

# Operation of NCT Vertical Machining Centres with Umbrella Type ATC

## Changing Tools

If on parameter N1200 PLC Bits0 bit N\_P03=1: the tool change takes place upon M6.

In case the parameter value is 0, only a T code has to be written into the program. In such case there is no tool preparation on the machine, and its effect is the same as if we program the following row into the same block:

T<tool number> M6

In the following we are going to describe in detail only the change by M6.

### Calling a Tool

Calling a tool takes place upon a T code:

**Tnnnnnnnn**

On a T code we can enter the type number of the tool on a maximum of 8 digits.

Upon the T type number the control unit starts the search for the tool.

At first it will check whether the tool with the referred type is in the spindle or in the magazine. If yes and under the same type number there are several tools in the magazine, it will hand over the place (magazine- and pot number) of the tool with the smallest but not yet expired tool life to the PLC. The PLC will rotate the magazine simultaneously with the machining process in order to get the called tool into a change position.

In case the referred T type number cannot be found neither in the magazine, nor in the spindle, the PLC will record a manual tool change.

### Tool change

The change of the tool takes place upon the

**M6 (or M06)**

code.

*In case there is a tool in the spindle loaded manually:*

– the PLC will give a stop and call on the operator to take out the tool.:

*Remove Tnnnnnnnn from spindle*

– after this, if the incoming tool is coming from the magazine, it will send the magazine to the spindle and put the new tool into the spindle,

– in case the incoming tool is not in the magazine, i.e. it has to be loaded manually, the PLC will give a stop and send a

*Put Tool No. nnnnnnnn. in spindle*

message to the operator, to put in the new tool. Upon the start the change terminates.

*In case there is a tool in the spindle loaded from the magazine:*

– it will send the magazine to the spindle and put the returning tool back to the magazine.

- if the incoming tool is coming from the magazine, axis Z will travel up to the upper change position, and afterwards it will send the magazine to the incoming tool and put it into the spindle,
- if the incoming tool is to be loaded manually, it will send a  
*Put Tool No. nnnnnnnn. in spindle*  
message to the operator, to put in the new tool. Upon the start the change terminates.

### Emptying of the spindle

The emptying of the spindle takes place upon the

#### **T0 M6**

block.

*In case there is a tool in the spindle loaded manually:*

- upon M6 it will send a message to the operator, to take out the tool:

*Remove Tnnnnnnnn from spindle*

*In case there is a tool in the spindle loaded from the magazine:*

- Upon T0 it will search for an empty pot for the returning tool, then upon M6 it will send the magazine to the spindle and put the tool back into the magazine.

### Execution order of T and M6 codes. Special cases.

In case T and M6 codes are specified in the same block

#### **Tnnnnnnnn M6**

the PLC will execute first the T than the M6 function.

If the tool is coming from the magazine, it is advisable for the T code to precede the M6 in the program by several blocks, in order to be able to rotate the magazine simultaneously with the machining process to the returning/incoming tool, by the time the execution of M6 starts. The execution of M6 always waits for the end of magazine rotation.

For example:

```

T1001 M6      (change of tool T1001 from the magazine)
T1002        (calling of T1002 from the magazine)
...          (there is no magazine rotation, as first of all it will
              put T1001 back to the place from where it took it out,
              except for the case where the magazine got rotated after
              the interruption of the program, as in that case an empty
              place shall be found for T1001)
M6           (change of tool T1002)
T1           (T1 manually to be loaded tool, no magazine rotation,
              because it will place T1002 back to the place from where
              it took it out)
...
M6           (change of tool T1)
T1003        (T1003 tool call: magazine rotation simultaneously with
              the machining process to the incoming tool)
...
M6           (change of tool T1003)
...

```

The execution of the M6 code takes place always after the programmed movement in the block, if we programmed also an interpolation in the given block.

The T and M6 execution precedes the execution of all functions.

After the execution of M6 the PLC will set the spindle into M5 state.

If several T codes are written in the program after each other, without M6, it will always change the tool belonging to the last T code for M6. For example:

```

T1
T2530
T108
M6           (tool T108 is changed)

```

In case in the program we write several M6s after each other, only those ones will be effective which are preceded by a T code. For example:

```
T54
M6          (tool T54 is changed)
M6          (nothing happens)
M6          (nothing happens)
```

### Tool change in manual modes

In manual modes (**Jog, Incremental jog, Handwheel**) it is not mandatory (but it is possible) to program an M6, and the tool change takes place also upon a T code. For example: upon the **T1016** code it will change the tool.

### Manual operations during the execution of M6

If the tool has to be taken out from or loaded into the spindle manually, before issuing the message, the PLC will generate a STOP status. Till the STOP lamp is on and the message is displayed on the screen, even in Automatic or Manual Data Input mode we can push the Jog or Handwheel mode select buttons:

- upon it the lamp of Jog or Handwheel mode and that of the Z jog buttons starts to blink and
- axis Z can be moved according to the selected mode, by the jog buttons or the handwheel, in order to bring the spindle into a height suitable for manual takeout or input.

### M62: T code=magazine number+pot number

If we program an M62 code besides the T code:

**M62 Tiiiikkkk**

the control unit will handle the T code as a reference to a **direct tool place (magazine+pot)**:

**iiii**: the number of the magazine we refer to

**kkkk**: the pot number of **iiii** magazine.

The leading zeros can be omitted. It will interpret the 8 digits that can be entered on the address T, as 2 pcs of four-digit groups: the upper 4 digits will mean the magazine number, and the lower 4 digits will mean the pot number.

Meaning of the T100001 code:

magazine number: 10 (spindle magazine)

pot number: 1 (pot No. 1, the spindle magazine has only one pot)

Meaning of the T10014 code:

magazine number: 1 (tool magazine)

pot number: 14 (pot No. 14)

After the call it will bring the pot of the referred magazine into a change position.

If the pot of the referred magazine is not empty, upon M6 it will change the tool in the pot.

If the pot is empty, nothing happens.

### **Registration of a tool in the table, loading a tool into the magazine through the spindle**

We can register a tool in any of the manual modes (**Jog, Incremental jog, Handwheel**) in the tool management table, respectively, we can load a tool into the magazine through the spindle. Switch on the registration mode by pushing the **T reg button** on the control panel.

Enter the type number of the tool to be registered into a single block:

**Tnnnnnnnnn**

(M6 can be omitted).

Of course we can register several tools with the same type number in the magazine if the tools

take place in the tool life management.

*The steps of registration are the following:*

- after starting the block containing T code the PLC will give a stop and ask the operator whether he would like to register the tool:

*Do you want to register tool Tnnnn? (Yes: Start/No: Reset)*

Upon the Start the tool change will start, and upon pushing Reset the process will stop.

- If we selected the registration, it will have the returning tool taken out from the spindle manually, or put it back into the magazine, and it will have the tool - determined by the T code - put manually into the spindle,
- the PLC will register the tool T into the tool management table into the spindle magazine No. 10 and pot No. 1.
- it will give a stop, then it will send the message  
*Fill in coloumns tool info and figure No.*
- The operator will fill in manually the tool info and figure number columns in the table. If the tool is too large, in the figure number table the settings belonging to the figure code shall be recorded.
- Upon the Start the PLC will check whether we filled in the above columns correctly or not.
- If the operator specified data which cannot be interpreted, such as
  - the tool is invalid (U), or
  - the tool is too large (L), but the figure number = 0, or
  - the tool has a normal size (N), but the figure number is not 0upon the Start the PLC will give a stop and write out again the  
*Fill in coloumns tool info and figure No.*  
message.
- If we filled it in correctly, the registration will continue. The PLC will check whether for the tool with the given figure number there is an empty place in the magazine or not. If there is, the registration will be completed. If there isn't, the PLC will delete the registration from the table, give a stop and write out the  
*No empty place, registration cancelled*  
message. Upon the Start the process will terminate.

The tool registered in this way will get into the magazine either at the registration of the next tool, or upon the next tool change (T M6).

If we want to get the tool registered in this way into a given position of the magazine after the registration, we have to rotate the magazine by the M62 Tiiiikkkk command to an empty pot. In case of an unsuccessful registration, the tool will be manually taken out from the spindle at the next registration or upon the next tool change (T M6).

### **Deletion of a tool from the table, removing a tool from the magazine through the spindle**

We can delete a tool in any of the manual modes (**Jog, Incremental jog, Handwheel**) from the tool management table, respectively, we can remove a tool from the magazine through the spindle. Switch on the tool deletion mode by pushing the **T del button** on the control panel. We determine the place (i.e. the magazine number and pot number) of the tool to be deleted by entering a single block, together with an M62 code:

**M62 Tiiiikkkk**

(M6 can be omitted). *If we omit the M62 code, the PLC will not execute a tool deletion but a tool change.*

- After starting the T code the PLC will give a stop and ask the operator whether he would like to delete the tool or not:

*Do you want to delete tool Tnnnn? (Yes: Start/No: Reset)*

- Upon the Start the tool change will start, and upon pushing Reset the process will stop.
- If we selected the deletion (Start), it will have the returning tool taken out from the spindle manually, or put it back into the magazine, and it will change the tool - determined by the M62 T code - into the spindle,
- the PLC will delete the tool from the tool management table
- then it will give a stop and send the

*Remove Tnnnnn from spindle*

message.

By this the process is completed.

## **Messages of tool management**

### Interrupted tool change

If the tool change process was interrupted, either due to an error, or upon the reset button or due to power failure, upon the Machine on or Start button the control unit will send the

*Tool change interrupted. Push !T in manual mode.*

message.

Before we push the !T button, we have to ensure that the tool can be removed from the spindle! In such case, by entering into some of the manual modes (**Jog, Incremental jog, Handwheel**) upon pushing the !T button the control unit will have the tool taken out from the spindle and delete it from the table.

*After this we have to review the tool management table, and correct it if necessary, or register again the tool taken out.*

### Message during the execution of T tool function

If for all tools with the same type number, called on

**Tnnnnnnnn**

address, it is true that their tool life has expired, the PLC will give a stop and send the

*Life of tool group Tnnnnnnnn has expired*

message. The operator can react to this in two different ways:

- Upon the Start it releases the machining, but at this time it has to know that it is going to cut by a tool the life of which has expired.
- The operator changes into some of the manual modes (**Jog, Incremental jog, Handwheel**, it interrupts the machining process), switches to the tool deletion **T del** mode on and removes from the magazine and table the tools with expired tool lives. Afterwards, by switching to **T reg** mode the operator will load new tools into the magazine and register them in the table with the same type number. Machining can be continued after filling in the tool offsets.

### Notice life message during machining

If during the machining, the difference between the Tool life and Tool life counter, set in the tool management table for the tool participating in the machining, reaches the value of the Notice life value, the control unit will warn the operator with a

*Tool life of T will shortly expire*

message that he should prepare for a tool change.

If we set the TMU bit of the 2900 Tool M. Config parameter to 1, the warning relates to the total

tool life of the tool group.

During the message the machining will continue, and the message can be deleted by the delete button.

Message during machining, if the life of the tool in the spindle has expired

If during machining the life of the tool machining has expired, the PLC switches into block by block mode, and at the end of the block it will issue a

*Life of tool Tnnnnnnnn in spindle has expired*

message. Upon the Start, the machining will continue, but the control unit will remain in block by block mode and in the stop state it will repeatedly write out the message again.

To Do: by interrupting the machining, in a manual mode the operator should issue a single block, a new tool - belonging into the same group - shall be changed, then by returning back to automatic mode, the machining can be continued after filling in the tool offsets.

Message during machining, if the life of the tool group in the spindle has expired

If during the machining the tool life of the tool group (the group of tools with the same type numbers) has expired, the PLC switches into block by block mode, and at the end of the block it will issue a

*Life of tool group Tnnnnnnnn has expired*

message. Upon the Start, the machining will continue, but the control unit will remain in block by block mode and in the stop state it will repeatedly write out the message again.

To Do: by interrupting the machining, in a manual mode, the operator should switch the tool deletion T del mode on and remove the tools with expired tool lives from the magazine and the table. Afterwards, by switching to T reg mode the operator should load new tools with the same type number into the magazine and register them in the table. Machining can be continued after filling in the tool offsets.

**Enabling/Canceling the tool life counter**

From a part program, the tool life counter can be cancelled by the

**M88**

code. From a part program, the tool life counter can be enabled by the

**M89**

code.

After the power-on, the default state is

**M89**

i.e. the tool life counter is enabled.

The tool life counter can be enabled or disabled also by a button.

If the lamp of the button is on, the tool life counter is cancelled, whether we switched it off by a button or by M88 from a program.

M88 state can be revised, i.e. the tool life counter can be enabled by the button. Now the lamp of the button starts to blink.

## **Functions and the order of their execution**

### 1 Tool call: T code

*Case A: Tool preparation by a reference to T type code:*

The tool preparation takes place upon a T code:

**Tnnnnnnnn**

On a T code we can enter the type number of the tool on a maximum of 8 digits. First it will call the tool with the smallest but not yet expired tool life. In case in the tool management table there is no tool with such a type number, the tool will be put in manually.

*Case B: Tool preparation by a reference to M62 T code:*

The tool preparation calls the tool located in the magazine and pot determined on the T code:

**Tiiiikkkk**

iiii: the number of the magazine we refer to

kkkk: the pot number of iiii magazine.

### 2 Tool change: M6

Changes the tool prepared.

### 3 Range change: to an S code, or M11, ..., M18

*Case A: Range change to an S code:*

In case there is no overlap between the ranges of the spindle and the value of the parameter N1201 PLC Bits1 bit

N\_P10=1

the range change will take place to an S code.

*Case B: Range change to an M code:*

In case there is an overlap between the ranges of the spindle or the value of the parameter N1201 PLC Bits1 bit

N\_P10=0

the range change will take place to M11, ..., M18 code.

### 4 Spindle management functions

Functions to be executed, by indicating the related spindles:

**M3:** spindle rotation CW

**M4:** spindle rotation CCW

**M5:** spindle stop

**M19:** spindle orientation

**M24:** position loop closure without searching for the zero pulse

### 5 Execution of Code S

Code of the spindle speed.

Its execution is parallel to the spindle rotation if M3 or M4 has been programmed together with S function.

### 6 Coolants on/off

The PLC is able to switch on and off 4 different coolants by 4 different M code pairs:

**M8:** coolant on,

**M9:** coolant off,

**M108:** coolant through spindle on,

**M109:** coolant through spindle off,

**M208:** air coolant on,

**M209:** air coolant off,

**M308:** water curtain on,

**M309:** water curtain off,

The switch-on and -off of the coolants takes place simultaneously at the same time, provided that we wrote the codes into the same block. For example: upon the

```
N120 M8 M108 M208 M308
```

Of course we can combine the switch-offs and switch-ons in a block, too:

```
N210 M8 M109 M209 M308
```

### 7 Switch-on and switch-off of probes

The PLC is able to switch on and off two probes by 2 different M code pairs:

**M80:** workpiece setter on

**M81:** workpiece setter off

**M82:** tool setter on

**M83:** tool setter off

The switch-on and -off of the probes takes place simultaneously at the same time, after the execution of coolant functions, provided that we wrote the codes into the same block.

For example: upon the

```
N120 M9 M109 M80 M82
```

Of course we can combine the switch-offs and switch-ons in a block, too:

```
N210 M80 M83
```

### 8 Chip conveyor cycle

It starts the operation of the chip conveyor cycle and after the time set in seconds on the PLC\_DWord10 parameter lapses, it will stop it automatically.

**M64:** Chip conveyor cycle

### 9 Washer

It carries out the cleaning of the bed and the workpiece.

**M67:** washer on

**M68:** washer off

### 10 Starting and stopping the interval timer

We can view the time elapsed between the issuance of codes M84 and M85 in the Settings menu on the Timers/Counters screen, next to the Timer title.

**M84:** start interval timer,

**M85:** stop interval timer.

After power-on, the default state is

**M85**

i.e. the timer is switched off.

### 11 Cutting block feed enable with spindle in standstill

**M86:** cutting block feed enable with spindle rotating (default),

**M87:** cutting block feed enable with spindle in standstill.

After power-on, the default state is

**M86**

i. e. feed is enabled only with spindle rotating.



## 12 Cancellation of life counter of tool in spindle

**M88**: cancelling of life counter of tool in spindle

**M89**: enabling of life counter of tool in spindle

After power-on, the default state is

**M89**

i. e. life counter is enabled.

## 13 Switching on/off automatic clamping of axes

**M400**: switch on automatic clamping of axis A

**M401**: switch off automatic clamping of axis A

**M500**: switch on automatic clamping of axis C

**M501**: switch off automatic clamping of axis C

After power-on, the default state is

**M400** and **M500**

i. e. automatic clamping of axes are on.

## 14 Program control codes

**M0**: programmed stop

**M1**: conditional stop

**M2, M30**: program end: stops the spindle and turns off the coolants and washer.

## **Switches for conditional block skip**

### 1 Conditional block skip switch on the control panel: /1, or /

It is operated by the Conditional block skip switch on the control panel.

The blocks beginning with /, or /1 will be skipped, if the lamp of the button is on.

The blocks beginning with /, or /1 will be executed, if the lamp of the button is off.

### 2 Conditional block skip switches on the PLC function buttons

/2, /3: If the lamp on the PLC function buttons is on, blocks beginning with /2 or /3 will be skipped.

### 3 End of the series switch: /8

The block following /8 will be skipped if the workpiece counter has not reached yet the set value.

The block following /8 will be executed in case the workpiece counter has reached the value set in advance.

## **Indexing of spindle S**

It is possible to index, i.e. position the spindle after the closure of position control loop (after the execution of M19 or M24 function). For example the command series

M19  
CS120

orientates the spindle then rotates it to the 120-degree position.

## Series ready message, night mode, automatic power-off of the machine

We can set an M code, to which the workpiece counter shall be increased, on the N2305 Part Count M parameter.

These can be for example M30 or M99, but we can set different codes, too.

In case the workpiece counter has reached the number of pieces set in advance, the control unit will issue a

*Workpiece series ready*

message.

If the control unit is switched into night mode and the series is ready, the control unit will stop the machining process and issue an emergency stop.

If the switch is built out on the machine, it will power-off the whole machine.

In the night mode it issues an emergency state, or optionally switches the power off if the control unit is in an error state for a period longer than 5 minutes.

## Parameters setting the operation of the PLC

### PLC Constants

N\_P00=PREV\_1=1: Prepositioning of magazin required

N\_P01=M\_BID=1: Magazine rotates in both directions

N\_P02=M\_NEG=1: Direction of rotation if magazine does not rotate in both directions

N\_P03=TCH\_M6=1: Tool change is done by M6

N\_P04=OVRD\_30: Override switch has 30 positions

N\_P05=OVRD\_ANA=1: Override from analogue pot

N\_P06=NO\_OILCLR=1: No oil cooler in spindle

N\_P07=N\_FOOLPRF=1: tool change not foolproof

N\_P10=S1RNG=1: S1 spindle range change by S code

N\_P17=TLNR=1: Tool life messages are not needed

N\_P20=W\_PULSE=1: workpiece touch probe switched by pulse

N\_P21=T\_PULSE=1: tool touch probe switched by pulse

N\_P22=WT\_EXL=1: Tool and workpiece touch probe can not be switched on simultaneously

N\_P23=WPS\_AUT=1: workpiece touch probe switch on, off automatically

N\_P24=TLS\_AUT=1: tool touch probe switch on, off automatically

N\_P25=WPS\_ROT=1: workpiece touch probe switched by spindle rotation

N\_P33=A\_CLMP=1: "A" axis can be clamped

N\_P34=C\_CLMP=1: C axis can be clamped

PLC DWord1 (N\_PDW1): MAGAZINE: Number of tool pots in magazine

PLC DWord2 (N\_PDW1+1): TREFPOS: Pot number of reference point in magazine

PLC DWord6 (N\_PDW1+5): LUB\_PAUSE: Pause between lubrication cycles [2+min]

PLC DWord7 (N\_PDW1+6): LUB\_TO: Slide lubrication timeout [5+sec]

PLC DWord8 (N\_PDW1+7): LUB\_KEEP: Lubrication keeping time after pressure build-up [2+sec]

PLC DWord10 (N\_PDW1+9): CP\_CNV\_DLY: Chip conveyor working interval [5+sec]

PLC DWord11 (N\_PDW1+10): S1\_FAN\_DLY: Spindle fan off delay [5+sec]

PLC\_DWORD12 (N\_PDW1+11): CLN\_AIR\_ON: Taper cleaning interval [2+sec]

PLC\_DWORD13 (N\_PDW1+12): 1. coolant on time [1+sec]

PLC\_DWORD14 (N\_PDW1+13): 2. coolant on time [1+sec]

PLC\_DWORD15 (N\_PDW1+14): 3. coolant on time [1+sec]

PLC\_DWORD16 (N\_PDW1+15): 4. coolant on time [1+sec]

PLC\_DWORD17(N\_PDW1+16): Workpiece touch probe on/off pulse width [30+msec]

PLC\_DWORD18(N\_PDW1+17): Tool touch probe on/off pulse width [30+msec]

PLC\_DWORD19(N\_PDW1+18): Tool number of workpiece touch probe

PLC\_DWORD20(N\_PDW1+19): Spindle speed of switch on of workpiece touch probe

### Tool setter danger zone settings

#### *Position Switches parameters:*

N1102 SW2 Axis Number=1 Tool setter X axis switch

N1103 SW3 Axis Number=2 Tool setter Y axis switch

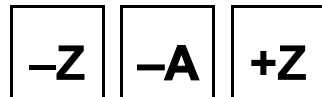
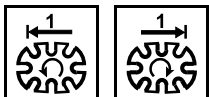
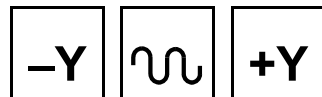
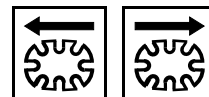
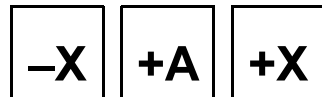
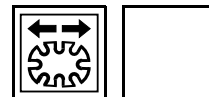
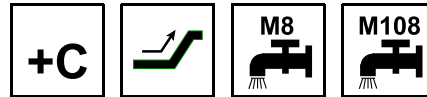
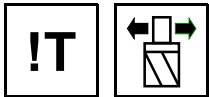
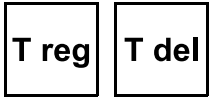
N1134 SW2 Min Pos: X axis zone negative position

N1135 SW3 Min Pos: Y axis zone negative position

N1166 SW2 Max Pos: X axis zone positive position

N1167 SW3 Max Pos: Y axis zone positive position

## Optional buttons of the control panel of machines with umbrella type ATC



### Spindle jog.

Can be switched on in Jog, Incremental jog or Handwheel mode.

By keeping the M3, respectively, M4 buttons pushed, the spindle is going to rotate slowly in the appropriate direction. By releasing button M3 or M4, the spindle will stop.



### Switch-on and switch-off of spindle orientation .

Can be used on in Jog, Incremental jog or Handwheel mode.

If the spindle is not oriented, it will be oriented, or if it is oriented, it will switch the orientation off.



### Registration of tools.

In Jog, Incremental jog or Handwheel mode, by pushing the button, it will enter into the tool registration mode.



### Deletion of tools.

In Jog, Incremental jog or Handwheel mode, by pushing the button, it will enter into the tool deletion mode.



### **Tool change interrupted.**

If the tool change was interrupted, or if the PLC variables stored in non-volatile RAM area has become faulty, the lamp of the button will blink. In Jog, Incremental jog or Handwheel mode, by pushing the button, it will have the tool taken out from the spindle by the operator and it will delete the tool from the tool management table.

*Afterwards the tool management tables needs to be checked!*



### **Tool unclamped lamp, tool clamp button.**

In case the lamp of the button is on, the tool is unclamped. In certain error states, the tool becomes clamped upon the button. Tool can be never be unclamped by the button.



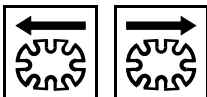
### **Mode of manual movement of magazine**

The lamp of the button is on if

- Jog, Incremental jog or Handwheel mode is set,
- and the tool is not clamped and axis Z is on the positive stroke limit,
- or the spindle is oriented and axis Z is in change position No.2.

In case in a manual mode we push the button, the PLC will send a message what should be done in order to enable the arm rotation.

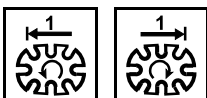
In case the lamp of the button is on, the magazine movement buttons are enabled.



### **Magazine into basic position, magazine to the spindle buttons**

If the lamp of the Mode of manual movement of magazine is on, upon pushing the button the magazine will move into basic (normal) position or move to the spindle.

If the lamp of the button is on, the magazine is in the basic position or at the spindle.



### **Magazine rotation buttons**

The lamp of the buttons is on if the magazine rotates in the appropriate direction.

If on the magazine there is a rotation command, but the magazine cannot be rotated, the lamps of the buttons are blinking.

If Jog, Incremental jog or Handwheel mode is set, upon pushing the button, the magazine will step one position in the selected direction. If we keep the button pushed, the magazine is going to rotate continuously.



### **Chip conveyor forward**

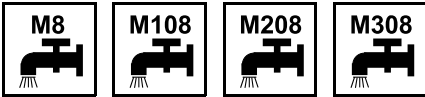
Upon pushing the button the chip conveyor will start. It will stop if we push again the button. The lamp of the button is on if the chip conveyor is moving forward.



### **Chip conveyor backward**

If the chip stucked in and we push the button, the chip conveyor will move backwards. It will

move backwards until we keep the button pushed.



### Coolant buttons

M8: coolant button,

M108: coolant through spindle button,

M208: air coolant button,

M308: water curtain button,

Upon pushing the button, the respective coolant will switch on, and upon its repeated pushing it will switch off.

The lamp of the button is on if the coolant is flowing.

If the program switched on the coolant by an M function, but we switched it off by a button, the lamp of the button is blinking.

### Operation of the PLC function buttons

#### F13 T BROKEN

Upon the button, it will set the status of the tool in the spindle to “broken” in the tool management table.

#### F14 TLC CANCEL

Tool life counter cancel button. Its effect is the same as that of M88, M89 functions. Upon pushing the button, it will cancel the tool life counter for the tool in the spindle, and it will enable it upon its repeated pushing.

If the lamp of the button is on, the tool life counter is cancelled.

If the tool life counter was switched off from a part program by the M88 function, but we switched it back by a button, the lamp of the button is going to blink.

#### F17 NIGHT MODE

By this button we can switch on or off the night mode.

If the lamp of the button is on, the control unit is in night mode.

#### F18 F HNDL

A special test mode. Upon pushing it the feed from handwheel function is switched on. In such case the program will go around the path of the tool upon the impact of the handwheel's rotation. We can switch on simultaneously the function lock button, as well.

#### F19 A CLAMP

In Jog, Incremental jog or Handwheel mode, upon pushing the button we can release the clamping of axis A, respectively, upon its repeated pushing we can clamp the axis.

If the lamp of the button is on, axis A is clamped.

#### F20 C CLAMP

In Jog, Incremental jog or Handwheel mode, upon pushing the button we can release the clamping of axis C, respectively, upon its repeated pushing we can clamp the axis.

If the lamp of the button is on, axis C is clamped.

### **F21 WASH DOWN**

The button for switching on or off the washer. Its effect is the same as that of M67, M68 functions. Upon pushing the button, the button will switch on washer, and upon its repeated pushing it will switch it off.

The lamp of the button indicates the switched-on status of the washer.

### **F22 WATER GUN**

It enables the use of the water gun in the opened state of the door.

If the lamp of the button is on, the water gun is enabled.

### **F23 LUBRICATION**

Upon pushing the button, the control unit executes a lubrication cycle on the machine.

The lamp of the button is on if the lubrication pump is operating.

### **F25 TLS ON**

In Jog, Incremental jog or Handwheel mode, upon pushing the button we can switch on or off the tool setter that can be switched automatically.

The lamp of the button is on if an automatic tool setter is switched on, or if a simple tool setter is connected.

### **F26 WPS ON**

In Jog, Incremental jog or Handwheel mode, upon pushing the button we can switch on or off the workpiece setter that can be switched automatically.

The lamp of the button is on if an automatic workpiece setter is switched on, or if a simple workpiece setter is connected.

### **F28 HOB. T. RETRACT**

If the G81.8 Electronic Gear Box function is switched on and if we push the hobbing tool retract button, the hob will be retracted from the cog on the axis determined in the Electronic Gear Box parameter group.

### **F29 /2, F30 /3**

The second and third conditional block skip switch. Upon pushing the button, the button will switch on, and upon its repeated pushing it will switch off.

In case the lamp of the button is on, during the execution of the program it will skip blocks starting with /2, respectively, /3.

### **Messages of the PLC program**

Upon the error messages sent by the PLC the control unit takes up the stop state. The error can be deleted by the cancel button. After the deletion of the error, the message “Restart with START button!” appears. Upon the START button the PLC tries to execute the function again.

If on the display we can see a message which can be eliminated by using any of the buttons, the PLC will enable the operation of the given button or group of buttons. In such case, before the deletion of the error state we can try to eliminate the error by using the buttons, then deleting the message by the delete button.

For example: if we receive the message “Magazine to basic position timeout”, by using the magazine moving buttons we can try to bring the magazine into the basic position. After this

we have to delete the error and after the message “Restart with the START button!” push the Start button.

001 \$0 Change Gear Range No. {#0:F0}  
002 \$1 Spindle Fluctuation Error  
003 \$1 Spindle Acc/Dec Error  
004 \$1 Spindle Orientation Error  
005 \$0 Drive A not Ready  
006 \$0 Start Please  
007 \$1 Spindle on Error  
008 \$1 Spindle Drive not Ready  
009 \$1 Spindle off Error  
010 \$0 Put Tool No. {#0:F0} in spindle  
011 \$0 Emergency Stop Button not Released  
012 \$1 Emergency Circuit Error  
013 \$1 Interface 24VDC Power Supply Error  
014 \$1 Drive X not Ready  
015 \$1 Drive Y not Ready  
016 \$1 Drive Z not Ready  
017 \$1 Drive C not Ready  
018 \$0 Just After Release Turns on!  
019 \$0 External Handwheel not in NC Position!  
020 \$1 Spindle Stop Error  
021 \$1 Restart by Start Button!  
022 \$0 Tool Code Error!  
023 \$0 Magazine Reference Error  
024 \$0 Magazine Prepositioning Error  
025 \$0 Magazine Positioning Overtime  
026 \$0 Remove T {#0:F0} from spindle  
027 \$0 Do you want to register tool T {#0:F0}? (Yes: Start/No: Reset)  
028 \$0 Do you want to delete tool T {#0:F0}? (Yes: Start/No: Reset)  
029 \$0 Spindle S {#0:F0} on! Last rotation code M03  
030 \$0 Spindle S {#0:F0} on! Last rotation code M04  
031  
032 \$0 Spindle error S {#0:F0}  
036 \$0 Loop closing error on spindle S {#0:F0}  
037 \$0 Spindle S not oriented  
038 \$0 Magazine not in position  
039 \$0 Tool pot isn't in change position  
040 \$0 Tool pot isn't in basic position  
041 \$0 Arm isn't in basic position  
042 \$0 Pot up timeout  
043 \$0 Pot down timeout  
044 \$0 Arm stuck  
045 \$0 Arm operation timeout  
046 \$0 Tool clamp timeout  
047 \$0 Tool unclamp timeout  
048 \$0 Ti ti ta error  
049 \$0 Program T function to unclamp tool!



050 \$0 Position control loop closed on spindle S {#0:F0}  
051 \$0 Fill in coloumns tool info and figure No.  
052 \$0 No empty place, registration cancelled  
053 \$0 Magazine/pot number specification error on address T  
054 \$0 Life of tool group T {#0:F0} has expired  
055 \$0 Life of tool T {#0:F0} in spindle has expired  
056 \$0 Toll life of T will shortly expire  
057 \$0 1st empty pot search error in T. Error code: {#0:F0}  
058 \$0 1st figure No. read error inT. Error code: {#0:F0}  
059 \$0 2nd figure No. read error inT. Error code: {#0:F0}  
060 \$0 2nd empty pot search error in T. Error code: {#0:F0}  
061 \$0 Write error in tool registration. Error code: {#0:F0}  
062 \$0 Read error in tool registration. Error code: {#0:F0}  
063 \$0 Empty pot search error in tool registration. Error code: {#0:F0}  
064 \$0 Delete error in tool registration. Error code: {#0:F0}  
065 \$0 Delete error in tool deletion. Error code: {#0:F0}  
066 \$0 Data swap error in M6. Error code: {#0:F0}  
067 \$0 No empty pot for returning tool!  
068 \$0 Tool change interrupted. Push !T in manual mode.  
069 \$0 Tool management table is full!  
070 \$0 Lubrication pressure falt  
071 \$0 Lubrication oil level low  
072 \$0 Tool not clamped  
073 \$0 Tool not unclamped  
074 \$0 Axis Z not on change position  
075 \$0 Z axis not on positive overtravel position  
080 \$0 Power supply error  
081 \$0 Motor protecttion switch fault  
082 \$0 Air pressure fault  
083 \$0 Phase error arisen  
084 \$0 Cooler not ready  
086 \$0 Door open  
089 \$0 Battery fault  
090 \$0 Workpiece series ready  
091 \$0 Night mode on  
092 \$0 Night mode off  
093 \$0 Error arisen by night. See history!  
094 \$0 Turn off the tool setter  
095 \$0 Turn off the workpiece setter  
096 \$0 Workpiece setter on fault  
097 \$0 Workpiece setter off fault  
098 \$0 Tool setter on fault  
099 \$0 Tool setter off fault  
100  
101 \$0 Magazine to basic position timeout  
102 \$0 Magazine to spindle timeout  
103 \$0 Magazine neither in basic position nor at spindle  
104 \$0 Axis Z not on change position 2  
105 \$0 Magazine not in position needed for return tool (reset)

106 \$0 Tool coming from magazine not in change position (reset)  
107 \$0 M3, M4 forbidden. Probe in spindle {#0:F0}  
108 \$0 Stylus in contact  
110 \$0 Axis A on error  
111 \$0 Axis A off error  
112 \$0 Axis A clamp error  
113 \$0 Axis A unclamp error  
114 \$0 Axis C on error  
115 \$0 Axis C off error  
116 \$0 Axis C clamp error  
117 \$0 Axis C unclamp error  
120 \$0 Magazine position signal failure  
121 \$0 Tool change data write error. Code: {#0:F0}  
122 \$0 Tool change data read error. Code: {#0:F0}  
123 \$0 Turn off data write error. Code: {#0:F0}  
124 \$0 Turn off data read error. Code: {#0:F0}