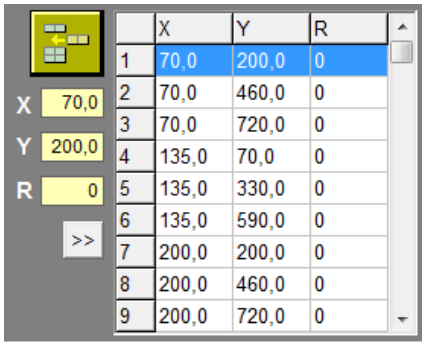
Figure 12.7: Calibre pallet settings screen

At the top on the right, the pallets already created are shown; when a selection is made here, the edge dimensions of the calibre pallet are displayed graphically on the left.

The upper three dimensions are purely for determining the graphic part. The height of the pallet indicates where the products are located in the area, relative to the zero point. This zero point is determined by RoboJob upon installation. Next, the X/Y coordinates of this calibre pallet may be entered at the bottom right. A new entry is selected via the input icon. 

When this is selected, new coordinates can be entered and be placed in the table via the enter icon  Using the R-value, an additional rotation around the Z-axis can be set. Usually this parameter is determined by RoboJob as default and the user does not need to adjust this. Points may be deleted from the table by selecting the desired point and then selecting the delete icon. 

Finally, new pallets can be created / copied and deleted using the function keys, which speak for themselves.



13. Rotational unit option

13.1 Introduction

The rotational unit is an additional option that can be installed on the standard Turn Assist systems. Using this option, many products can be completely finished on both sides, even though the machine only has one clamping device. Please note: this is only possible if the diameter reach of the robot grippers is suitable for gripping the product on both sides in each case, and if the machine is also suitable for clamping. However, the robot has two grippers, while there are four grasping operations needed to rotate a product. In the software, these four operations are divided into two setup screens, as further described in this manual.

1) Gripping the **rough** material on the **Turn Assist**
2) Gripping on the first **finished** side in the **machine** and positioning on the rotation unit.

→ First setting screen

3) Gripping the **rough** material on the **rotation unit**
4) Gripping on the second **finished** side in the **machine**

→ Second setting screen

For products with large diameter variations, it is consequently not possible to rotate these, subject to creating specific stepped robot grippers that are capable of absorbing these diameter variations.

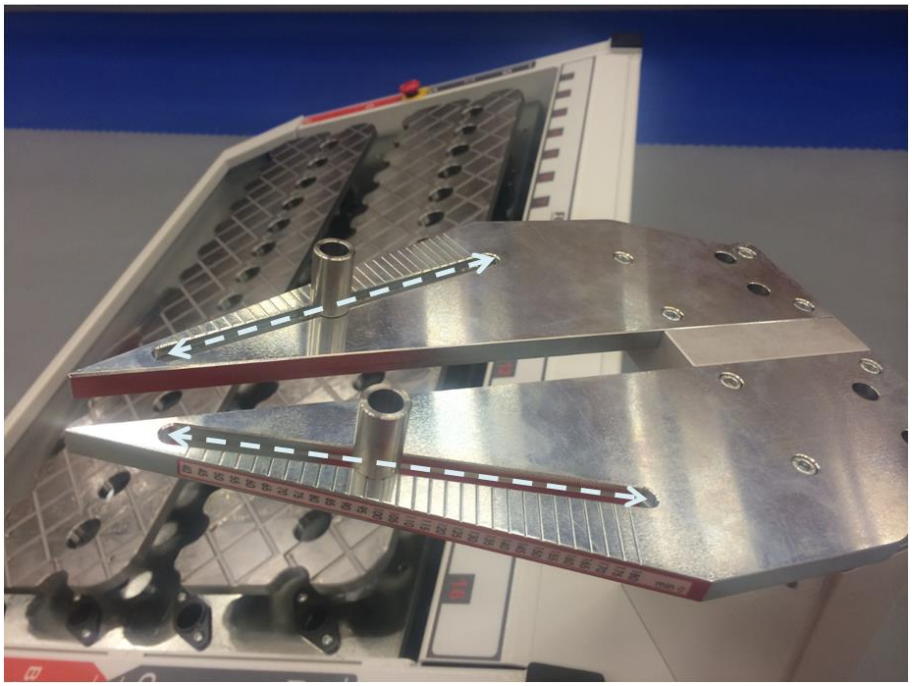


Figure 13.1: Rotational unit hardware

As figure 13.1 shows, this rotational unit consists of two support plates that are separated by a slot. The intention here is that the robot is always able to move with one gripper finger between this slot in order to grasp the product on both sides. The product may be aligned by means of adjustable pins at the top.
To set the rotational unit, both **hardware** and **software** settings are necessary.
Both of these settings may be carried out independently.

13.2. Rotational unit hardware settings

Before a product can be rotated, the rotational unit must be set correctly. This means that the support pillars must be set into the right position, since the calculated position where the robot goes to re-grasp is diameter dependent.
The subdivision on the rotational unit is staggered per 5 mm wherein the rule is that **the setting of the support pillars** must always be <= **workpiece laying diameter** and the difference between the setting of the support pillars and laying diameter may not exceed 4 mm.
See figure 13.3 as example table.

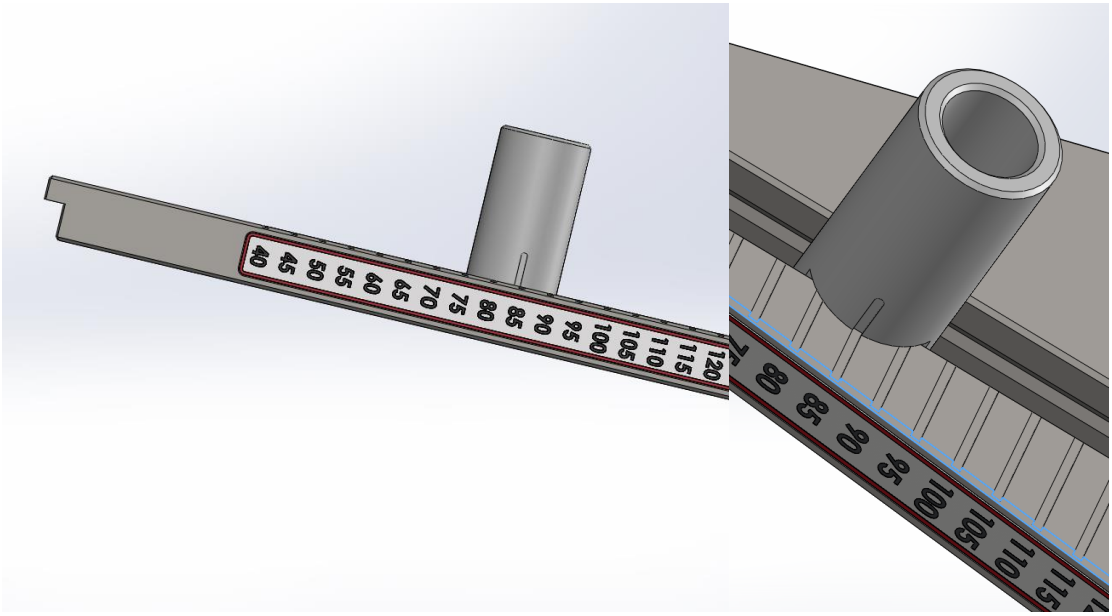


Figure 13.2: Configuration of support pillars on 85

Workpiece laying diameter	Support pillars' setting	?
40	40	
43	40	
52	50	
60	60	
65	60	65
71	70	
96	100	95
103	100	
105	100	105
150	150	
152	150	

Figure 13.3: Hardware setting of the rotational unit example table

13.3 Rotational unit software settings

Activating the rotational unit

If the rotational unit option is installed, the user can make use of this via the WP sub-screen by means of activating the rotational unit icon.

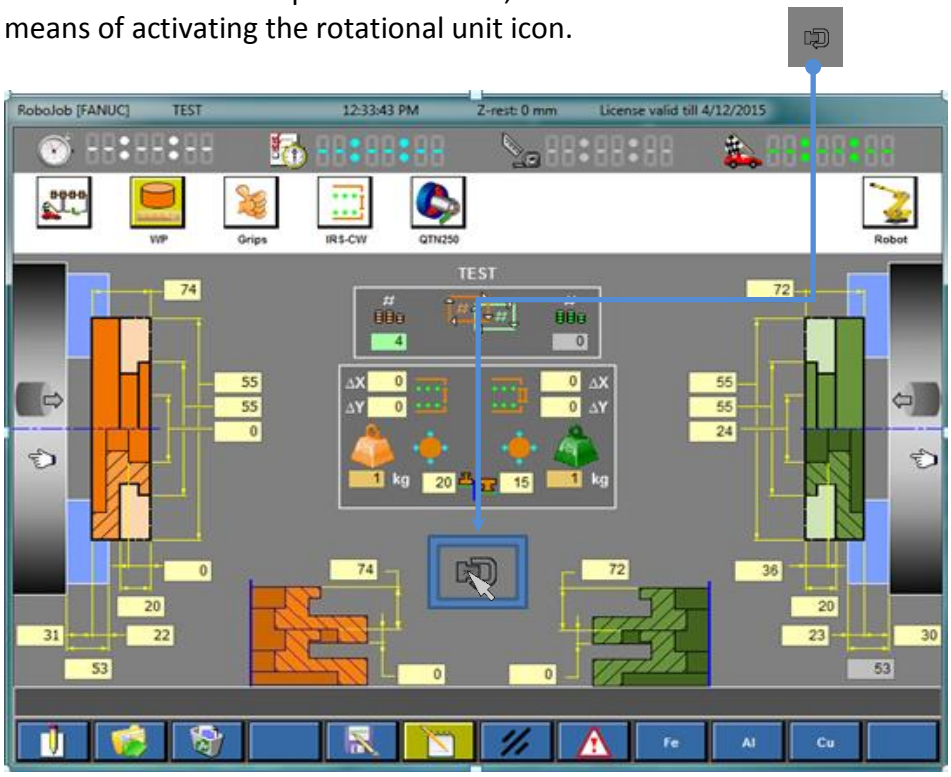


Figure 13.4: Rotational unit icon (deactivated here) in the WP sub-screen

When this icon is clicked on once, it will be activated and the Turn Assist Software changes to the rotational unit mode as shown in figure 13.5

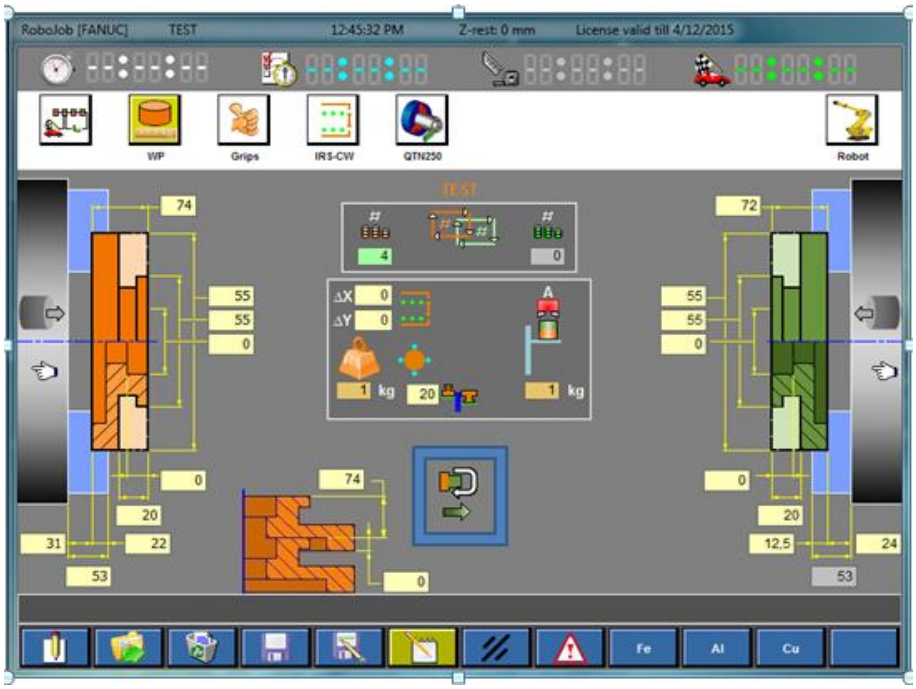


Figure 13.5: Rotational unit icon (activated here) in the WP sub-screen

As indicated earlier, when rotating a product there are four operations to be configured. This becomes clear in the Turn Assist software by means of the additional rotational unit icon with which the user can switch between the first two operations (gripping of the rough product on the TA and the discharging of the first finished side), and the subsequent two last operations (loading of the second side and discharging of the finished second side)

1) Gripping the rough material on the Turn Assist
2) Gripping on the first finished side in the machine and positioning on the rotation unit.
3) Gripping the rough material on the rotational unit
4) Gripping on the second finished side in the machine

First setting screen

Second setting screen

By clicking on the selection arrows, one can switch between the different rotational unit screens (figure 13.6 and figure 13.7)

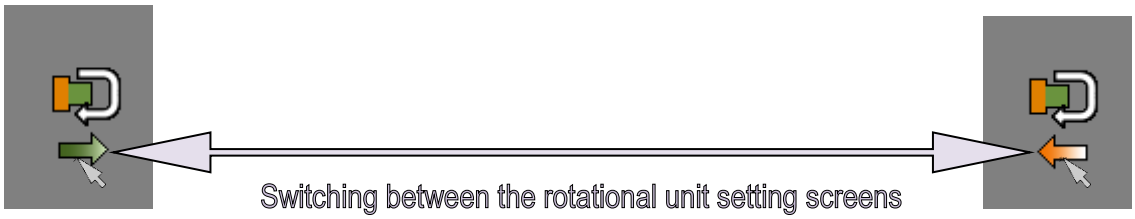


Figure 13.6: Switching between the rotational unit setting screens

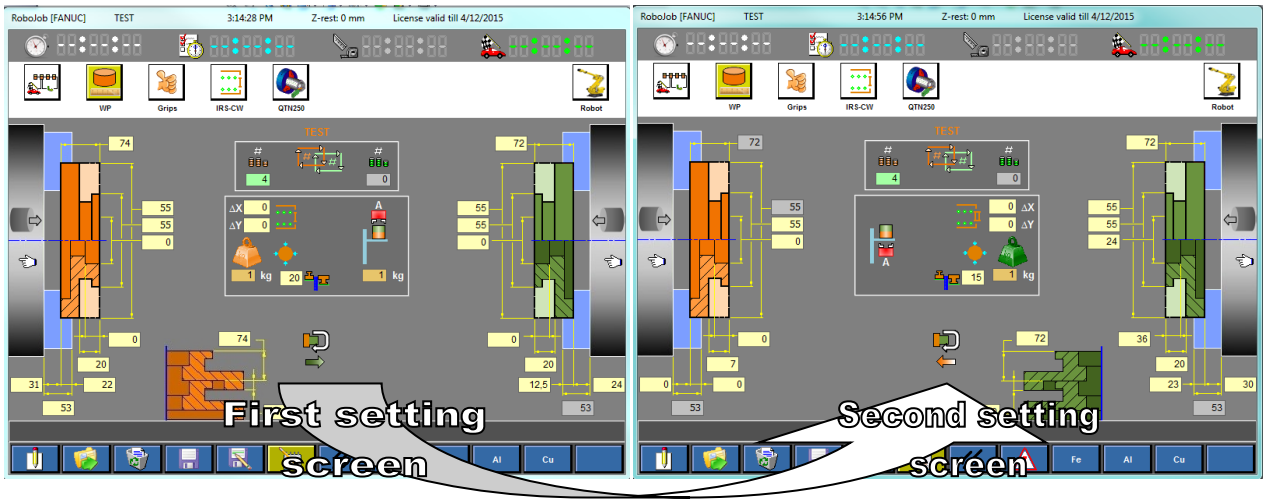
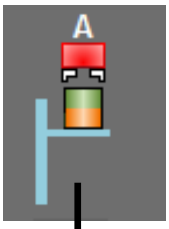


Figure 13.7: Switching between the rotational unit setting screens

First rotational unit setting screen

Figure 13.10 shows the first rotational unit setting screen.
This screen is similar to a WP sub-screen without rotational unit. Only the position of the finished component is now replaced by the rotational unit.



This icon indicates that the first finished side will be brought to the rotational unit, so that the robot can re-grasp this in order to place the second side back into the machine. Important with this is that it is shown with which gripper the first finished side will be gripped (figure 13.8) and whether the robot will position this along the underside of the rotational unit or along the upper side (figure 13.9). The operator can select this by clicking on this icon to grip. Note that only the **B gripper** along the underside can be selected. The reason for this is that a hold-down spring system will cause a collision with the rotational unit.

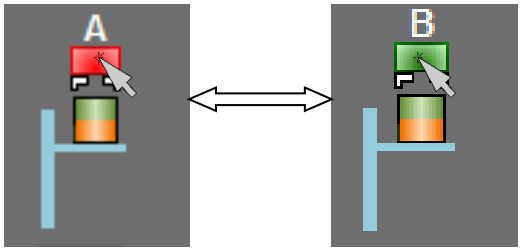


Figure 13.8: Gripper choice for first finished side

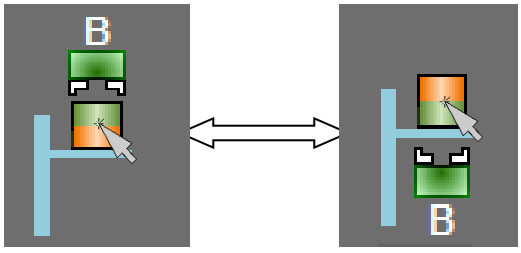


Figure 13.9: Positioning on upper side or lower side

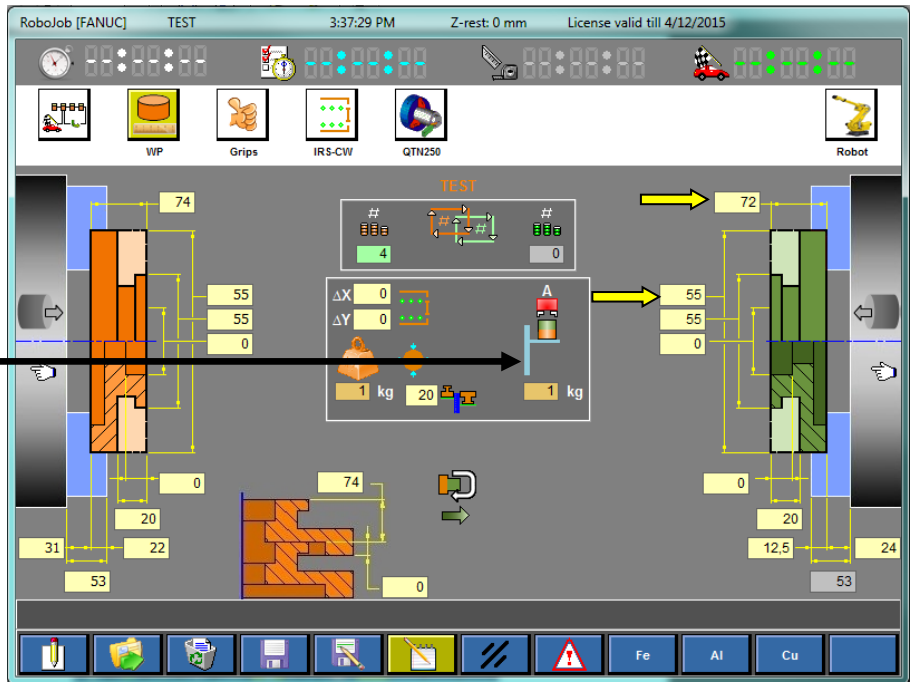
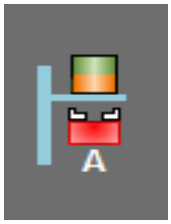


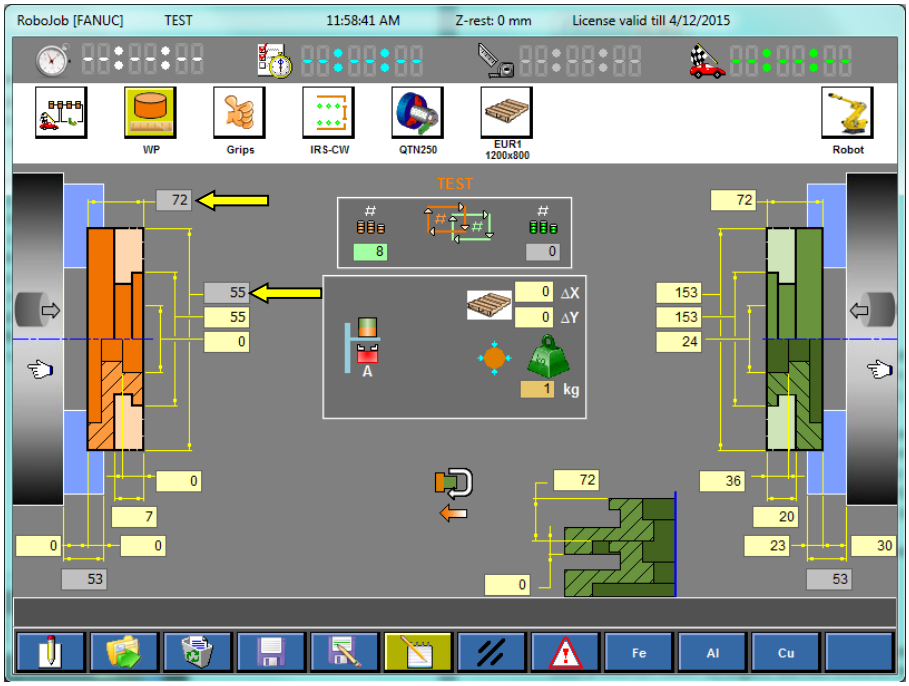
Figure 13.10: First rotational unit setting screen

Second rotational unit setting screen

Figure 13.11 shows the second rotational unit setting screen.
This screen is also similar to a WP sub-screen without rotational unit. Only the position of the rough component is now replaced by the rotational unit (similar to with the first rotation setting screen.

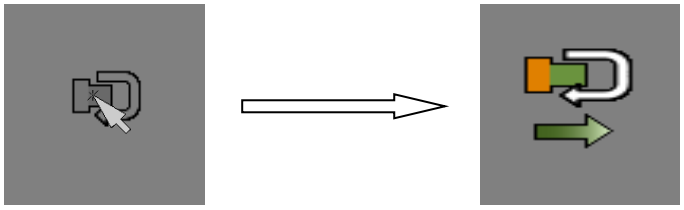


This icon indicates that the second rough component comes from the rotational unit, after the robot has unloaded the first side from the machine, and in which way it will re-grip this in order to load this side into the machine. As opposed to the first rotational unit setting screen, the software will always select the A gripper for this side and depending on what was selected in the first sub-screen, the software will also automatically preselect the other side (upper side / lower side). It is therefore important that in the first sub-screen consideration is given to the possible grippers and how the robot will or will not be able to grasp. It's immediately noticeable that certain values are blocked for entry of the rough second side. This is logical since these values will depend on the entry on the right side of the first rotational unit setting screen.

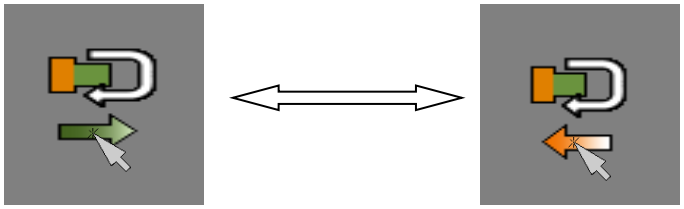


13.4 Rotational unit settings summarised

1) Set the rotational unit hardware correctly, i.e. position the support pillars in the right way using figure 13.3 as an example.
2) Activate the rotational unit icon in the WP sub-screen



3) Set the first and the second rotational unit sub-screen. *(Can be switched each time by clicking on the arrow of the rotational unit icon.)*



4) Tip: When setting the rotational unit screens it is important to create understanding of the gripper part.

- *Be aware that with the A-gripper you can never unload the **first side** and then set aside **at the bottom** on the rotational unit (this causes a collision by the hold-down spring system)*
- *The second side is re-gripped each time with the A-gripper because this is considered to be a rough product.*
- *The total finished product is then re-gripped each time with the B-gripper because this is considered to be a fully finished product.*

14. Shaft option

14.1 Introduction

The shaft option is an extra on both hardware and software level.
Using this option, the Turn Assist Stacker may be converted to a system with specific calibres onto which shaft-shaped products can be placed.
Also at software level one can switch between the 'shaft-shaped products' mode and 'disc-shaped products' as shown in figure 14.1

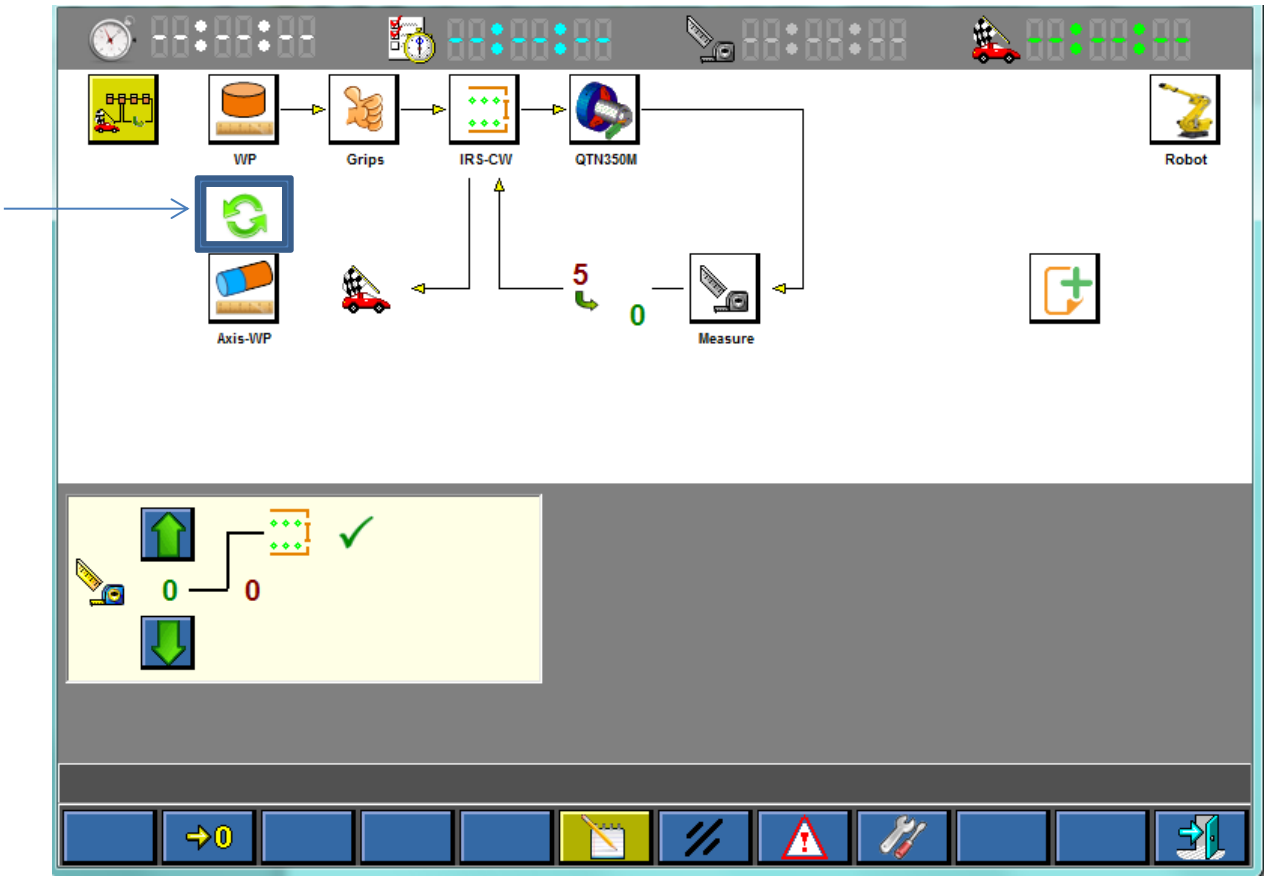
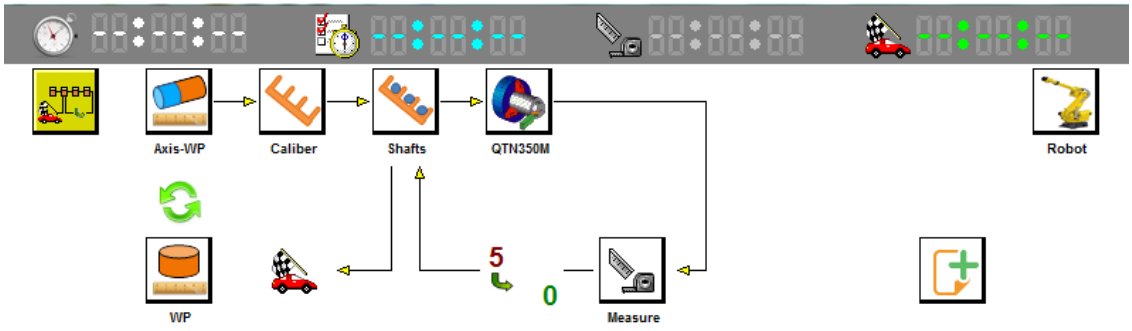


Figure 14.1: Software for switching shafts/discs

Once the shafts' option is enabled, the software will take into account this method of working and the two-point gripper will be used to handle the products. The menu tree changes to the shafts' mode.



14.2 Shaft WP sub-screen

Just like the settings for disc-shaped products, the software will guide you step by step through the necessary settings. The first menu that we see is the Shaft WP (workpiece) screen.
This screen is activated by clicking on the icon  in the menu tree and looks like that shown in figure 14.2.

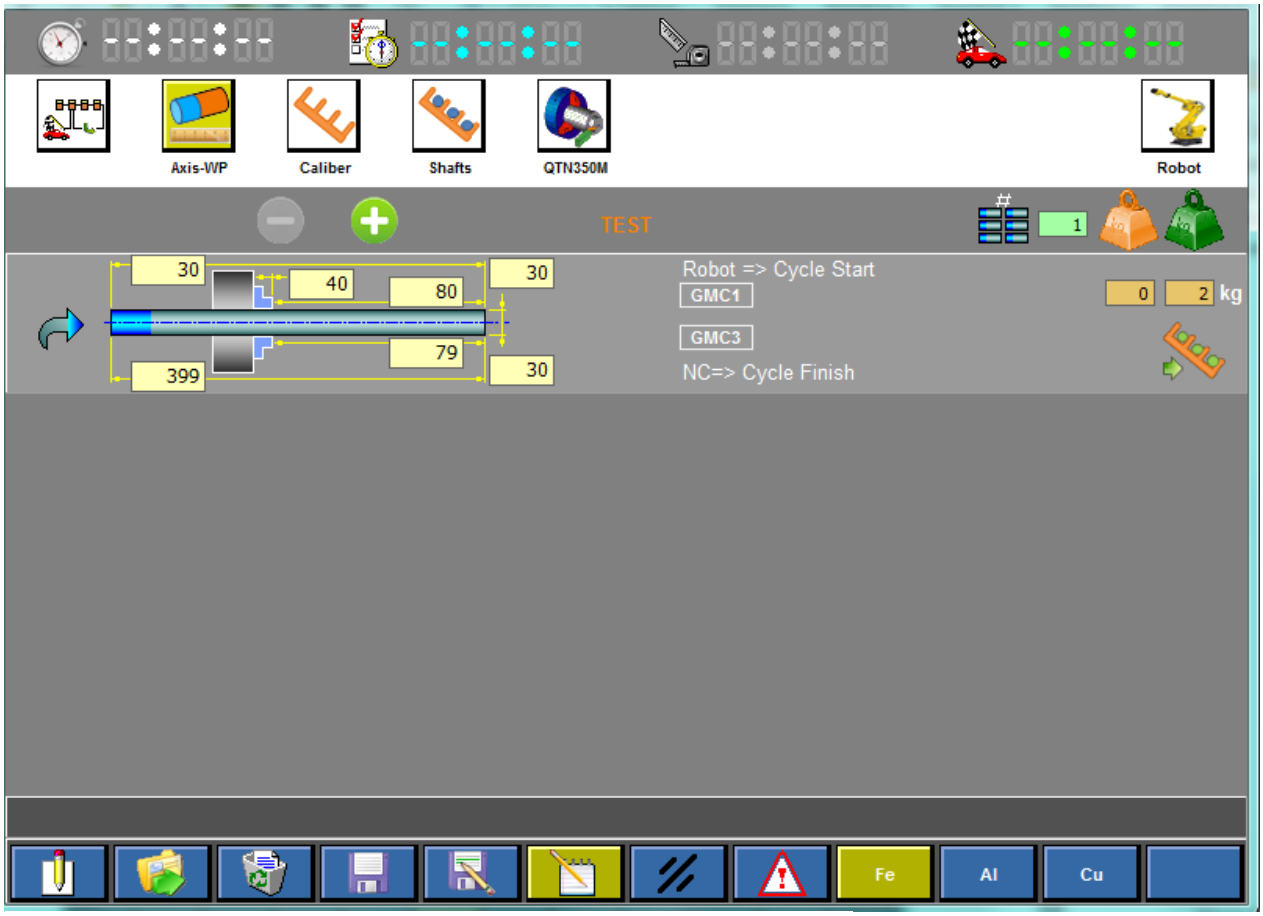


Figure 14.2: Shaft WP sub-screen

Depending on how the product is made various steps can be set.
Figure 14.2 is an example of 1 step. The shaft will be loaded into the machine, then processed once and subsequently unloaded. Figure 14.3 shows the required input fields wherein the section at the top is intended for the rough shaft, and the section at the bottom is intended for the finished shaft. On the right-hand side, the quantity can be entered, the weight of shaft and the set aside position.

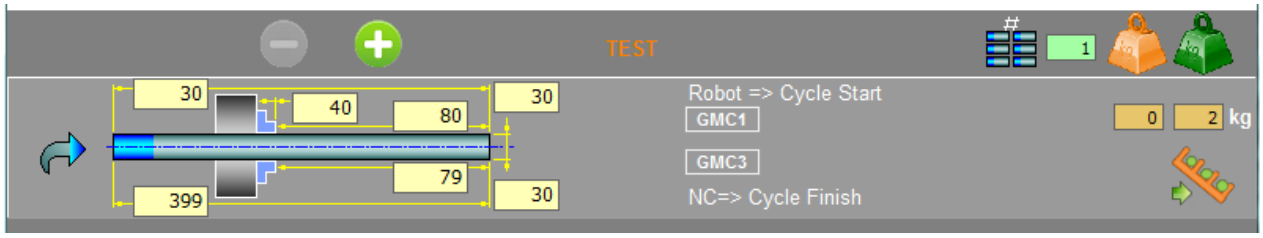


Figure 14.3: Shaft WP entry fields

A second step may be added based on the icon 
If this icon is clicked on, an extra step appears in the Shaft sub-screen. This then looks like that shown in figure 14.4

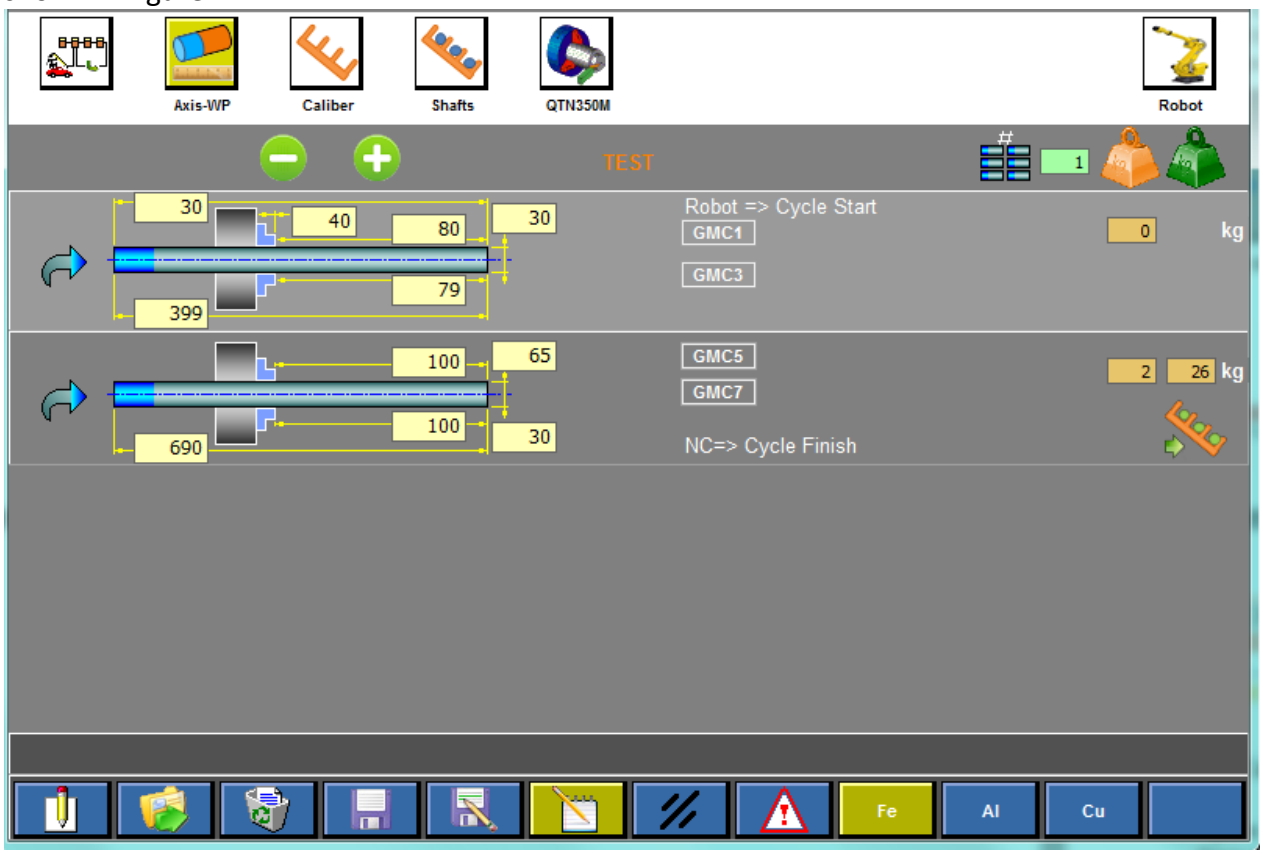
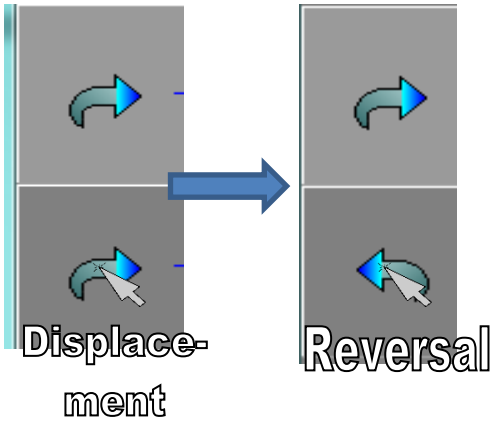


Figure 14.3: Shaft WP sub-screen 2 steps

This second step means an extra intervention of the robot. This intermediate step can be a displacement of the shaft, or a reversal of the shaft; which is indicated on the basis of the selection arrow on the left in the image.



Up to 4 steps may be added in this setting screen.
With this it is important that the machine can of course handle these different steps, which

means that sufficient interface signals must be present in order to be able to communicate with the robot.

Further, it is possible to load shafts singly. In this way several products can be made in the machine and unloaded, for example by means of a Part Catcher. Important! This way of operating may be indicated with the icon by means of the switching icon in figure 14.4 (On the right of the screen)

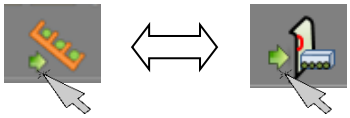


Figure 14.4: Finished products position determination, single loading

It goes without saying that the machine therefore will only send the ‘load' signal (GMC1) to the robot for operation with step 1 (figure 14.5)

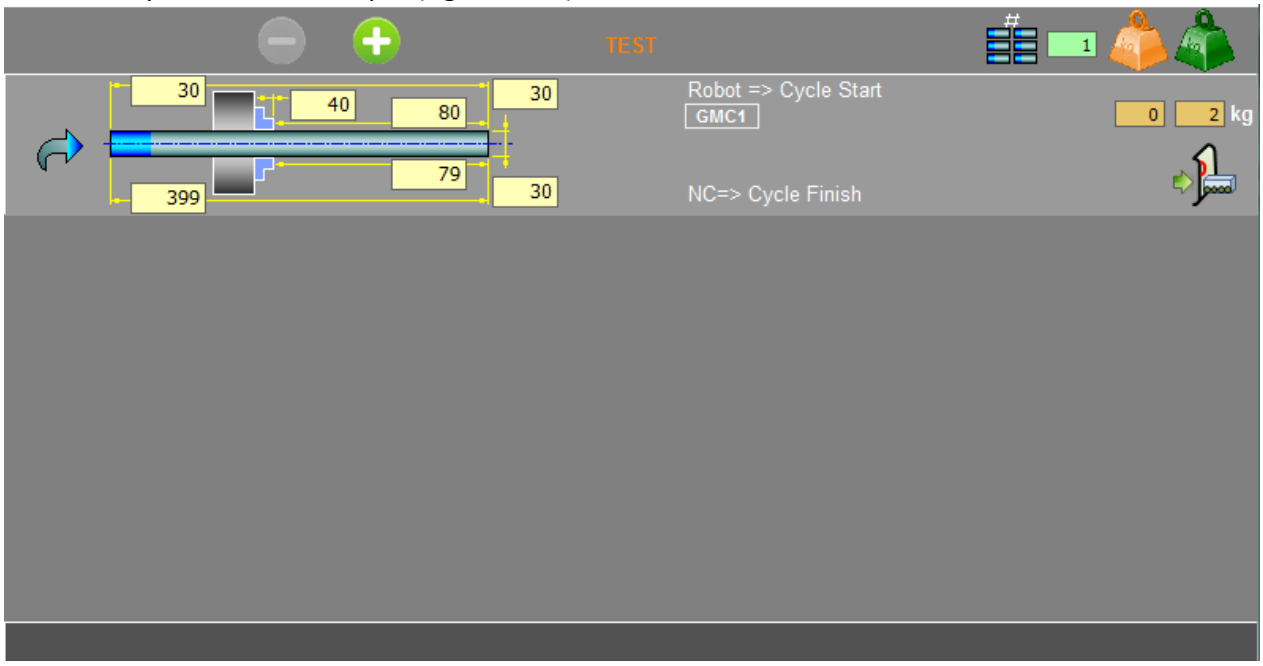


Figure 14.5: Example of single loading

14.3 Calibre sub-screen

Once the settings are set in the Axis-WP screen, the user may proceed to the following menu: the Calibre sub-screen. Figure 14.6

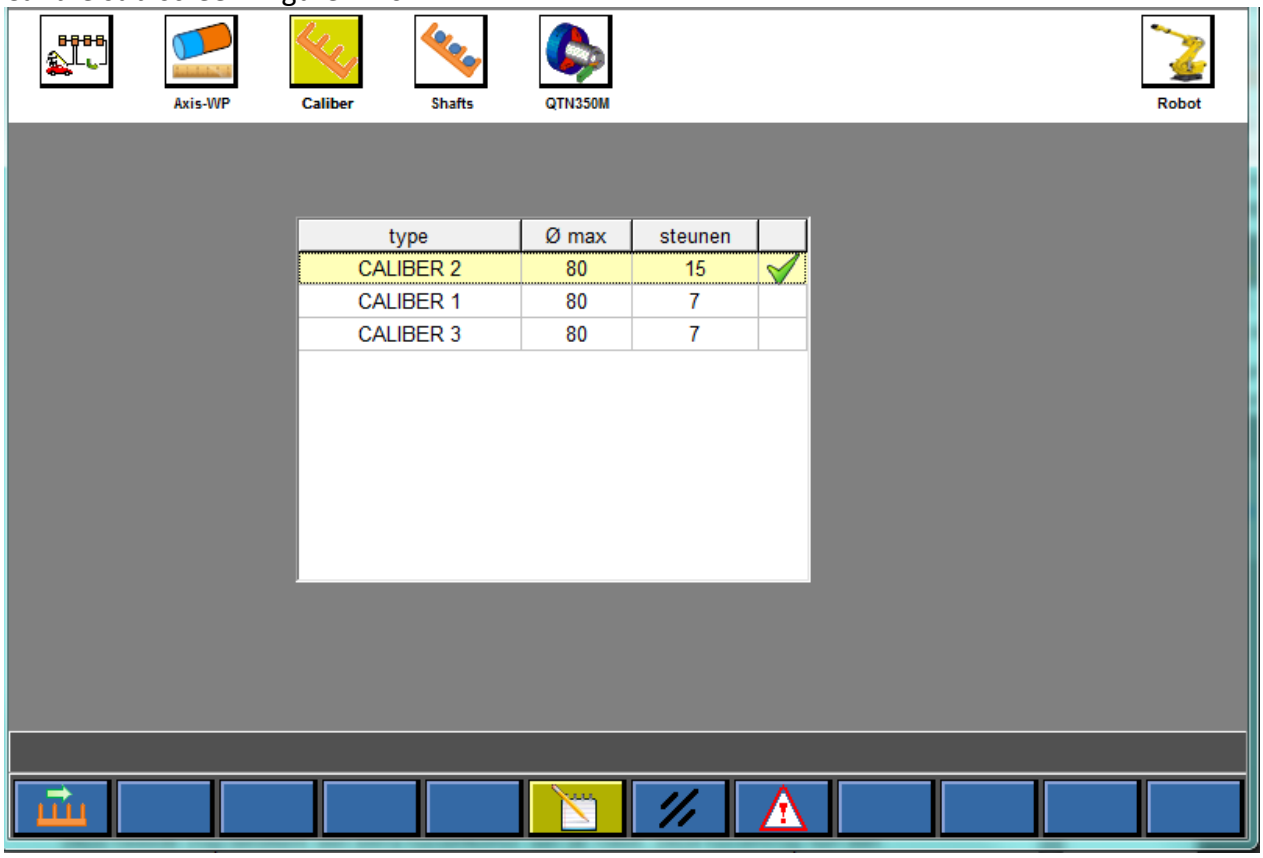


Figure 14.6: Calibre sub-screen

The only thing to be done in this screen is to select the desired calibre. Only the possible calibres are shown for this workpiece. It is thus not possible for example, to use calibres with smaller dimensions than the workpiece diameter.

An additional function key appears  , this may be used in order to send the Turn-assist plates to the desired position in order to mount the shaft rack.

14.4 Shaft sub-screen

Finally, the process may be started in the Shaft sub-screen. This is also the graphic overview of how the shafts should be positioned on the Calibres. (fig. 14.7)

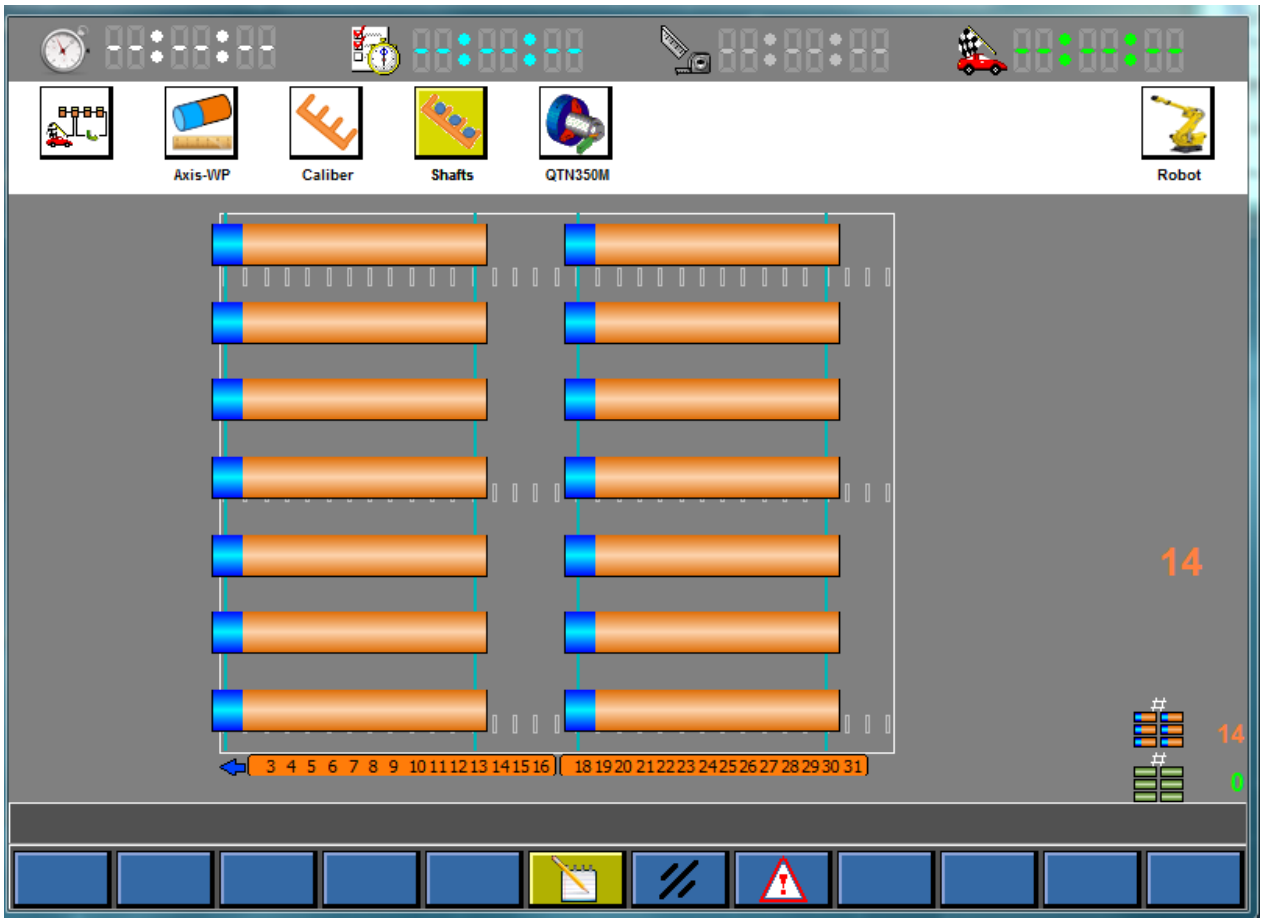


Figure 14.7: Shaft sub-screen

Here too, the process may be started by deactivating the Edit mode and then selecting the start icon.

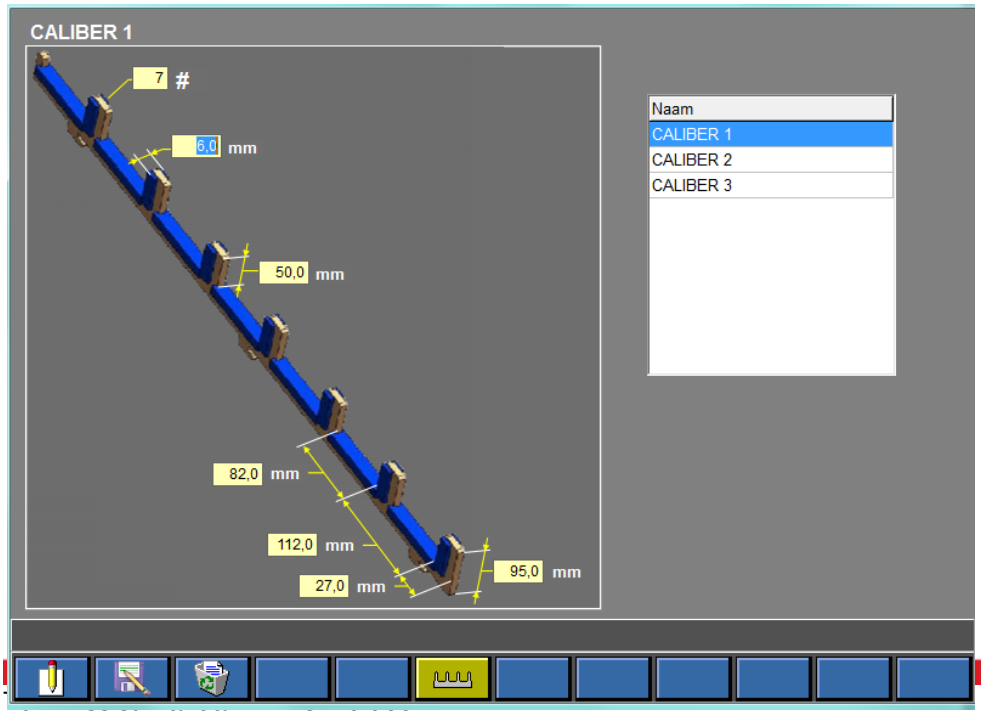
ATTENTION

At the moment the process is started, a Cycle Start signal is simultaneously sent to the machine! Make sure that the machine is in automatic mode and that the correct NC program has been pre-selected.

14.5. Settings

If the shaft option is selected, an additional function key appears in the settings screen (figure 14.8).
This is the database of the available calibres and may be modified by the customer themself.

Figure 14.8: Calibre settings



15. Interaction with the user

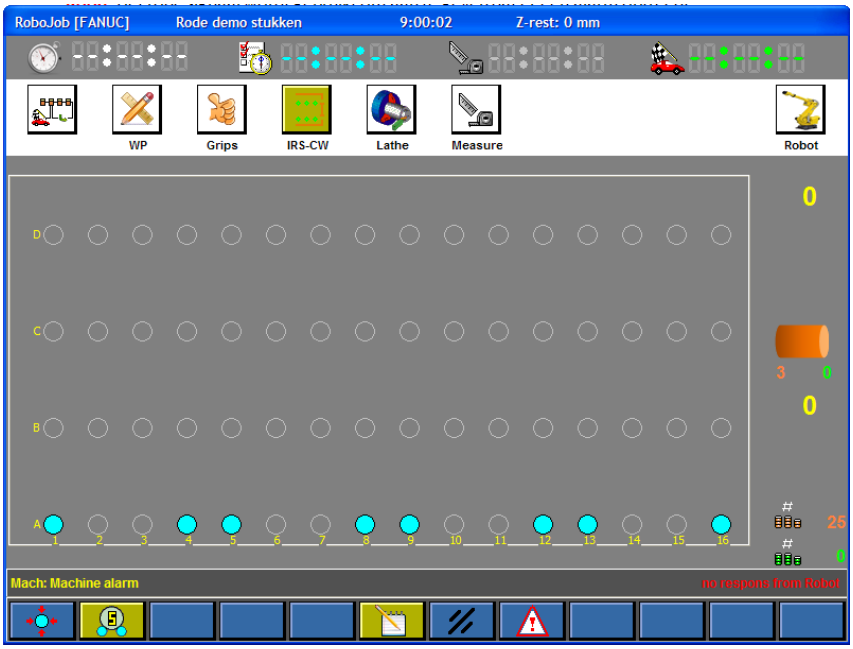
15.1 Signal towers

RoboJob will place a signal tower on each TURN ASSIST system. This serves to indicate to the user in what state the system is.
These signal towers comprise of four colours by default: Red, Blue, Green and Orange.

Red: The red signal is used to indicate that an alarm is occurring.
Blue: The operator is prompted with the blue signal. This could be when a measurement is carried out (the blue lamp will blink), or if the entire series is finished (the blue lamp will continuously burn).
Green: The green lamp indicates that the system is in cycle. This lamp will blink when the robot or IRS-CW is moving.
Orange This indicates when the machine has finished its operation.

15.2 Alarms

Undesirable problems may occur during the operation of the system.
These problems will then create alarms and will also be shown on the IPC.
The black bar above the function keys is reserved for the alarm display.



As shown in fig.15.1 we can differentiate between the alarms that are displayed to the left and the alarms that are displayed to the right. The alarms on the right are alarms that relate to the communications. These alarms are not shown in the alarm list.

The alarms on the left are all the other alarms; these are all shown in the alarm list.

Figure 15.1: Alarms

The IPC will show the alarm with the highest priority each time. At that moment however, no other alarms may appear. These can be called up in the alarm list. 
Yellow alarms are alarms w.r.t. to the machine. White alarms are alarms w.r.t. the IRS-CW. Blue alarms are alarms w.r.t. to the robot.

The following pages give an overview of all the potential alarms, together with their cause and the way in which these alarms may be resolved.

No compressed air

Cause:
The compressed air supply has been interrupted or the set pressure cannot be attained by the compressed air network.

Solution: Check whether the compressed air installation is correctly connected. Also check that the air pressure has not been set too high. This can be checked on the compressed air system of the IRS-CW as shown in fig. 15.2.

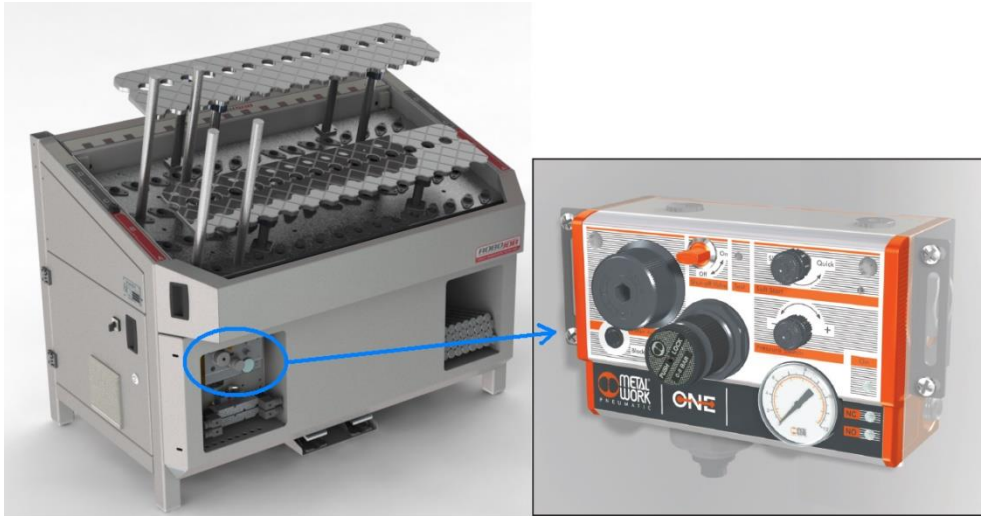


Figure 15.2: IRS-CW compressed air connection

Failure to clamping the pillars

Cause:

- The sensors that detect whether the pillars are clamped on to the IRS-CW do not work properly.
- The pillars are not fully connected at the bottom.
- The IRS-CW has a mechanical malfunction.

Solution:

- Check whether the pillars are all fastened in the right way. If one of the pillars is too high, then other pillars also cannot be clamped. Press the Reset function key.
- Contact RoboJob.

Failure to unclamping the pillars

Cause:

- The sensors that detect whether the pillars are unclamped on to the IRS-CW do not work properly.
- There's a mechanical malfunction.

- The pillars are not fully connected at the bottom.

Solution:

- Contact RoboJob.

Safety alarm:

Cause:

- The safety doors are open.
- The safety switches are not working properly.

Solution:

- Check whether the safety doors are closed, and press the Reset function key again.

Machine alarm:

Cause:

- Machine alarm.

Solution:

- Refer to the machine manuals in order to resolve the problem.

Door 1 Open sounds an alarm:

Cause:

- The left-hand machine door is mechanically blocked by e.g. swarf or other items.
- The compressed air connection to the cylinders that control the doors has been broken or incorrectly connected.
- The left-hand machine door opens too slowly.

Solution:

- If necessary, remove the swarf that is in the vicinity of the door guides and make sure the left-hand machine door cannot be blocked.
- Check that the connecting pipes and compressed air valves are connected correctly.

Door 2 open sounds an alarm:

Cause:

- The right-hand machine door is mechanically blocked by e.g. swarf or other items.
- The compressed air connection to the cylinders that control the doors are has been broken or incorrectly connected.
- The right-hand machine door opens too slowly.

Solution:

- If necessary, remove the swarf that is in the vicinity of the door guides and make sure the right-hand machine door cannot be blocked.
- Check that the connecting pipes and compressed air valves are connected correctly.

Door 1 closed sounds an alarm:

Cause:
- The left-hand machine door is mechanically blocked by e.g. swarf or other items.
- The compressed air connection to the cylinders that control the doors has been broken or incorrectly connected.
- The left-hand machine door closes too slowly.

Solution:
- If necessary, remove the swarf that is in the vicinity of the door guides and make sure the left-hand machine door cannot be blocked.
- Check that the connecting pipes and compressed air valves are connected correctly.

Door 2 closed sounds an alarm:

Cause:
- The right-hand machine door is mechanically blocked by e.g. swarf or other items.
- The compressed air connection to the cylinders that control the doors has been broken or incorrectly connected.
- The right-hand machine door closes too slowly.

Solution:
- If necessary, remove the swarf that is in the vicinity of the door guides and make sure the right-hand machine door cannot be blocked.
- Check that the connecting pipes and compressed air valves are connected correctly.

Clamp 1 open sounds an alarm:

Cause:
- The sensors for clamping and unclamping the left-hand spindle are not set properly.
- It takes too long before the left-hand spindle is unclamped.

Solution:
- Refer to the machine manuals in order to resolve the problem.

Clamp 2 open sounds an alarm:

Cause:
- The sensors for clamping and unclamping the left-hand spindle are not set properly.
- It takes too long before the left-hand spindle is unclamped.

Solution:
- Refer to the machine manuals in order to resolve the problem.

Clamp 1 closed sounds an alarm:

Cause:

- The sensors for clamping and unclamping the left-hand spindle are not set properly.
- It takes too long before the left-hand spindle is clamped.

Solution:

- Refer to the machine manuals in order to resolve the problem.

Clamp 1 open sounds an alarm:

Cause:

- The sensors for clamping and unclamping the left-hand spindle are not set properly.
- It takes too long before the left-hand spindle is clamped.

Solution:

- Refer to the machine manuals in order to resolve the problem.

Putting into working area 1 or 2 sounds alarm:

Cause:

- The putting cycle took too long. Cause may be that the user has held up the robot for too long a time by means of the HOLD key on the IPC pillar.
- One of the conditions for preparing the machine for a putting cycle has not been attained.

Solution:

- Stop the program by means of clicking the STOP function key 

; this function key can be found in the workflow screen, the Grips sub-screen and the tacker sub-screen. Confirm that the program must be stopped. Then go to the robot sub-screen and select the Home function key  .
  The robot will now move to its 'Home' position. If it has arrived here, reset the program and try to start again.
- The machine spindles may not be blocked beforehand. Unblock the machine spindles and try again.
- Contact RoboJob.

Picking in working area 1 or 2 sounds alarm:

Cause:

- The picking cycle took too long. Cause may be that the user has held up the robot for too long a time by means of the HOLD key on the IPC pillar.

Solution:

- Stop the program by means of clicking the STOP function key 

; this function key can be found in the workflow screen, the Grips sub-screen and the TURN ASSIST sub-menu

screen. Confirm that the program must be stopped. Then go to the robot sub-screen and select the Home function key 
The robot will now move to its 'Home' position. If it has arrived here, reset the program and try to start again.
- Contact RoboJob.

Cycle Start in working area 1 or 2 sounds alarm:

Cause:
- The machine must be in automatic mode for automatic operation. If this is not the case, an error is generated.
- For some machines, certain shafts of the machine must be in the 'Home' position in order to be able to give Cycle Start.

Solution:
- Put the machine into automatic mode.
- Bring the shafts of the machine into the 'Home' position before starting.
- Stop the program by means of clicking the STOP function key 

; this function key can be found in the workflow screen, the Grips sub-screen and the IRS-CW sub-screen. Confirm that the program must be stopped. Then go to the robot sub-screen and select the Home function key. 
The robot will now move to its 'Home' position. If it has arrived here, reset the program and try to start again.

Error situation:

Cause:
- An error has occurred in the robot section.

Solution:
- This error can usually be resolved by clicking the Reset function key on the IPC. 
- Contact RoboJob.

Replace CMOS battery:

Cause:
- The Robot's CMOS battery needs to be replaced.

Solution:
- Contact RoboJob.
  Replacing the battery needs to follow a certain procedure. Do not attempt to do this yourself, because the Robot may lose all of its settings owing to faulty operation. In the latter case, a full Robot calibration needs to be done.

16. Examples

In this chapter some examples are discussed as to how the TURN ASSIST software must be set for certain workpieces. No account is taken of what jaws the user has in his possession. We assume that two sets of standard jaws are always present, so that at least one set is usable for both the rough and the finished workpieces each time.
Since the user themself can create other potentially non-standard jaws, in that case it may be that jaws other than those shown here in the examples are usable.
For the time being we discuss some examples in the case where no Gripper magazine is present.

Examples <u>without</u> Gripper magazine

Example 1

In this example, the machine only has one spindle. This means that both the rough and the finished product must be programmed in the same spindle. The dimensions of the rough product are given in Appendix 1. The dimensions of the finished product are given in Appendix 2. The material used is aluminium. We want to grip the rough and the finished product with external jaws whereby the rough product must be gripped with hard jaws and the finished product with soft jaws. The jaws project 65 mm from the machine and the piece is clamped 10 mm in the jaws. In this example we want to process a batch of 60 products. We assume that no measurements need to be done. After starting the TURN ASSIST software, the screen on fig. 1.16 appears.

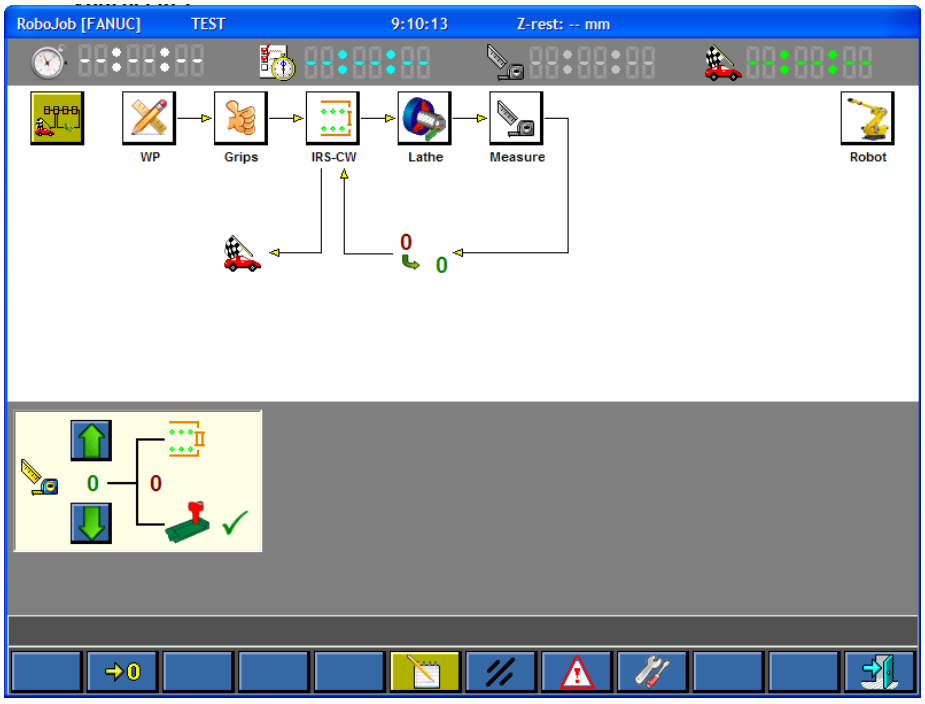


Figure 16.1: Workflow screen

To enter a new product we go to the WP sub-screen by clicking on the following icon in the workflow: 
The WP sub-screen now appears, where we are able to enter the data on the rough and finished product. The correct data has been entered for this example in figure 16.2

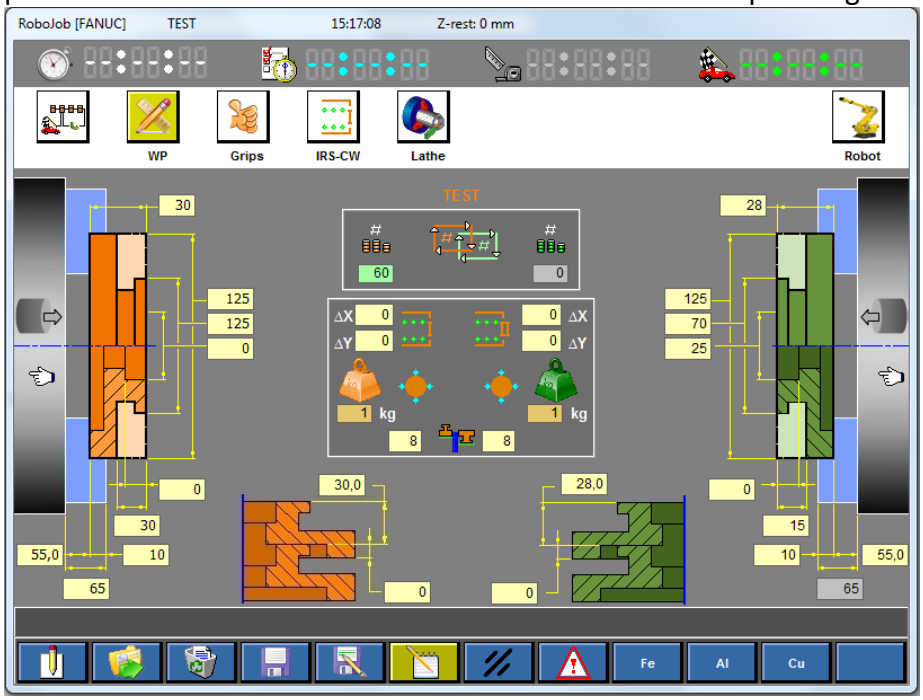
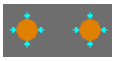


Figure 16.2: Example 1; WP sub-screen

Comments:

- With both the rough and finished product, the selection hand points to the left. This makes sense because the machine in this example only has one spindle. 
- The material used is aluminium. The material selection and associated weight setting in this example are done with the aid of the function key. 
- Both the rough and the finished product will have to be gripped externally. 
- The batch size = 60 pieces. 
- These data may be saved in the database with the aid of the following function keys: 

Now that all the data from the WP sub-screen have been entered, we follow the workflow and continue to Grips sub-screen  as shown in fig. 16.3.

The potential jaws for both the rough and the finished product are represented in this screen. In this case, J3P.125.U066.2.20.16.H and J3P.125.U066.2.20.S can be used for both the rough and the finished product. As the products are made from aluminium, we want to grip the finished products with soft jaws.
The rough products may be gripped with hard jaws.
The icon  indicates that the jaws are currently not on the gripper.

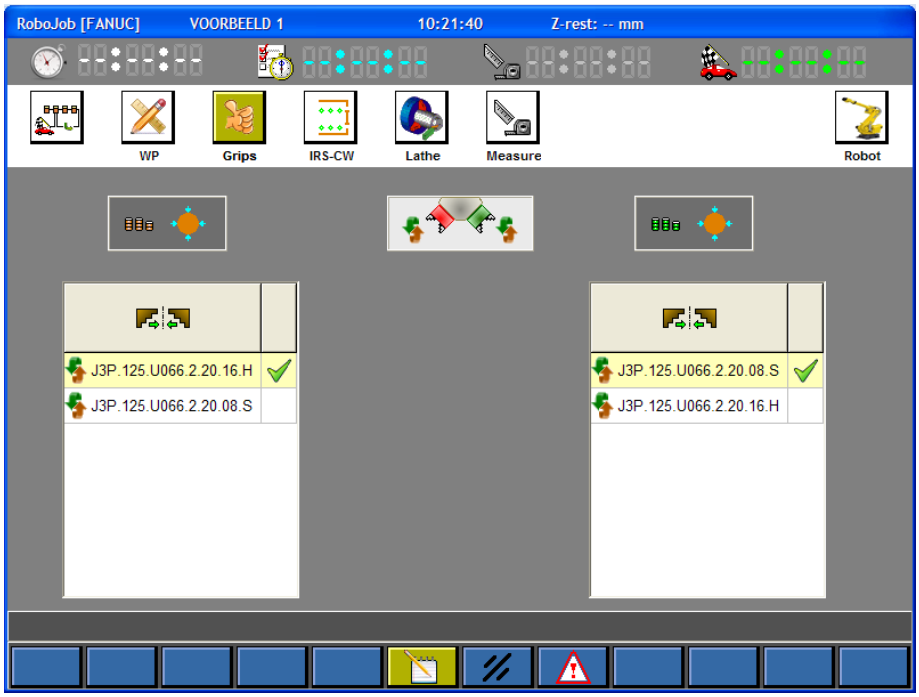


Figure 16.3: Example 1; Grips sub-screen

After the jaws have been selected, in the workflow diagram, we go further to the IRS-CW sub-screen.  (fig.16.4)

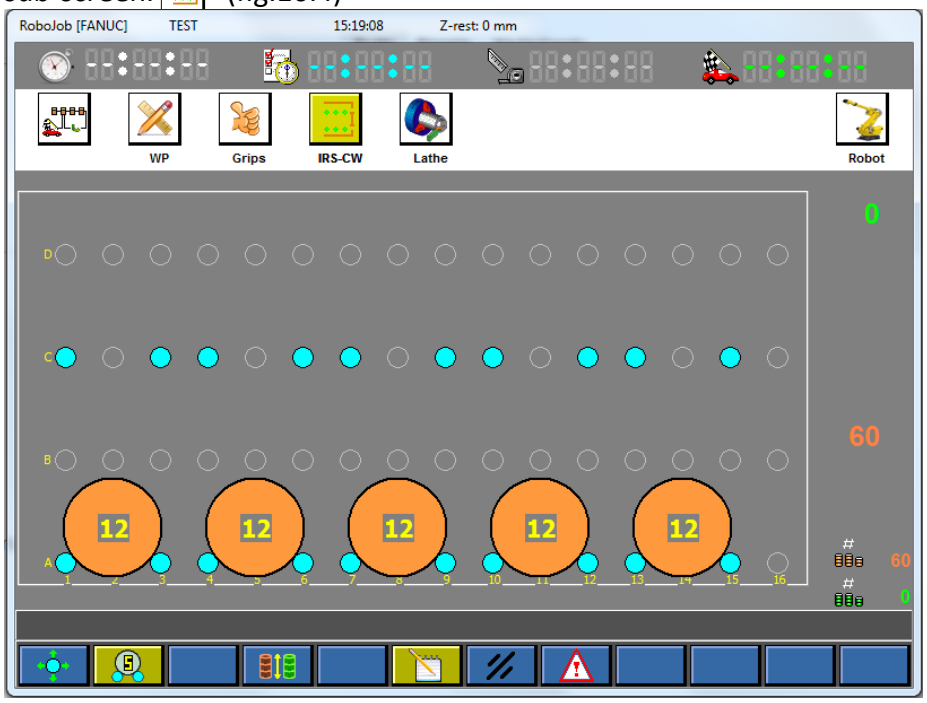


Figure 14.4: IRS-CW sub-screen

In this screen the TURN ASSIST software shows how the pillars should be positioned and how the workpieces should be on the IRS-CW. In order to position the pillars on the IRS-CW, these must first be unclamped with the aid of the function key. When the pillars have been successfully unclamped they may be placed together with the rough workpieces on the IRS-CW according to the way that the TURN ASSIST software indicates. Afterwards, the pillars need to be re-clamped. In this way, all the data has been set and we can start on the batch. For this, we assume the edit mode and we set the IRS-CW plates.

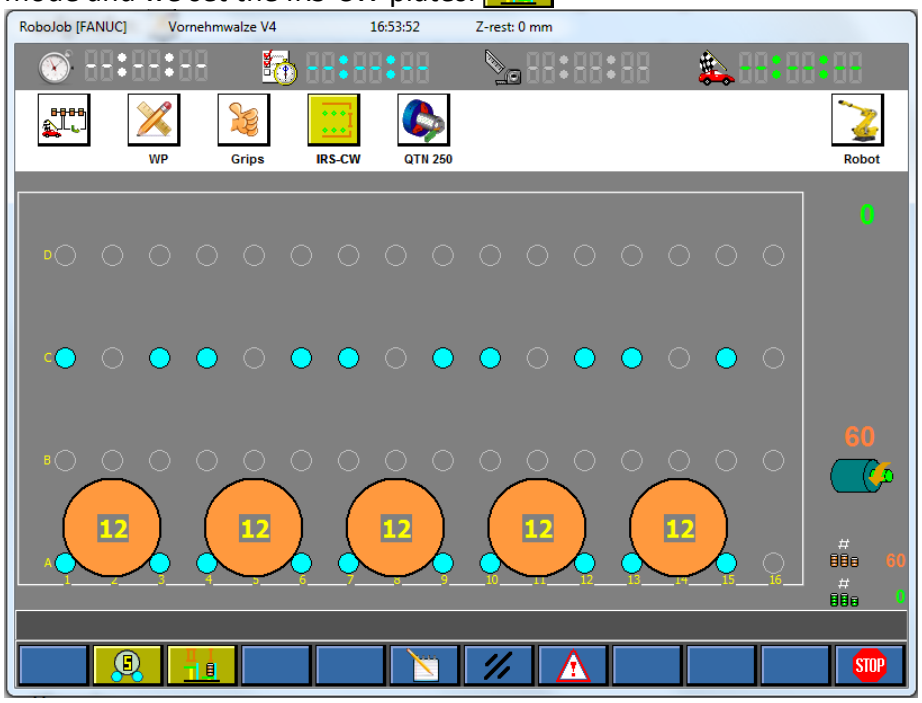


Figure 16.5: Example 1; IRS-CW sub-screen

As soon as the IRS-CW-plates have been set, the function keys appear. The system is now ready to start.

By clicking on the function key , this will become active and the cycle will start. Note that the correct jaws still have to be placed on the grippers. To this end, the robot moves to a handy 'jaw change' position. The user can now place the correct jaws on the grippers. To do this he will need to open the safety doors.

If the correct jaws are on the grippers, he can confirm this to the robot (fig. 16.6).

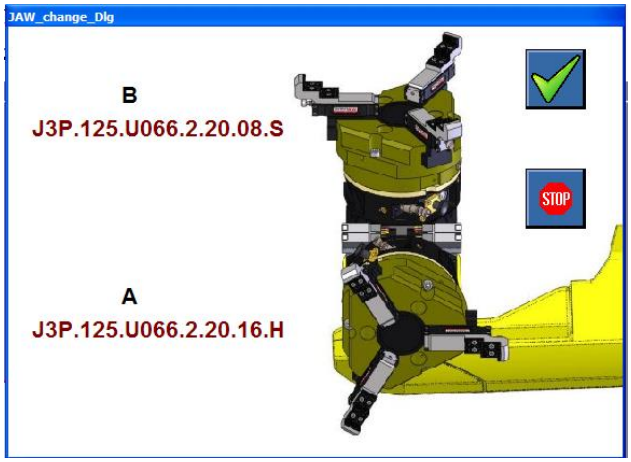


Figure 16.6 Confirming jaw change

Finally, he must still reset the safety alarm and then continue the cycle by pressing the 'Robot Run' push button.

Example 2

In this example we're going to process the back of the product from example 1.
The finished product from example 1 will be considered as rough product in this example. The dimensions of the finished product from this example can be found respectively in Appendices 3 and 4. The machine only has one spindle. Since the rough product has already been pre-processed, we want to now grip it using a soft, external gripper. We now grip the finished product with a soft internal gripper.
In this example, the jaws project 45 mm from the machine and the product is clamped 13 mm in the jaws. We again want to set up a batch of 60 products wherein here we want to carry out a measurement on the IRS-CW every 20 pieces.

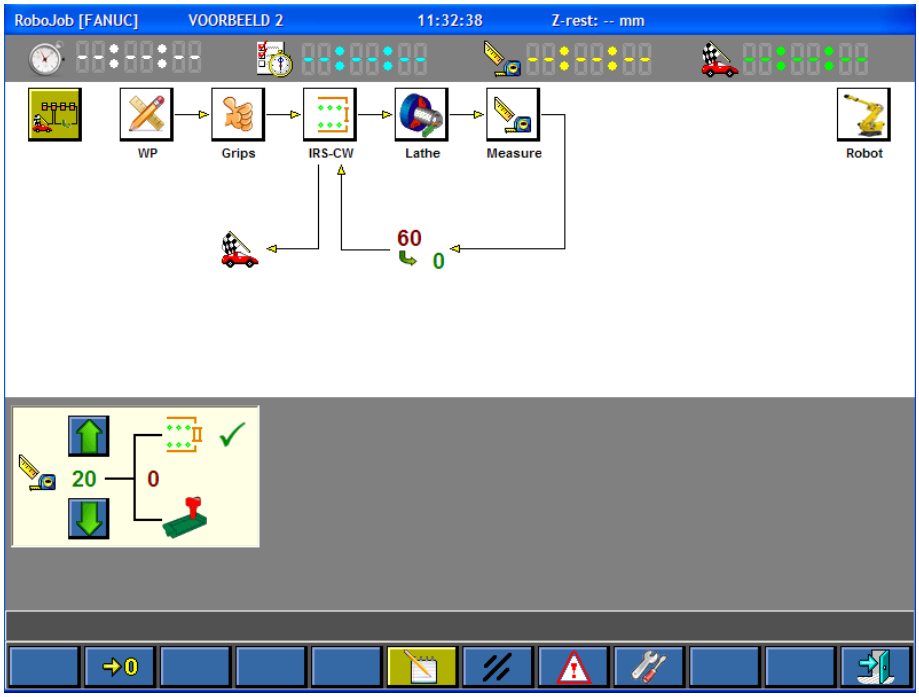


Figure 16.7: Example 2; Workflow screen

Figure 13.7 shows the Workflow screen that the Turn Assist software displays upon the program start-up. Here we can immediately enter that we want to carry out a measurement on the IRS-CW after 20 Cycles (fig.16.8). In the workflow diagram we then go to the WP sub-screen. By pressing the function key for 1 second, we create a new product in the TURN ASSIST software.
The correct data for this example has been entered in fig. 16.9

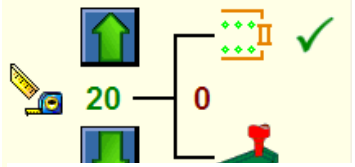


Figure 16.8: Measurement on the IRS-CW.

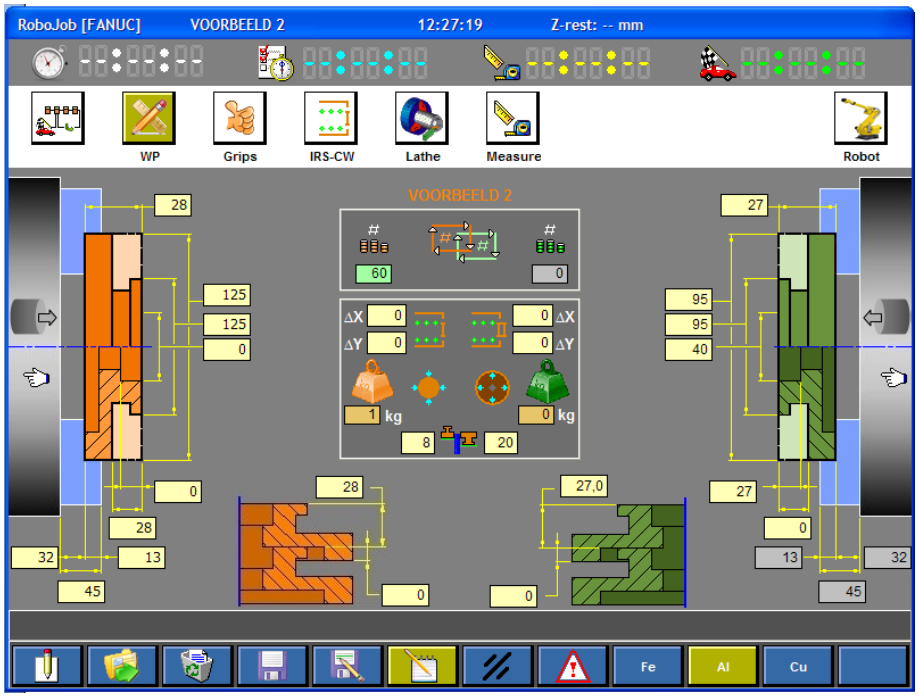
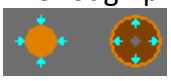


Figure 16.9: Example 2; WP sub-screen

Comments:

- The data of the rough piece in this example are different from the data of the finished piece from example 1, while in this case it concerns the same pieces. This is due to fact that the pieces are now reversed in the spindle.
- For the positioning stop against the pillars, we select 8 mm for the rough product and 20 mm for the finished product. For the finished product, we have to choose at least 16 mm since the product is stepped. If 15 mm or less is selected, then the flange will protrude above the pillars.
- The rough product must be externally gripped and the finished product internally.



Now that all the data from the WP sub-screen has been entered we follow the workflow and we continue to Grips sub-screen 

as shown in fig. 16.10.

The same for example 1, we select the appropriate jaws.
In this example also, the TURN ASSIST software indicates that the jaws selected are currently not present on the grippers. After the jaws have been selected, in the workflow diagram we go further to the IRS-CW sub-screen (fig.16.11).
Once the pillars have been fitted correctly and the rough workpieces have been placed on the IRS-CW, we can exit the edit mode again, so that we can set up the IRS-CW plates. 
We can start the set batch only when these have been set up and the function keys  appear.

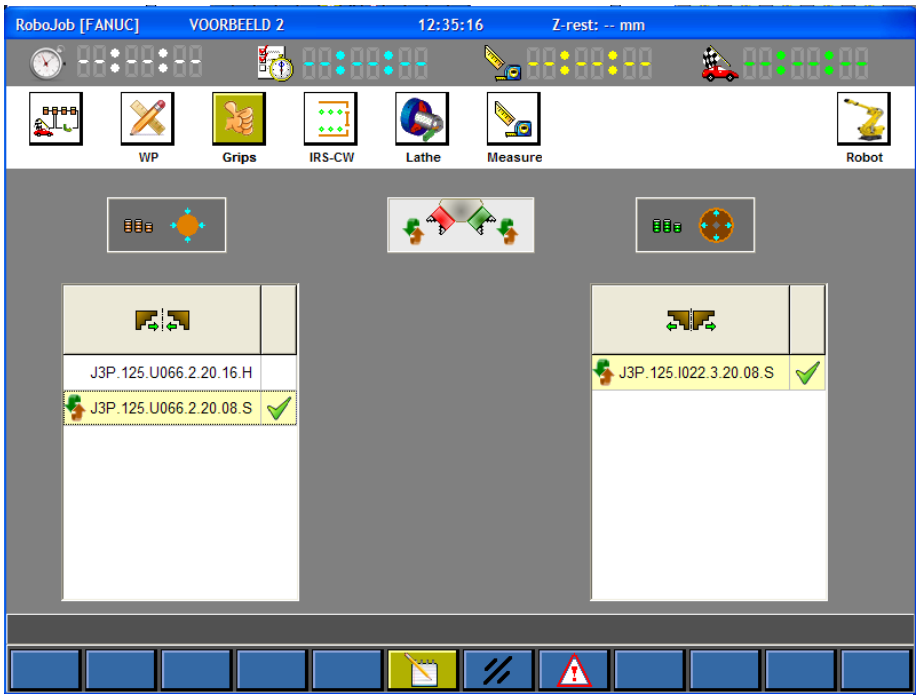


Figure 16.10: Example 2; Grips sub-screen

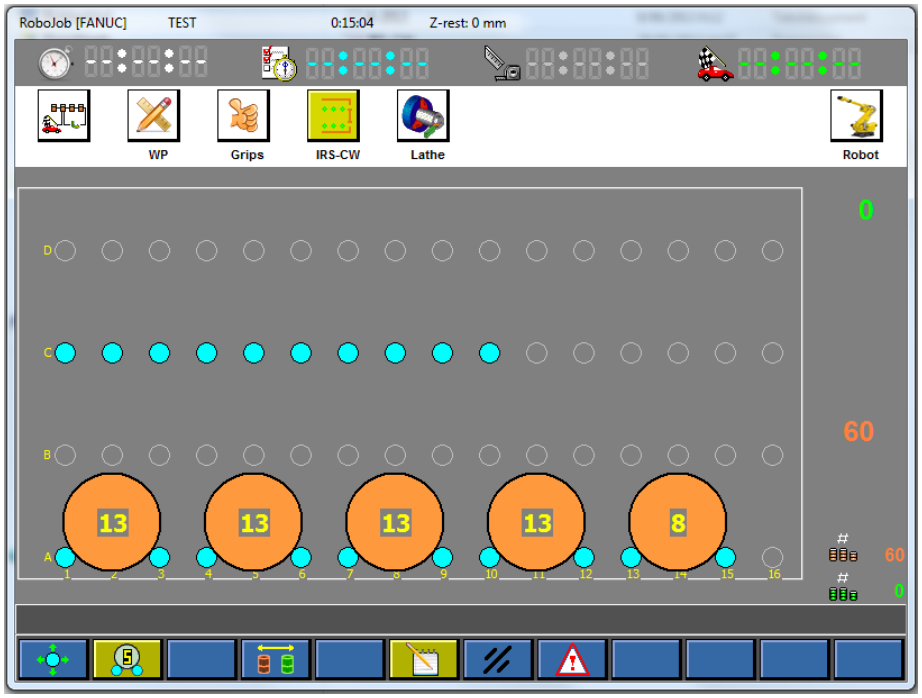


Figure 16.11: Example 2; IRS-CW sub-screen

Since the selected jaws are not yet present on the grippers, the robot will first go to the 'jaw change position', so that the selected jaws can be mounted. After this has been confirmed, the production can be started, as illustrated in fig. 16.6. After 20 pieces, the blue lamp will blink, meaning that the user can come and carry out a measurement on the IRS-CW. After the measurement has been carried out and some parameters have possibly been adjusted in the

machine, the batch may be continued with by clicking on the function key  . Please note that the measured piece is put back on the IRS-CW!

Example 3 (products fitting together, special stacking)

In this example, the machine has two spindles. The rough workpiece is loaded onto the left-hand spindle while the finished workpiece is unloaded from the right-hand spindle. The rough product is gripped with a hard external gripper, while the finished product is gripped with a soft internal gripper. The material from which the products are made is aluminium. The dimensions of the rough and finished product can be found respectively in Appendices 5 and 6. The jaws of the left-hand spindle protrude 75 mm from the jaw plate; the workpiece is clamped with a length of 40 mm. The jaws of the right-hand spindle protrude 35 mm from the jaw plate; the workpiece is clamped in this with a length of 18 mm. We want to produce a batch of 18 workpieces. After 6 workpieces we want to carry out a measurement in the machine.

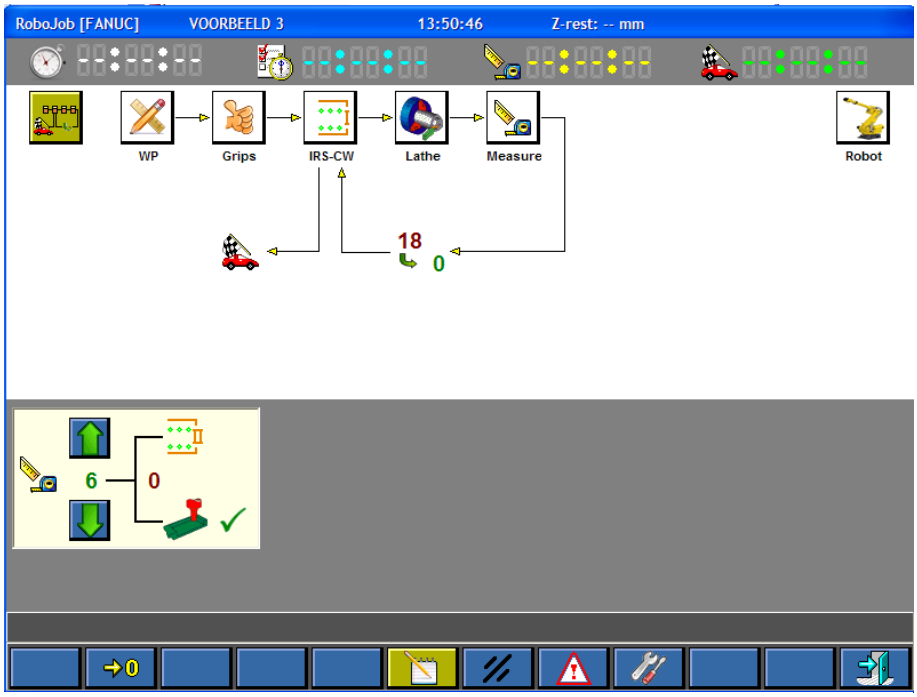


Figure 16.12: Workflow screen

Figure 14.12 shows the Workflow screen that the TURN ASSIST software displays with the program start-up. Here we can immediately enter that after 6 Cycles we want to carry out a measurement in the machine (fig. 16.13). In the workflow diagram we then go to the WP sub-screen.  . By pressing the function key  for 1 second, we create a new product in the TURN ASSIST software. The correct data for this example has been entered in fig. 16.9.

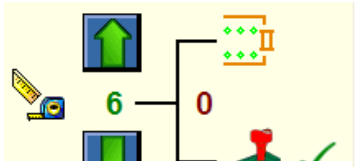


Figure 16.13: Measurement in the machine.

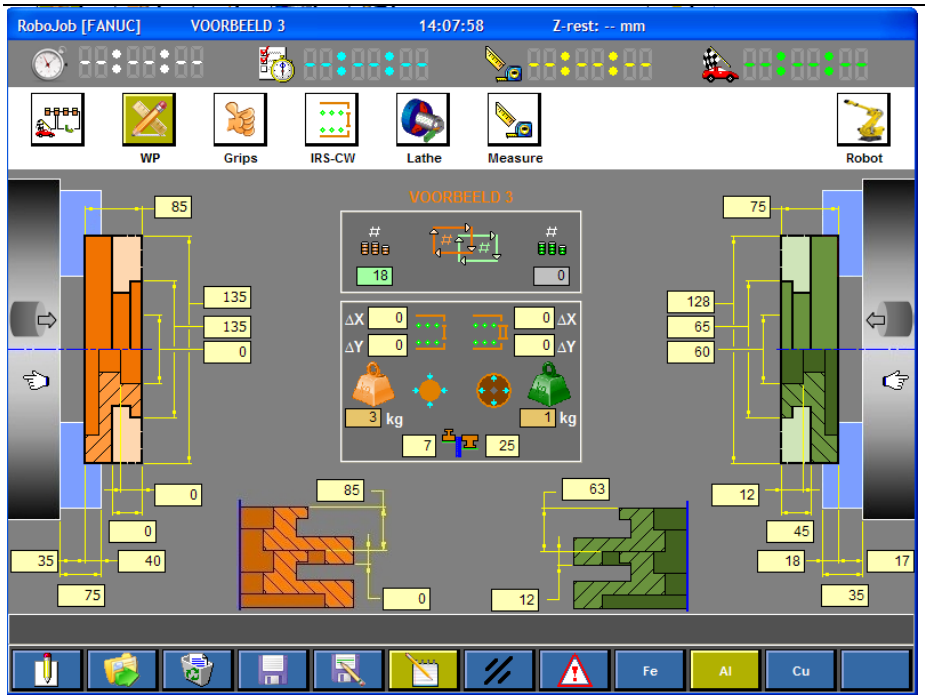
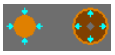


Figure 16.14: Example 3; WP sub-screen

Comments:

- The selection hands in this case are not in the same direction. The rough workpiece will be loaded onto the left-hand spindle  while the finished workpiece is unloaded from the right-hand spindle. 
- The rough products are gripped externally; the finished products are gripped internally. 
- For the finished components, in this example, we have to enter the way in which the workpieces are stacked. As shown in fig. 16.15, the finished workpieces fit together over a length of 12 mm. We can enter this stacking length into the TURN ASSIST software as shown in fig. 16.16.

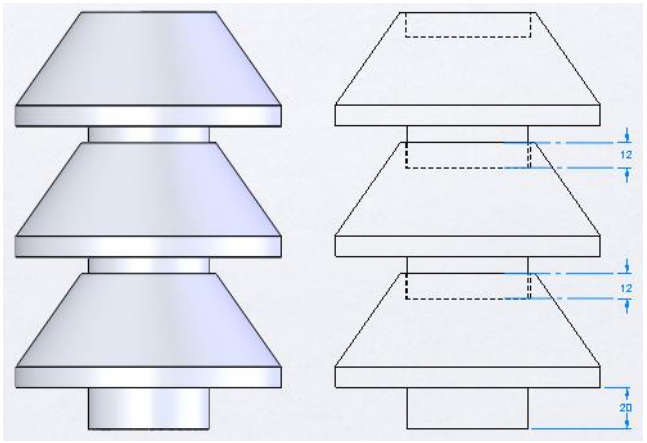


Figure 16.15: Example 3; stacked finished products

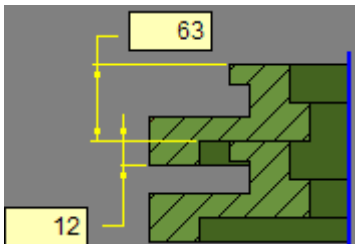


Figure 16.16: Stacking length entry

- The stop length against the pillars does not play a role for the rough products. Here we select 8 mm. For the finished products must select a value greater than 20 mm. (see fig. 16.15). In this example, we select 25 mm.

After all of the data has been entered in the WP-screen, we can proceed in a similar way to the previous examples. We again select a suitable gripper and set up the IRS-CW as shown on the IRS-CW sub-screen. The batch may then be started using the function key  . The robot will or won't move to the 'jaw change position', so that the jaws selected can be mounted on the grippers. The batch may then be started. After 6 products have been finished, the blue lamp will blink. This way the TURN ASSIST software indicates that the user can come and carry out a measurement; in this case a measurement in the machine. After the measurement has been carried out, the batch may be continued with by means of the function key. 

Example 4 (Single cycle, for heavy workpieces)

In this example, the machine has two spindles. The material from which the products are made is steel. Both the rough product and the finished product may be gripped with a hard external gripper. We want to produce a batch of 25 workpieces. The dimensions of both the rough and finished component can be found respectively in Appendices 7 and 8. With both the rough and the finished product the jaws protrude 60 mm from the jaw plate and the workpieces are clamped 20 mm in the jaw plate. In this example it is assumed that we don't have to carry out any measurement.
After starting the TURN ASSIST software, we come to the Workflow screen (fig. 16.17).

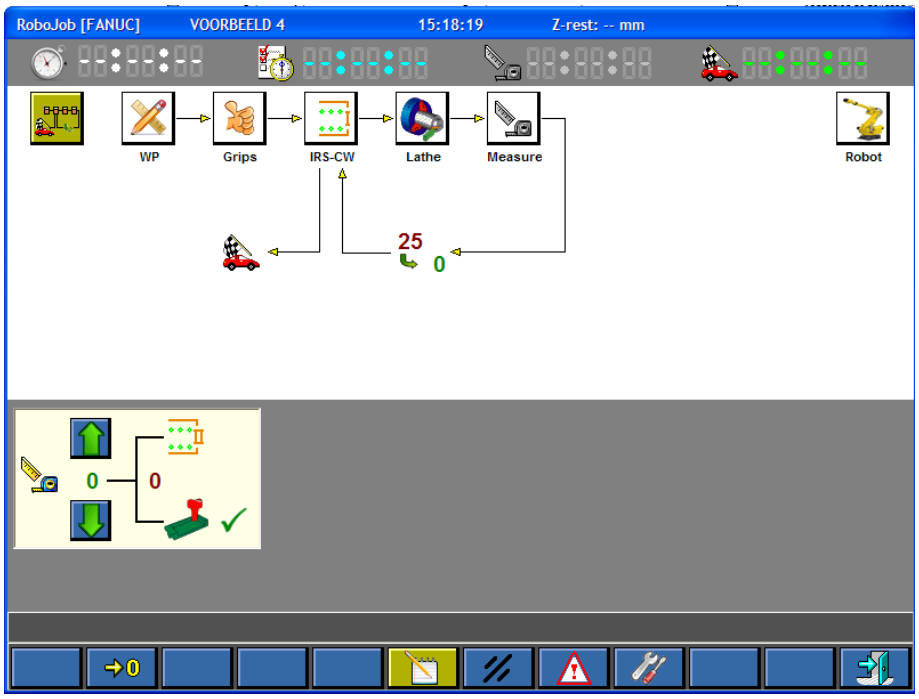


Figure 16.17: Workflow screen

Since we are not going to carry out any measurements in this example, in the workflow scheme we can go to the next sub-screen, the WP sub-screen. The correct data for this example is shown in fig. 16.18

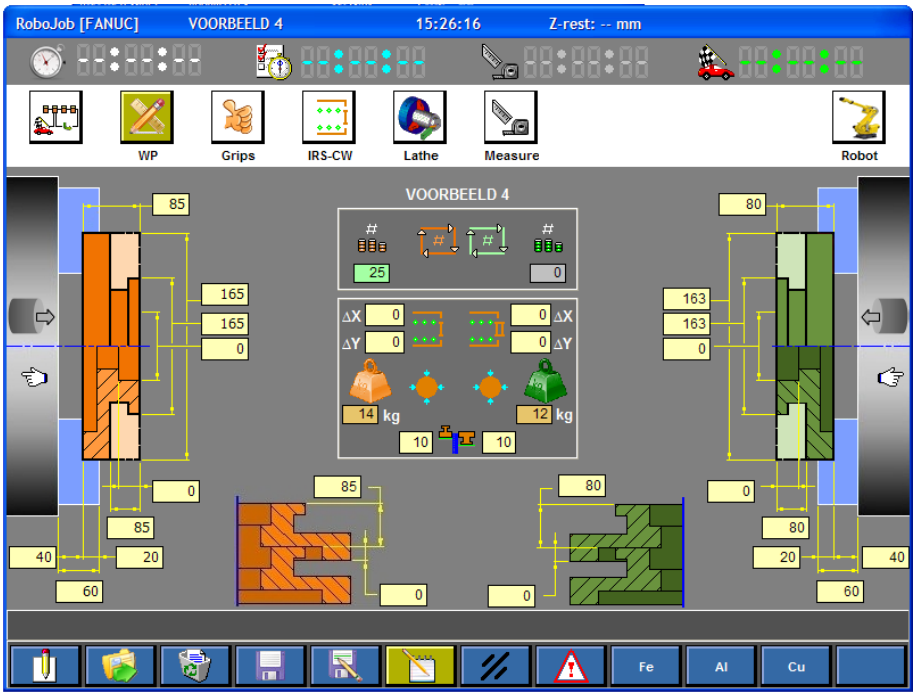
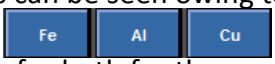
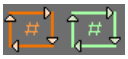


Figure 16.18: Example 4; WP sub-screen

Comments

- The weight input is done manually here; this can be seen owing to the fact that none of the function keys are coloured dark yellow. 

- The positioning stop against IRS-CW pillars is for both for the rough product and the finished product = 10 mm. In this case one can choose the stop length freely, since both the rough and the finished workpiece are not stepped, and also cannot be stacked in each other.
- Here, a single cycle is selected  . This is a sensible choice because the sum of the rough and finished product is in excess of 20 kg (the load capacity of the robot).
  Should the user forget to select the single cycle, the software will adjust this itself!
  If one forgets to split the cycle in case of excess weight, the software itself will tell you.

Now that all the data has been entered in the WP sub-screen, in the Workflow diagram one can go to the Grips sub-screen (fig 16.19).
One can then set to work in the same way as in the previous examples in order to select the grippers and to set the IRS-CW in the IRS-CW sub-screen in order to then start the automatic operation.

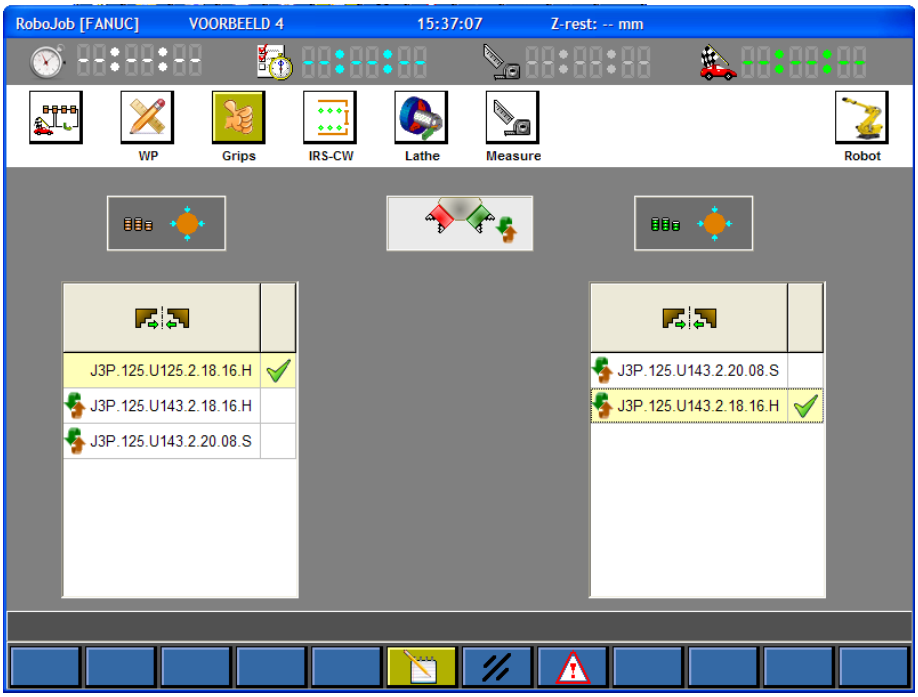


Figure 16.19: Grippers - sub-screen

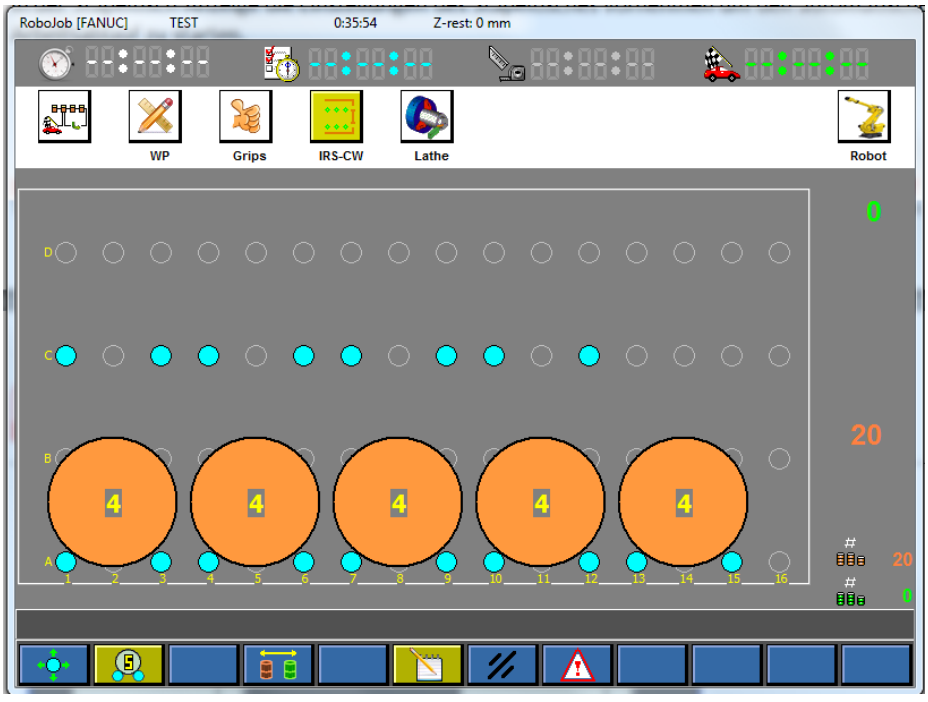


Figure 16.20: IRS-CW sub-screen

Example 5 (compensating X/Y oneself)

In this example a workpiece is discussed for which the user themself must enter a compensation on the IRS-CW. The reason for this is that the finished product is no longer round, but has a square shape. However, this square shape cannot be entered into the TURN ASSIST software so that the square shape also cannot be positioned correctly against the IRS-CW-support pillars. For these 'special' products, the user themself can calculate where the ideal IRS-CW position is. The drawings of both the rough and finished component can be found respectively in Appendices 9 and 10.

In this example it is assumed that the machine is fitted with two spindles.

The rough product is gripped with a hard external gripper; the finished product is gripped with a soft internal gripper. In this example we are assuming that no measurements need to be made. For both the left-hand and the right-hand spindle, the jaws protrude 40 mm from the jaw plate and the workpieces are clamped 10 mm in length. We want to produce a batch of 110 workpieces.

The WP sub-screen looks like this:

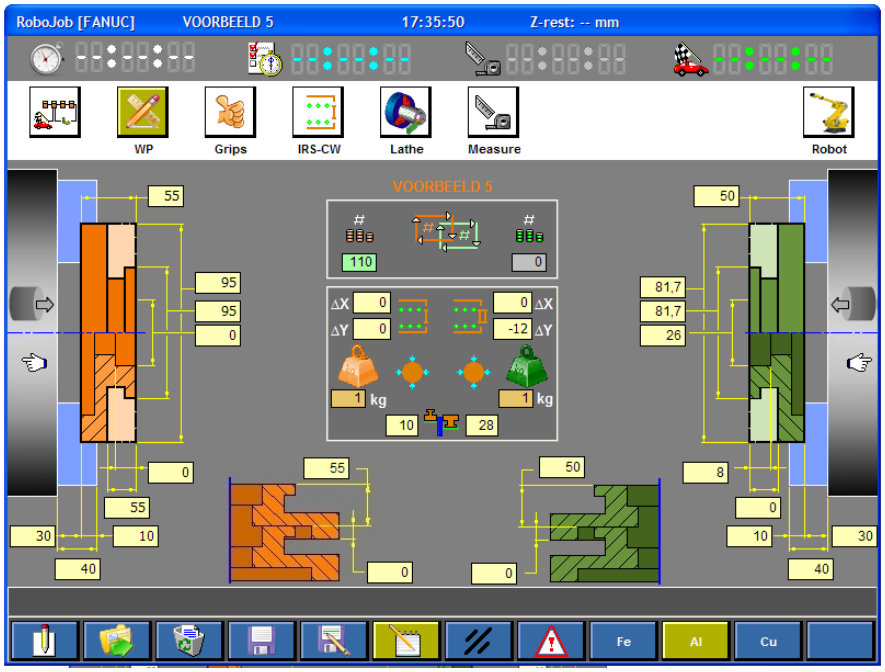
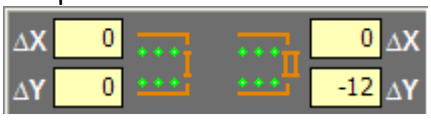


Figure 16.21: Example 5; WP sub-screen

Comments

- A negative delta Y compensation has been entered for the data on the finished component.



The reason for this is the following:
If we were not to enter any compensation, the robot would place the product on the IRS-CW as shown on figure 16.22.
The products will thus not come to be aligned against the IRS-CW pillars, because the products are not completely round.

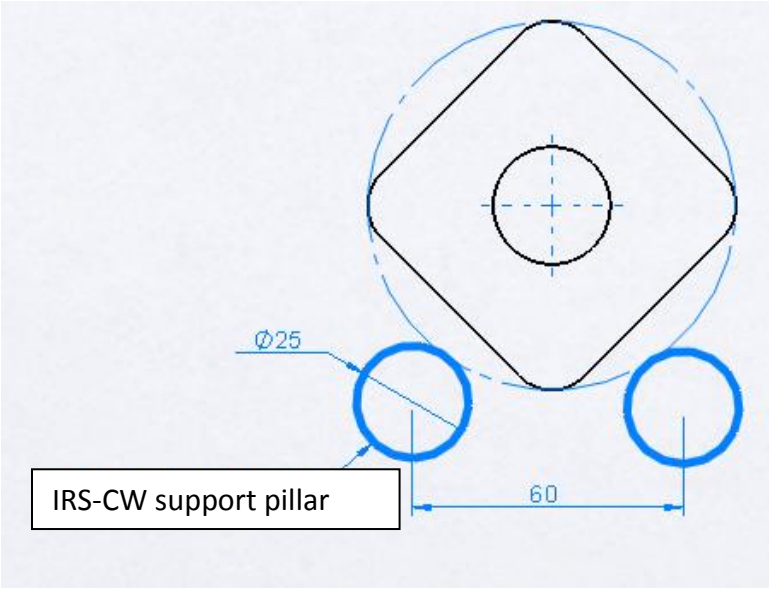


Figure 16.22: Laying position without compensation

Next, the compensation must be entered as illustrated on fig. 16.23 wherein the coordinates' system must be in accordance with fig 16.24.

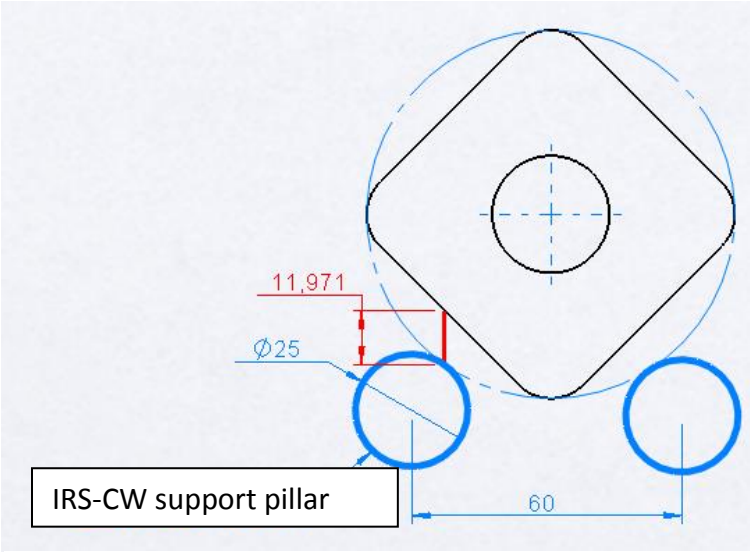


Figure 16.23: Compensation size

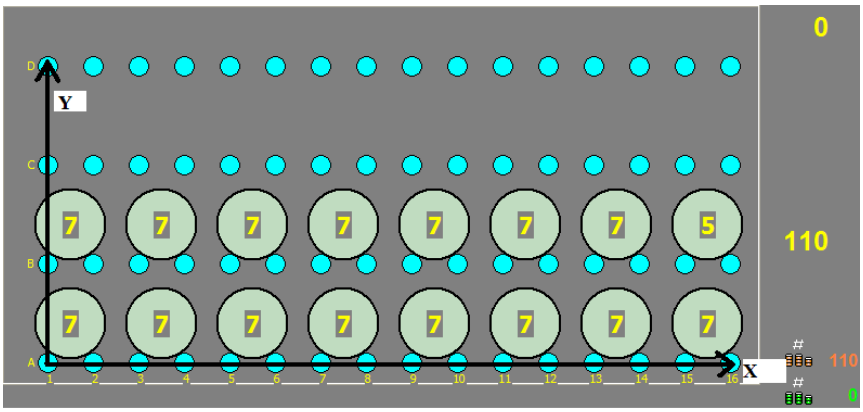


Figure 16.24: Example 5; IRS-CW sub-screen

In this way the user themself can enter a compensation. In this example we rounded up the compensation from 11,971 mm to 12 mm.
The further course of the program happens again in an identical way to the previous examples.
It is also possible to enter a compensation in the X direction.
Both compensations can finally be entered for both the data of the rough and the finished product.

17. Safety Laser Scanner / Fencing

With a laser scanner it is possible to create an open workspace with smaller robots (less than 50 kg load capacity) without a large safety fence.

Figure 17.1: Installation with fencing

Robot with a load capacity of 50 kg, equipped with a safety fence wherein it stops when the door(s) open.

The advantage of a laser scanner is that one can use 2 zones:

- A warning zone
- A stop-zone (option)

Figure 17.2: Installation with safety laser scanner

17.1 Safety Laser Scanner

On entering the warning zone, the speed is limited to a standardized safety speed of 250 mm / s. Thus one can still work in this range if desired. When exiting this zone, the preset operating speed will automatically resume. In the event that there is a stop-zone present: the robot will stop when one enters the stop-zone after the first warning zone.

Figure 17.3: Positioning Laser scanner

The safety laser scanner is positioned Under the IPC (indicated in the yellow circle in figure 17.3)

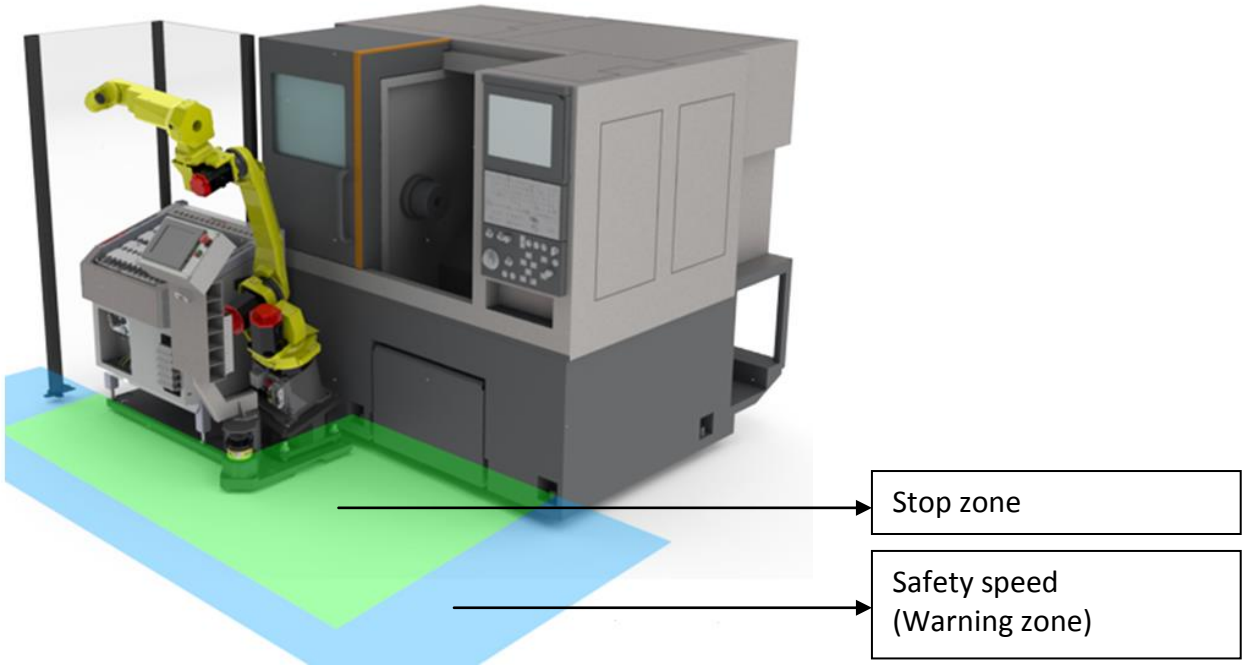


Figure 17.4: Warning zone and Stop zone

17.2 Cleaning and Status

How to clean optics

- Remove dust with a clean soft cloth.
- Make the optics window dirt free using a damp antistatic cloth.

Do not use any aggressive or abrasive cleaning agents.

Error and status messages from the laser scanner:

This section describes the meaning of the various error messages or status indications of the laser scanner.

	Object in the safety field
	Safety field free
	Object in one of the warning fields
	No or too low supply voltage

	Re-configuration necessary
	Start-up time exceeded
	No error message
	Optics dirty, operation is no longer assured
	Optics dirty, operation still assured

17.3 Safety Fencing

The installation with safety fencing may be fitted with:

- 1 Door
- 2 Doors
- 3 Doors
- Or with a safety light curtain (option)

Depending on the requirements, possible combinations can be made here.

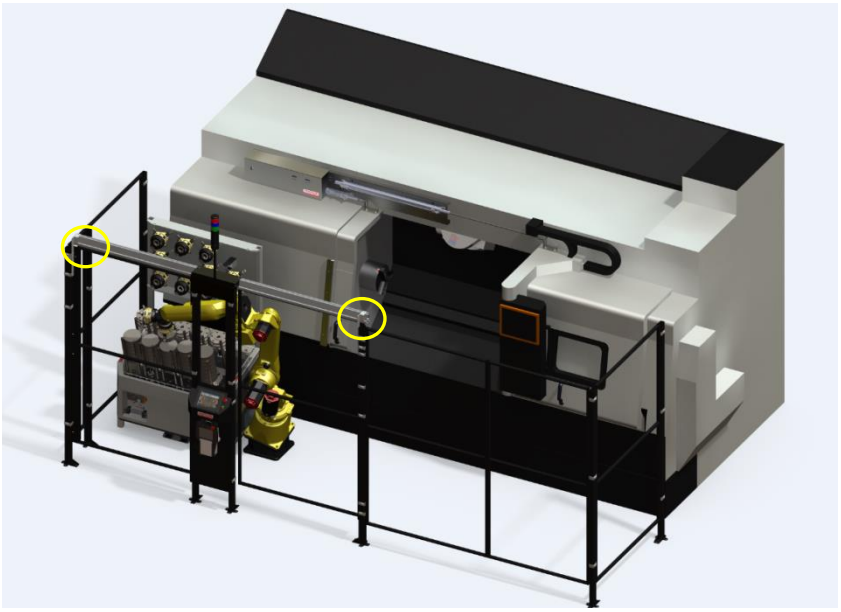


Figure 17.5: Installation with safety fencing and 2 doors

The door safety switches are shown in the yellow circle in figure 15.5. With the option of a 'light curtain', one or more doors can thus be replaced. The operation remains the same for both cases.

The robot will stop when this zone is entered (by means of opening the door or walking through the light curtain). When one exits this zone, in the case of the safety switch on the doors, one must close this again, and ... (This is an action more than for the purpose of the laser scanner) one should press the reset button  in order for the error message to disappear (fig. 17.6) after which one then presses the ‚Robot Run' button in order to continue the progress.

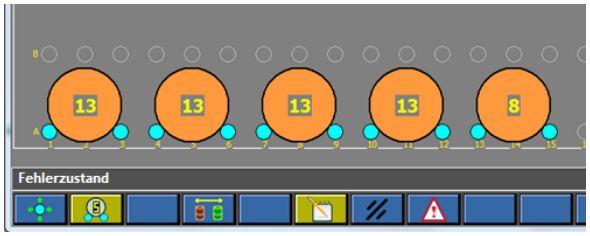


Figure 17.6: Error status with the safety stop of the robot

18. Notes

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