Ver 1.0

FRYER® MACHINE SYSTEMS

Precision Built Solutions™

FRYER / SIEMENS
SINUMERIK ONE CONTROL

ELECTRICAL MAINTENANCE MANUAL
MILLING & TURNING

MADE IN USA

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1.0 GENERAL INFORMATION

1.1 Electrical System

- Schematics (1) – The Electrical and Pneumatic Schematics are inside electrical cabinet
- Cabinet Filter Type (2) – Purolator A23465 or equivalent
- Check Filter Interval - Weekly
- Change Filter Interval – As Required (depending on environment)

1.2 Setting Axes Home Positions

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The SINUMERIK ONE control comes standard with absolute encoders which generally do not require homing. However, if you have an issue with the battery or the machine is not turned on for an extended length of time the machine may need to be re-homed according to the following procedure. In addition, if an axis motor is removed or there is an issue with a motor coupling or pulley / belt assembly, one or more axes may need to be re-homed.

Refer to Section 1.4 for directions to access parameter screens.

1. Press 
2. Select **SETUP**
3. Select **MACHINE DATA**
4. Select **AXIS MD**
5. Select **SEARCH**
6. Enter **34210 [0]** in the search field (This will read **ENC_REFP_STATE**)
7. Select **OK**
8. Select the proper axis with the **AXIS + AND AXIS –**
9. Change the parameter **34210 [0] to 0** for an axis with a motor encoder
10. Change the parameters **34210 [0]** and **34210 [1] to 0** for an axis with a scale
11. Press **INPUT**
12. Cycle power to machine leaving it off for a minimum of 30 seconds
13. **Take extreme caution now as the machine can be crashed!**
14. Line up the home markers for all axes that need to be homed

15. Press the **E-STOP** button to turn off the servos
16. Press 
17. Select **SETUP**
18. Select **MACHINE DATA**
19. Select **AXIS MD**
20. Select **SEARCH**
21. Enter **34210 [0]** in the search field (This will read **ENC_REFP_STATE**)
22. Select **OK**
23. Select the proper axis with the **AXIS + AND AXIS –**
24. Make sure Parameter **34210 [0] and 34210 [1]** (if axis has a scale) **are set to 0**. If it is not, it is probable that the wrong axis is selected.
25. Change the parameter **34210 [0] to 1** for an axis with a motor encoder
26. Change the parameters **34210 [0]** and **34210 [1] to 1** for an axis with a scale
27. Press **INPUT**
28. Turn the feed rate override all the way down
29. Pull the **E-Stop** button out
30. Select **RESET**
31. Press **HOME RETURN (**should say Jog Ref at the top of the screen)
32. For a mill, press **AXIS+ (refers to the hard key on the manual panel you have selected)**
33. For a lathe, press cycle start.
34. When done make sure parameter **34210 [0] shows 2** for all axes (axis with motor encoder)
35. When done make sure parameter **34210 [0]** and parameter **34210 [1] shows 2** for all axes (axis with scale)

1.3 Adjusting Backlash Compensation

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

- Refer to Section 1.4 for directions to access parameter screens.
  - Press 
  - Select **SETUP**
  - Select **MACHINE DATA**
  - Select **AXIS MD**
  - Using **AXIS+ AND AXIS-,** select the correct axis
  - Select **SEARCH**
  - Enter **32450 [0] or 32450 [1]** if the machine is equipped with glass scales on the selected axis
  - Adjust the backlash on each axis
  - Select **SET MD ACTIVE (cf)**
  - Select **RESET (po) to** reboot the control

1.4 Accessing Machine Parameters

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

> ⚠ WARNING
>
> **Malfunctions of the machine as a result of incorrect or changed parameter settings**
>
> As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.
>
> - Protect the parameterization (parameter assignments) against unauthorized access.
> - Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

1. Press 
2. Select **SETUP**
3. Select **MACHINE DATA**
4. Available folders: **GENERAL MD / CHANNEL MD / AXIS MD**

1.5 Accessing the Software Version

To find out the version of the software you are running on your SINUMERIK ONE control:

1. Press 
2. Select **DIAGNOSIS**
3. Select **VERSION**
4. The Software Version number is on the first line and will read: ***"V##.## + SP ## + HF ##"***

1.6 Revert to the Factory Set Password

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

1. Press 
2. Select **SETUP**
3. Select **SET PASSWORD**
4. Enter the password: **SUNRISE**
5. Press **OK**
6. The lower part of the screen should now read "Current Access Level: Manufacturer"

1.7 Adjusting Input Voltage Parameters

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The Siemens control will shut itself off if the line voltage is more than 10% different than the voltage set in the control. You must adjust the parameter to match your line voltage to the machine.

The first step to accurately measure your line voltage. There are two ways to do this.

- Measure the incoming line voltage across all three legs with a voltmeter. Average your readings and write down the value.

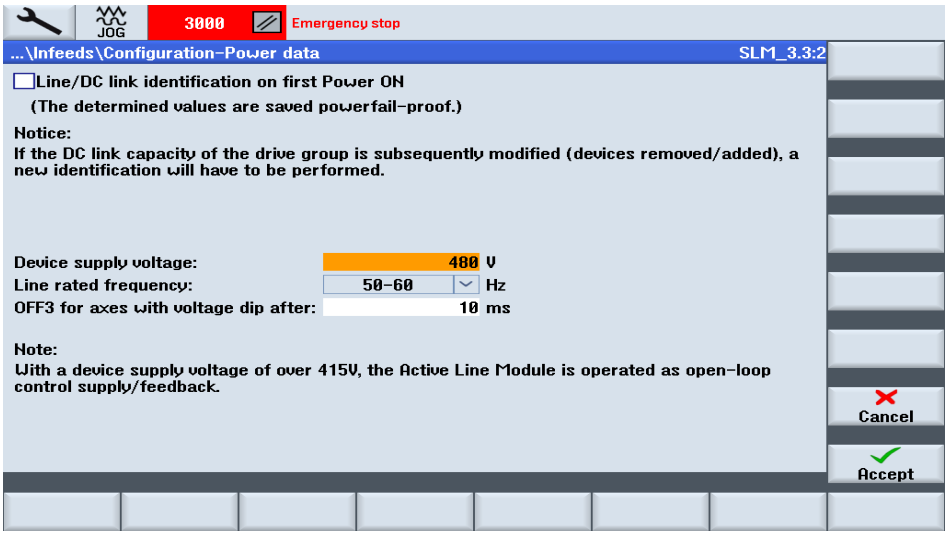
  \- OR -

- Read the line voltage from the control, follow the following steps:

-  key
- **SETUP** key
- **INFEED PARAMETER** key
- **Find r25[0] =** and write down the voltage value in this parameter.

- Now you have the proper line voltage value to enter in the control.

  Follow the steps below:
  - Press E-stop
  -  key
  - **SETUP** key
  - Press ∧ (up arrow hard key next to machine hard key)
  - **DRIVE SYSTEM** key
  - **SUPPLY** key
  - **POWER DATA** key See screen below:



  - Scroll down to the **Device Supply Voltage** field like in the screen shot above. Enter the line voltage value you obtained in the previous steps, press enter
  - Press **ACCEPT** key
  - There will be a message that states, “Confirm You Want to Change the Parameter”, Press **YES** key to accept the change
  - You are done.

1.8 Siemens Alarms

An alarm will be displayed once a fault occurs.

> ! ***Warning****: If you do not heed an alarm that is issued and do not resolve the cause of the alarm, it can present a hazard to the machine, the work piece, the saved settings, and in certain circumstances, may cause injury.*

1. If a familiar alarm number / description appears carefully check the machine and resolve the cause of the alarm.

2. If you are unfamiliar with the alarm in question, proceed to the alarm list as follows:

    a. Press 
    b. Select **DIAGNOSTICS**
    c. Select **ALARM LIST**

3. *Once "**ALARM LIST**" has been selected, press **HELP** key and additional information will be provided on the control screen.

1.9 Clearing an Alarm

1. Carefully check the machine according to the description given in the alarm. Clarification of the alarm codes can be found by using the **HELP** as described above.
2. Resolve the cause of the alarm.
3. Press **RESET**
4. Certain alarms will require a reboot of the control to clear.

1.10 File Types

- **NC** archive contains the machine ***PARAMETERS***
- **PLC** archive contains the ***LADDER LOGIC*** for the machine functions
- **DRV** archive contains the ***AXIS DRIVE SETTINGS***

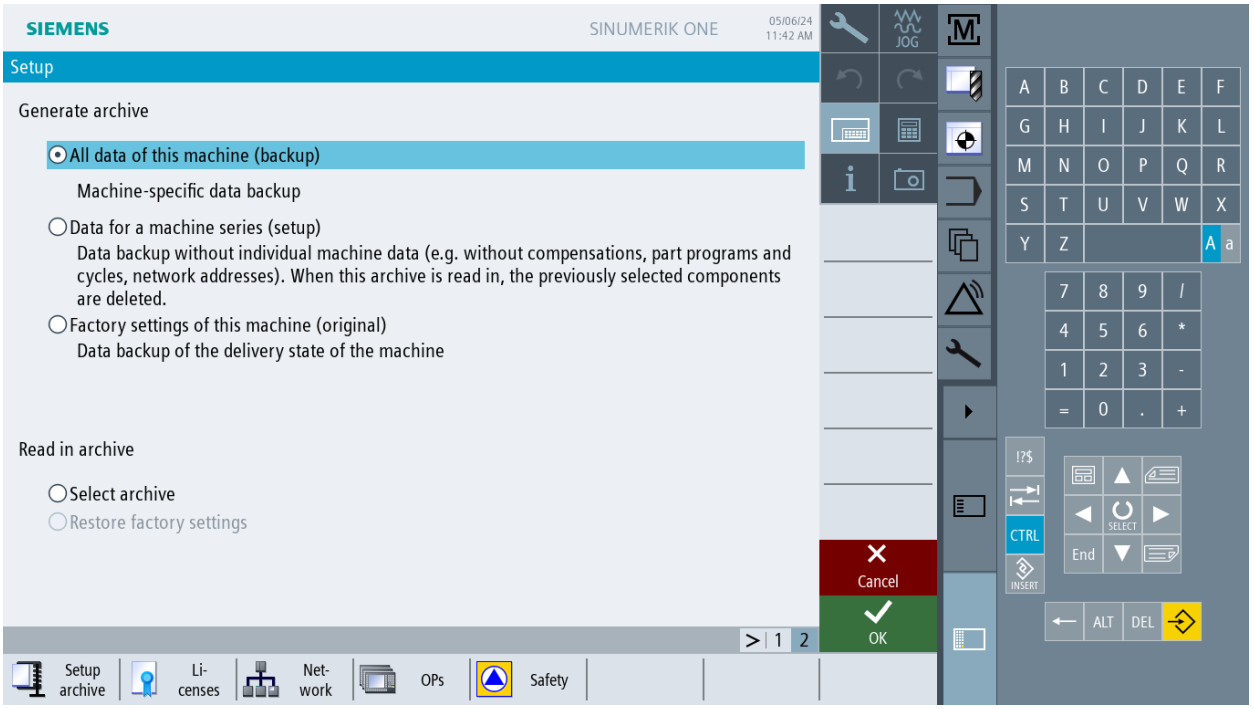
1.11 Saving and Loading PLC, NC, DRV, HMI Archives

This procedure will explain how to save the current archives and load a new archive. Please read the entire instructions before following this procedure. For all procedures perform the following steps first:

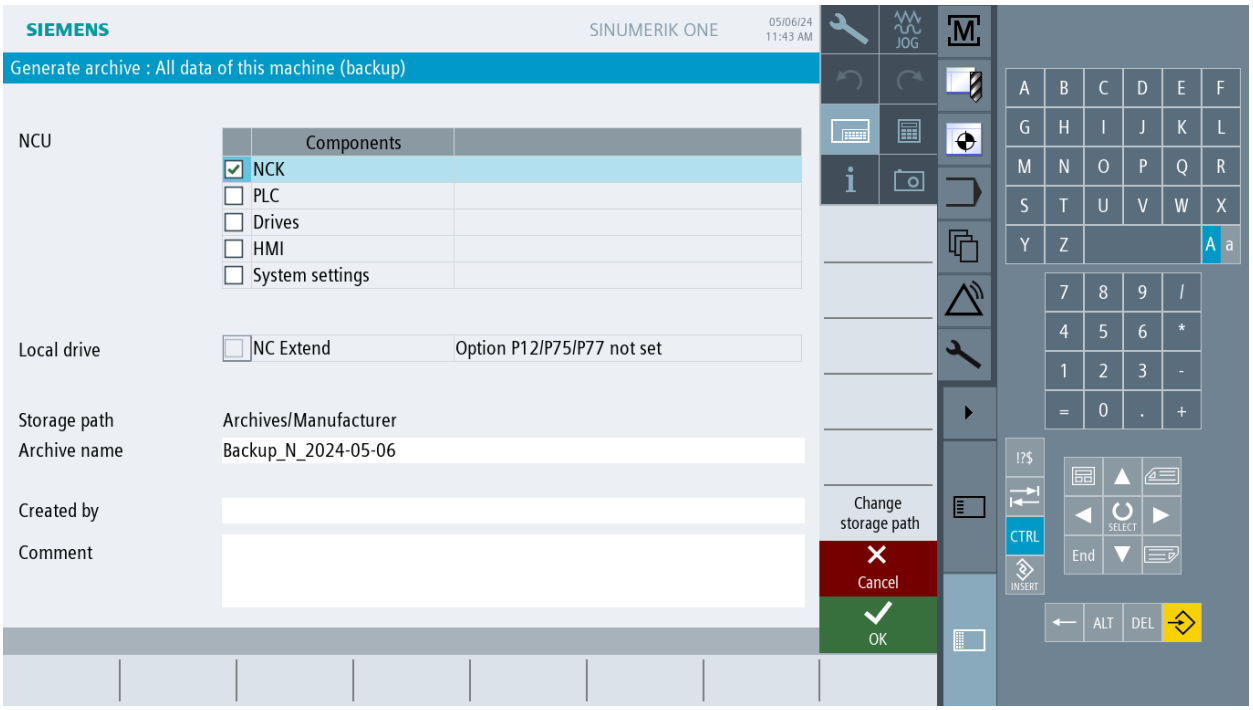
1. Move machine to x,y,z and any other axis you may have to machine zero.
2. Press E-stop.

Saving and creating an archive:

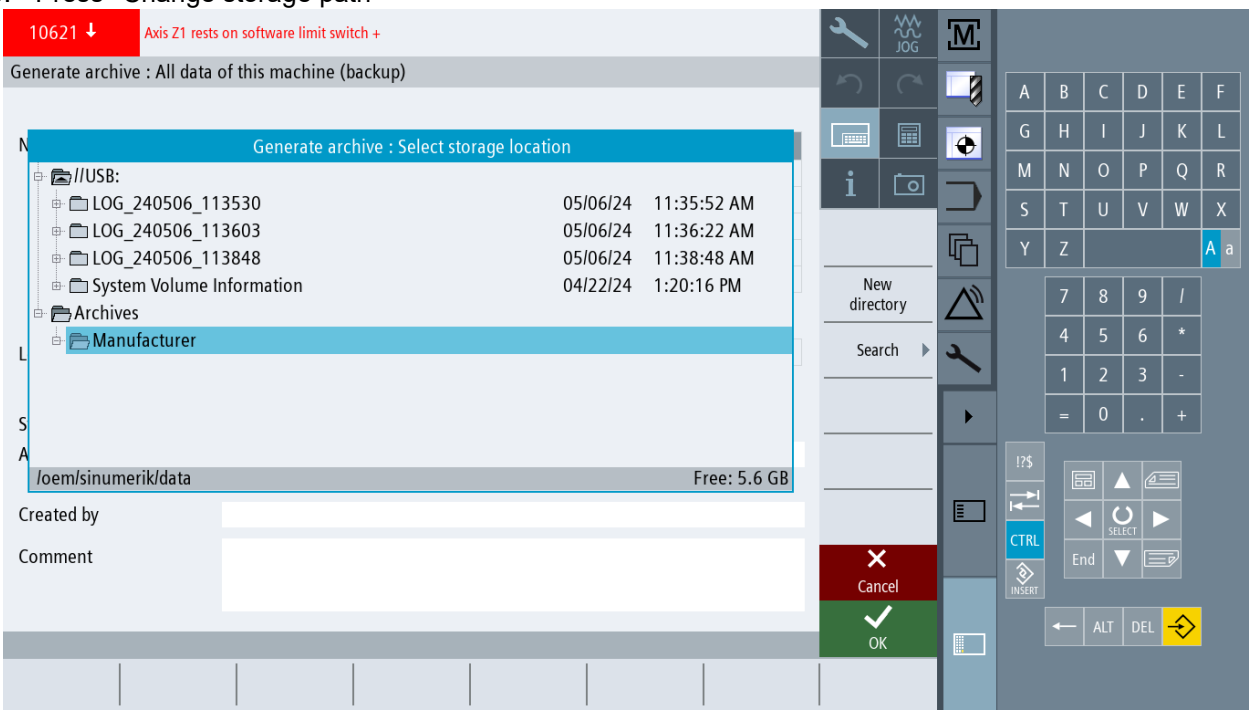
1. Press **COMMISSIONING** (wrench symbol)
2. Press "^" until in main selection menu, the ^ will disappear.
3. > arrow over until button "**SETUP ARCHIVE**" is displayed and press. See screen shot #1 below:



4. Highlight the circle “All data of this machine (backup)” as in screenshot above, press OK
5. Check the “NCK “ or “PLC” or “Drives” or “HMI” checkbox, make sure no other boxes are checked, as in screenshot below:



6. Press “Change storage path”

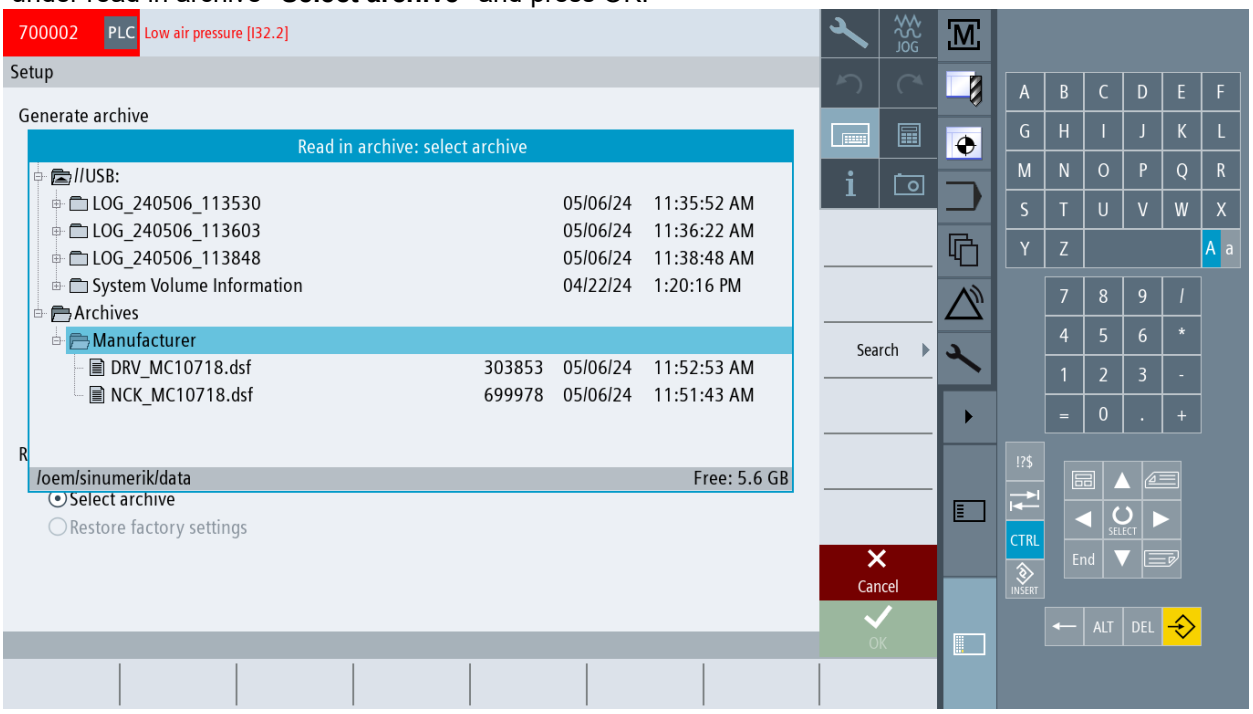


7. Using the arrow keys select the USB (It will be highlighted). Press OK
8. Change the archive name, normally we use the format NC_12345 (12345 is the machine serial number. The NC refers to an NC archive. Press OK to generate archive on the USB stick.

READING IN A NEW ARCHIVE

Note: there is a special switch on the NCU that must be set to stop in order to load a PLC archive, see instructions for loading a PLC archive.

1. Press setup archive, see first picture in this document of the setup archive document. Highlight the circle under read in archive “**Select archive**” and press OK.



2. Scroll to the archive on the USB stick you want to load, press OK. This will load the archive.
3. Wait for archive to be loaded, you will see a message stating archive loaded successfully, may take a few minutes.
4. Reboot the machine.

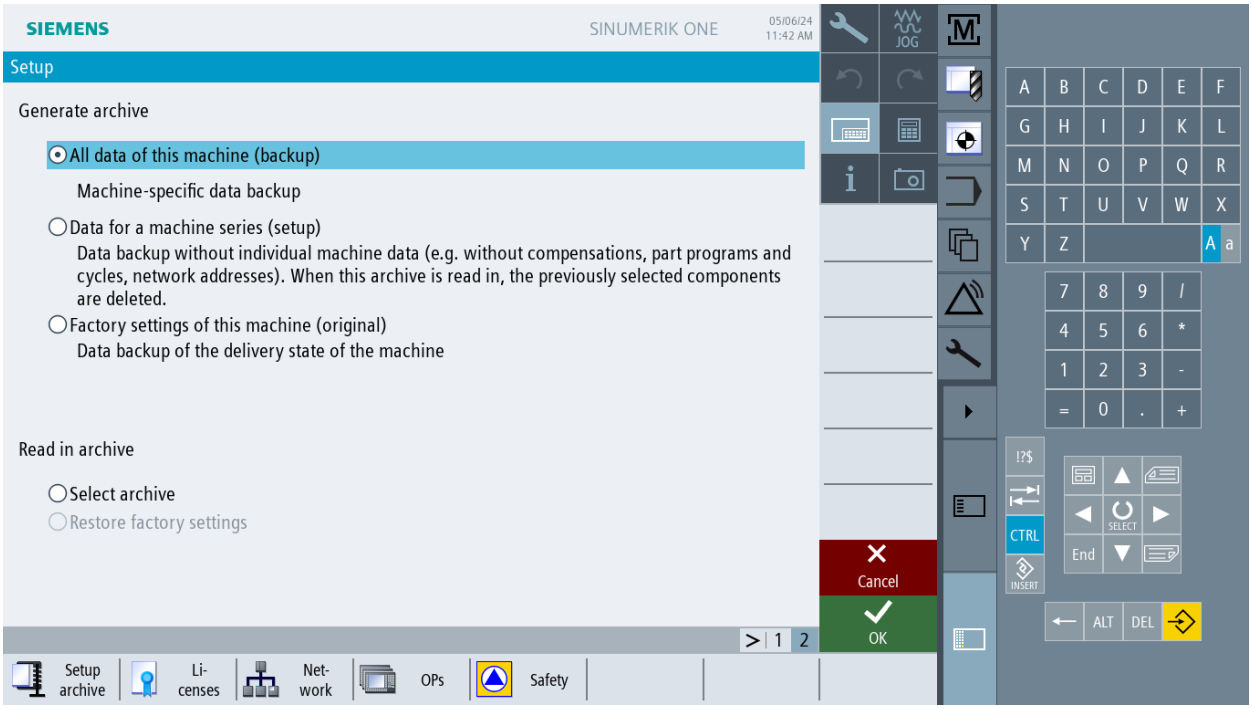
1.12 Saving and Loading PLC Archive

This procedure will explain how to save the current PLC archive and load a new archive. Please read the entire instructions before following this procedure. For all procedures perform the following steps first:

1. Move machine to x,y,z and any other axis you may have to machine zero.
2. Press E-stop.

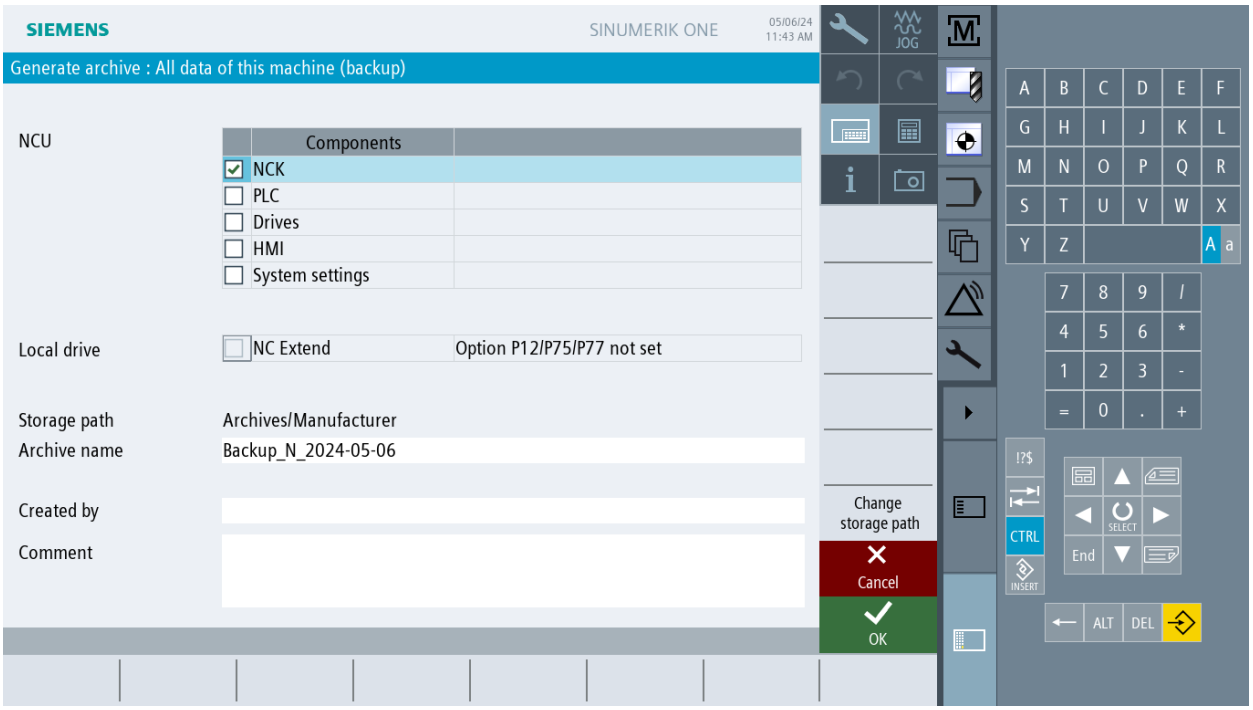
Saving and creating an archive:

1. Press **COMMISSIONING** (wrench symbol)
2. Press "^" until in main selection menu, the ^ will disappear.
3. > arrow over until button "**SETUP ARCHIVE**" is displayed and press. See screen shot #1 below:

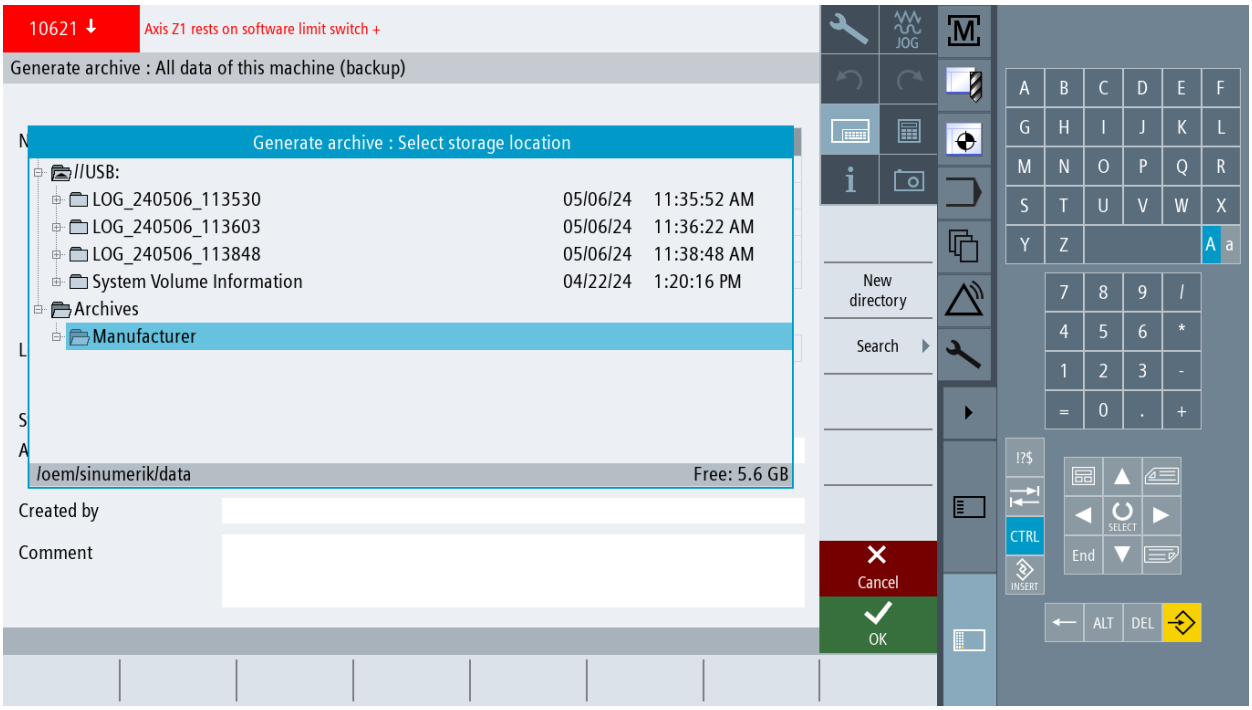


4. Highlight the circle "All data of this machine (backup)" as in screenshot above, press OK

5. Check the “PLC” checkbox, make sure no other boxes are checked, as in screenshot below:



6. Press “Change storage path”

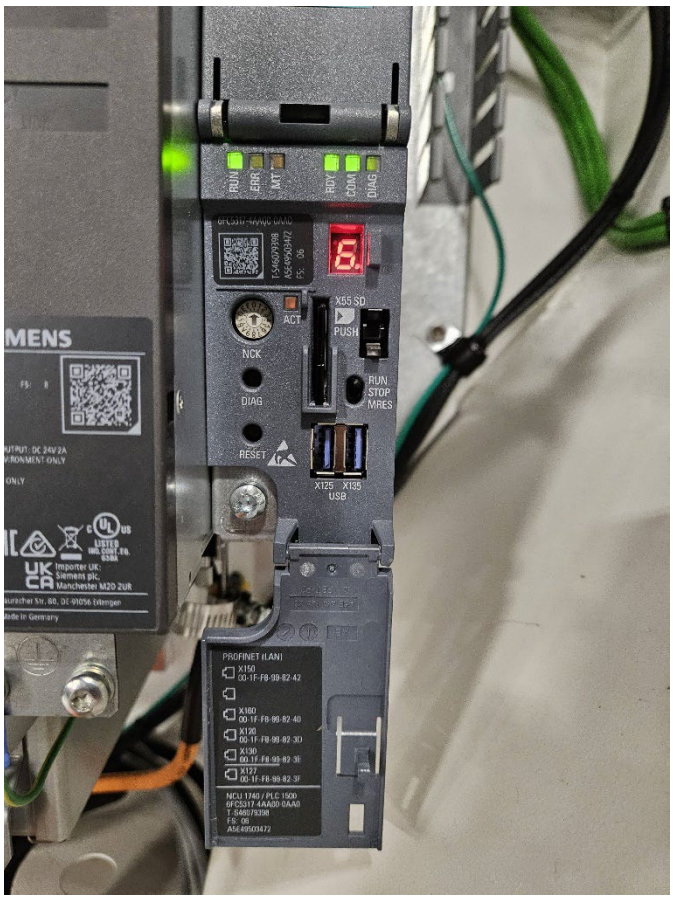


7. Using the arrow keys select the USB (It will be highlighted). Press OK

8. Change the archive name, normally we use the format PLC_12345 (12345 is the machine serial number. Press OK to generate archive on the USB stick.

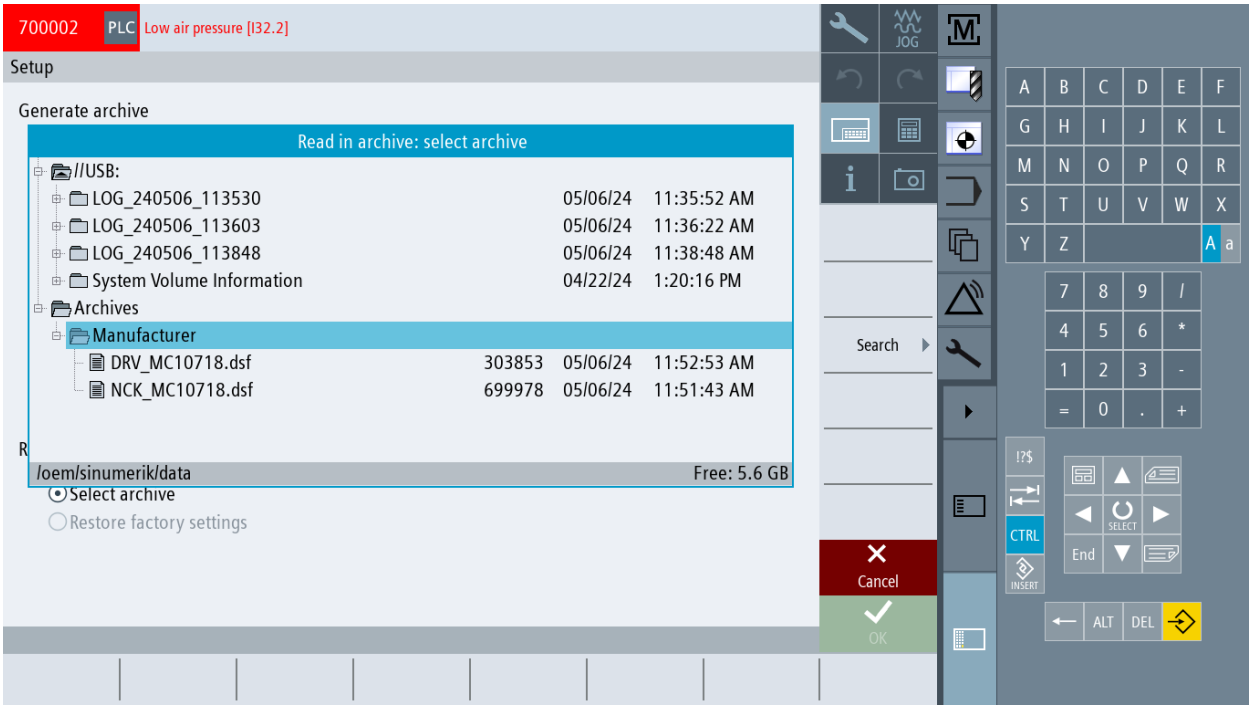
READING IN A NEW PLC ARCHIVE

Note: there is a special switch on the NCU that must be set to stop in order to load a PLC archive, see instructions for loading a PLC archive.



1. Open the electrical cabinet and find the Siemens NCU, normally grey box on the right of the series of Siemens drives. Open the lower door by pressing the button. See picture below and flip switch (RUN, STOP, MRES) to stop, this is the middle position not the bottom position.

2. Press setup archive, see first picture in this document of the setup archive document. Highlight the circle under read in archive "**Select archive**" and press OK.



3. Scroll to the archive on the USB stick you want to load, press OK. This will load the archive.
4. Wait for archive to be loaded, you will see a message stating archive loaded successfully, may take a few minutes.
5. Flip the switch back to Run (Up) on the NCU
6. Reboot the machine.

1.13 Backing Up Tool Data on the SINUMERIK ONE Control

NOTE: Setup data from part programs can only be backed up if they have been saved in the **WORKPIECES** directory.

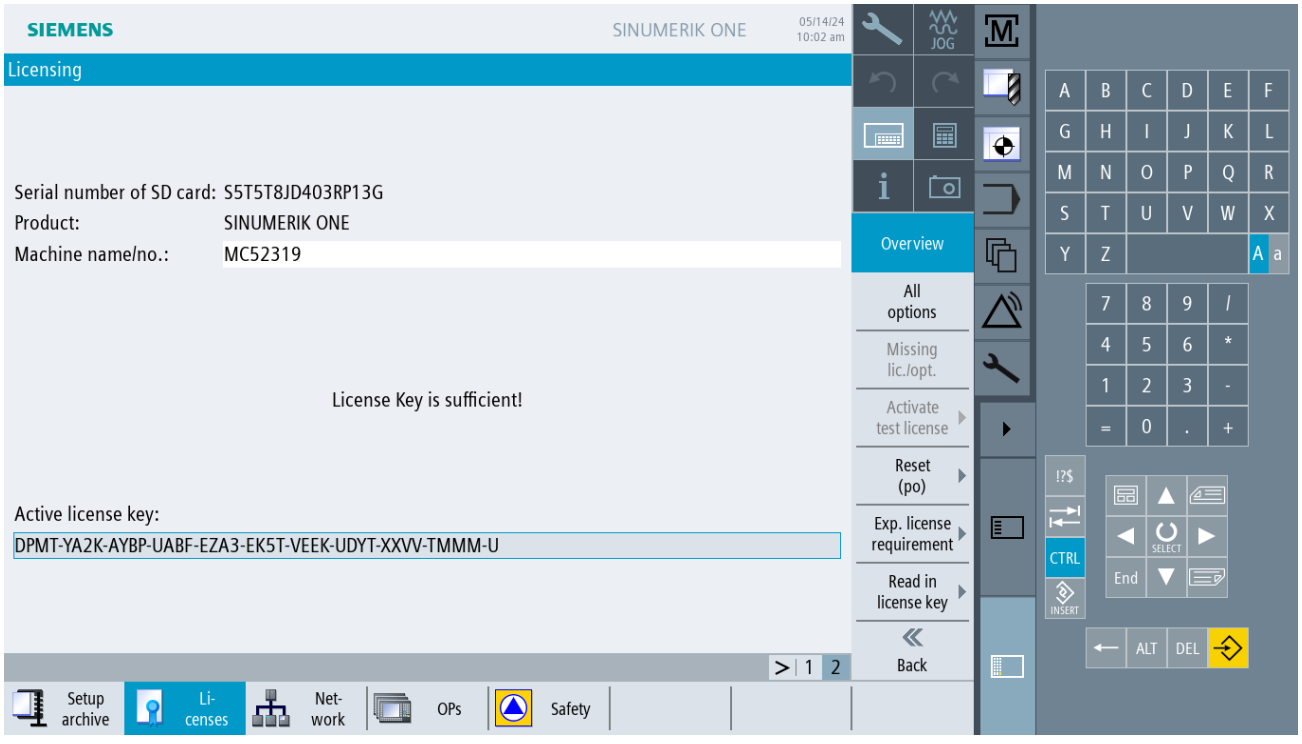
For part programs, which are located in the **PART PROGRAMS** directory, **SAVE SETUP DATA** is not listed.

1. Select the **PROGRAM MANAGER** operating area.
2. Position the cursor on the program whose tool and zero-point data you wish to back up.
3. Press the **>>** and **ARCHIVE** keys.
4. Press the **SETUP DATA** key.
5. The **BACKUP SETUP DATA** window opens. Select the data you want to back up.
6. Change the specified name of the originally selected program in the **FILE NAME** field, if needed.
7. Press the **OK** key.
8. The setup data will be set up in the same directory in which the selected program is stored as an INI file.

1.14 Adding a Software Option on the SINUMERIK ONE Control

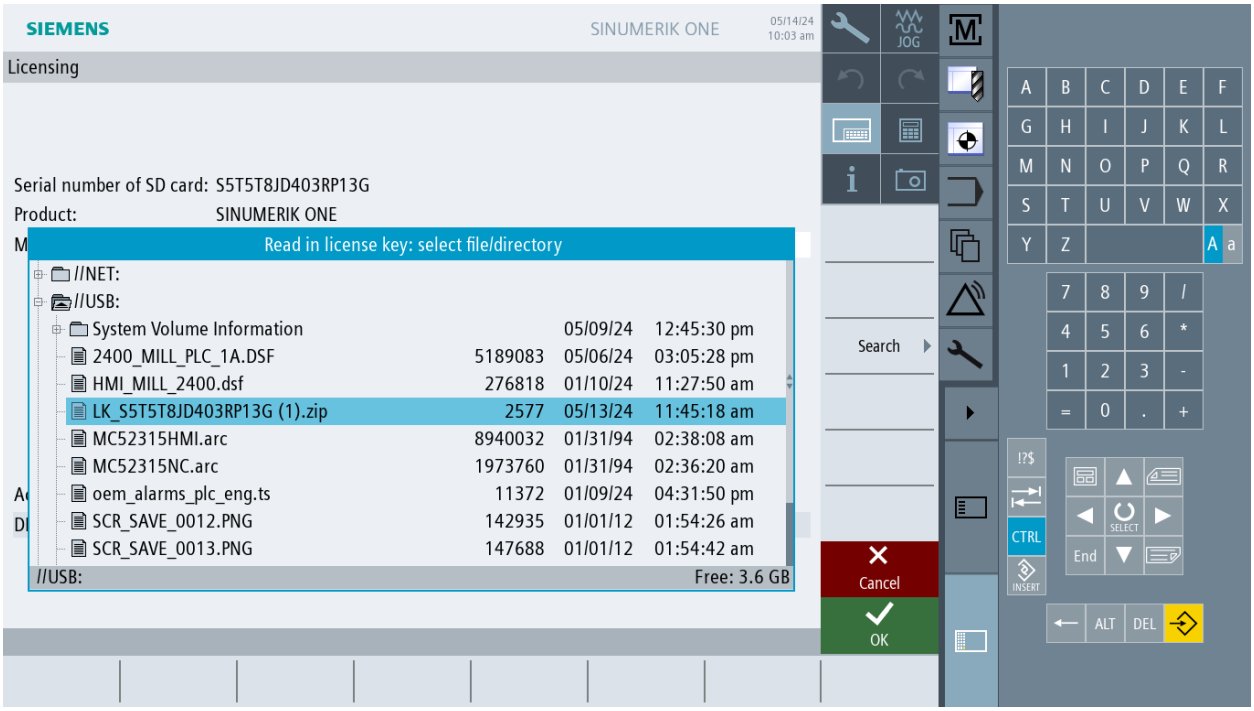
When you receive your machine all license numbers applicable to your order are activated prior to the machine leaving the factory. If you purchase a control option after the machine arrives at your facility you will receive a file on a USB stick to load on your control. Once you have received this license on the USB stick, insert the USB stick into the machines control. Proceed to the following steps.

1. Press 
2. Select **LICENSE** (you may have to press the ^ or > key to see the soft key) See screen below

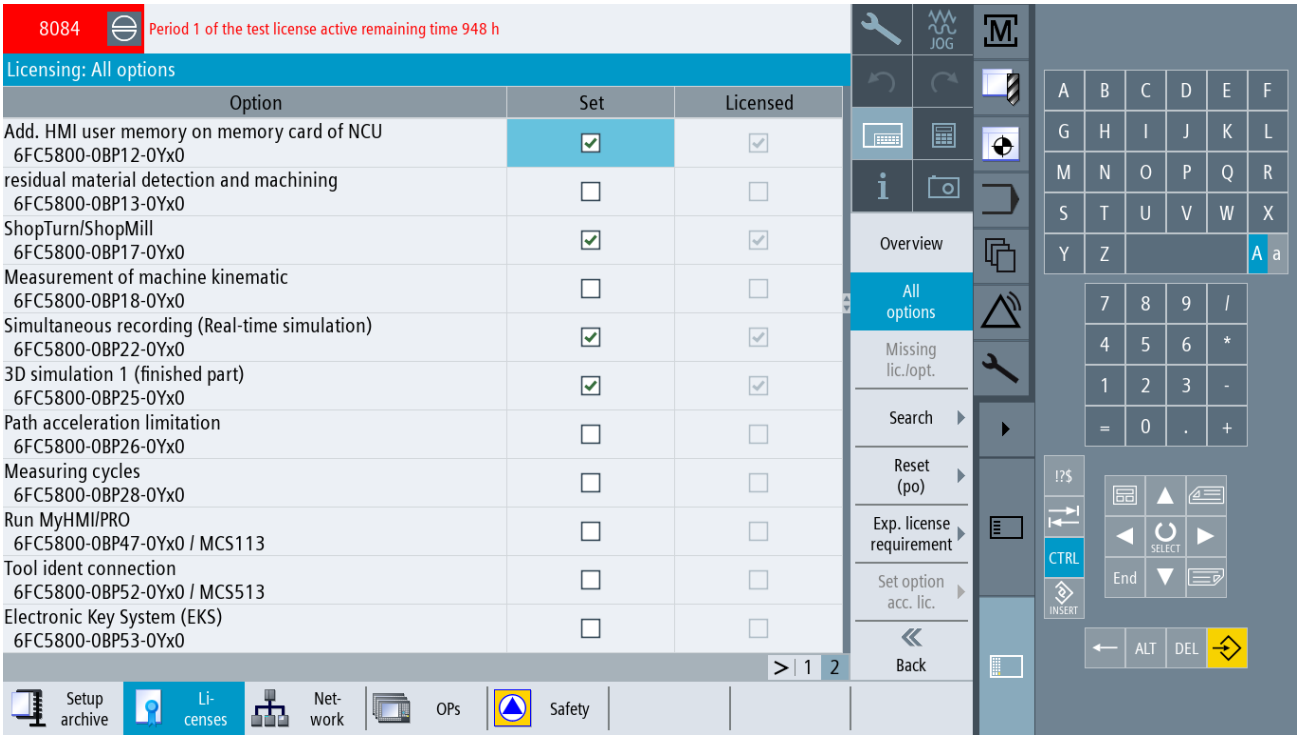


3. Press “Read in license key”

4. Navigate to the USB stick as in screen below. Use the cursor keys to highlight the license file. It starts with LK_**********.zip Press OK. It will then say license is complete.



5. Press the all options and select the new option as in screen below: In the example below the option additional user memory (P12) is added with a check mark



1.15 Set up the Network Drive in the SINUMERIK ONE

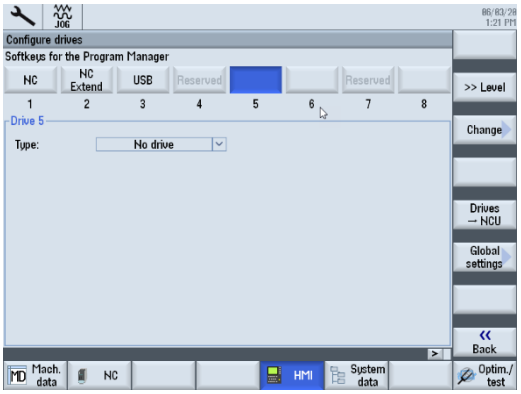
> **! NOTE:** *It is recommended that this procedure be performed by an experienced network administrator.*

The transfer of programs can be achieved by mapping a soft- key to a networked computer. The soft key will appear in the Program Manager screen of the controller.

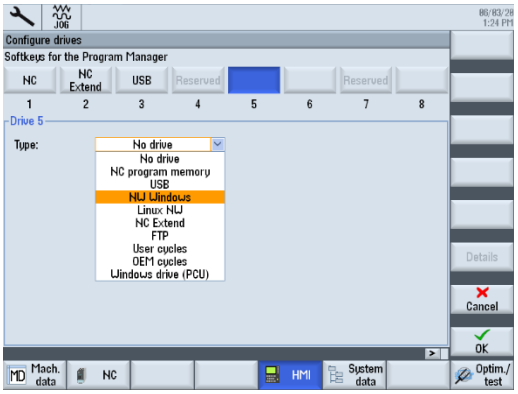
The computer connected to the network must be configured with a unique username and password. This information will be required for inputting on the controller. A dedicated shared folder is required on the PC for the storage of files.

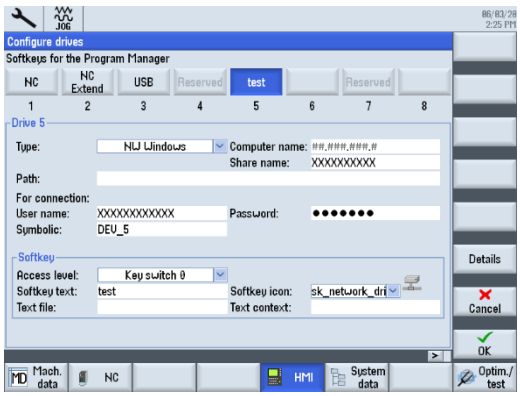
Refer to Section 1.4 for directions to access parameter screens.

1. Press 
2. Select **SETUP**
3. Select **START-UP**



4. Press the **HMI** and **LOG. DRIVE** keys. The **SET UP DRIVES** window opens.
5. Select the open key that you want to configure (**example #5**).
6. To allow entry fields to be edited, press the **CHANGE** key.
7. Select the data for the corresponding drive or enter the necessary data.





8. Press the **OK** key. The entries are checked. A window with the appropriate message opens if the data is incomplete or incorrect. Acknowledge the message with **OK** key. If you press the **CANCEL** key, then all of the data that has not been activated is rejected.
9. Restart the control in order to activate the configuration and to obtain the keys in the **PROGRAM MANAGER** screen.

2.0 MILLING INFORMATION

2.1 Mill M-Codes

An M code in CNC programming controls miscellaneous machine functions, including starting and stopping specific actions or programs.

M00 PROGRAM STOP
M01 OPTIONAL PROGRAM STOP
M02 END OF PROGRAM
M03 SPINDLE CLOCKWISE
M04 SPINDLE COUNTERCLOCKWISE
M05 SPINDLE STOP
M06 TOOL CHANGE REQUESTED
M07 MIST COOLANT OR PROGRAMMABLE AIR BLAST
M08 FLOOD COOLANT (SPINDLE MAY HAVE TO BE ON)
M09 COOLANT (FLOOD AND MIST) OFF
M10 INDEXER CYCLE START WAIT FOR COMPLETION
M11 MISC. MCODE M11=ON
M12 MISC. MCODE M12=OFF
M13 1ST ROTARY TABLE AXIS BRAKE ON
M14 1ST ROTARY TABLE AXIS BRAKE OFF
M15 2ND ROTARY TABLE AXIS BRAKE ON
M16 2ND ROTARY TABLE AXIS BRAKE OFF
M17 END OF MACRO PROGRAM
M18 HIGH PRESSURE THRU SPINDLE COOLANT OFF
M19 SPINDLE ORIENT
M21 CHIP AUGER ON (CHIP WASHDOWN. PRIME PUMP FIRST)
M22 CHIP AUGER OFF
M23 2ND PROGRAMMABLE. AIR BLAST ON
M24 2ND PROGRAMMABLE. AIR BLAST OFF
M25 TURNS ON PART PROBE
M26 TURNS OFF PART/TOOL PROBE
M27 TURNS ON TOOL PROBE
M30 END OF PROGRAM
M31 MISC. MCODE M31=ON
M32 MISC. MCODE M32=OFF(M31)
M33 MISC. MCODE M33=ON
M34 MISC. MCODE M34=OFF(M33)
M41 SHIFT GEARBOX INTO LOW RANGE
M42 SHIFT GEARBOX INTO HIGH RANGE
M50 ATC SLIDE EXTEND (SX TOOL CHANGE POSITION)
M51 ATC SLIDE RETRACT (SX TOOL CHANGE RETRACTED)
M52 ATC CAROUSEL IN (ARM ATC POT DOWN)
M53 ATC CAROUSEL OUT (ARM ATC POT UP)
M54 DRAWBAR ON
M55 DRAWBAR OFF
M58 ATC CAROUSEL CW 1 POSITION
M59 ATC CAROUSEL CCW 1 POSITION

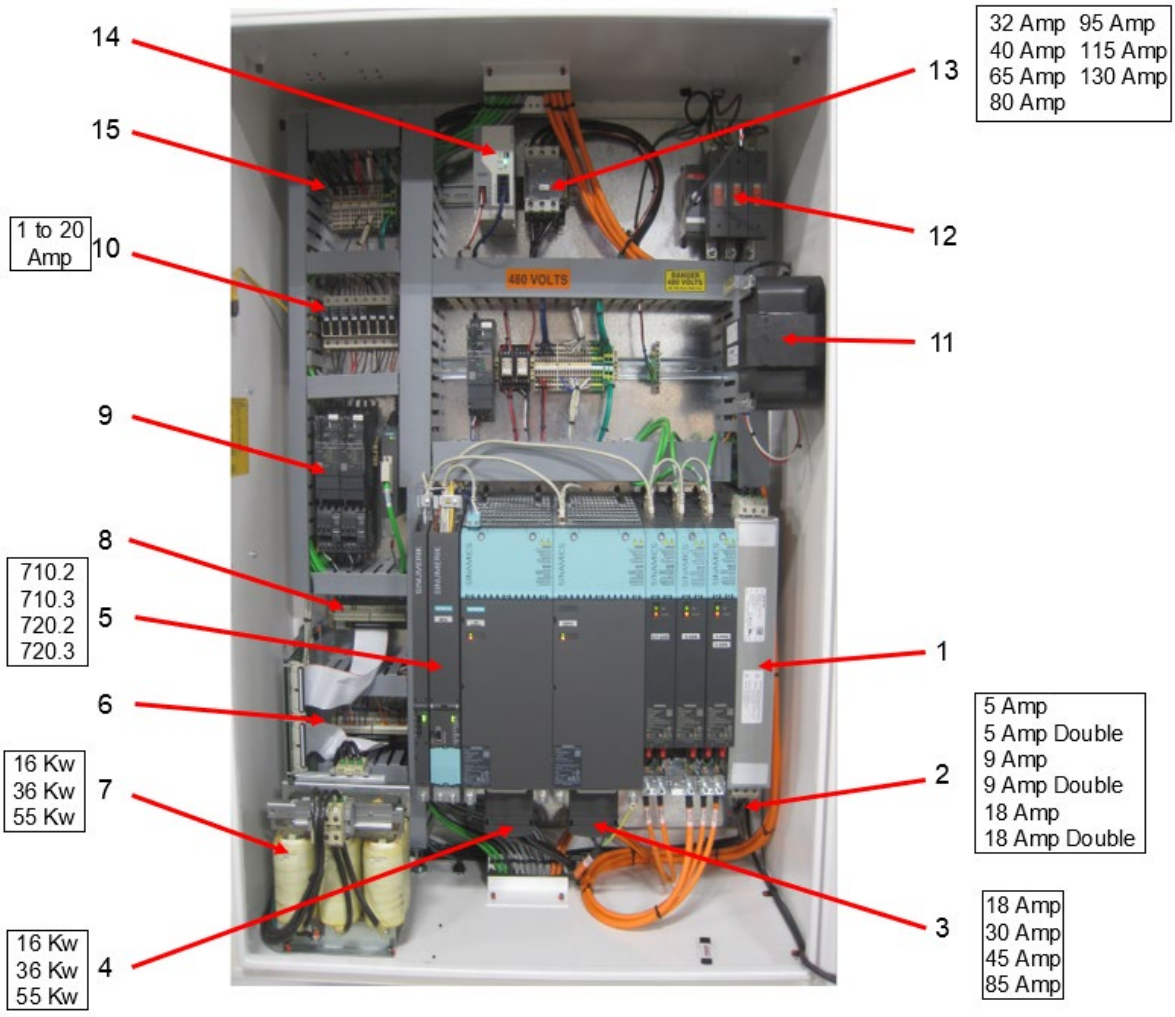
M61 HOME ATC CAROUSEL TO POCKET 1, ASUMES TOOL 0 IN SPINDLE
M62 ARM ATC GRAB TOOL (ON ELECTRIC ATC ALSO SWAPS TOOLS AND GOES UP)
M63 ARM ATC ARM ORIGIN
M64 PNEUMATIC ARM ATC ARM DOWN AND SWAP TOOLS
M65 PNEUMATIC ARM ATC ARM UP
M66 SERVICE MODE FOR ATC SETUP
M88 HIGH PRESSURE THRU SPINDLE COOLANT ON

Note: M-codes may change depending on options the machine is equipped with.

2.2 Fryer PLC Alarms and Descriptions - Mills

There are certain PLC alarms in the 700000 range which are not in the **HELP** screen. These are FRYER Machine specific alarms that are for optional equipment installed on the machine. The alarms are listed below:

700000 ATC CAROUSEL NOT REFERENCED: EXECUTE M61
700001 LOW WAY LUBE [I32.6]
700002 LOW AIR PRESSURE [I32.2]
700003 HOME REQUIRED! PRESS CYCLE START
700004 PROBE ERROR / SIGNAL LOSS
700005 GEAR CHANGE FAULT
700006 SPINDLE OUT OF GEAR
700008 CHILLER FAULT
700009 HYDRAULIC PRESSURE FAULT
700011 THRU SPINDLE COOLANT FAULT, CHECK COOLANT SUPPLY
700013 EMERGENCY STOP PRESSED DURING TOOL CHANGE
700014 COUNTER-BALANCE CYLINDER PRESSURE LOW!
700016 CAROUSEL CANNOT INDEX POT NOT RETRACTED
700024 M52-TOOL POT DOWN TIMED OUT
700025 M53-TOOL POT UP TIMED OUT
700026 M69 CAUSED SERVO OFF
700027 M62 TIMED OUT CHECK TC HEIGHT, ORIENT, THERMAL MCATC
700028 M63 TIMED OUT CHECK THERMAL MCATC
700029 M54 DRAWBAR ON TIMED OUT
700030 M55 DRAWBAR OFF TIMED OUT
700032 CONTOUR HANDWHEEL ACTIVE
700033 Z MOTION AND ATC ARM NOT AT HOME POSITION
700034 RESET SUPPRESSED UNTIL TOOL CHANGE COMPLETION
700035 HOME RETURN: DEPRESS CYCLE START
700037 REPLACE PROBE BATTERY
700038 TOOL SETTER ACTIVE
700039 PART PROBE ACTIVE
700040 WAY OILER PRESSURE FAULT
700041 DOOR IS OPEN ~ CLOSE DOOR; PRESS CYCLE START TO CONTINUE
700043 DRAWBAR FAILURE



SINUMERIK ONE CONTROL ELECTRICAL PANEL – PARTS

REF	PART NO.	DESCRIPTION	PARTS NAME	QTY
1		Siemens Touch Screen Filter		1
2		Siemens Servo		1
3		Spindle Module		1
4		Line Module		1
5		NCU		1
6	CMB-3112	PP72/48 I/O Board		1
7		Siemens Reader		1
8	MSE-1330	Wiedmuller Breakout Board		1
9	MSE-6624	Schneider Contactor Relay		1
10		Fuses		1
11	MSE-1610	.75 Kw Transformer		1
12		Fuse, Main		1
13		MCI		1
14	MSE-2940	24V Power Supply		1
15	MSE-6620	Schneider Contactor		1

SINUMERIK ONE CONTROL PANEL – PARTS

REF	PART NO.	DESCRIPTION	PARTS NAME	QTY
1		Siemens Monitor NCU		1
2	SWT-6210	E-Stop w/ Contact Block		1
3	MSM-8210	Keys (3)		1 set
4	CMB-3202	Siemens Control Panel		1
5		USB Port		1

ARM STYLE ATC OPERATION

2.5 Safety Rules -- READ BEFORE OPERATING ATC

CAUTION! Always follow all Lock Out Tag Out procedures before performing any maintenance

- Due to the complexity and timing of the ATC, it should only be operated with the **M6** command.
- ***Never interrupt the tool changer in the middle of cycle, wait for it to complete the tool change.***
- The carousel motor is a 3-phase motor and must be phased correctly for proper direction. The machine is phased properly at the factory before shipment, so if the carousel rotates in the wrong direction, switch any two incoming power wires at the disconnect. ***Make sure the main power breaker is off!***
- **M58** moves carousel position CW one position, **M59** moves carousel position CCW one position.
- If the T code is programmed on the same line as the M6 command, make sure the M6 is before the T code (example: M6T4).

2.6 Manual Operation of the Tool Changer

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The following is the process to manually step through the tool change operation in MDI.

NOTE*: Make sure you follow these steps in sequence to prevent damage to the ATC or machine.*

The proper sequence of a tool change and the respective M-codes are as follows:

1. T-code executes to move carousel to pending tool
2. **M52** tool pot down
3. **M19** orient spindle.
4. **G75 FP=1 ZO**, moves z axis to tool change position.

   (Tool change position is stored in **Axis MD Z1** parameter **30600 - FIX_POINT_POS[0]**)
5. **M62** Arm moves under spindle to grab tool and carousel pot
6. **M54** Drawbar open to unclamp tool
7. **M62** Arm removes tool from spindle and carousel tool pot and swaps them
8. **M55** Drawbar off to clamp tool in spindle.
9. **M63** Arm to origin position.
10. **M53** Carousel tool pot up.

2.7 Setting Tool Change Height

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The proper tool change height must be set for the ATC to perform correctly. The tool change height (machine coordinates from home position) is stored in parameter **30600**:

Axis MD Z1 parameter **30600 - FIX_POINT_POS [0]**

! This must be checked if the home position is different due to the removal of the axis motor, home switch or dog.

Refer to Section 1.4 for directions to access parameter screens.

There is some allowance **(play)** allowed for the tool change height (about .03”). This is the difference between the V- flange groove of the tool and the V location of the arm. You will see this vertical play if you install a tool into the arm when the machine is in **E-Stop**. **Make sure you do not leave the tool there!**

1. Home the machine.
2. Manually move the axis to the tool change height specified in parameter **30600** or use **G75 FP=1 Z0** and the machine will position to the tool change location.
3. Orient the spindle with an **M19** command.
4. Install a tool in the spindle.
5. Command **M81** to set TC service mode. Allows axis movement when arm is not at origin.
6. Command **M52** for tool pot down
7. Command **M62** to move arm and grab tool.
8. Using the handwheel at its finest setting jog .001” increments to move the Z axis so the V-flange groove of the tool is in the center of the arm’s V-notch. Be careful not to put stress on the ATC arm. **(This is “play” as described above.)**
9. When the correct **Z** axis tool change position is found, record the machine coordinate value, and retain for entry into parameter **30600** for the appropriate axis.
10. Command **M54** to release drawbar.
11. Command **M62** to exchange tools.
12. Command **M55** for drawbar off.
13. Command **M63** to move arm to origin position.
14. Command **M53** for tool pot up.
15. Command **M82** to disable TC service mode.
16. Update parameter **30600 FIX_POINT_POS [0]** with the new tool change height for **Z**.

2.8 Recovering from a Tool Change Failure

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

- If a tool change fails, record all of the alarm messages that are displayed on the alarm screen. Make sure the number is written down.
- The tool change recovery button will be flashing. Press E-stop. Remove tools out of spindle, arm and carousel pot that is extended for tool change.
- Turn on drives. Press Rest Button. Momentarily press the tool change recovery button multiple times until arm is a rest location and carousel pot is retracted into carousel.
- Make sure you catch any tool still in the spindle as it will be ejected. Press reset when complete. Check tool table to install tools in correct location.
- Repair any problems that have caused the failure.

2.9 ATC HOME Position and Tool Bin# Reset

To reset all the tool bin locations, follow this procedure:

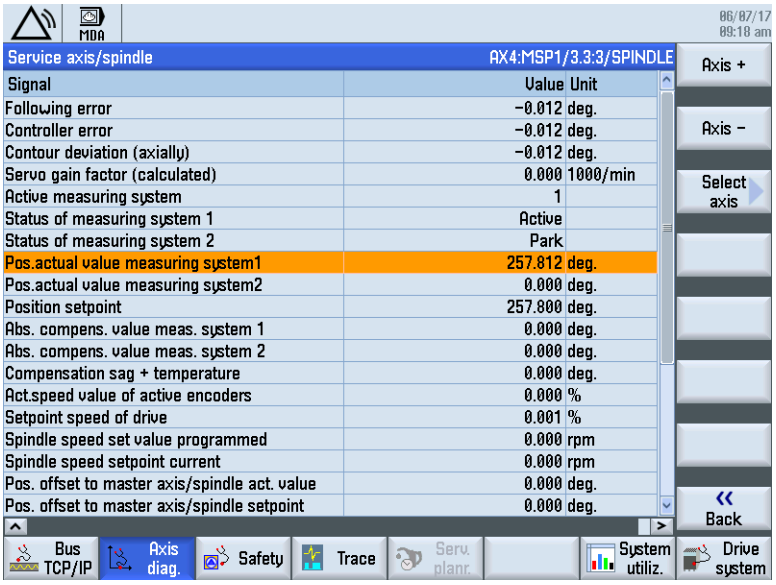
1. Remove the tool from the spindle
2. In **MDI** command: Type in **M6T0** and press **CYCLE START**
3. Remove all new tools from the spindle
4. Go to command **M61** to index the carousel to bin #1
5. Go to tool table and select the **MAGAZINE** function.
6. Select **UNLOAD ALL** to remove the tools from the table.
7. Now select **TOOL LIST**. At this point all the current tool definitions are still in the table. They moved to the bottom below the highest tool number in your carousel.
8. You can now begin loading each tool definition up to the appropriate number that matches the physical location of the tool in the carousel. Do this by selecting **LOAD** and selecting a location number.

2.10 Spindle Orient Adjustment

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

This procedure will outline how to adjust the spindle orient position when an **M19** is commanded to perform a tool change. Read all instructions carefully and do not skip steps.

1. In **MDI** clear out any previous commands and type in:
   G75 FP=0 Z0
   M19
2. Command **M62** to move arm under the spindle.
3. With **Z** axis at maximum positive limit and **ATC** arm under spindle nose, make sure the spindle can be spun without spindle keys hitting **ATC** arm.
4. Press 
5. Press **DIAGNOSTICS**
6. Press **AXIS DIAG**, (If you do not see key press "**>**" arrow key to see more buttons.
7. Press **SERVICE AXIS** Use **Axis +** or **Axis -** key to display **AX4:MSP1/3.3.3/SPINDLE** see screen below:



8. Press **RESET** and slowly turn the spindle until the spindle keys line up with the **ATC** carousel key.

9. Note what the degrees are reading on the highlighted line above and write it down. Compare it with the **Position Setpoint** below the highlighted line.
10. Press 
11. Press **SETUP**
12. Press **MACH DATA**
13. Press **AXIS SD** (you may have to press "**>**" to show additional buttons)
14. Use **Axis+** until spindle axis is displayed.
15. Scroll down to parameter **43240 $SA_M19_SPOS**, this is the current orient position. Add the value you obtained in step **10** and input into this field.
16. Command **M63** to move arm to origin position.
17. Press **RESET** and make sure the spindle orient goes to the correct position before doing a tool change.

CAROUSEL TYPE ATC OPERATION

2.11 Safety Rules -- READ BEFORE OPERATING ATC

CAUTION! Always follow all Lock Out Tag Out procedures before performing any maintenance

- Due to the complexity and timing of the ATC, it should only be operated with the **M6** command.
- ***Never interrupt the tool changer in the middle of cycle, wait for it to complete the tool change.***
- The carousel motor is a 3-phase motor and must be phased correctly for proper direction. The machine is phased properly at the factory before shipment, so if the carousel rotates in the wrong direction, switch any two incoming power wires at the disconnect. ***Make sure the main power breaker is off!***
- **M58** moves carousel position CW one position, **M59** moves carousel position CCW one position.
- If the T code is programmed on the same line as the M6 command, make sure the M6 is before the T code (example: M6T4).

2.12 Manual Operation of the Tool Changer

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The following is the process to manually step through the tool change operation in MDI.

NOTE*: Make sure you follow these steps in sequence to prevent damage to the ATC or machine.*

The proper sequence of a tool change and the respective M-codes are as follows:

1. T-code executes to move carousel to pending tool.
2. **M19** orient spindle.
3. **G75 FP=2 Z0**, moves z axis to tool change clearance position. (Tool change clearance position is stored in Axis MD Z1 parameter 30600 – FIX_POINT_POS[1]).
4. **M52** – Tool change carousel in position.
5. **M54 -** Drawbar open to unclamp tool.
6. **G75 FP=1 Z0**, moves z axis to tool change height position. (Tool change height position is stored in Axis MD Z1 parameter 30600 – FIX_POINT_POS[0]).
7. **M55** Drawbar close to clamp tool in spindle.
8. **M53** Tool change carousel out position.

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

The proper tool change height must be set for the ATC to perform correctly. The tool change height (machine coordinates from home position) is stored in parameter **MD30600**.

NOTE: To manually get the tool grab fingers of a carousel style ATC under the spindle you will need to disconnect the air from the machine and manually push the carousel toward the spindle. With the air disconnected you will be able to move the carousel in and out by hand.

- Refer to Section 1.4 for directions to access parameter screens.

1. Press **MENU SELECT**
2. Select **SETUP**
3. Select **MACHINE DATA**
4. Select **GENERAL MD**

Caution! Take extreme care as changing these parameters will defeat built in safeties for TC collision!

5. Select **SEARCH**
6. Type in **14512**
7. Select **OK**
8. There will be multiple **14512** parameters
    - **14512 [2]** is for carousel tool changers
9. You need to make a change to this parameter to turn the tool changer off
    - For carousel style tool changers subtract **1** from the current value
10. Cycle power to the machine leaving it off for at least 30 seconds
11. Insert a tool in the spindle
12. Now you need to get the tool grab component of the tool changer under the spindle
    - *See note above on how to do this
13. To line up the “V” profile in the tool holder with the mating profile in the arm, use the handwheel on a fine setting to carefully move the head up or down
14. Remove air from machine
15. Manually move the carousel towards the spindle so the “v” profile in the tool holder needs to line up with the mating profile in the carousel fingers
    - Use a flashlight to get this alignment as close as possible
16. If “V” profile does not match
17. Record the **Z** axis machine position
18. Complete steps **1 – 8** to get back to setting the **14512** parameter
19. You need to change this parameter back to the previously noted values
    - For carousel style tool changers add **1** to the current value
20. Select **AXIS MD**
21. Select **AXIS +** until you are on **Axis Z**
22. Select **SEARCH**
23. Type in **30600**
24. Select **OK**
25. Set **30600[0]** equal to the value that you recorded in step **15**
26. Cycle power to the machine leaving it off for at least 30 seconds
27. Execute a manual tool change to verify proper function

2.14 Recovering from a Tool Change Failure

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

If the tool changer fails, you may get an alarm. This means that after 30 seconds of waiting, a function did not receive its proper finish signal. At this point, **do not E-stop or hit reset**. This can cause a tool to drop and possibly cause an injury to the operator.

- Locate the pneumatic solenoid for the carousel in/out function. You can do this by referring to the pneumatic system decal and labeled air lines.
- Once the proper solenoid is located, lock the carousel in the “in” position by pushing in the blue switch and turning it clockwise to keep it locked.
- At this point, the value of parameter **14512[2]** will need to be reduced by **1**. Use extreme caution as this will allow the Z-axis to move freely with the ATC in the “in” position.
- Cycle power leaving the machine off for at least 30 seconds.
- Execute an **M54** (drawbar on) to unclamp the tool from the spindle.
- The Z-axis can now be moved to the positive soft limit, clearing it from the tool in the tool changer.
- The solenoid can now be unlocked, which will return the carousel to the “out” position.
- Execute an **M55** (drawbar off) to clamp the tool in the spindle
- At this point the tool bin locations are potentially compromised. Refer to Section 2.10 to reset the tool bin locations.
- If there is a tool in the spindle and in the carousel and they crash into one another, hit E-stop to send the carousel to the out position. Refer to Section 2.10 to reset the tool bin locations.

2.15 Tool Carousel HOME Position and Tool Bin# Reset

To reset all the tool bin locations, follow this procedure:

1. Remove the tool from the spindle
2. In **MDI** command: Type in **M6T0** and press **CYCLE START**
3. Remove all new tools from the spindle
4. Go to command **M61** to index the carousel to bin #1
5. Go to tool table and select the **MAGAZINE** function.
6. Select **UNLOAD ALL** to remove the tools from the table.
7. Now select **TOOL LIST**. At this point all the current tool definitions are still in the table. They moved to the bottom below the highest tool number in your carousel.
8. You can now begin loading each tool definition up to the appropriate number that matches the physical location of the tool in the carousel. Do this by selecting **LOAD** and selecting a location number.

2.16 Spindle Orient Adjustment

PROCEDURE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY

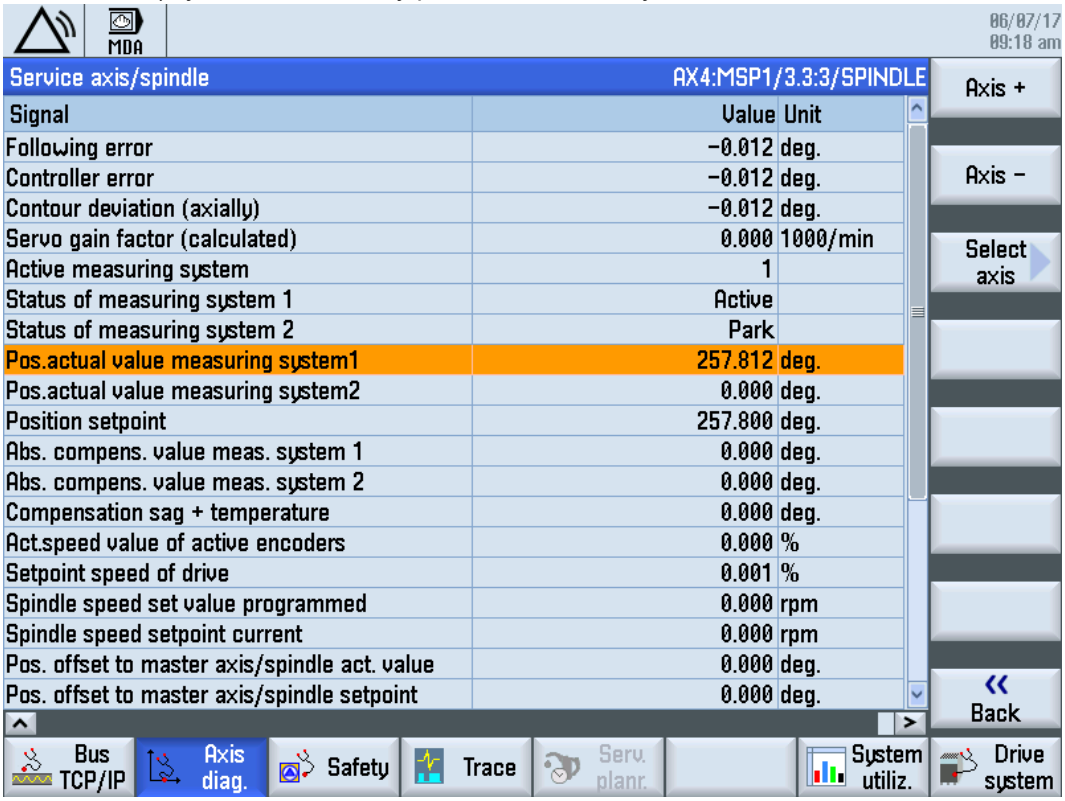
This procedure will outline how to adjust the spindle orient position when an M19 is commanded to perform a tool change. Read all instructions carefully and do not skip steps.

1. Put a tool in the spindle, make sure the carousel location in the load position (directly opposite the spindle) is empty.
2. In **MDI** clear out any previous commands and type in:

   G75 FP=0 Z0

   M19

3. Press **CYCLE START** to execute. Notice the direction the spindle goes in (Forward or Reverse)
4. Press **MENU SELECT**
5. **DIAGNOSTICS**
6. **AXIS DIAG,** (If you do not see key press "**>**" arrow key to see more buttons.



7. Press **SERVICE AXIS**
8. Use **Axis +** or **Axis -** key to display **AX4:MSP1/3.3.3/SPINDLE** see screen below:
9. Press **RESET** and slowly turn the spindle in the direction the **M19** orient command turned in step 3, until the spindle keys line up with the ATC carousel key.
10. Remove the air pressure and push the ATC carousel under the spindle make sure the spindle key is lined up. While looking at the above screen turn the spindle CW and CCW. Note the max and minimum values of the Pos. actual value measuring system 1. Calculate the average of the two values. This is the new orient position.
11. Press **MENU SELECT**
12. Press **SETUP**
13. Press **MACH DATA**
14. Press AXIS SD (you may have to press "**>**" to show additional buttons)
15. Use **Axis+** until spindle axis is displayed.
16. Scroll down to parameter **43240 $SA_M19_SPOS**, this is the current orient position. Add the value you obtained in step 10 and input into this field.
17. Press reset and make sure the spindle orient goes to the correct position before doing a tool change

3.0 TURNING INFORMATION

3.1 Lathe M-Codes

An M code in CNC programming controls miscellaneous machine functions, including starting and stopping specific actions or programs.

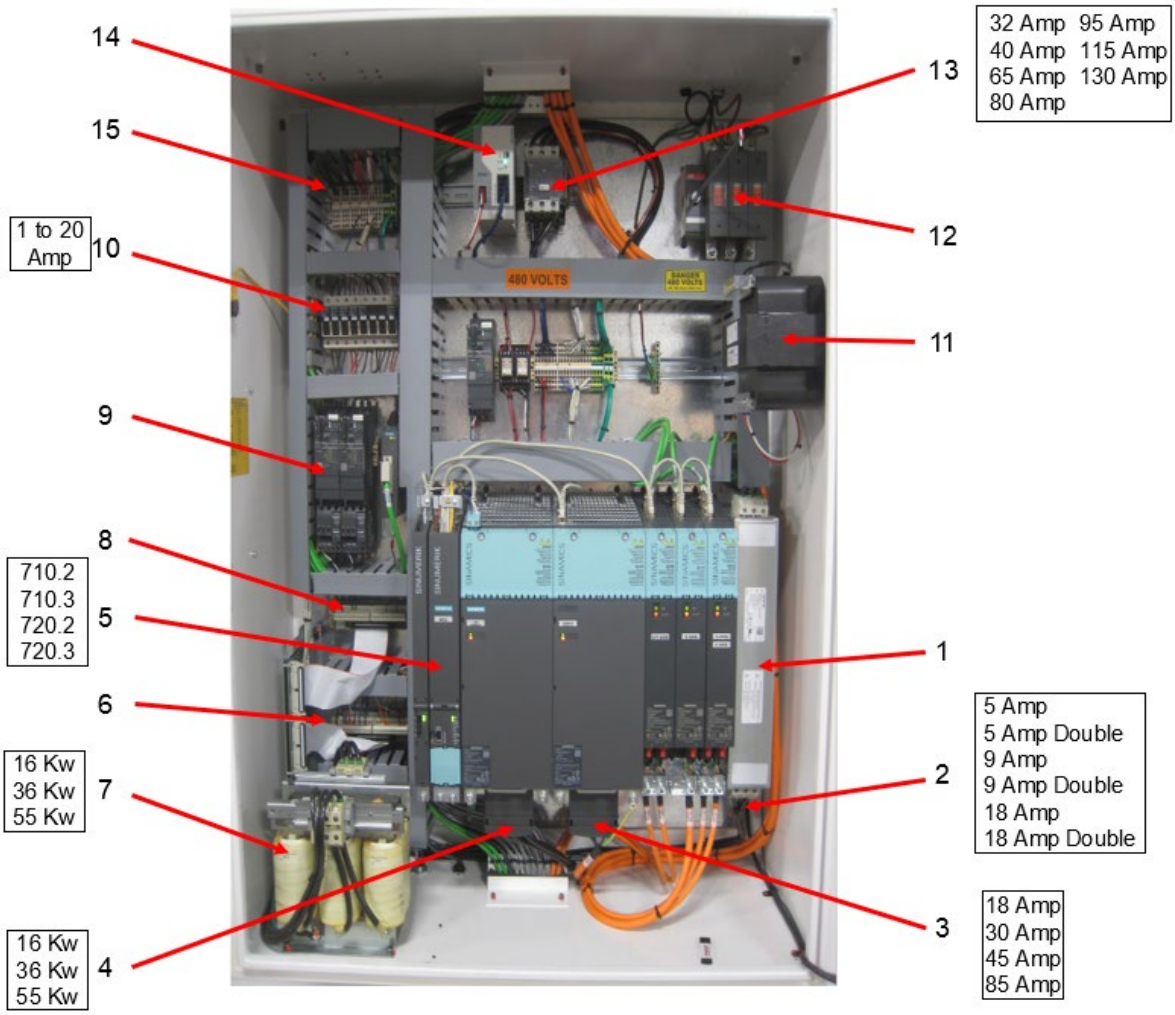
M00 Program stop
M01 Optional program stop (button on panel must be on)
M02 End of Program
M03 Spindle clockwise M1=3 MAIN SPINDLE M2=3 LT SPINDLE only
M04 Spindle counterclockwise M1=4 MAIN SPINDLE M2=4 LT SPINDLE only
M05 Spindle stop M1=5 MAIN SPINDLE M2=5 LT SPINDLE only
If equipped with live tool and sub spindle then M2=sub spindle and M3= live tool
Same for spindle speed S2=sub spindle S3=live tool
M07 Spray mist coolant or air blast
M08 Flood coolant
M09 Coolant off (M07, M08 and M88)
M10 Optional indexer start with wait for completion
M11 Miscellaneous M-code function on
M12 Miscellaneous M-code function off
M17 Reference turret to tool #1
M19 Main spindle orient
M20 Main spindle collet or chuck open (with ID-OD grip switch in OD)
M21 Main spindle collet or chuck close (with ID-OD grip switch in OD)
M22/M23 Tailstock or Sub-spindle collet or chuck close/open
M25 Wireless Part Probe On
M26 Wireless Part and Tool Probe off
M27 Wireless Tool Probe On
M28 Second M code function on
M29 Second M code function off
M30 End of program
M33/M34 C axis Brake On/Off
M36/M37 LT Disengage/Engage
M41 Low Gear
M42 High Gear
M46 Barfeed cycle-edit barfeed program for alterations
M48 Tool Arm down
M49 Tool Arm up
M69 Force E-stop (drives off)
M70 C axis Mode Enable
M73/M74 Sub Spindle Brake on/off
M75/M76 Y axis brake on/off
M77/M78 Tailstock Un-Lock/Lock
M80/M81 Steady rest Un-Lock/Lock
M82/M83 Steady Rest Open/close
M84/M85 Tailstock Extend/Retract
M86/M87 Steady Rest second Open/close
M88 Thru tool coolant high pressure
M90/M91 Parts catcher catch position/retract
M92/M93 Washdown On/Off

***NOTE**: M-codes may change depending on options the machine is equipped with*

3.2 Fryer PLC Alarms and Descriptions – Lathes

There are certain PLC alarms in the 700000 range which are not in the **HELP** screen. These are FRYER Machine specific alarms that are for optional equipment installed on the machine. The alarms are listed below:

700000 HEADSTOCK OIL PRESSURE FAULT
700001 LOW WAY LUBE
700002 TURRET THERMAL OVERLOAD
700004 GEARSHIFT FAULT-CHECK AIR PRESSURE
700005 LOW AIR PRESSURE FAULT
700006 LOW HYDRAULIC PRESSURE FAULT
700007 C AXIS HANDWHEEL ACTIVE (X AXIS OFF)
700008 LIVE TOOL DRIVE GEAR NOT ENGAGED!!
700009 CHUCK OR COLLET MUST BE CLOSED TO RUN SPINDLE
700010 HIGH PRESSURE COOLANT ALARM
700012 TURRET NOT INDEXED OR CLAMPED!
700013 TAILSTOCK NOT CLAMPED!
700014 SPINDLE OUT OF GEAR
700015 TAILSTOCK DRAG ARM NOT AT REST POSITION!
700016 WAY OIL PRESSURE SWITCH
700032 CONTOUR HANDWHEEL ACTIVE
700033 DEPRESS HOLD THEN STOP TO STOP SPINDLE DURING AUTO CYCLE
700034 TAILSTOCK NOT CLAMPED
700035 REFERENCE RETURN: PRESS START
700037 DOOR IS OPEN CLOSE DOOR AND PRESS CYCLE START
700038 TOOL SETTER ACTIVE
700039 PART PROBE ACTIVE
700042 TURRET NOT FULLY CLAMPED



SINUMERIK ONE CONTROL ELECTRICAL PANEL – PARTS

REF	PART NO.	DESCRIPTION	PARTS NAME	QTY
1		Siemens Touch Screen Filter		1
2		Siemens Servo		1
3		Spindle Module		1
4		Line Module		1
5		NCU		1
6	CMB-3112	PP72/48 I/O Board		1
7		Siemens Reader		1
8	MSE-1330	Wiedmuller Breakout Board		1
9	MSE-6624	Schneider Contactor Relay		1
10		Fuses		1
11	MSE-1610	.75 Kw Transformer		1
12		Fuse, Main		1
13		MCI		1
14	MSE-2940	24V Power Supply		1
15	MSE-6620	Schneider Contactor		1

SINUMERIK ONE FRONT CONTROL LAYOUT – PARTS

REF	PART NO.	DESCRIPTION	PARTS NAME	QTY
1	TOP1900	Siemens Touchscreen		1
2	MCP398C	Siemens Control Panel		1
3	DCL-6052	Apron Panel Decal		1
4	HDL-6094	Handwheel for ET-18/21/25 X & Z		2
5	MSM-8210	Keys (3)		1 set
6	SWT-5052	Joystick Switch		1
7	70131528	Fine / Coarse Toggle Switch		1
8	SWT-6210	e-Stop w/ Contact Block		1

5. DIAGNOSTIC

ALARMS AND WARNINGS

The electronic unit constantly executes self-diagnosis and can signal alarms condition.
An alarm is present if **READY is LOW and an ALPOSXX output is different from zero**

Turret is in normal operation if READY= ON: in this case the ALPOSxx outputs give the code of the current position.
When an alarm occours the READY = OFF: in this case ALPOSxx outputs give the alarm code in binary format (ALPOS01= LSB).

Starting from FW 2.0 there is no more separation in group and subgroup.

OUTPUTS						Actual position (READY= ON)	ALARM CODE (READY= OFF)	ALARM DESCRIPTION (READY= OFF)
ALPOS32	ALPOS16	ALPOS08	ALPOS04	ALPOS02	ALPOS01			
0	0	0	0	0	0	Out of position	0.0	No alarm
0	0	0	0	0	1	1	0.1	Non consistent parameters in memory.
0	0	0	0	1	0	2	0.2	Failure in internal power supply.
0	0	0	0	1	1	3	0.3	External 24V DC supply is too low.
0	0	0	1	0	0	4	0.4	Thermal I^2t threshold reached.
0	0	0	1	0	1	5	0.5	Motor overspeed.
0	0	0	1	1	0	6	0.6	Overload: check inertia and friction, check motor and resolver wirings.
0	0	0	1	1	1	7	0.7	Short circuit on power stage: check servomotor wiring or internal damage. (1)
0	0	1	0	0	0	8	0.8	Ground leakage in power stage, check wirings to motor and servomotor. (1)
0	0	1	0	0	1	9	0.9	Internal braking resistor circuit error. (1)
0	0	1	0	1	0	10	1.0	Trouble on power stage control section. (1)
0	0	1	0	1	1	11	1.1	Overvoltage during motor braking. Reduce inertia on the disk. (1)
0	0	1	1	0	0	12	1.2	Undervoltage on threephase
0	0	1	1	0	1	13	1.3	Short circuit on resolver power line (RPOW+, RPOW-) or broken wire on (RSIN+, RSIN-, RCOS+, RCOS-).
0	0	1	1	1	0	14	1.4	Fault on digital outputs: check for external shorts or overloads.
0	0	1	1	1	1	15	1.5	Profile generator fault.
0	1	0	0	0	0	16	1.6	HW ENABLE is not present.
0	1	0	0	0	1	17	1.7	Positioning timeout
0	1	0	0	1	0	18	1.8	Heatsink overtemperature. (1)
0	1	0	0	1	1	19	1.9	Overvoltage on threephase line. Check main supply. (1)
0	1	0	1	0	0	20	2.0	Reached maximum positioning error.
0	1	0	1	0	1	21	2.1	Timeout in cycle execution.
0	1	0	1	1	0	22	2.2	Motor overtemperature. (1)
0	1	0	1	1	1	23	2.3	The signal of Locking switch does not go OFF during unclamping.
0	1	1	0	0	0	24	2.4	The signal of Locking switch has gone ON while turret is unclamped.
0	1	1	0	0	1	N.A.	2.5	The unclamping phase is too slow, check the pressure, and purge the hydraulic circuit..
0	1	1	0	1	0	N.A.	2.6	N.A.
0	1	1	0	1	1	N.A.	2.7	N.A.
0	1	1	1	0	0	N.A.	2.8	The signal of Locking switch has gone OFF while turret is clamped.
0	1	1	1	0	1	N.A.	2.9	Clamping timeout.
0	1	1	1	1	0	N.A.	3.0	N.A.
0	1	1	1	1	1	N.A.	3.1	Need to run the the setup procedure.
1	0	0	0	0	0	N.A.	3.2	Requested tool is not existing
1	0	0	0	0	1	N.A.	3.3	Parity error on tool number request.
1	0	0	0	1	0	N.A.	3.4	PBITXX are changed but PSTART did not came on time.
1	0	0	0	1	1	N.A.	3.5	PLC set EMERGENCY MODE during turret cycle
1	0	0	1	0	0	N.A.	3.6	Trouble during setup procedure execution
1	0	0	1	0	1	N.A.	3.7	Cannot clamp during setup procedure.
1	0	0	1	1	0	N.A.	3.8	Error in D current controller. Check motor and resolver wirings.
1	0	0	1	1	1	N.A.	3.9	Error in Q current controller. Check motor and resolver wirings.
1	0	1	0	0	0	N.A.	4.0	Error in speed controller.
1	0	1	0	0	1	N.A.	4.1	Error in position controller.

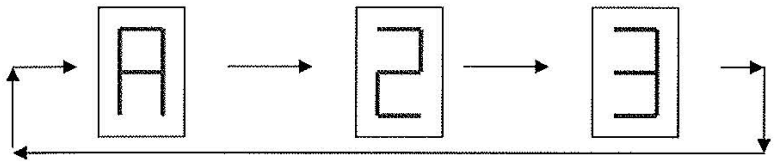
1	0	1	0	1	0	N.A.	4.2	N.A.
1	0	1	0	1	1	N.A.	4.3	N.A.
1	0	1	1	0	0	N.A.	4.4	N.A.
1	0	1	1	0	1	N.A.	4.5	N.A.
1	0	1	1	1	0	N.A.	4.6	N.A.
1	0	1	1	1	1	N.A.	4.7	N.A.
1	1	0	0	0	0	N.A.	4.8	N.A.
1	1	0	0	0	1	N.A.	4.9	N.A.
1	1	0	0	1	0	N.A.	5.0	N.A.
1	1	0	0	1	1	N.A.	5.1	N.A.
1	1	0	1	0	0	N.A.	5.2	N.A.
1	1	0	1	0	1	N.A.	5.3	N.A.
1	1	0	1	1	0	N.A.	5.4	N.A.
1	1	0	1	1	1	N.A.	5.5	N.A.
1	1	1	0	0	0	N.A.	5.6	N.A.
1	1	1	0	0	1	N.A.	5.7	N.A.
1	1	1	0	1	0	N.A.	5.8	N.A.
1	1	1	0	1	1	N.A.	5.9	N.A.
1	1	1	1	0	0	N.A.	6.0	N.A.
1	1	1	1	0	1	N.A.	6.1	N.A.
1	1	1	1	1	0	N.A.	6.2	N.A.
1	1	1	1	1	1	N.A.	6.3	N.A.

N/A = No alarm and/or position associated to this code.
(1) = **strongly suggested to switch off the threephase supply to TMC controller when power driver alarms are detected.**

Display:
A 7-segment display is available.

When the driver is in normal condition all the segments are blinking in sequence.
When the alarm is present, the display will show in sequence, A->(first alarm digit)-> (second alarm digit)

As example, the alarm 2.3 is



Alarm are stored and can be reset with EMERGENCY/RESET function.
Power off causes the reset of the active alarm.

A PC software is available to improve the stat-up procedure and troubleshooting.

Fault of electronic unit:
After recognizing the fault, the problem can be easily solved.
In case of electronic unit fault, it can be easily replaced.