AMK

AMKASYN

VARIABLE SPEED DRIVES

AZ-MC1
Multi point
Multi channel
CNC contouring control

Short description
System overview

Subject to change without prior notice.

<Sys9827e.doc>

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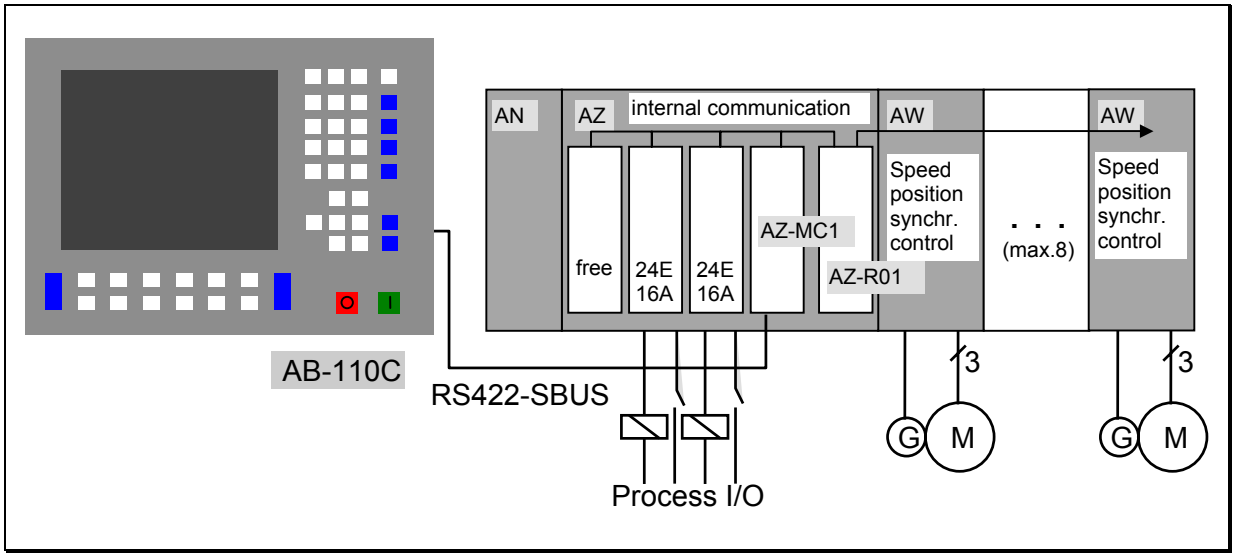
1.1 System overview



The CNC-controller AZ-MC1 is a powerful contouring control system based on a modern 32-bit technology which can be used in different production technologies and which is suitable for robotics. It can be plugged into the AZ module of the AMKASYN drive system.
The AZ-MC1 controller comprises all essential NC functions and can be regarded as an stand-alone NC-controller (interpolator, decoder, NC-data storage, mode control (MC), technology data processing) without operator panel.

The data link of the AZ-MC1 controller to the operator panel/programming unit takes place via the AMK SBUS (serial RS422 or optical fibre). This interface supports all necessary data types for the operator process control (commanding and display), NC programs, machines and drive parameters, controller configuration etc.

PC based systems, e.g. AB 110C, are available as operator panels. The data exchange between controller and drive system takes place via the internal bus in the AZ module.
This means:
- Digital setpoint /actual value linking and thus maximum accuracy
- Access to all drive data even from operator communication system
- No additional interface between controller and drive
- No wiring between controller and drive

Up to 8 numerical axis can be controlled. The physical axes can be assigned by configuration of different linear, path, spindle and synchronous axes.

The integrated user programmable interface controller (PS) permits the execution of machine specific functions. I/O cards (AZ-EAx) plug able in the system form the edge elements of the binary I/O interface.

The controller processes programs according to DIN 66025. Linguistic elements extended with respect to DIN for direct and indirect parameter calculation, for mathematical function calculation (sine, cosine, tangent, logarithm...) and for control of the NC-program flow (loops, conditions, branching...) are implemented.

AMK numeric control applications are

- CNC drilling and milling machines
- CNC working centres
- CNC transfer lines interlinking up to 20 single stations
- CNC lathes
- CNC saw blade grinding machines
- handling technology
- Load and unload stations

1.2 Overview of the NC functionality

NC functionality		
Number of drives per unit	1 - 8	
Number of logic axes per unit	up to 12	
Axes per unit which can be interpolated commonly	2 - 8	
Synchronous axis programmable to different master axis	M27,M28	thread in S word
2 independent spindles can be configured	M3,M4,M5 M13,M14,M15	
Kinematic transformation	linear/ rotativ, Scara	cartesianally programmable
Number of NC channels per unit	up to 2	
Axis designation	X,Y,Z,A,B,C, U,V,W,..	configurable
Position increment	.01 /.001/.0001 mm/inch/ degree/rd	configurable
Maximum path length +/-	200000.0000 mm	
Closed-loop position control cycle time	0.5 ms	
Interpolation cycle time	Standard 8 ms (4/2ms)	depending on number of config. axes
Block cycle time	in interpolation cycle time	
Max. feedrate (0.0001 mm position resolution, for rapid traverse and processing)	208 m/s	with 4ms interpolation cycle time
Part(s) program storage	128 kB	battery-backed CMOS-RAM
Binary I/O	I/O cards	

NC Programming		
Programming with extended DIN 66025	$IF,$WHILE,..	similar to „C-language“
Rapid traverse	G00	
Interpolation	G01 G02/G03	linear circular cw / ccw
Dwell time	G04 X[sec]	
Delay at block start/end	G08/G09	initial state: G08 G09 effective per block
Plane selection	G17/G18/G19	
Rounding of linear blocks	G36/G37	ON/OFF
Area switching over with kinematic transformation	G38/G39	
Tool radius compensation	G40/G41/G42	inactive/left/right of contour
Tool length compensation	D00/Dxx	inactive/active
Programmable coordinate offset	G53 G54/..../G59	inactive Offset 1/.../Offset 6
Exact positioning	G60,G61,G62	
Override switching-off	G63	set to 100%
Input system	G70/G71	Inch/mm
Programmable homing cycle	G74	
Co-ordinate input	G90/G91	absolute/incremental
Revolutional feedrate	G94/G95	OFF [1/min] / ON [mm/rev]
Programmable software limit switch	G98/G99	pos./neg. direction
Absolute circle centre	G161	
Relative circle centre	G162	initial state
Tool compensation data record	D1 - D40	
Feed	F in [mm/min]	
Tool position selection	T1 - T40	
Block number	N0 - N99999	
Definition of circle centre	I/J/K	
Programmable halt	M00	
Optional halt	M01	
Clockwise (CW) spindle start	M03 (M13)	()-Spindle 2
Counter-clockwise (CCW) spindle start	M04 (M14)	()-Spindle 2
Spindle stop	M05 (M15)	()-Spindle 2
Spindle orientation	M19 (M22)	()-Spindle 2
Constant cutting speed	M18 (M21)	Master axis freely configurable
Synchronisation of axis groups	M26	e.g. line and path
NC sub program end	M29	
NC program end	M30, M2	
Programmable acceleration override	M96 S100	S indication in %
Machine functions (M-) (NC output functions to integrated PLC) with different handshake mechanisms		freely configurable, can be freely assigned to the PLC input image
Tool change	M06	Example for M functions
Cooling	M07/M08/M09	
PS-H functions	H0 - H255	per configuration
Block masking out	„/“	
Call of global subprogram	Lxxxx	
Call of local subprogram	LLxxxx	

Programming with extended DIN 66025	**$IF,$WHILE,..**	**similar to „C-language“**
Linguistic construct of extended DIN to influence flow of NC program processing	IF/ELSE WHILE/FOR DO, CASE SWITCH	
Parameters	R1-R255	
Parameter passing from PLC	R1000...	Parameters in Data block
Extended DIN for mathematical basic arithmetical operations	+,-,*,/	
Extended DIN for mathematical functions	ABS/SQR SQRT/LN /LOG EXP/DEXP SIN/ASIN COS/ACOS TAN/ATAN INT/FRACT ROUND	

Tool management		
Tool management data for tool life alternative tool tool break	TLIFE, TRES, TALT, TLOC, TWARN	special commands to access tool life data from NC program

Operating modes		
Automatic with: Single block, Block masking out („/“) Repositioning		
Manual with Jog, Step and Handwheel		
MDI		Manual Data Input

2 System components

The AMKASYN MC1-contouring control system consists of the following components:

-**AZ-MC1**	Card with CNC- and PS-software module for 1 NC-channel	
-**AZ-MC1-2**	Card with CNC- and PS-software module for 2 NC-channels	
-**AZ-K03**	Card for optical fibre link (option)	
-**AMKASYN**	-Basic system:	AN (main module) AZ (central module), AW (inverter modules) DV and DH motors
-AZ-EA24	I/O cards for periphery linkage	
-**AB-110C**	PC operator panel with RS422 interface	
-**AB-K02**	Card for optical fibre linkage to operator panel	
-AB-EA16	PC-card with 16 opto-isolated inputs	
-AB-CAN	PC-card with CAN-Controller for connecting CANopen® I/O-Modules	
-AB-TS1	Keyboard-option	
-**AB-MB1**	Machine operator's panel. Front board with AMK-Logo	
-**AB-HG1**	Hand-held controller	

2.1 AZ-MC1 (CNC computer card)

The AZ-MC1-card with implemented CNC- and PS-software modules is the „heart" of the AMK-CNC contouring control. The installation of the AZ-MC1 card expands the AMKASYN-basic system to a CNC-contouring control system with integrated **P**rogrammable Interface **C**ontroller (PS). For the linking of an operator panel (PC-operator panel, miniature operator panel) a standard RS422-interface is available.

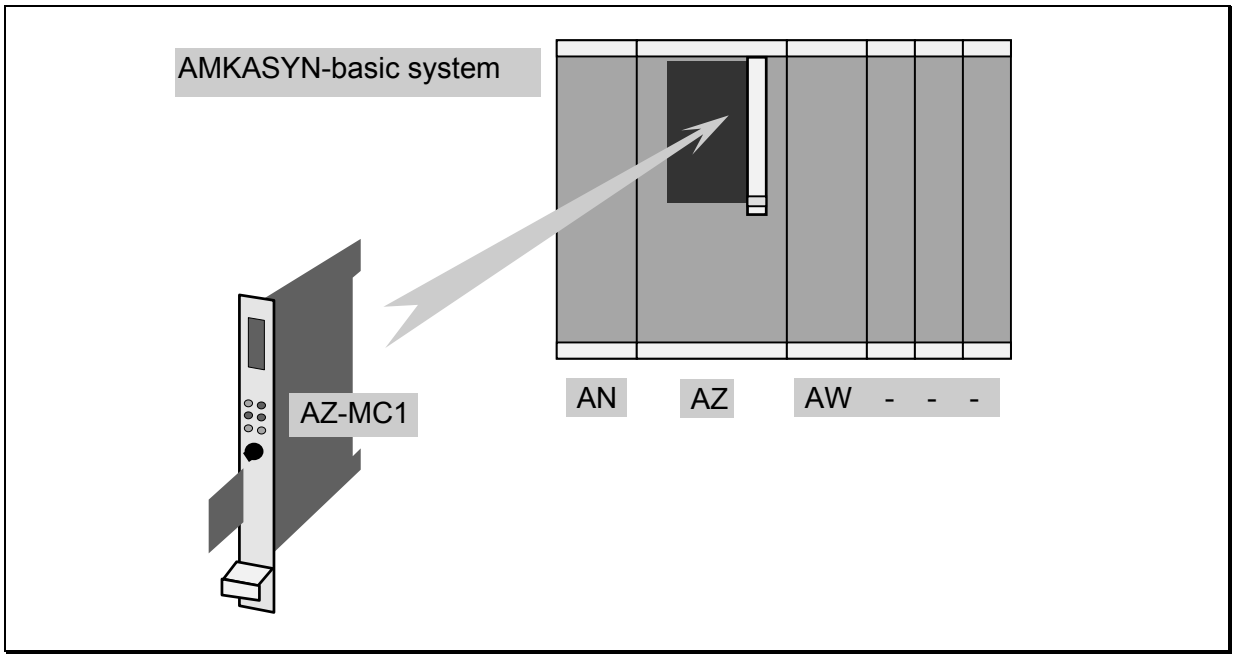


Abb.2.1: Integration of the AZ-MC1 card

2.2 AZ-K03 (optical fibre option)

By connecting AZ-MC1 with an AZ-K03 card it becomes part of a multipoint CNC-contouring control which can be linked via an optical fibre (LWL). The transfer rate is 2Mbit/s. The AZ-K03 card is directly connected with the AZ-MC1 card via a local processor bus. The connected pair of cards is plugged in the AMKASYN-basic system. For this 2 optional slots are needed.

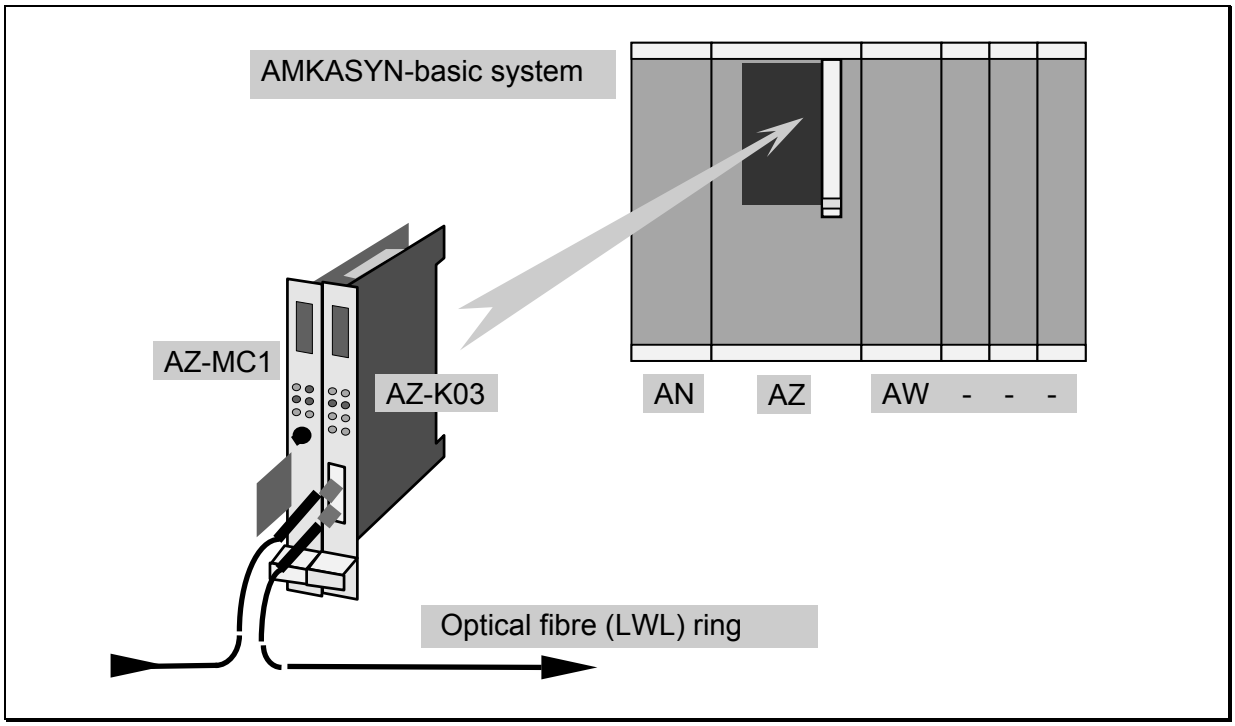
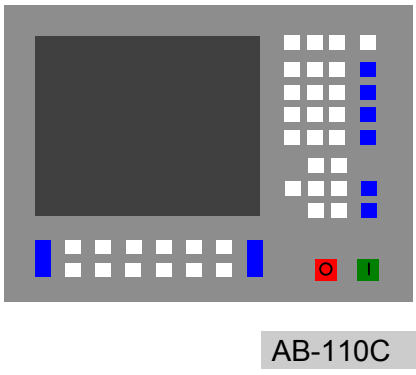


Abb.2.2: AZ-MC1 with optical fibre option (AZ-K03)

2.3 AB-110C (PC operator panel)

The AB-110C operator panel with MC1-operator software has an operator interface on PC basis geared to the MC1-contouring control system. As a standard it is directly connected with the AZ- MC1 card in the AMKASYN basic system via an integrated RS422-interface. The operator panel consists of the following components:



-10.4’ TFT-Display
-Operator keyboard
-PC-keyboard option (AB-TS1)
-4MB or 10MB flash disc for operation program and data storage
-16potential-free inputs
-optional CAN-Interface for standard I/O-modules
-1 RS422-interface for direct connection with AZ-MC1
-1 RS232-interface for data transfer

Abb.2.3: PC-operator panel

2.4 AB-K02 card (optical fibre option for operator panel)

In connection with the PC-plug-in card AB-K02 the PC-operator panel becomes an operator station for linked AMKASYN-CNC contouring controls.

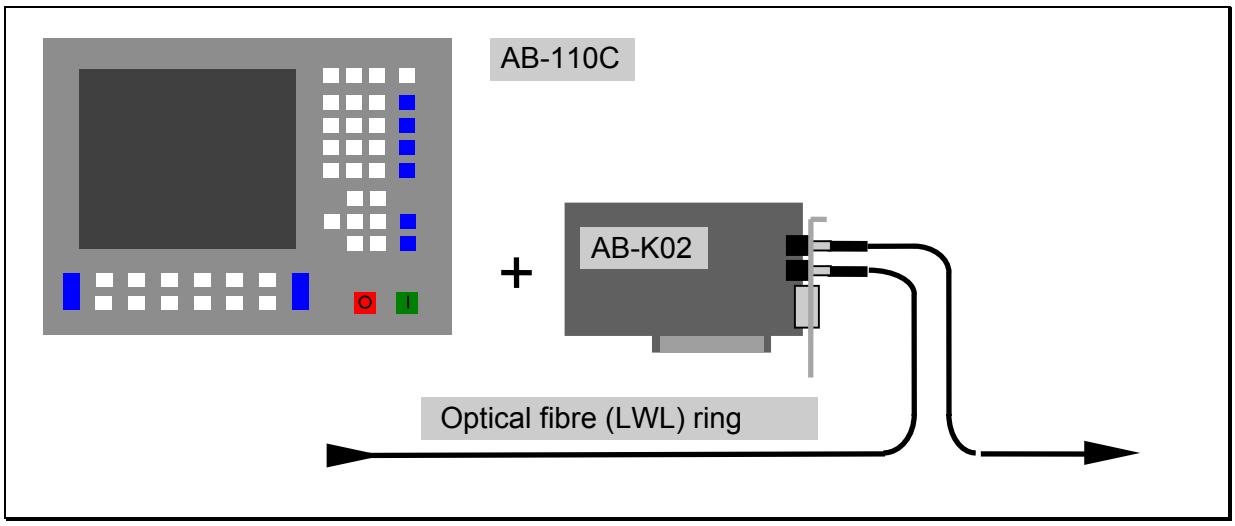


Abb.:2.4 AB-110C with option AB-K02 for multipoint CNC

2.5 Machine controls

For connection to the PC-operator panel the following machine controls are available:

- AB-MB1 machine operator panel
- AB-HG1 hand-held controller

Further custom-designed keys or switches can be connected directly with the operator panel via I/O card or via optional CAN-card and standard I/O modules.

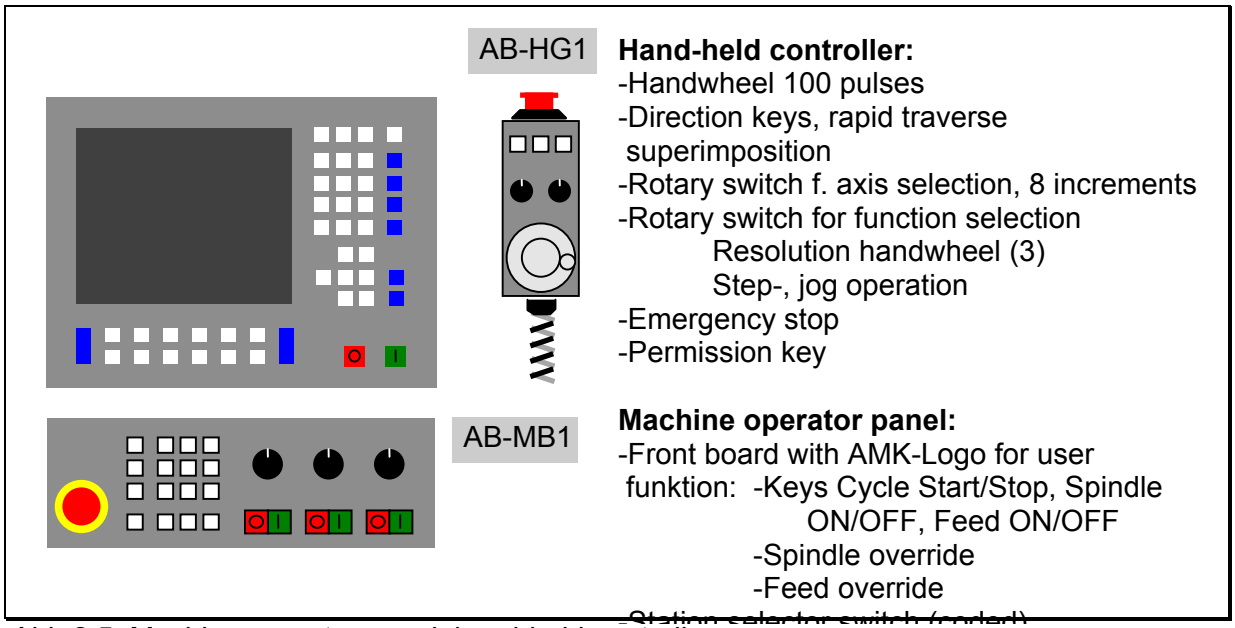


Abb.2.5: Machine operator panel, hand-held controller

3 System project planning

3.1 Single system

For single machines the standard RS422 connection between operator panel AB-110F and AZ-MC1 is provided. With the 3964R-protocol supported on AZ-MC1 by the PS-software even other operator panels, such as the AMK-miniature terminal (AB-202L), can be connected to the RS422-interface.

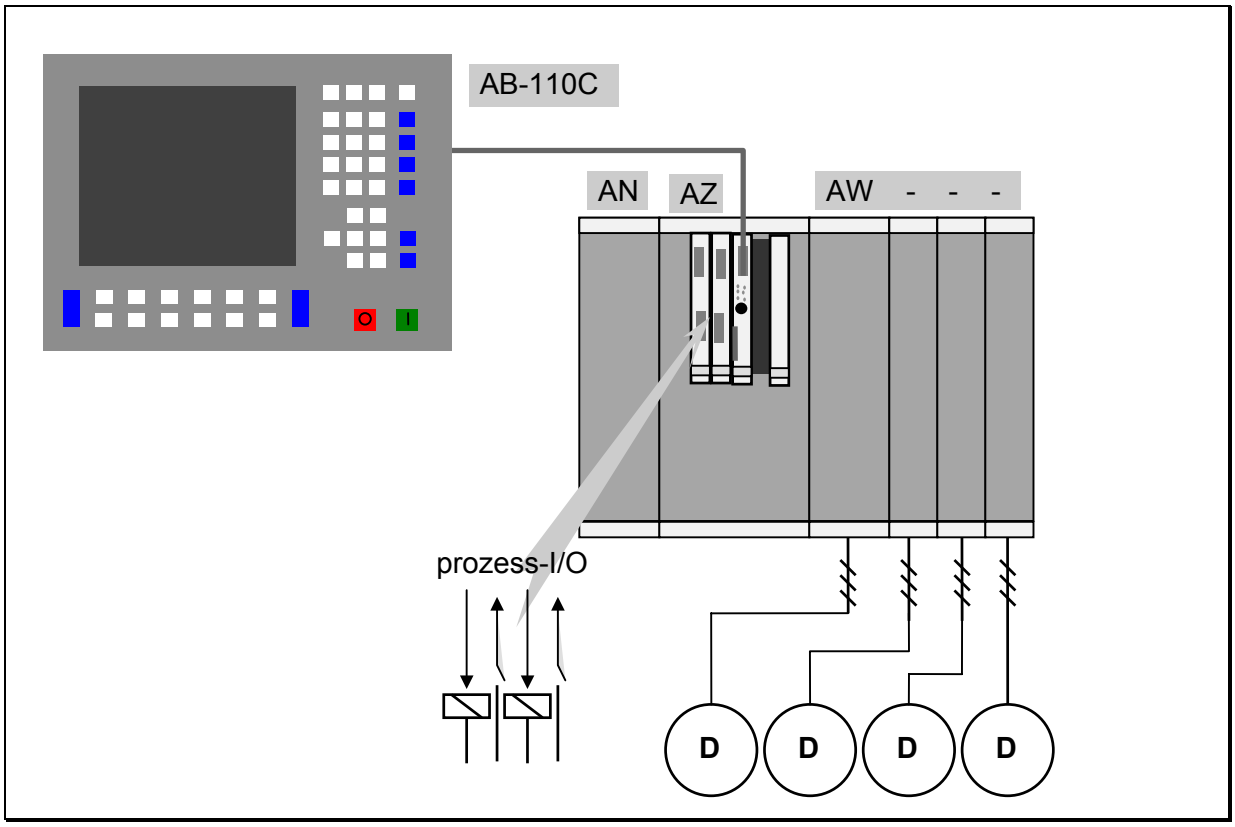


Abb.3.1: Connection AB-110C and AZ-MC1 in the AMKASYN-basic system

3.2 Multipoint CNC (interlinking)

The optical fibre (LWL) options permit the implementation of interlinked multipoint-CNC-contouring controls. With this up to 20 stations can be operated from an operator station. The optical fibres between the single stations can be up to 40m long. The operating software supports control of interlinked machines as transfer lines.

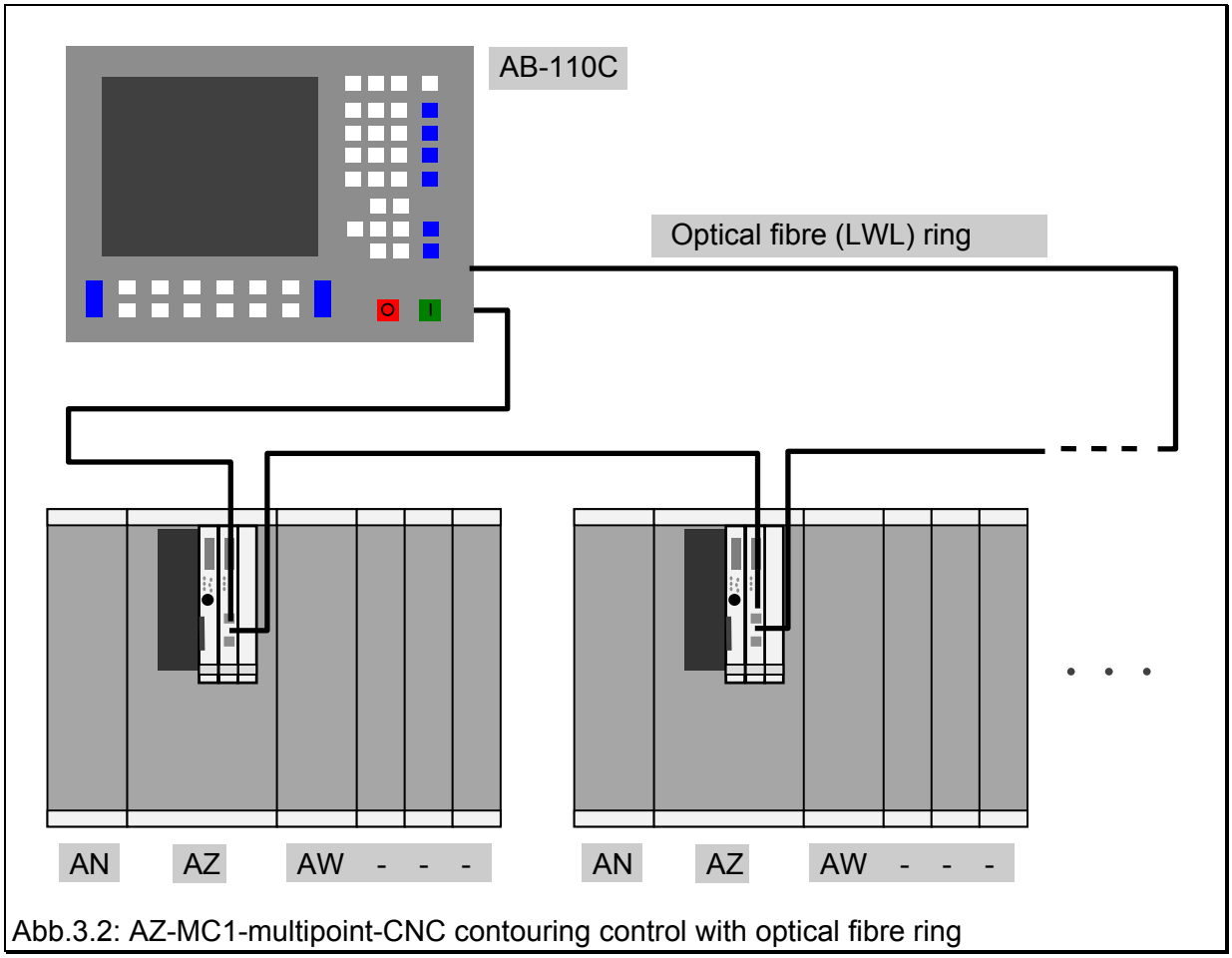


Abb.3.2: AZ-MC1-multipoint-CNC contouring control with optical fibre ring

3.3 Configuration

The configuration of the NC is made according the wishes of the customer. AMK needs the configuration table as shown below to build the NC- basic configuration files (to fix axes names, AW-assignment, axis-types,..). Changes of axes data can made directly with the operating panel.

machine name:		(max. 8 characters)	channel:	

	name	attribute	AW-NR	log. NR.	comments
	X,Y,..	lin/rot	1..8	1..16	
contouring axis					the first 3 axis are contouring axis each other axes follows the contouring axis
following axis					following axis were interpolated with the contouring axis: arrival at the end position at the same time as the contouring axes The maximum number of contouring and following axes is 8.
straight cut axes 1					Each straight cut axis is independent programmable and movable from a contouring axes.
straight cut axes 2					
spindle 1					1. and 2. speed controlled axis
spindle 2					
synchron					Master-assignment in AW-parameters

Abb.3.3: Configuration table

4 Impressum

Title **AMKASYN System overview CNC**

Objective

Part-Number **27885**

History

Date
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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)

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