AMK

# AMKASYN

VARIABLE SPEED DRIVES

# AZ-MC1
# Multi-station-
# CNC-control

## NC - Commissioning



<inb0898.docec>

AMK

Arnold Müller, Antriebs- und Steuerungstechnik GmbH & Co.KG, D-73230 Kirchheim/Teck,
Tel.: 07021/50 05-0, Telefax: 07021/50 05-176

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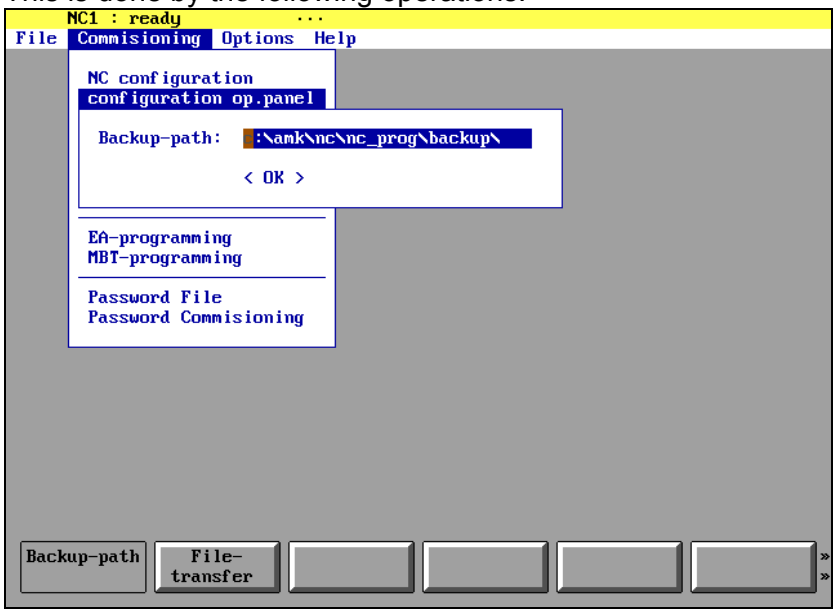
# 1 Commissioning

Commissioning is part of the programming module and can thus be reached only by pressing the Data key on the operating panel. On first selection the entire menu can be protected by a password.

## 1.1 First commissioning

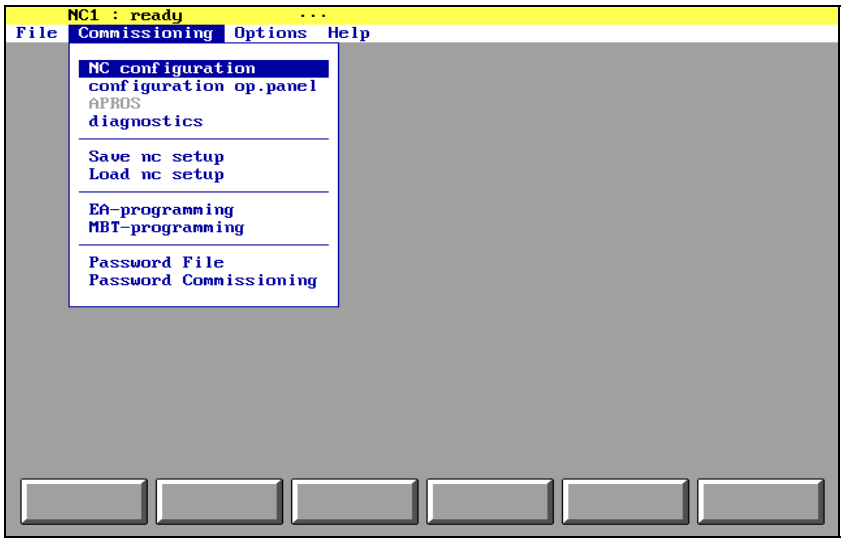
At the first commissioning of an unconfigured AZ-MC1, it is initially necessary to load the AZ-MC1 with the necessary configuration data and axis parameters, as well as a PLC program. This is done by the following operations:




**pic_I_10**

1. The backup path must be set up -if not yet done- in the "Commissioning - Configuration OP ' menu item ( see above picture)
2. The configuration data of the NC must be generated with the NC configuration program and transferred from there into the backup path of the machine.
3. Generate a PLC program with the 'APROS' program and load it into the backup path of the machine or make use of a standard PLC program which is loaded into the path.
4. Load the generated data records and the programs on the MC1 in the 'Commissioning - Load nc-setup' menu item.
5. Most of the data become effective only after renewed booting of AZ-MC1 and OP, i.e. switch both off and back on.
6. The data records can be edited in the 'Commissioning - NC Configuration' menu item. These become valid by renewed booting of AZ-MC1 and OP.
7. Perform a complete backup of the data to back up all changes through the 'Commissioning - Save nc-setup' menu item.

The commissioning pulldown menu offers the following selection:



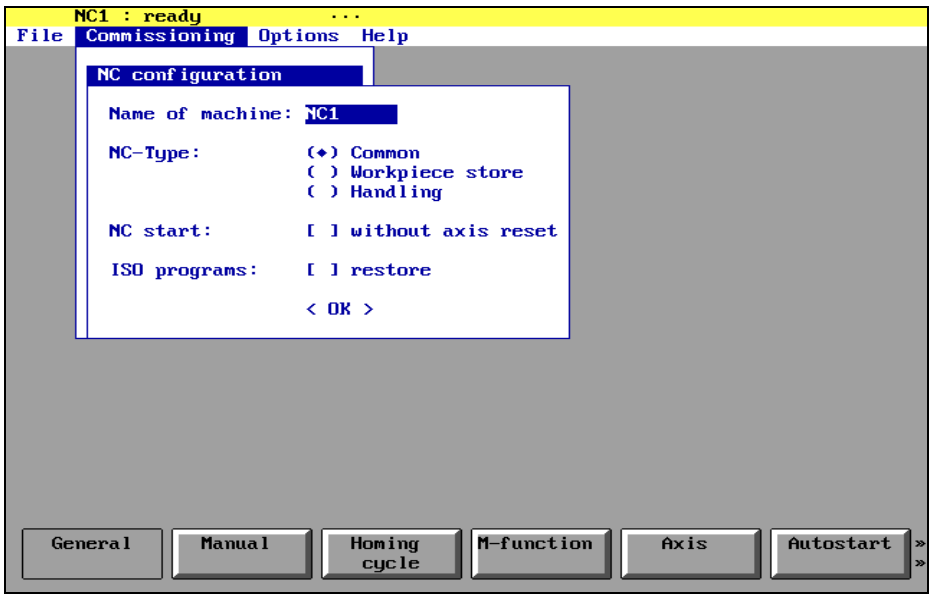

**pic_I_1**

## 1.2 NC configuration

Several dialog pages belong to the NC configuration. You change between these with the softkeys. The entries do not become valid until the OK box in one of the dialog pages is confirmed with Enter. As long as this has not been done, the entries made up to then (i.e. the entries on all pages) can be rejected again with ▲.

You move between the entries inside a dialog page with the Enter and ↓ keys forwards and by means of ↑ backwards.

If several NC machines are connected to the control panel, firstly select those for which the following entries apply.




pic_I_2

**General**

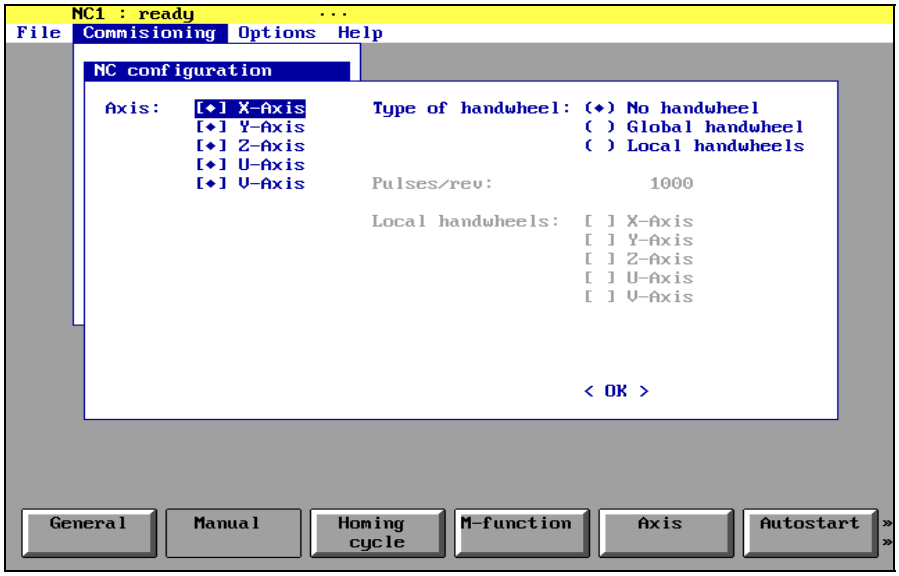
Machine name: Name of the machine, max. 8 characters. The machine name serves for identifying the NC machine. It is required primarily in multimachine operation and for backup of the data records. Each machine receives a default name from the operating program which mirrors its position in the bus system. This default name should be changed by the operator corresponding to the task of the machine.

NC type: Here you can define if the machine is not a general but a special machine (e.g. part accumulator). Special menu and dialog items extending general operation also exist in part for these machines.

NC start: You can define with this option that the NC start command should be implemented in the NC machine without position setting, i.e. considerably faster.

ISO programs: This specifies that at the start of the interface, the ISO programs are transferred from the NC into the OP.

**Manual**




pic_I_21

Handwheel type: no handwheel -> no handwheel is connected
global handwheel -> one handwheel is used for all axes
local handwheels -> each axis has its own handwheel

Sync-Z: Factor for assessing the handwheel increments

local handwheels: List of the connected local handwheels

**Homing cycle**

Homing cycle: Selection whether the common homing cycle should take place through a string or a DIN program.

DIN program: The homing cycle program can be edited after pressing the Enter key on the edit field.

Reference string: Configuration of the reference string for each existing axis: the larger the number, the later is the corresponding axis started. A zero means that the axis is not included in the string.

**M function**

Activation of the required M function of the NC. With variable M functions, the type of synchronization and the couple bit to the PLC must be specified in addition.

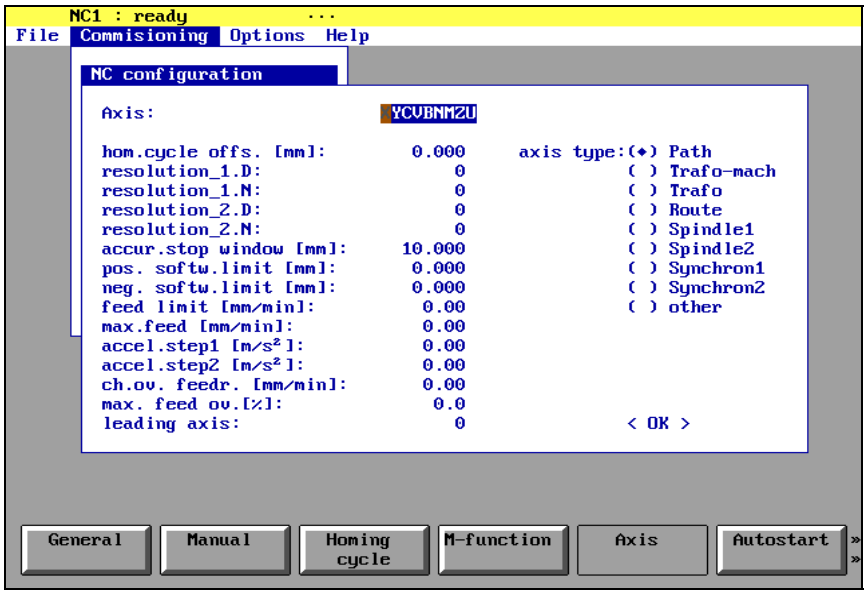
M function: Entry of the M function to be edited

M-Sync: Activation and selection of the wanted synchronization.

Input: Number of the coupling input to the PLC

Bit: Number of bits inside the coupling input

## Axis




Axis

Name of the axis to which the following entries of this dialog part refer. The relevant axis can be selected with the cursor keys as long as the bar cursor is on the axis selection line. Editing the data of the selected axis is made possible with Enter or ↓. The meaning of the axis data is described in the NC Configuration document. The following entries are offered for a linear axis:

| | |
|---|---|
| hom. cycle offset: | Shifting the machine zero. |
| resolution_1.D | Entry of the conversion factors between metric and incremental measuring system |
| resolution_1.N: | |
| resolution_2.Z: | „ |
| resolution_2.N: | „ |
| accur.stop-window: | Position window for in-position programming function (G60) |
| pos. softw. limit: | Positive software limit switch |
| neg. softw. limit | Negative software limit switch |
| feed limit: | Feed limitation can be activated by PLC |
| max.feed: | Maximum feed speed |
| accel. step1: | Definition of the acceleration ramps |
| accel. step2: | „ |
| ch. ov. Feedr.: | „ |
| max. feed.-ov.: | Max. permissible feed override |
| leading axix: | Definition of the type of axis |

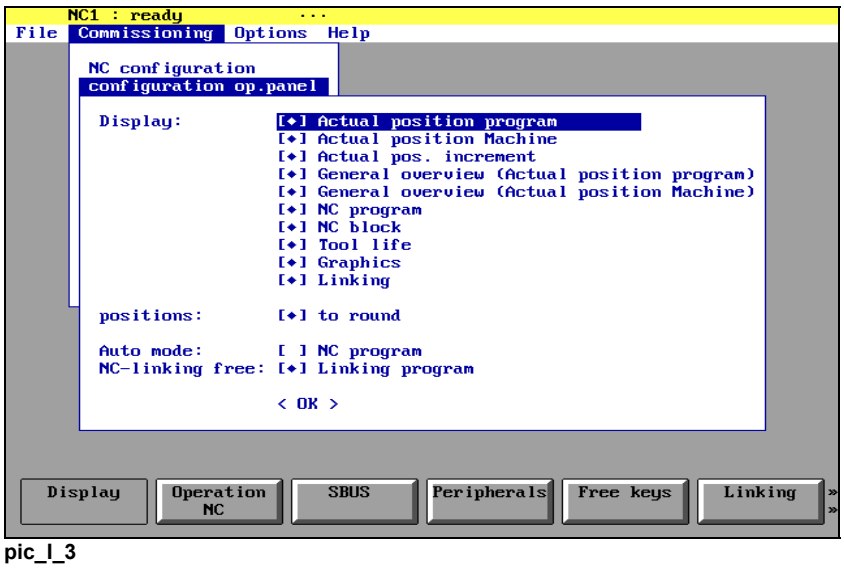
**Autostart**

The autostart file consists of a ISO program which is executed in the NC automatically at the start of the operator interface. The ASCII editor is used to produce the file.

## 1.3 Operator Panel (OP) configuration

Several dialog pages belong to the OP configuration. You change between these with the softkeys. The entries are not valid until the OK box in one of the dialog pages is confirmed with Enter. As long as this has not been done, the entries made by then (i.e. the entries on all pages) can be rejected again with ▲.

You move with the Enter and ↓ keys forwards and by means of ↑ backwards between the entries inside a dialog page.




pic_I_3

**Displays**

This dialog item specifies which data of the NCs are displayed in the NC operating module and in which manner. Several types of display between which it is possible to change at will in the on-line module can be selected.

| | |
|---|---|
| Program actual position: | The actual positions (related to the programmed reference system) of all interpolatable axes are displayed in uppercase letters |
| Machine actual position: | The actual positions (related to the internal reference system of the machine) of all axes are displayed in uppercase letters |
| Ipos Increments: | The actual position increments of all axes are displayed in uppercase letters |
| Total overview (P): | The actual positions (related to the programmed reference system) and the residual distance of all interpolatable axes, current feed settings and the just executed NC block are displayed |

| | |
|---|---|
| Total overview (M): | The actual positions (related to the internal reference system of the machine) and the residual distance of all interpolatable axes, current feed settings and the just executed NC block are displayed |
| NC program: | The execution of the NC program can be followed in the source text |

| | |
|---|---|
| NC block: | All executed NC program blocks are displayed sequentially |
| Tool lives: | The current tool lives of all tools are displayed |
| Graphic: | The graphical display of the position of the first two NC axes is made |
| Linking: | Execution of the free linking program can be followed |

With the ‘round’ option, it is specified whether positions should be displayed rounded in all types of display completely or to the last place but one.

**NC operation**

| | |
|---|---|
| Jog feed: | Feed value without rapid traverse superimposition in mm/min (as F word) in the Jog or Step mode. |
| Jog fast feed: | Feed value with rapid traverse superimposition in mm/min (as F word) in the Jog or Step mode. |
| NC start: | If this option is set, a check is made before each NC start whether all axes are homed. |
| MDI: | An automatic line change takes place if this switch is set when executing DIN blocks in the MDI mode. |

**Sbus**

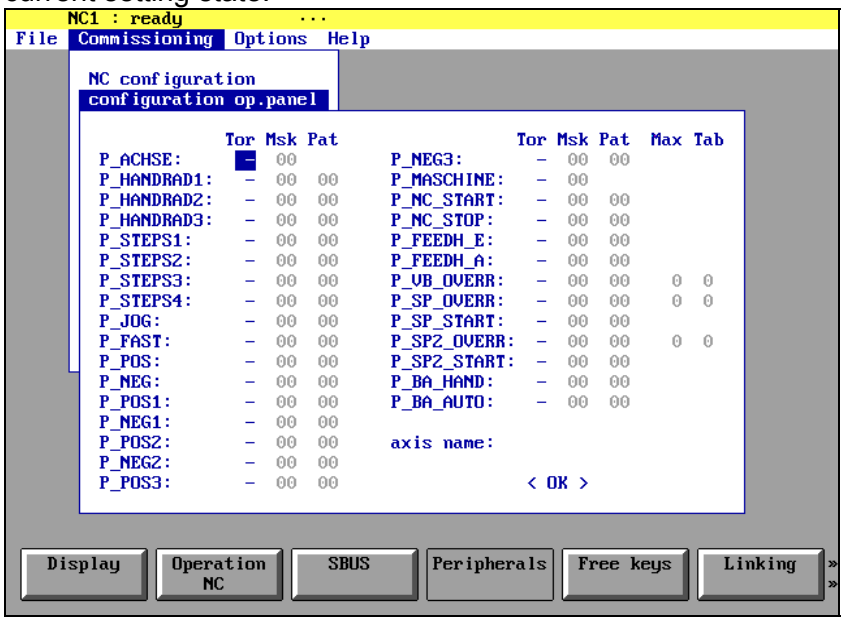
The Sbus ports can be activated or deactivated with this. A physical address belongs to each port.

| | |
|---|---|
| COM1 | Serial interface 1 of the PC (OP) |
| COM2 | Serial interface 2 of the PC (OP) |
| ABK-V422 | V422 interface of the adapter card |
| ABK-LWL | Fibre optic cable on the adapter card |
| Light | Luminance of the fibre optic transmitter |
| Timeout | Time (in s) which is waited in Sbus requirements |

## ! Caution: The set values are used only at the next start of the OP!

**Periphery**

This dialog item consists of a list of all operating elements that can be activated and their current setting state:




**pic_I_4**

Apart from the designator, an entry consists of the following elements:

| | |
|---|---|
| Gate: | Number of the input gate (0...) |
| Msk (mask): | Masks the value read in by the input gate and thus also specifies right offsets |
| Pat (reservation): | Comparison value for determining the target state (for single switches) or threshold value for changes (for value switches) |
| Max: | Only for value switches: the maximum reservation of the maximum value assigned to the masked bits (only if no assignment table is active for the entry) |
| Tab: | Only for value switches: activation of an assignment table (by entering the value 1 or 2) |

The assignment table serves for the completely free assignment of wanted values to input reservations. The table itself must be generated in the RED file in the form

P_TABELLE1 = 0,10,15,17,18,19,...

whereby a maximum of 32 values can be entered, i.e. the table can be applied to maximum 5 input bits. In the example, the value 0 is assigned to the input reservation 0, the value 10 to the input reservation 1, the value 15 to the input reservation 2 etc.
Additional explanations for the periphery can be found in the Diagnosis - Periphery' item chapt. 3.3.

A further input item serves for identifying the reservation of the axis selector switch:

| | |
|---|---|
| Axis designation | Designations (letters) of the axes on the axis selector switch |

NC operating functions can be blocked with the aid of the peripheral functions P_BA_HAND and P_BA_AUTO (see Commissioning - OP Configuration - Periphery') item. If none of the two peripheral functions is activated (or defined), the blocks do not exist and all operating functions listed below are possible. This corresponds to the setting mode.

| Operating function | Setting mode | Manual mode | Automatic mode |
|---|---|---|---|
| Set override | ✓ | ✓ | - |
| Set spindle override | ✓ | ✓ | - |
| MBF simulation | ✓ | ✓ | - |
| Machine operating panel | ✓ | ✓ | - |
| Edit in automatic/linking | ✓ | ✓ | - |
| Single operation in linking | ✓ | ✓ | - |

**Free keys**
Reservation of the user keys <UK1>...<UK8> with freely selectable letters. These can be used both in the ASCII editor and also for axis selection in manual mode and for the homing cycle.

**Linking**
Linking choice of the type of linking in the NC operating module between programmed and parameterized linking. The further settings of the masked linkings are explained in a separate documentation.

**Backup path**
Complete path for the storage of settings (data record) and programs

**File transfer**

| | |
|---|---|
| Interface: | Selection of the interface for the serial file transfer |
| Rate: | Transmission rate |
| Parity: | Parity check on file transfer |
| Bits: | Number of data bits |
| Stop: | Number of stop bits |
| BOT: | Definition of a beginning of transfer character; if none is defined, transmission and reception is without begin character |
| EOT | Definition of a end of transfer character; if none is defined, transmission and reception is without end character |
| BOK | Definition of a string marking the begin of head-data; if there is no defined, sending and receiving is done without this element. |
| EOK | Definition of a string marking the end of the head-data; if there is no defined, sending and receiving is done without this element. |
| BOD | Definition of a string marking the begin of each data-set; if there is no defined, sending and receiving is done without this element. |
| EOD | Definition of a string marking the end of all data-set; if there is no defined, sending and receiving is done without this element. |

## 1.4 APROS

If this menu item is selected, the programmed logic controller (PLC) can be commissioned with the aid of the "APROS" program. If the program is not present on the OP, the menu item cannot be selected.

## 1.5 Saving and loading nc-configuration-data

There is always access to a backup medium from the NC operator interface. It is specified in the ‘Commissioning - OP Configuration - Save nc-setup’ menu item where this is located. It can be on a floppy disk drive (entry e.g. *b:*\) or the hard disk (e.g. *c:**nc_prog**backup*\). Backing up and loading data must be controlled by the operator using the following menu items:

### 1.5.1 Saving of nc-configuration data ( Backup)

Using the ‘Commissioning - Save nc setup’ menu item, all files in the NC file management which are needed for the configuration

- of the NC (nc**XX**.cfg, geo**XXN**.cfg, sda**XXN**.mds, ax**XXN**.mds),
- of the associated PLC (p01.sps) as well as
- of the operator interface (pnc**N**.red, modul**N**.dsc, auto**N**.)

are backed up on the backup medium in a directory with the name of the NC machine and the extension ‘nc’.

They are reloaded using the ‘Commissioning - Load nc setup’ menu item.

### 1.5.2 Saving of part projects

Part projects are loaded to the backup medium in the ‘Data input - Part project management - Backup part’ menu item completely in a directory with the name of the project (without extension).

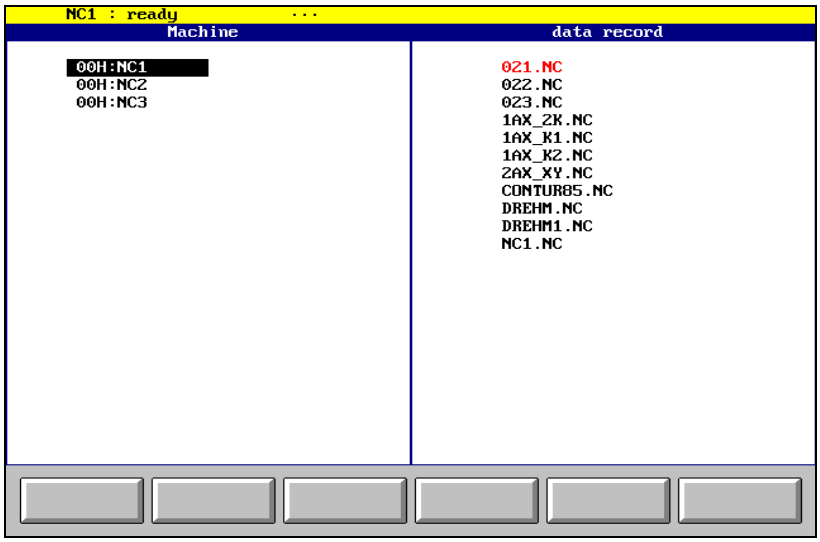
They are reloaded using the ‘Data input - Part project management - Load part’ menu item.

### 1.5.3 Saving of ISO programs

All DIN programs (those produced outside part projects) can be backed up jointly in the root directory of the backup medium in the ‘Data input - ISO program management - Complete backup’ menu item.

They are reloaded individually using the ‘Data input - ISO program management - Load file’ menu item.

## 1.5.4 Load nc setup




**pic_I_5**

2 screen halves are offered, overwritten on the left with "Machine" (data destination) and on the right with "Data record" (data source). With an unconfigured NC, a standard designation of the NC[1-4] type appears under "Machine", which means as much as NC on the SBUS transmitter 1, physical subscriber number 4. The directory under which the data records are located in the backup path appears on the right. The directory name corresponds to the selected machine name with the extension *.NC, e.g. "021.NC". The cursor stands initially on the machine designation (NC[1-4]) and jumps by pressing Enter to the right side for selection of the corresponding data record. Renewed pressing Enter causes the program to copy all files from the directory selected in the right window into the NC of the machine.

This is the reverse process of "Save nc-setup“.

In the above picture, several machines are connected to one operating panel, so that a machine selection also takes place.

It is then necessary to switch both the operating panel and the machine (AZ-MC1) (power OFF) and to boot anew in order to work with the now valid data or to modify them.

## 1.6 I/O programming

The linkages of the I/O control are programmed in this menu item. The goal of the linkages consists in the programmable and thus variable "wiring" of all inputs and outputs of the NC interface among one another as well as to other processes (machine operating panel, linking).
The I/O program becomes active automatically after the start of the operator interface as well as also after editing and works constantly unnoticed in the background.
The ASCII editor serves for producing the I/O links. The links are described with the aid of a simple line-oriented language. Each line consists of an allocation of a source (Q) to a destination (Z) in the general type

***Z = Q***.

If no bits are specified, each element consists of one byte. Bits can be separated individually:

***Z.bit = Q.bit***

or as group:

***Z.bit..bit = Q.bit..bit***

Thus, for instance, *E0.2* means bit 2 of input 0. The expression *E0.4..7* on the other hand separates the bits 4 to 7 from input 0.
Each source can be negated bit-wise in the allocation:

***Z = !Q***.

Comments are introduced by a semicolon and always extend up to the line end.
A maximum of 250 characters can be entered per line. The line can be lengthened by the backslash character (\) at the line end.

The following table provides an overview of the command set:

| | Z | Q | Contents | Param. 1 | Param. 2 |
|---|---|---|---|---|---|
| **E** | | u | Peripheral inputs of the OP | Gate (0...11) | |
| **A** | u | | Peripheral outputs of the OP | Gate (0...3) | |
| **G** | u | u | Global status | ph. address (1...32) or machine | Byte (1...6) |
| **M** | u | u | Flag | Number (0...255) | |
| **$** | u | u<br>u | Fixed addresses<br>LINKING - IO of the linking<br>MACHINE - Machine selection | | |

**E Inputs**
The binary (gate 0 to 3) and analog (gate 4 to 11) inputs of the OP are read by this.

Example: E0

**A Outputs**
The binary outputs of the OP are set.

Example: A1

**G Global status**

As source: A byte of the global status of a Sbus subscriber becomes accessible. Here the following variants are possible:
- The name of a machine is stated
- The physical address of a subscriber is stated (1...32)
- No subscriber is addressed: the global status of the OP is read

As target: A byte of the global status of the OP is set; the addressing of another Sbus subscriber is ignored and can therefore be dispensed with, but is not reported as error.

Note further that the bytes in the global status are generally counted from 1 to 6.

| | | |
|---|---|---|
| Example: | G["Layout"]4 | as source |
| | G4 | as target |

**M Flag**

The flag cells are read or set. All flag cells can be used bidirectionally and have a special meaning in the logical combination with other operating functions, like the machine control panel or the programmable linkage.

Example: M100

**§ MACHINE fixed address**

The selected machine number (value starting from 0) is accessible as source with this element.

Example: $MACHINE

**§ LINKING fixed address**

The coupling bytes of the linking (one each as source and target) are accessible with this element.
The bits are defined specifically for both types of linking.

Example: $LINKING

An example can look like the following:

```
;Transfer of the selected machine number to the PLC through global status
G1.0..4 = $MACHINE

;Transfer of free input ports to the PLC through global status
G5 = E2
G6 = E3

;Bridging the clocking with linking without connected PLC
$LINKING = $LINKING
```

## 1.7 Software Machine Panel (SMP) programming

An extensive software machine operating panel can be produced with SMP programming. It functions only in connection with the I/O control and uses its flags as general memory and for coupling with the actual I/O functions.
The operating panel does not become active until the corresponding function in the NC operating module is selected with Panel and it is inactive if the function is exited again.

Three main types of element exist in the SMP:
- Dialog and display elements
- Elements for data coupling to the PLC
- NC control elements

The ASCII editor serves for producing the SMP elements. The elements are described with the aid of a simple line-oriented language. Each line consists of an allocation of an element to a flag (M) with the general syntax:

***M Number { Typespec } allocation element***

Apart from the separation of bits analogously to IO programming:

| | |
|---|---|
| ***.bit*** | separates the bit |
| ***.bit..bit*** | separates the bits from..to |

extended data types can also be used as type specification:

| | |
|---|---|
| ***-W*** | Word type (2 bytes), unsigned |
| ***-SW*** | Word type (2 bytes), signed |
| ***-L*** | Long type (4 bytes), unsigned |
| ***-SL*** | Long type (4 bytes), signed |

If no type is specified, each element consists of one byte.
The allocation defines whether the flag should be read and/or written:

| | |
|---|---|
| **=>** | only read |
| **<=** | only write |
| **=** | read and write |

whereby certain elements can be used only in one direction.

The following table shows an overview of the elements that can be used:

| | S | L | Contents | Param. 1 | Param. 2 | Par. 3 |
|---|---|---|---|---|---|---|
| **BS** | u | | Operating switch | Position | Text | |
| **BT** | u | | Operating button | Position | Text | |
| **BW** | u | | Operating menu | Position | Text list | |
| **BA** | | u | Operating panel output (texts) | Position | Text list | |
| **FT** | u | u | Function button | Level (1...2) | Number (1...12) | Text |
| **DIAL** | u | u | Dialog or display | Position | Text | Places |
| **BP** | u | u | PDU memory field | Machine | Bytes (0...7) | |
| **DB** | u | u | Data block memory field | Machine | DB number (0...63) | Bytes (0...125) |
| **PSTART** | | u | Program start | Machine | Program number | |

| | |
|---|---|
| Position | - identifies the screen position (column, line), with max. 76 columns and 18 lines, |
| Machine | - name of the NC machine |
| Text | - max. 20 or 11 characters, framed in quotation marks |
| Text list | - texts separated by commas |
| Places | - number of places / places after the decimal point |

The texts in the operating elements and outputs can contain red letters apart from black letters. These must be enclosed in curved brackets. Nevertheless, these brackets are included in the number of characters.

```
Example:  BA(10,1)“    “,“{Red}“
```

Comments are introduced by a semicolon and always extend up to the line end.
A maximum of 250 characters can be entered per line. The line is lengthened by the backslash character (\) at the line end.

**BS Operating switch**

The switch is displayed on the image at the defined position with the selected labelling. If the switch is actuated, its status changes (pressed / released). The pressed status is identified by the value 1, the released status by the value 0.

```
Example:      M5 <= BS(1,1)“Switch“
```

**BT Operating button**

The operating button corresponds to an operating switch with the difference that it does not engage and therefore springs back into the quiescent state after a certain time.

```
Example:      M5 <= BT(1,3)“Button“
```

**BW Operating menu**

The menu elements are displayed on the image starting from the defined position under one another with the selected labelling. The associated value is activated by activating an element. The first text has the value 0, the second the value 1 etc.
A blank place in the menu is generated by two commas within the text list without text in between.

```
Example:M0 <= BW(10,1)"One","Two","Three","Four","Five","Six","Seven","Eight"
```

**BA Operating panel output**

In each case one of the texts is displayed on the image starting from the defined position, if the assigned value corresponds to the value in the flag. The first text has the value 0, the second the value 1 etc.

```
Example:    M0 => BA(1,15) "State 0","State 1","State 2","State 3"
```

**FT Function buttons**

The function buttons also do not engage like the operating buttons. They are shown in the grid of the softkeys and are assigned permanently to the 6 softkeys (FT number 1 to 6) and the 6 central free keys <Uk2> to >UK7> (FT number 7 to 12) located directly below. Several levels (currently 2) can be occupied and leafed through by means of the <ROLL> key. The pressed state is identified on writing by the value 1, the released state by the value 0.

```
Example:    M3 <= FT[0]1,"Key"
```

When reading the value not equal to 0 is used to show the key marked. Thus it is possible to reflect pressing the key directly:

```
Example:    M3 = FT[0]1,"Key"
```

or to use the marking as signal independent of the pressed state:

```
Example:    M3.0 <= FT[0]1,"Key"
            M3.1 => FT[0]1              (a text may not be stated here!)
```

One sees with the last example that the two allocation directions can also be used separately for each FT function, in contrast to all other dialog or display elements.

**DIAL Dialog / Display**

This is a universal element for the display and/or input of a value, whereby this can be named towards the outside by a fixed text. The display of the value is specified by the number of places and, if required, by the number of places after the decimal point.

```
Example:    M7 = DIAL(30,1)“Value:“5        ->  Value:     0
            M7 = DIAL(30,1)“Value:“5,2      ->  Value:  0.00
            M7 = DIAL(30,1)5                ->         0
            M7 = DIAL(30,1)5,2              ->      0.00
```

The type of allocation specifies whether the value should only be displayed (allocation: read only), the value should be corrected (allocation: read and write) or always newly overwritten (allocation: write only).

```
Example:    M7 => DIAL(30,1)“Value:“5       ->  only display
            M7 = DIAL(30,1)“Value:“5        ->  correction dialog
            M7 <= DIAL(30,1)“Value:“5       ->  overwriting dialog
```

It is also possible with this element to display a fixed text (i.e. without display of a value). This is done by leaving out the place data. The assignment to a flag is then indeed redundant, but must be made for syntactic reasons:

```
Example:    M7 = DIAL(40,1)“Solo“
```

**BP PDU memory field**
A PDU memory field becomes accessible to the PLC with this logical combination. It should be noted that currently only one PDU memory exists and therefore data can be exchanged only with one machine.

```
Example:    M17 => BP[“Layout1“]5
            M18 <= BP[“Layout1“]5
            M19 = BP[“Layout1“]0
```

**DB Data block memory field**
Areas of data blocks of the PLC are read and/or written byte by byte with this element.

```
Example:    M17 => DB[“Layout1“,1]5
            M18 <= DB[“Layout1“,1]5
            M19 = DB[“Layout1“,1]0
```

All DB elements which are only written are initialized on selection of the SMP function, i.e. the momentary reservation is read out from the PLC. Thus allocations for constant reading and writing are not necessary in the normal case.

**PSTART Program start**
This produces a (repeated) start of a DIN program in the stated machine. It must be possible to activate the program on the machine for this purpose (set project with automatic operation menu item). The start command is always triggered if the value is not equal to 0 and the machine is at rest.

```
Example:    M100 => PSTART[“Layout1“,4000]  -> Program 4000 is started
```

A small example can look like the following:

```
;Menu (actuators) and software buttons on the PLC through global status
M2.0..6 <= BW(30,1)  "One","Two","Three","Four","Five","Six","Seven","Eight","Nine"
M2.7    <= BT(30,13) "Basic"

;Reservation display status from global status of machine "021"
M5       => BA(30,15) "State 0","State 1","State 2","State 3"

;Starting the program on key pressure
M1.0   =   FT[0]1“Start machine“
M1.0   => PSTART[“Layout2“,3000]

;Input of a value and transfer to PLC
M10-L  => DB[“Layout2“,1]20                ;Write long value
M10-L  = DIAL(1,1)“Number:“8               ;Have long value entered
```

## 1.8 Password File

The file password serves for blocking the NC programming (off-line module) against unauthorized access. The term entered here is queried at the first transition NC operation =>NC programming. If the password was entered once correctly, the query is deactivated and becomes active again only by a restart of the operating program or by selection of this menu item (concluded with Enter).

## 1.9 Password Commissioning

The commissioning password serves for blocking the entire commissioning menu item against unauthorized access. The term entered here is queried at the first selection of this main menu item. If the password has been correctly entered once, the query is deactivated and becomes active again only by restart of the operating program.

# 2 Diagnosis

## 2.1 Diagnosis - SBUS

The SBUS is a local bus which is used to connect the NC operator interface with the NC machines and other AMKASYN components. Since this menu item is intended only for operators with special knowledge of the structure of the SBUS protocols, it is not explained further here.

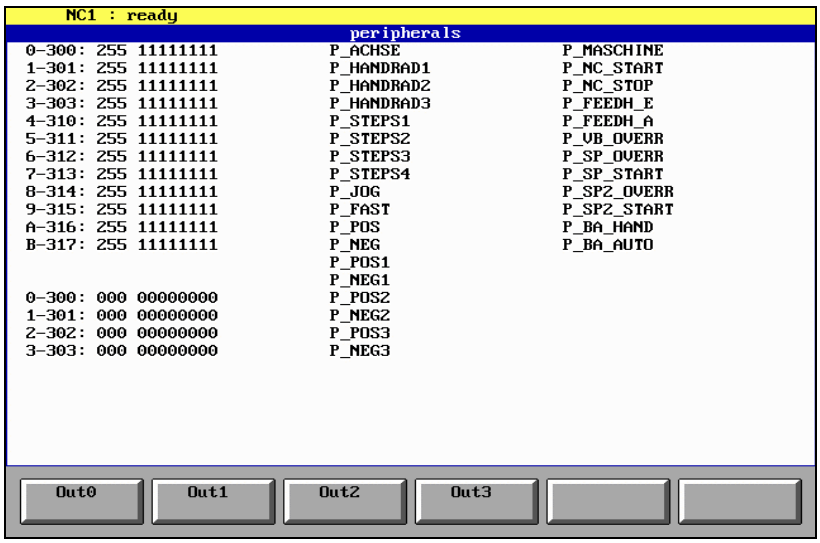
## 2.2 Diagnosis - View trace

Certain events, such as error messages, are stored in the trace file. This file can be viewed by selecting this menu item. The ASCII editor is used in the read only mode for this purpose.

When evaluating the file note that this is filled according to the ring buffer principle, i.e. the last line of the file is not necessarily also the last written one.

## 2.3 Diagnosis - Periphery

This menu item serves for checking the directly connected operating elements.




**pic_I_6**

All usable peripheral input and output gates are displayed in decimal and binary form with number, address and currently present value in the left part of the window.

The output gates can be set individually after pressing the keys <SOK1> to <SOK4>. Nevertheless, it can happen that this entered pattern is immediately written over again by the internal I/O control.

All activatable operating elements and their current setting state are displayed in the right part in the following form:

*P_NAME [gate&mask:state]*

The example: P_ACHSE [1&38:07]

means that the axis selector switch at the input gate 1 is connected. The bit pattern 38 (hex) is the mask for setting free the switch inputs (i.e. bits 3...5 of the gate). The switch is in the position 07 (i.e. axis 8 is set).

If no settings are displayed behind a name, the operating function is inactive. It is then implemented by OP key functions in many cases.

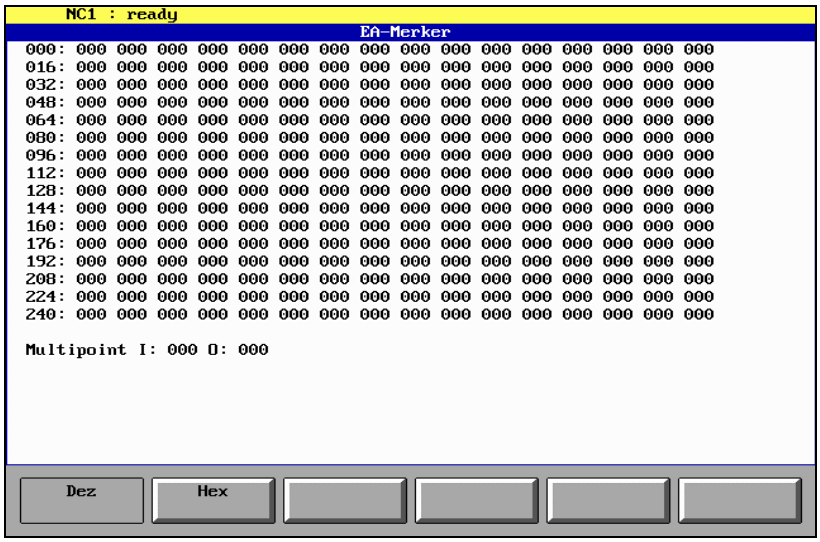
The following functions are currently implemented:

| Name | Function | Example |
|---|---|---|
| P_ACHSE | Axis selection in manual mode | 0,0x38 |
| P_HANDRAD1 | Mode selection for manual mode, handwheel with factor 1 | 1,0x07,0 |
| P_HANDRAD2 | Mode selection for manual mode, handwheel with factor 10 | 1,0x07,1 |
| P_HANDRAD3 | Mode selection for manual mode, handwheel with factor 100 | 1,0x07,2 |
| P_STEPS1 | Mode selection for manual mode, steps 0.01 | 1,0x07,3 |
| P_STEPS2 | Mode selection for manual mode, steps 0.10 | 1,0x07,4 |
| P_STEPS3 | Mode selection for manual mode, steps 1.00 | 1,0x07,5 |
| P_STEPS4 | Mode selection for manual mode, steps 10.0 | 1,0x07,6 |
| P_JOG | Mode selection for manual mode, Jog movement | 1,0x07,7 |
| P_FAST | Switch-over key for rapid traverse in manual mode | 0,0x04,1 |
| P_POS | Pos. direction key for manual mode (variable axis) | 0,0x01,1 |
| P_NEG | Neg. direction key for manual mode (variable axis) | 0,0x02,1 |
| P_POS1 | Pos. direction key for manual mode axis 1 | |
| P_NEG1 | Neg. direction key for manual mode axis 1 | |
| P_POS2 | Pos. direction key for manual mode axis 2 | |
| P_NEG2 | Neg. direction key for manual mode axis 2 | |
| P_POS3 | Pos. direction key for manual mode axis 3 | |
| P_NEG3 | Neg. direction key for manual mode axis 3 | |
| P_MASCHINE | Selection of the selected station (machine) | 2,0xf8 |
| P_NC_START | NC start function for several NC operating functions | 3,0x40,1 |
| P_NC_STOP | NC stop function for several NC operating functions | 3,0x80,1 |
| P_FEEDH_E | Activate feedhold | |
| P_FEEDH_A | Deactivate feedhold | |
| P_VB_OVERR | Machine override setting | 4,0xff |
| P_SP_OVERR | Spindle override setting | 5,0xff |
| P_SP_START | I/O switching the spindle | |
| P_SP2_OVERR | Override setting for spindle 2 | |
| P_SP2_START | I/O switching the spindle 2 | |
| P_BA_HAND | Activating / deactivating the manual mode | |
| P_BA_AUTO | Activating / deactivating the automatic mode | |

The functions P_POS... and P_NEG... serve for moving the axes in manual mode and thus also implicitly for stopping in Jog mode.

## 2.4 Diagnosis - Reservation of IO flags

The reservation of all IO flags can be viewed dynamically in this menu item.



pic_I_7

## 2.5 Diagnosis - Operating panel logout

The operating panel is immediately logged out in the NC on selection of this menu item. Thus another subscriber (e.g. PLC operating panel) is enabled to send movement commands to the NC.

## 2.6 Diagnosis - NC logout

The NC is immediately logged out from the drive commanding interface for the AZ-R01 on selection of this menu item. Thus it is possible to operate drives from the AZ operating panel (e.g. inching mode).

# 3 File and file management

## 3.1 Operator Panel

Start directory:

| | |
|---|---|
| pnc.exe | Program for NC interface |
| pncstart.bat | Batch for starting the ‘pnc.exe’ and programs called by it |
| pncex.bat | This file is generated by ‘pnc.exe’ and therefore does not always have to be present |
| pnc.red | Settings for the OP (description see Appendix 5) |

Overlays directory:

| | |
|---|---|
| pnc_ger.hlp<br>pnc_eng.hlp | Files for the on-line help (German and English) |
| pnc_ger.lng<br>pnc_eng.lng | Files with texts for operation (German and English) |
| pnc.ses | Settings for the OP (options) |
| pnctrace.txt | Trace file for error events |
| tskoment.hlp | Help texts for part memory |
| sp_abb.wsp<br>sp_bak.wsp | Status image of the part memory |
| ~?.tmp<br>~red?.tmp | Temporary data |

Amkglobl directory:

| | |
|---|---|
| helvb.fon | Font file for title picture |
| amklogo.pcx | Image file with AMK logo |
| azr.err<br>mc.err<br>ps.err<br>psu.err<br>pnc.err | Abbreviations of the error messages of the AZ computer<br>Abbreviations of the error messages of the NC<br>Abbreviations of the error messages of the PLC<br>Abbreviations of the user error messages of the PLC<br>Abbreviations of the error messages of the NC operation |
| azr_ger.erh<br>mc_ger.erh<br>ps_ger.erh<br>psu_ger.erh<br>pnc_ger.erh | Description texts for the error messages of the AZ computer (German)<br>Description texts for the error messages of the NC (German)<br>Description texts for the error messages of the PLC (German)<br>Description texts for the error messages of the user PLC (German)<br>Description texts for the error messages of the NC operation (German) |

User directory:

All programs and part projects produced by the programmer and intended for execution are stored in this directory. A separate subdirectory is created for each part project. The files which are produced without part project are filed in the basic directory of ‘User’.

| | |
|---|---|
| mdi. | MDI inputs |
| pnc.ea | IO logical combinations (IO program) |
| pnc.SMP | SMP elements |
| *. | DIN programs (consist of numerical name without extension) |
| *.pnc | Project control files |
| *.npv | Zero shift files |
| *.wkz<br>*.wwz<br>*.zwz | Tool files |
| *.kor | Offset data files |
| *.vkt<br>*.vkv | Linking program files |

## 3.2 NC file management

| | |
|---|---|
| nc**XX**.cfg | Configuration data for the NC |
| geo**XXN**.cfg | - " - |
| sda**XXN**.mds | - " - |
| ax**XXN**.mds | - " - |
| wz**XXN**.mds | Tool offset data |
| wwz**XXN**.mds | Tool setting data |
| zwz**XXN**.mds | Current tool data |
| np**XXN**.mds | Zero shift data |
| pnc**N**.red | Settings for the OP (description see Appendix 5) |
| modul**N**.dsc | Settings for the OP (including machine name) |
| p01.sps | PLC program |
| auto**N**.din | Autostart DIN file |
| refer**N**.din | Homing cycle program |

The characters **XX** stand in this case for the (variable) NC address (01...49) and the **N** for the channel number (1 or 2).

All DIN programs of the selected part project are also included.

## 3.3 Backup medium

Part projects and NC configuration data are filed on the backup medium.

Part projects are taken over as complete directories from the user path.

# 4 RED files

Set configuration data are stored in textual form in the RED files. There exists one such file for the NC interface in the OP (pnc.red) as well as in each case one for each NC (one each for each channel) in the NC file management (pnc1.red or pnc2.red).

Each RED file consists of a set of entries in the form:

*Designator = Contents*

Each entry must be in a separate line. Any number of blank characters can stand before and after the equal sign. A double hyphen at the line start identifies a comment and can thus be used for deactivating an entry.

A standard value which is used if no entry is provided exists for (almost) every designator.

Apart from the entries described below, further entries, which are required for test and diagnosis purposes, can stand in the files.

## 4.1 RED file in the Operator Panel

| Designator | default | Contents / Use |
|---|---|---|
| **Data paths (absolutely necessary entries)** | | |
| USERPFAD | | Path to the storage medium in which the user data are stored (part projects). |
| BACKUPPFAD | | Identification of the drive and path for all backup actions. |
| INTERNPFAD | | Path on the storage medium for read only internal data (language files, help files ... ) and default path for the conditionally necessary data paths. |
| **Conditionally necessary data paths** | | |
| TEMPPFAD | Internal path | Path on the storage medium in which all internal data of the operator interface should be stored, such as temporary files and session files. |
| AMKGLOBAL | Internal path | Path on the storage medium from which all global data of the operator interface should be read, such as error texts, AMK logo and font file. |
| **Parameterization of the BDE** | | |
| UserKeys | | max. 8 Ascii characters for allocating the <UK1>...<UK8> |

| Designator | default | Contents / Use |
|---|---|---|
| Sbus-Kanal | com2+ | Initialization string for the SBUS in the form:<br>*port [± [adr]] {, port [± [adr]] }*<br>port com1 - ser. interface1 of the PC<br>com2 - ser. interface2 of the PC<br>abksyn - fibre optic cable to ABK02<br>abkasyn - V422 on ABK02<br>+ Port undertakes master function<br>- Port is slave<br>adr phys. Sbus address of the port |
| LwlLicht | 1 | Luminance of the fibre optic transmitter on the ABK02 |
| Sbus-Timeout | 5.5 | Timeout time (in s) for file and command accesses through the SBUS |
| StartPause | 0 | Delay of the start of the operator interface (in 50 ms). |
| KeyDelay | 15 | Delay (in 50 ms) of the keyboard query for the softkey and manual movement keys. |
| Titel | 1 | Display and operation of the title picture:<br>0 - Title picture is not displayed<br>1 - Title picture is displayed during the start process<br>2 - Title picture must be confirmed by key<br>3 - Title picture must be confirmed by [M]+ [Enter] |
| StartOnLine | 1 | With <>0 the on-line module is started after start, with 0 the off-line module. |
| TRANS-SS | 0 | Number of the serial interface (Com) for serial transfer |
| TRANS-BOT | 2 | Start character for serial transfer |
| TRANS-EOT | 3 | End character for serial transfer |
| **Peripheral functions** | | |
| PeripherieDelay | 1 | Time interval (in 50 ms) of the peripheral query. |
| P_..... | | Definition of peripheral functions (see Commissioning item) |
| AX-SCHALTER | | Designations of the positions of the axis selector switch |
| **Adaptation of NC operating functions** | | |
| VB-JOG-NORM | 500 | Speed during the simple JOG movement |
| VB-JOG-FAST | 5000 | Speed during the fast JOG movement |
| MDI-AUTO-LF | 0 | The automatic LF function is switched on in the Mdi with <>0 |

| Designator | default | Contents / Use |
|---|---|---|
| ANZEIGEN | 1,0,... | List of the activated and deactivated display types |
| ANZEIGE | 0 | Active display |
| ANZEIGERATE | 0.2 | Repetition rate (in s) of the display freshening |
| POS-RUNDEN | 1 | Positions are rounded in the display with <>0 |
| TEST-REFER | 0 | A test is made before each start command (automatic or manual) whether the machine has executed the homing cycle completely with <>0. |
| **Linking** | | |
| VERKETTUNG | 0 | Parameterizable linking is used as linking program with 1, otherwise programmable. |
| VKT-NAME | | Name of the active linking program |
| VKM-PFAD | | Path to the program pool for the parameterizable linking |
| VKM-ANLAGE | | Name (and subpath) for the parameterizable linking |
| VKM-PLAETZE | | Number of machine locations |
| VKM-ZEILE0<br>VKM-ZEILE1<br>..... | | Is created for each reserved workplace of the parameterizable linking with the syntax:<br>*Name[,Offset±Register]* |
| VKM-TEILE | 0,0,... | State of the submasks in the parameterizable linking |
| **Entries which are used only for test purposes** | | |
| Starttrace | 0 | The inner functions of the program booting are displayed on the screen with <>0 |
| Debug | 0 | Activating different debug functions |
| TokenTimeout | ? | Setting the token timeout time |
| Pdu-Trace | 0 | All PDUs processed by the Sbus distributor are listed in the file "sbtrace.txt" with <>0. |
| NCSimulation | 0 | The NC is simulated with <>0. |

## 4.2 RED file in the NC

| Designator | default | Contents / Use |
|---|---|---|
| NC-Typ | 0 | 0=general; 1=part memory |
| Referenzart | 0 | Type of the common homing cycle 0=sequence, 1=program |
| Referenzfahrt | 0,0,... | List of the homing cycle priorities of the axes |
| Handradtyp | 0 | Set handwheel |
| SyncZJog | 1 | Factor for assessing the handwheel resolution |
| HandradLokal | 0,0,... | List of the axes with local handwheels |
| Fast-Nc-Prog-Start | 0 | The NC program start is executed without setting function with <>0. |
| ProjektName | | Active part project |
| DinName | | Active DIN program |

# 5 Layout of text files for error messages

There are two types of text files with defined layout for each error source (control module):

- Abbreviations
- Description texts (in different languages)

The files must be present in pure text format (PC8-Ascii) and must not contain any formatting commands (also no tabulators). The line end is identified by the CR-NL sequence.

### ❖ Abbreviations

These files serve for decoding the error numbers and error identifications in short term. They are broken down into sections for this purpose. Each section is introduced by an empty square bracket and serves for decoding one or several error numbers (function numbers). Each error number must stand in a separate line, consisting of error number and short text. Detailing of the error numbers in the form of the assignment of terms to error identifications can then be provided.

Comments are identified by two hyphens.

Example:

```
[]                              ⇨  Section start
2010  ERROR_SBMAN_VERT          ⇨  Error number 2010
2011  ERROR_SBMAN_BUS           ⇨  Error number 2011
2019  ERROR_WSP                 ⇨  Error number 2019
[*2019]                         ⇨  Start of detailing for error No. 2019
1     ERR_WSP_SP_FILE           ⇨  Error identification 1 for error No. 2019
2     ERR_WSP_GRF_UNDEF         ⇨        ....
3     ERR_WSP_ZIEL_START        ⇨
4     ERR_WSP_NC_NBEREIT        ⇨
5     ERR_WSP_FLSNCFKT          ⇨
6     ERR_WSP_TIMEOUT           ⇨
[]                              ⇨  Start of next section
```

Machine-related error numbers are possible for the PSU errors.

```
Example:    [*113*milling]    ⇨    Error number 113 of the „milling“ machine
```

### ❖ Description texts

The description texts contain detailed explanations for the abbreviations. They exist for each source module in different languages. Each explanation starts with a list of the abbreviations for which the following text applies, whereby an exclamation mark must stand directly before each designation and this always at the line start. The description text can extend over several lines, but must not contain any exclamation marks at the line start. The exclamation mark of the next short term serves as text end identifier.

Example:

!ERR_LADER_SERVER_NR_LESEN_RETURN
!ERR_BEDIENFELD_NICHT_AKTIV_ERROR
!ERR_NC_STATUS
!ERR_DIAGNOSE_DATEN
!ERR_DIAGNOSE_ERROR_KLASSE

The command which was sent to the NC through the SBUS received a negative acknowledgement from there.

It should be checked why the command could not be correctly accepted or executed!

!ERROR_SBMAN_VERT

The file names are defined as follows:

| | |
|---|---|
| Abbreviations | *QQQ.err* |
| Description texts | *QQQ_LLL.erh* |

The *QQQ* stands for the possible error sources:

| | |
|---|---|
| AZ computer: | AZR |
| NC kernel: | MC |
| PLC kernel: | PS |
| Operating program: | PNC |
| PLC-AWL: | PSU |

*LLL* stands for the language used:

| | |
|---|---|
| German | ger |
| English | eng |

The files for the PLC-AWL error messages do not exist yet but can be produced by the AWL programmer if needed.

# 6 Simulation of the NC in the OP

To activate simple NC simulation in the OP, the entry

NCSimulation = 1

must be present in the RED file. The simulation requires a file management which is created as path in the OP. This is searched for as standard under ‘c:\nc_prog\dv_ncsim\’. Should another be used, this must be defined as entry in the RED file

NCSimulationPath = .....

The path for the files of the simulation must exist before the program is selected. So that the simulation can work, the configuration files of the NC and of the OP must be present in this directory (can also be loaded with the OP program item ‘Commissioning - Load nc setup).

**! Caution: Simulation can be switched on only in some software versions!**

# 7 DNC-Data Format

## 7.1 Message Structure

Each message consists of a Header section and a Data section. These are framed by a single byte start and end character:

| BOT | Header | Data | EOT |
|---|---|---|---|

Each Header and Data sections can contain a number of entries. Each entry is on a separate line, terminated by a [CR]. The order of the entries is not important. Elements that are not required are not transmitted, so only some of the possible entries are transmitted.

Many entries consist of a Designator followed by text or a number, in which case they must be separated by a [SPACE].

### Start- and End Characters

These characters are configurable, or can be switched off completely. Default values are:

- BOT: 02 [^B]
- EOT: 03 [^C]

### Header

The Header consists of a Header block which can be framed by a start message and end message:

| BOK | Header block | EOK |
|---|---|---|

The start message (BOK) and end messages (EOK) are configurable, or can be switched off completely.

The following 3 Header block entries are possible:

| Designater | Parameter | Description | Example |
|---|---|---|---|
| MASCHINE | Text | Name of the maschine | MASCHINE Lathe |
| PROJEKT | Text | Name of the project | PROJEKT Part |
| TYP | P<br>W<br>N | DIN-program with number<br>Tool correction data<br>Zero point offset data | TYP P<br>TYP W<br>TYP N |

If no Project name is specified, the data is associated to the active (selected) project.

At present the MACHINE Designator is not implemented and can be omitted.

### Data

The Data section consists of a number of data block each with a number of entries. Each data block can begin with a start message. The entire Data section can be termibated by an End message:

| BOD | Data block | BOD | Data block | … | EOD |
|---|---|---|---|---|---|

The start message (BOD) and (EOD) are configurable, or can be switched off completely.

### DIN Program

The data block begins with the program number:

| Designator | Parameter | Description | Example |
|---|---|---|---|
| NR | number | Number of the program | NR 100 |

This is followed by the complete DIN program. The number of program lines is unlimited.

### Tool correction data

Tool Correction Data are a sequence of single tools. The data blocks start with the tool number:

| Designator | Parameter | Description | Example |
|---|---|---|---|
| NR | number | Marks the beginning of a new data block and contains the tool number | NR 16 |

This is followed by the following, in any order:

| Designator | Parameter | Description | Examole |
|---|---|---|---|
| LN | Maß | Tool length | LN 12.4 |
| RA | Maß | Tool radius | RA 0.7 |
| A? | Maß | Tool offset of assigned axis | AZ 20.5 |
| TA | Maß | Updated tool life | |
| TM | Maß | Tool life remainder | |
| TS | Maß | Alternative tool number | |
| TN | Maß | T-number | |

## Zero-point-offset data

Zero Point Offset Data are a sequence of single blocks. The data blocks start with the block number:

| Designator | Parameter | Description | Example |
|---|---|---|---|
| NR | number | Marks the beginning of a new data block and contains the corresponding number | NR 3 |

This is followed by the following, in any order:

| Designator | Parameter | Description | Example |
|---|---|---|---|
| A? | dimension | Offset along the specified axis | AZ 20.5 |

## 7.2 Examples

**Example for DIN-program:**

```
PROJECT LATHE
TYP P
NR 100
%100
G01 X100 Z100 F10000
G01 X0
G04 X10
M30
```

### Example Tool correction data (Standard):

```
PROJECT LATHE
TYP W
NR 1
RA 0.9
AX 100
NR 2
RA 0.5
NR 5
RA 0.5
AX 80
AZ 2
```

### Example Tool correction data (with start- and endtext):

```
TXA                    -> starttext for head
PROJECT LATHE
TYP W
TXE                    -> endtext for head
DATA                   -> starttext for data
NR 1
RA 0.9
AX 100
DATA                   -> starttext for data
NR 2
RA 0.5
DATA                   -> starttext für data
NR 5
RA 0.5
AX 80
AZ 20
DATE                   -> endtext for data
```

# 8 I / O Definition

12 Input and 4 Output ports are supported and addressable by the user. The physical addresses of the ports must be in the RED file. The port addresses can be seen in the menu item „Commisioning - Diagnosis - Perpherals“ under the port addresses.

Direct Input and Output

If the port addresses are not set in the RED file, default direct inputs are defined 300H...303H and 310H...317H and direct outputs are defined as 300H...303H. The port addresses can be seen in menue item „Startup-Diagnosis-Peripherals“. To change these preset addresses, the keywords IN or OUT must be used in the RED file. For example the entry:

```
OUT=0x220,0x221
```

defines the four output ports as: 220H, 221H, 302H and 303H

Ein- und Ausgabe über CANopen-Module

To use the module for I/O, the CAN ID list of the module must be defined in the RED file. For example:

```
CAN-ID=1,5,7
```

The inputs and output ports are then assigned to the module in numerical order. Individual ports can be masked out by the IN or OUT keywords in the RED file. For example:

```
OUT=CAN0,CAN2, CAN3,CAN4
```

Mixed Input and Output

The IN and OUT keywords can also be used to mix dirct I/O with CANopen ports in the RED file as described above. It is important to use the CAN-ID keyword to differentiate them.

An offset value must be defined as follows:

**Definition of an offset mask:**

Designator = Type : Number , Element

| | |
|---|---|
| Designator: | Any term of maximum 18 characters; this term is displayed after calling the online correction |
| Type: | wz - for tool correction data<br>np - for number zero point offset data |
| Number: | Data block number (1...40 for TC), (1...7 for ZPO) |
| Element: | Name of the the data block element |

- Axis name
- L - for tool length offset
- R - for tool radius offset

Example: Length = wz : 1 , X

Blanks are permissible within the line. With 2 hyphens (--) at the beginning the line has no effect.

# 9 Impressum

**Title** **NC-Commissioning**

**Objective** **Commissioning of the operation panel**

**Part-Number** **27878**

**History**

| Date |
|---|
| 1998/08 |

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**Service**

Tel.: **+49/(0)7021 / 5005-191, Fax –193**

Business Hours:
Mo-Fr 7.30 - 16.30, On weekends and holidays calls are forwarded to an emergency response number by the automated answering system.

To assure a fast and accurate response to solve customer problems we ask for your cooperation in providing us with the following information:

- Nameplate data
- Software version
- System configuration and application
- Description of problem and presumed cause of failure
- Diagnostic message ( error code )

**Publisher**

AMK Arnold Müller Antriebs- und Steuerungstechnik GmbH & Co. KG
Gaußstraße 37 – 39, 73230 Kirchheim/Teck

Tel.: 07021/5005-0, Fax: 07021/5005-176
E-Mail: info@amk-antriebe.de

**For further information** www.amk-antriebe.de