AMKAMAC A4/A5 Controller

Compact, scalable, powerful.

AMK

AMK

The new controller A4/A5

The latest generation of the AMKAMAC controllers delivers top performance in a space-saving package. With its extremely compact dimensions as cabinet controller and controller with visualization, it fits optimally into your machine design.

The AMKAMAC A4/A5 is the optimal solution for controlling machines and systems. The controller demonstrates its full potential in central as well as modular machine controller designs. With EtherCAT as real-time fieldbus, there are practically no limits to the number of devices on the bus. For modular machine designs, the AMKAMAC A4/A5 features a synchronized cross-communication to other controllers in the system.

Included in the AMKAMAC control system are not only the hardware components, but engineering tools, web visualization, technology functions and application software as well. This reduces your development efforts and your machine is completed quicker.

The communication interfaces via Ethernet and USB offer flexible possibilities to access the control. PLC programs can be loaded easily. Remote maintenance and diagnostics are done all the way into the drive. Data exchange with other programs is possible with the OPC server. Process data can be accessed and managed.

BENEFITS

- Scalable all-in-one solution
- Open for all machine designs
- Thorough remote maintenance concept
- Powerful technology functions
- High-performance engineering tools

The space-saving all-in-one solution.

PLC functionality, motion control, comprehensive technology functions.

AMKAMAC A4/A5 is the new generation of controller for stand-alone machines, modular machines and systems.

The controller uses a real-time Linux operating system, features a compact design and does not have any rotating parts. An ATOM processor is built into the powerful A5.

Several different models of the controllers are available. These include A4S/A5S drive cabinet mounted controllers as well as smart-Panels as a single design unit consisting of a controller and 7", 9", 12" or 15" touch panel. For versions equipped with I/Os, analog inputs and digital inputs/outputs are available for direct connection right on the device. The devices with fieldbus master and slave are extremely well-suited for modular machines and systems.

With a jitter of less than 30 ns in the fieldbus, a highly precise synchronization amongst the sensors and actuators is ensured. This is also available even if the fieldbus devices are located on different hierarchical levels.

Engineering tool

AIPEX PRO integrates all engineering tools that are needed during the service life of a machine, for example, programming, visualization, parameterization, startup, optimization and diagnostics.

Programming

The proven reliable programming platform CoDeSys in successful use around the world, is integrated in AIPEX PRO, enabling you to program according to IEC 61131-3. Additionally, the powerful Motion Control and Technology functions for easy programming of machines and systems are available, such as:

- Virtual master
- Electronic cam
- Printing mark control
- NC motion

Visualization

You create your machine visualization with the graphic functions of the integrated visualization editor and build upon preprogrammed visualization modules.

An additional visualization tool that is available is Qt, a program featuring many advanced design elements. Both programming and operation are a snap.

Remote maintenance and diagnostics

You can access the machine control and the bus devices from any location.

Properties

- Freely programmable with CoDeSys according to IEC 61131-3
- High-precision synchronization of multiple axes with only a single controller
- Cross-communication in real-time across several levels, synchronized with high precision
- EtherCAT master and slave (optional)
- Data exchange with other software via OPC server, integration with ERP system
- Real-time Linux
- Power failure-safe process data memory without battery
- No UPS required
- No rotating parts

AMKAMAC A4/A5 interfaces

I/Os with single- or triple-conductor technology

- 2 analog inputs, ±10 V with 10 V reference voltage output
- 1 square-wave input

I/Os with single- or triple-conductor technology

- 8 digital inputs, 24 V, 30 µs, potential-free

I/Os with single- or triple-conductor technology

- 2 digital probe inputs, 24 V, 180 ns, potential-free
- 4 digital outputs, 24 V, 500 mA, potential-free
- 2 digital outputs, 24 V, 500 mA, potential-free with time stamp

Inputs

Inputs

Inputs/outputs

Ethernet, LAN

USB host
USB client

RTE slave

RTE master

ACC (CAN)

Ethernet, LAN

- Load PLC programs
- Diagnostics all the way into the drive
- Remote maintenance
- OPC access by external programs
- Provisioning of process data
- File transfer by FTP
- Firmware update
- WebVisu

USB

- Transfer PLC programs offline
- Transfer parameters offline
- File exchange
- Firmware update

RTE Real-time Ethernet Slave

- Cross-communication
- Synchronization between fieldbuses
- EtherCAT
- Profibus (no RTE, X41 port)
- ProfiNet
- Ethernet/IP

RTE Real-time Ethernet Master

- EtherCAT
- 255 bus devices
- 500 µs cycle time

ACC (CAN)

- Fieldbus master
- Synchronous to RTE Master

Technical data – A-series.

AMKAMAC A4 cabinet controllers

Models	A4S-M00	A4S-MC0	A4S-M0E	A4S-MCE
Processor	ARM11 with 500 MHz			
RAM memory	512 MByte			
Flash memory	256 MByte			
Remanent memory	128 MByte			
Ethernet	1 x 10/100 Mbps	2 x 10/100 Mbps	1 x 10/100 Mbps	2 x 10/10 Mbps
Fieldbus master	EtherCAT, ACC (CAN)			
Fieldbus slave	–	Optional: see accessories	–	Optional: see accessories
I/Os	–	–	Yes	
USB	Host and client			
Programming	IEC 61131-3, CoDeSys, optional PLCopen			
Performance	50 000 instructions per ms			
Visualization	A4-VIS for WebVisu or Qt			
IP class	IP20			
Ambient temperature	0 – 45 °C			
Power supply	24 VDC, 6 W	24 VDC, 9 W	24 VDC, 8 W	24 VDC, 11 W
Weight	approx. 0.8 kg			

AMKAMAC A4 smartPanel   ... and A4 panel

Models	A4D-M00-07T A4D-MC0-07T A4D-M0E-07T A4D-MCE-07T	A4D-P00-07T
Basic controller	A4S-M00, A4S-MC0, A4S-M0E, A4S-MCE	–
Touch display	7" colour TFT, diagonal: 17.8 cm, WVGA 800 x 480	
IP class front/other	IP65/IP20	
Visualization	WebVisu: integrated, Qt: optional	Display of WebVisu or Qt
Power supply	24 VDC, max. 14 W	
Dimensions	220 x 160 x 81 mm	
Weight	1.7 kg	

AMKAMAC A5 cabinet controllers

Models	A5S-M00	A5S-MC0	A5S-M0E	A5S-MCE
Processor	ATOM with 1.1 GHz			
RAM memory	512 MByte			
Flash memory	512 MByte			
Remanent memory	128 MByte			
Ethernet	1 x 10/100 Mbps	2 x 10/100 Mbps	1 x 10/100 Mbps	2 x 10/100 Mbps
Fieldbus master	EtherCAT, ACC (CAN)			
Fieldbus slave	–	Optional: see accessories	–	Optional: see accessories
I/Os	–	–	Yes	
USB	Host and client			
Programming	IEC 61131-3, CoDeSys, optional PLCopen			
Performance	200 000 instructions per ms			
Visualization	A5-VIS for WebVisu or Qt			
IP class	IP20			
Ambient temperature	0 – 45 °C			
Power supply	24 V DC, 9 W	24 V DC, 12 W	24 V DC, 11 W	24 V DC, 14 W
Weight	approx. 0.8 kg			

AMKAMAC A5 smartPanel

Models	A5D-M00-07T A5D-MC0-07T A5D-M0E-07T A5D-MCE-07T	A5D-M00-09T A5D-MC0-09T A5D-M0E-09T A5D-MCE-09T	A5D-M00-12T A5D-MC0-12T A5D-M0E-12T A5D-MCE-12T	A5D-M00-15T A5D-MC0-15T A5D-M0E-15T A5D-MCE-15T	A5D-M00-15T A5D-MC0-15T A5D-M0E-15T A5D-MCE-15T
Basic controller	A5S-M00, A5S-MC0, A5S-M0E, A5S-MCE				
Touch display	7" colour TFT, diagonal: 17.8 cm WVGA 800 x 480	9" colour TFT, diagonal: 22.7 cm WVGA 800 x 480	12" colour TFT, diagonal: 30.5 cm SVGA 800 x 600	15" colour TFT, diagonal: 38.1 cm XGA 1024 x 768	15" colour TFT, diagonal: 38.1 cm XGA 1024 x 768
IP class front/other	IP65/IP20				IP69K/IP20
Visualization	WebVisu: integrated, Qt: optional				
Power supply	24 V DC, max. 17 W	24 V DC, max. 21 W	24 V DC, max. 18 W	24 V DC, max. 21 W	24 V DC, max. 21 W
Dimensions (WxHxD)	220 x 160 x 81 mm	273 x 195 x 81 mm	330 x 266 x 81 mm	410 x 310 x 85 mm	410 x 310 x 85 mm
Weight	1.7 kg	1.9 kg	2.7 kg	3.9 kg	4.5 kg

AIPEX*PRO*

E n g i n e e r i n g T o o l

PLC programming

Technology functions

Machine setup

Visualization

Diagnostics

Motion control

Remote access

Engineering and programming.
With AIPEX PRO.

AIPEX PRO integrates all engineering tools that are needed during the service life of a machine, for example, programming, visualization, parameterization, startup, optimization and diagnostics. This does away with time-consuming adjustments made, for example, between your PLC program (with the drive parameters) and the configuration of the exchange of user data via the fieldbus. AIPEX PRO runs fully automatically here and performs all work for you that does not relate directly to your application. This leaves you with time to focus on the truly important aspects of your application.

Configuration

With the hardware configuration, you compile all the components of your drive system from a data base (motor, inverter, controller module, optional cards, controllers, I/O modules).

Programming

The proven programming platform CoDeSys, in successful use around the world, is integrated in AIPEX PRO. All programming languages according to IEC 61131-3 are supported and can even be combined within a project. Program in the preferred language. Programming modules are available in a number of libraries.

In the development environment, the visualization and the base library are cornerstones for the automation solution. This library contains a large number of basic modules such as mathematical functions and logic modules (timer, counter, etc.).

Libraries

This tool offers you a number of pre-programmed motion control and technology functions.

Motion control libraries

These modules contain the basic functions of the machine controller. These include electronic camshaft control and the cam function.

Technology functions

You can further streamline your engineering processes by using the technology functions, including, for example, the functions: tubular bag, printing mark control, winder and cross cutter.

PLCopen

Libraries according to the PLCopen standard are also available.

Visualization

Create your machine visualization with the graphic functions of the integrated visualization editor and build upon prefabricated visualization objects. Using the suitable hardware, you can access the web visualization in the AMK controllers around the world.

Remote maintenance and diagnostics

You have access to the machine controllers and the drives from any location.

Using the update tool included with AIPEX PRO, you can update your firmware fast and easily.

B E N E F I T S

- All programming languages according to IEC 61131-3
- Economically design of your machine software
- Reduction in time-to-market for your machine
- Possible to create innovative machine designs using drag & drop
- Many pre-programmed AMK technology functions
- Integrated web visualization which can be accessed anywhere in the world

Programming in CoDeSys.
Simple and efficient.

With the CoDeSys development platform designed in accordance with IEC 61131-3 and in successful use around the world, you can use any programming language covered by the standard and combine them according to your needs. You can exchange your PLC programs quickly and easily between the different controllers. The runtime system, code generator and programming system are fully compatible, something which significantly reduces the amount of programming you need to do. The user-friendly interface makes it easier for you to create your application.

Properties	Description
Programming Languages	• Instruction List • Structured Text • Function Block Diagram • Ladder Diagram • Sequential Function Chart • Continuous Function Plan Editor
Visualization	Integrated
Library Manager	• CoDeSys Basic Libraries • AMK Libraries • User Libraries
Development Environment	• Program input acc. to IEC 61131-3 • Setting of break points • Starting and stopping the PLC program • Step-by-step processing • Monitor and describe PLC variable • Graphical plotting of variables
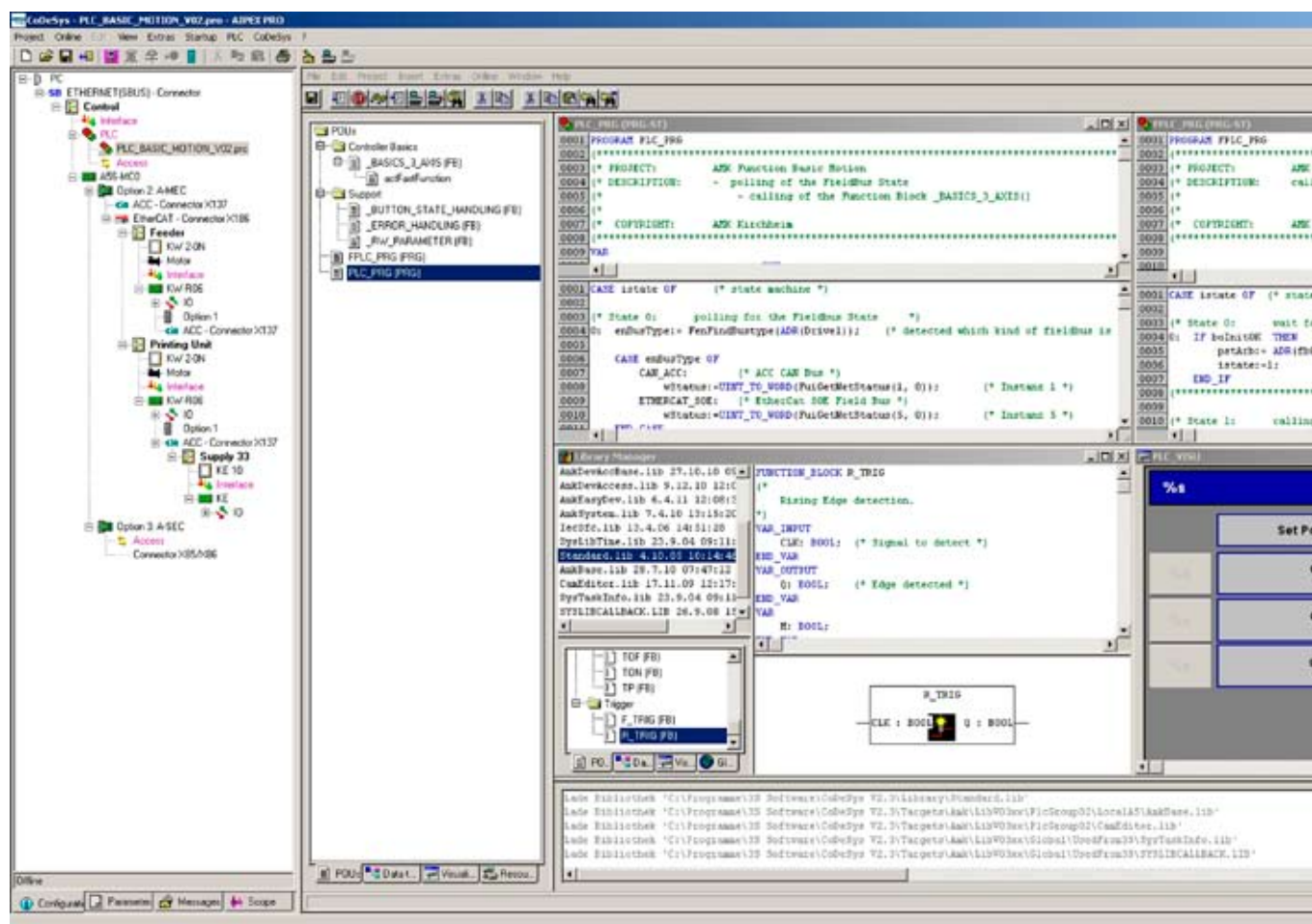
Programming tool with the use of several different programming languages and an integrated visualization tool

Libraries.
Pre-programmed motion control and technology functions.

Regardless of what AMKAMAC control device you choose, you will have a wide selection of technology functions available to you.

The AMK technology library is another tool that helps reduce your programming work to a minimum. Leverage our expertise in controller technology for your success: We control the movements – you focus on your application.
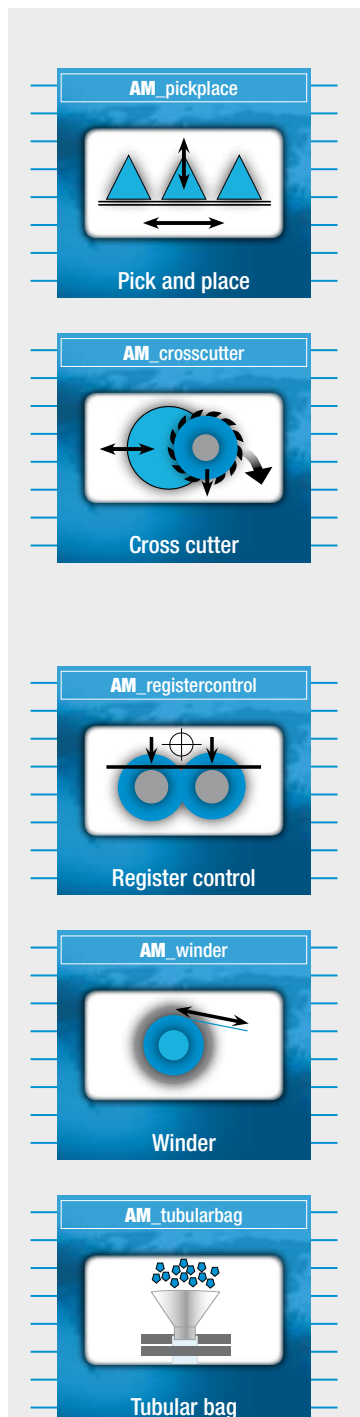
Integrated standard functions such as:

- Probe functions
- Reading/writing drive parameters
- Communication via fieldbuses and Ethernet using TCP/IP and UDP
- Access to all system parameters and functions

Pre-programmed motion control functions such as:

- Complex controllers
- Positioning
- Electronic transmission
- Virtual masters
- Electronic cams
- Electronic cam controls

BENEFITS

- Streamline the engineering process using function blocks
- Save time and money for programming
- Design your machine more quickly
- Proven motion control functions
- Easy to maintain and service your application software
- Low training costs

AM_pickplace

Pick and place

AM_crosscutter

Cross cutter

AM_registercontrol

Register control

AM_winder

Winder

AM_tubularbag

Tubular bag

Technology functions, including:

Pick and place.

With the help of the spline function the path is automatically calculated on the basis of specified and taught points. For precise lifting or placing of, for instance, packets or stock you have a predefined, special approach and withdraw function.

Cross cutter or flying saw.

You can use this technology function to your advantage not just for cutting of paper, wood and metal, but rather also for printing, labeling and inspection of products: While the material is being fed or the master axis is continuing to run, the slave axis with the saw blade or knife must exactly follow the forward movement and move to a previously defined point.

Register control.

With the register control library function, also called printing mark control, a cut can be carried out according to the printing mark. Two products that come from different transport feeds can also be synchronized.

Winder.

The winder technology function offers you wind and unwind functions. Whether with a dancer, with a pressure load cell or without a sensor, the fast implementation of your application solution can be realized quickly and easily with this technology function.
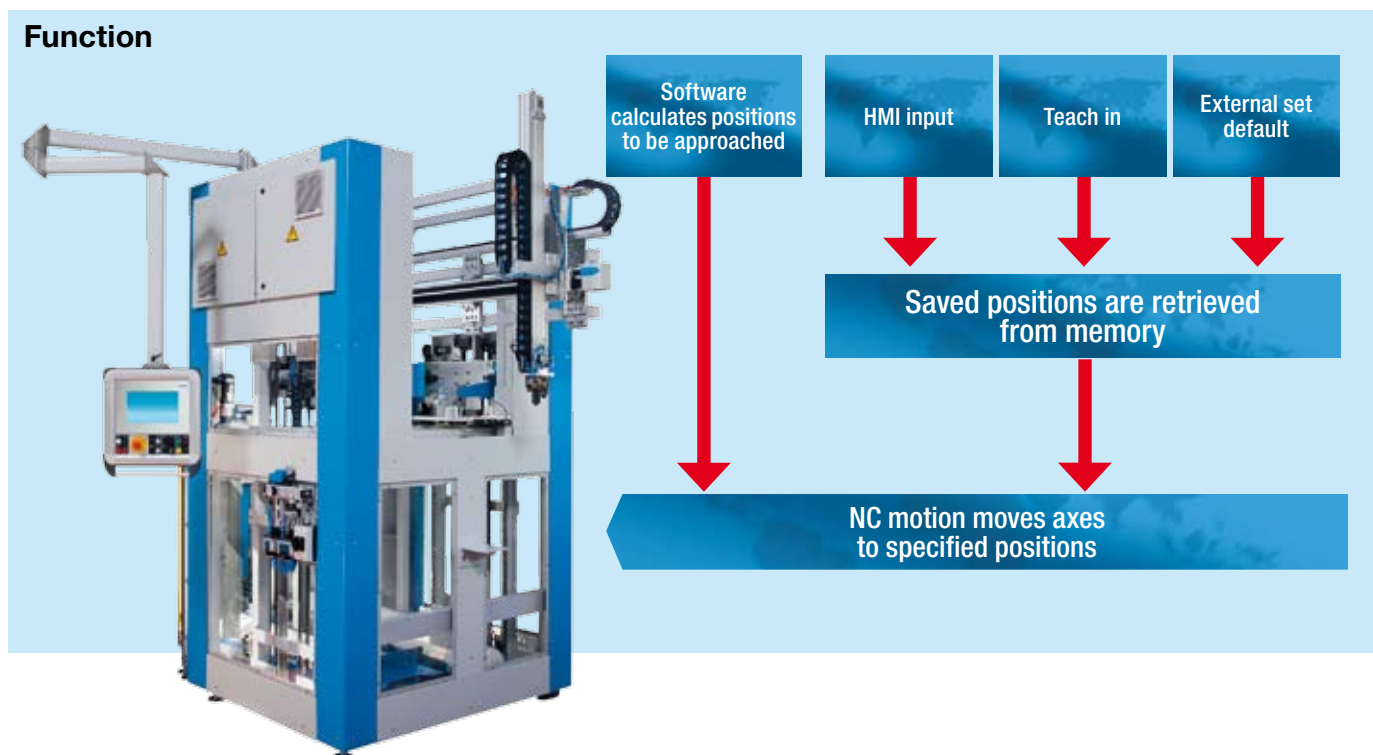
Tubular bag.

The "tubular bag" library function is a typical application in the packaging industry. In this module functions are included such as lengthwise and crosswise sealing for closing packaging units and a temperature regulation.

NC motion technology function. NC functionality with your PLC.

NC motion is an AMK technology library used to coordinate the movement of two or more (cartesian) axes. The individual axes are moved at a prescribed contouring control.
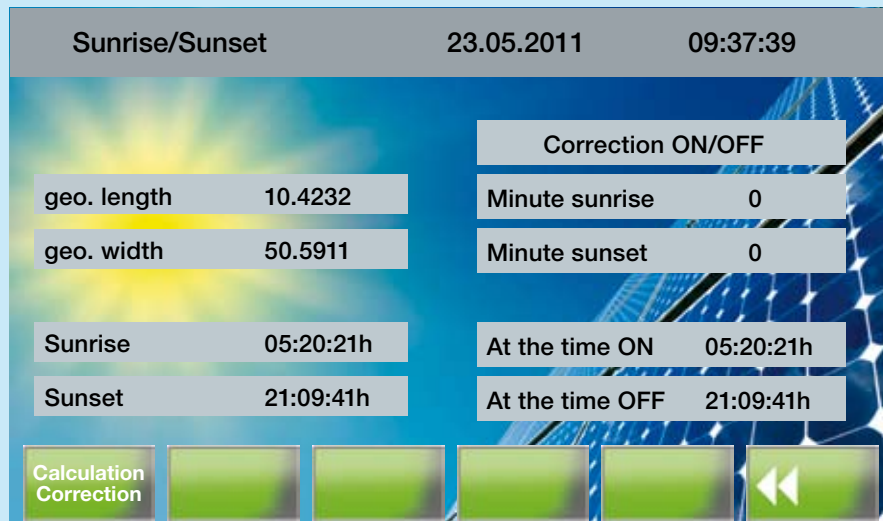
AM_pathcontrol

NC_Motion

Function

Software calculates positions to be approached

HMI input

Teach in

External set default

Saved positions are retrieved from memory

NC motion moves axes to specified positions

Properties

- Line interpolation of up to 16 axes
- Circular interpolation in the main axes on three levels
- Circles 2½ D: Helix + coupled axes
- Programmable contouring control
- Jerk-limited acceleration
- Output of the current contouring control for adhesive application, laser output, etc.
- No drop in velocity between tangential NC blocks
- Possible to insert wait time between two NC blocks
- Test functions like single step, stop at end of block, override 0 – 200%
- Three switching functions with/without stop (M-functions, synchronized) per NC block
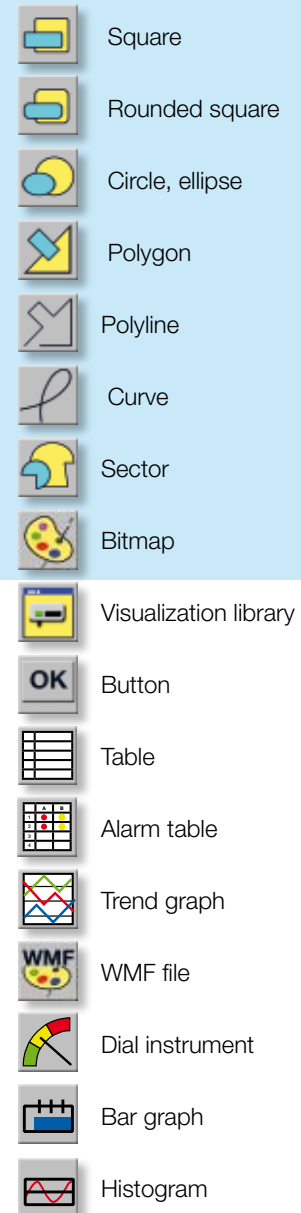- 16 process files per NC block

Applications

- Handling
- Palletizers
- Gantry drives
- Portal robots
- Loading and unloading systems

Web visualization.
Intuitive and affordable.

Sunrise/Sunset		23.05.2011	09:37:39

geo. length	10.4232
geo. width	50.5911
Sunrise	05:20:21h
Sunset	21:09:41h

Correction ON/OFF

Minute sunrise	0
Minute sunset	0
At the time ON	05:20:21h
At the time OFF	21:09:41h

Calculation Correction

Example of the design of a web visualization: The web visualization only needs to be created once, after which it can be used worldwide on all devices equipped with web browsers. Regardless of whether you are in the factory or somewhere else in the world, you can access information on the status of your machines using any number of control units and display devices.

No knowledge of HTML or Java is required to create the web visualization. The programming tool converts the file into the appropriate format for you.

- Integrated into CoDeSys
- Extremely easy to access PLC variables
- Automatic generation of HTML pages using Java code
- Visualization in web browser
- Visualization on machine, in design office or via remote maintenance

Visualization elements

	Square
	Rounded square
	Circle, ellipse
	Polygon
	Polyline
	Curve
	Sector
	Bitmap
	Visualization library
OK	Button
	Table
	Alarm table
	Trend graph
WMF	WMF file
	Dial instrument
	Bar graph
	Histogram

BENEFITS

- Visualization and programming in a single development environment
- Intuitive design of visualization
- Automatic exchange of data between PLC program and visualization
- Control of visualization using PLC program
- Create your own visualization libraries
- Suitable for keyboard operation or with touch screens
- Possible to connect USB keyboard

Qt visualization.
To meet the highest standards.

Visualization elements
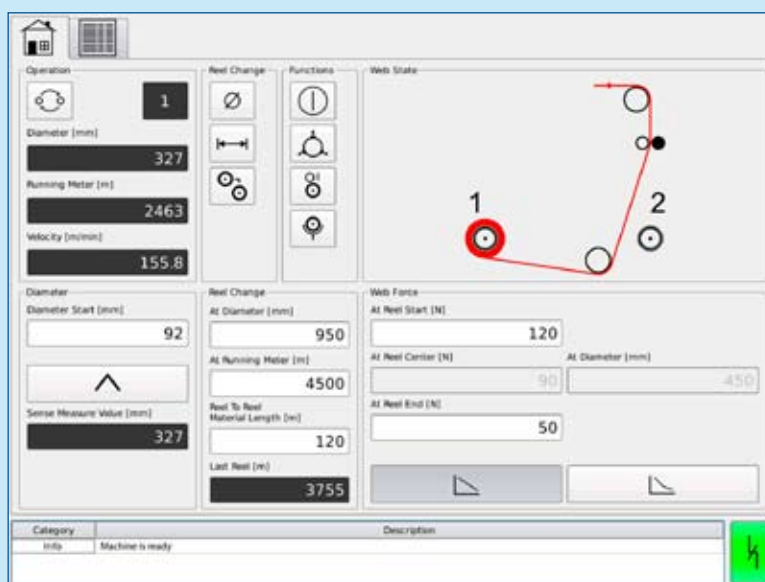
Qt is an advanced development tool you can use to program intuitive user interfaces. Programming is performed using the integrated development environment Qt Creator. This features a source code editor with syntax highlighting and autopopulate, a project manager, a GUI designer, a debugger as well as Qt documents. When setting up the visualization, select from a wide range of advanced design elements. With Qt, it is possible to access an integrated SQLite data base.

This data base makes it possible to record production data and organize recipes. In addition, several user manuals and further documents can be opened as PDF files; the operator has all of the necessary information available at all times.

An AMK plug-in enables the PLC programming interface CoDeSys to work together with Qt and to exchange data in real-time with it.

BENEFITS

- Fast response
- Modern design elements
- Designed for touch screen operation
- Possible to connect USB keyboard
- Integrated SQLite database
- Multi-language capable
- User administration
- Programming language C++
- For A4D and A5D
- Free production licence
- For Windows and Linux
- Advanced development tool
- Automatic exchange of data between PLC program and visualization
- Large number of intuitive visualization elements

Fieldbus configurations with AIPEX PRO.
Fast and easy.

Fieldbuses

Through coupling of the component configuration and the programming environment, fieldbus configuration is now done in a snap. AIPEX PRO knows all the data to be transferred and automatically generates the fieldbus configuration. Data is provided thereby synchronously or asynchronously in the PLC program depending on their purpose. Fully automatic and reliable.

This frees the programmer from having to perform this difficult and time-consuming task, allowing him to focus his full attention on the key components of his machine and system controller.

The devices and the I/O data are configured fully automatically in this process.

Drives

The servo inverter and motor constitute the drive system which must optimally perform its assigned task. Wizards help with the parameterization for standard functions of the drive. With the parameter explorer, you have access to all parameters in the system. Adjustments and optimizations can be made even during running operation. The temporary changes are taken over directly.

Using the freely configurable multi-channel oscilloscope, you can record axis-spanning drive values simultaneously by several devices with a common trigger. Use the records for documentation, analysis and optimization of your application. Monitor the status of your drive components in the configurable online monitor and maintain an overview over several drives as well. Status messages and actual values are displayed at a single click.

To obtain this information, AIPEX PRO has access to all devices in the fieldbus network. All parameter and configuration data can be read and written from a single central point.

Troubleshooting is made easier thanks to the central access available with AIPEX PRO. When a message is generated, this and other information is sent to you as a plain-text message.

With the options described above, AIPEX-PRO provides targeted support for machine startup to help make this process much more cost effective.
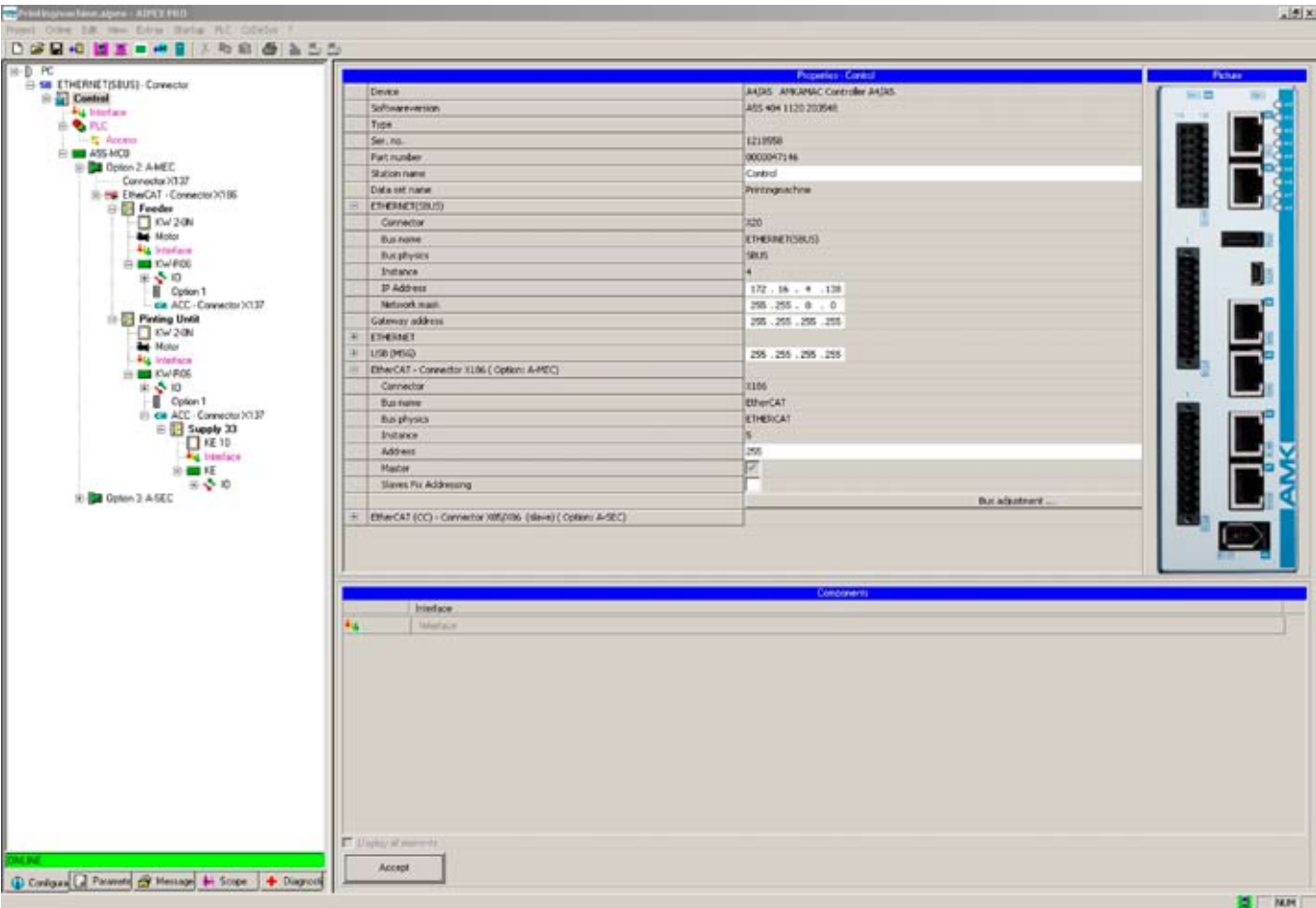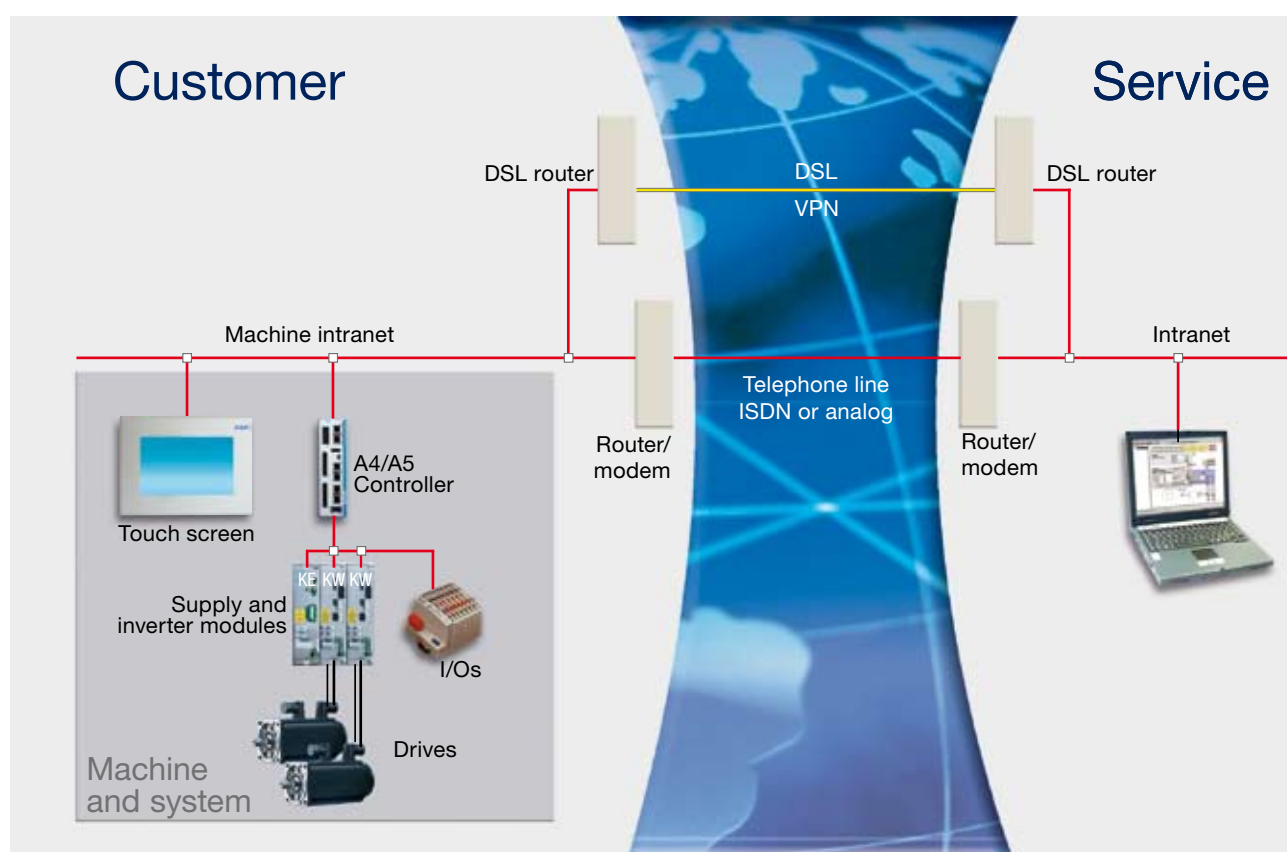
Remote maintenance and diagnostics.
For fast, direct support.

Remote maintenance enables you to main-tain and perform a diagnostic check on your machine from any location. Detailed system diagnostics can be performed at any time as a means to check the status of the machine.

By using remote maintenance, it is possible to reduce the number of times service tech-nicians are dispatched, which saves time and lowers costs for travel to the site. When technicians are sent out on a service call, a detailed pre-check can be carried out to ensure the work is performed in a targeted manner. Using remote maintenance, you are

able to reduce machine downtimes, while also preventing unnecessary service calls. Even if there is a problem with an applica-tion, it is still possible to directly access machine data from any location and there-fore deliver rapid support.

Customer — DSL router — DSL VPN — DSL router — **Service**

Machine intranet — Telephone line ISDN or analog — Intranet

A4/A5 Controller
Touch screen
Supply and inverter modules
KE KW KW
I/Os
Drives
Machine and system
Router/modem
Router/modem

BENEFITS

- Startup of your machines and systems optimized to lower costs
- Regardless of where your machines or systems are located
- Rapid diagnostics and maintenance
- Display on monitor identical to visualization on-site
- Diagnostics and parameterization using AIPEX PRO configuration tool
- Direct PLC diagnosis and software download
- Simple firmware download
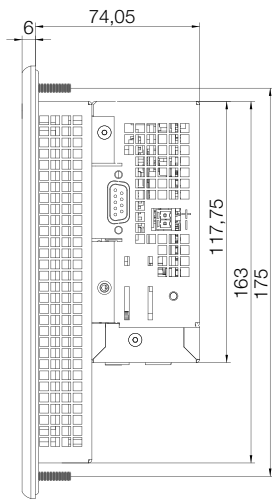- Direct online support for on-site operating personnel
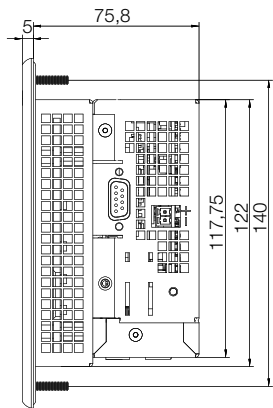
Dimensions AMKAMAC A4/A5 smartPanel.
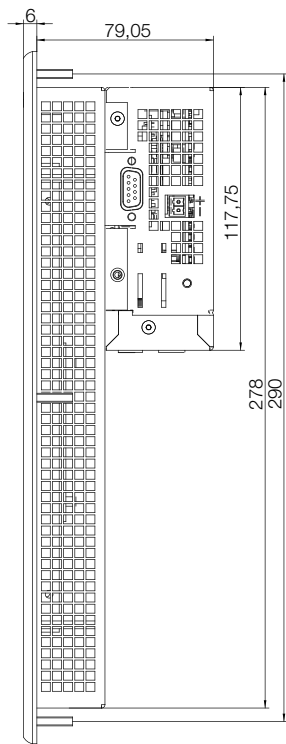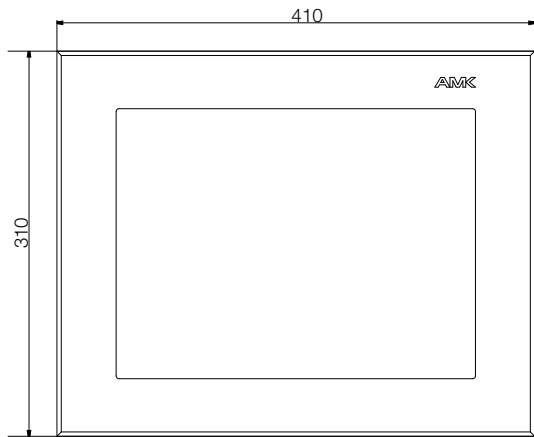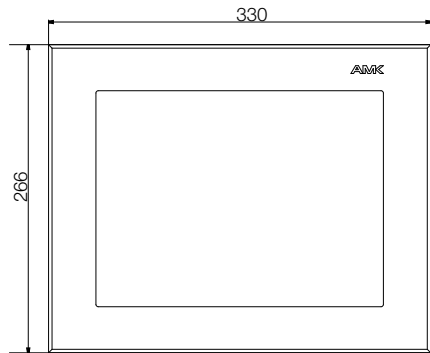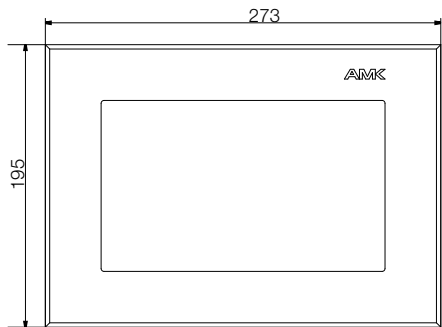
A5 smartPanel 15"
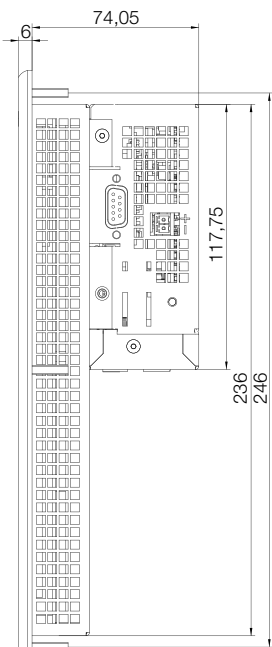
A5 smartPanel 12"

A5 smartPanel 9"
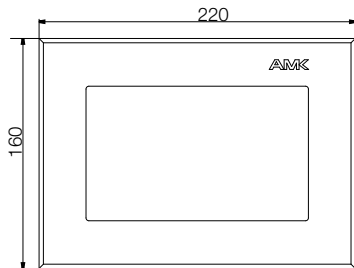
A4/A5 smartPanel 7"

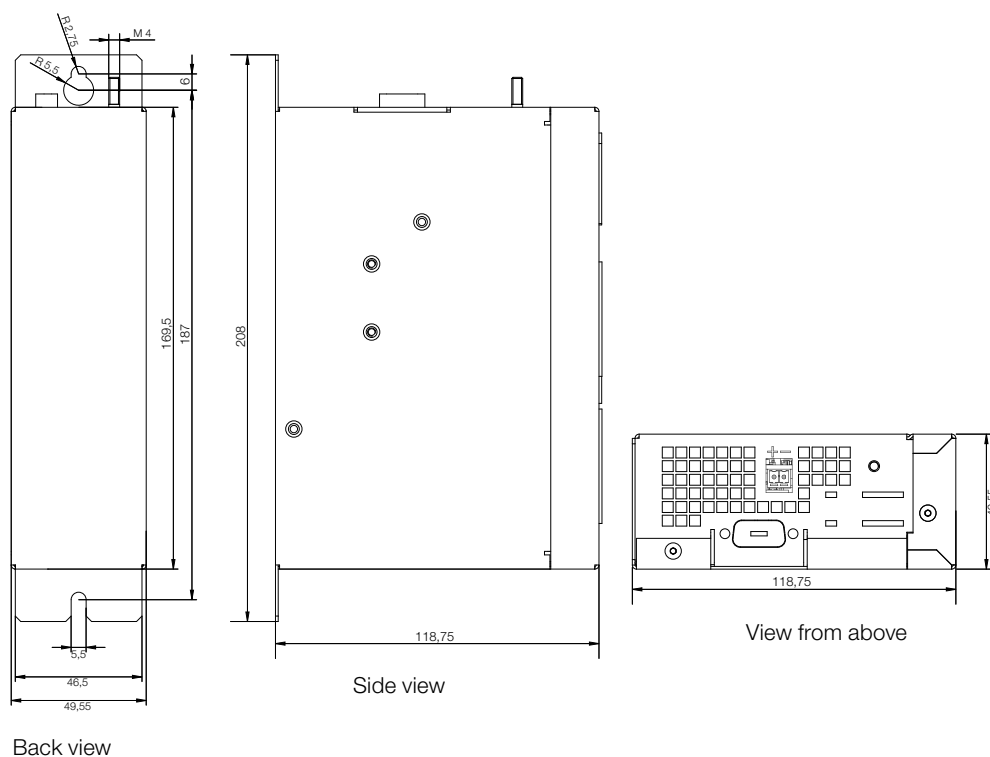A5 smartPanel 15"

A5 smartPanel 12"

A5 smartPanel 9"

A4/A5 smartPanel 7"

Dimensions AMKAMAC A4/A5 cabinet controller.

Back view

Side view

View from above

Accessories

| Type	Module name	Part no.
Visualization		
A5-VIS	A5 WebVisu	O831
A4-VIS	A4 WebVisu	O832
Qt		O865
PLC open		
A5-PCO	A5 PLCopen	O844
A4-PCO	A4 PLCopen	O868
I/O connector		
A-E1L	I/O connector, 10-pin, single-conductor technology with LED	O847
A-E3L	I/O connector, 30-pin, triple-conductor technology with LED	O848
A-ERA	Female plug, 16-pin, 2-row. Analog input and square-wave input	O846
Fieldbus slave		
A-SEC	EtherCAT slave	O833
A-SIP	Ethernet/IP slave	O875
A-SPN	ProfiNet RT	O876
A-SPB	Profibus DP V0	O843

Centrally controlled machines.
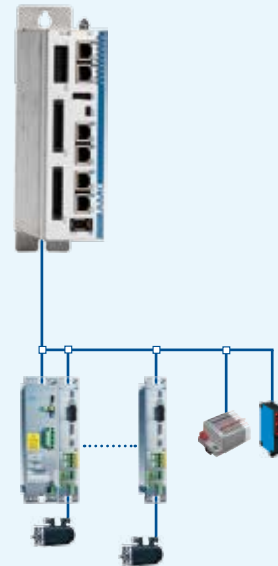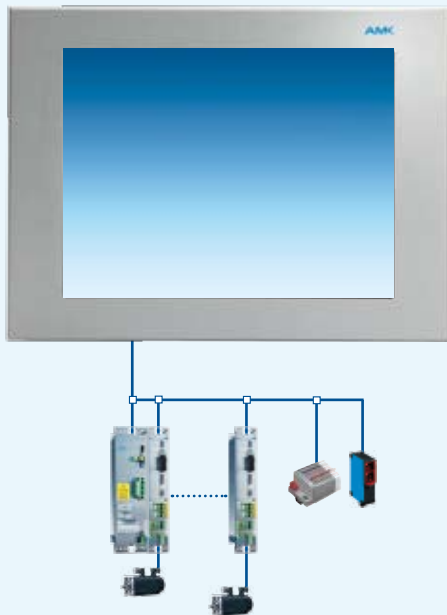
Packaging Industry.

Tubular bag, enveloping, blister packaging and foil wrapping machines or palletizer.
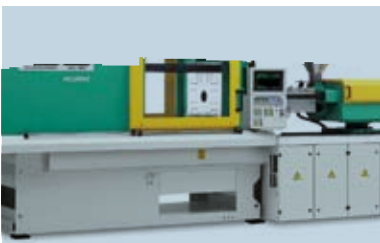
Plastics Industry.

Cycle times of 1.6 seconds. The highest standards in precision and repeatability.
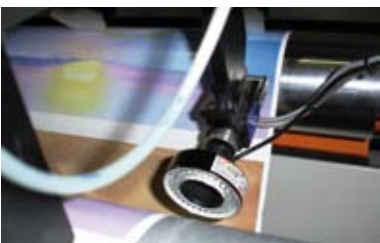
Paper processing.

At speeds of up to 10 m/s, 2 x 2 mm printing marks are detected within an accuracy of ±30 µm.

INDUSTRIES

▶ Handling
▶ Pick & place
▶ Packaging
▶ Paper processing
▶ Converting
▶ Plastics industry

BENEFITS

- Control and operation of entire machines and systems
- Direct I/Os
- Machine visualization
- PLC and motion control
- All from one source
- Extensive industry know-how for innovative machine designs

Modular machines.
Hierarchical control structures.
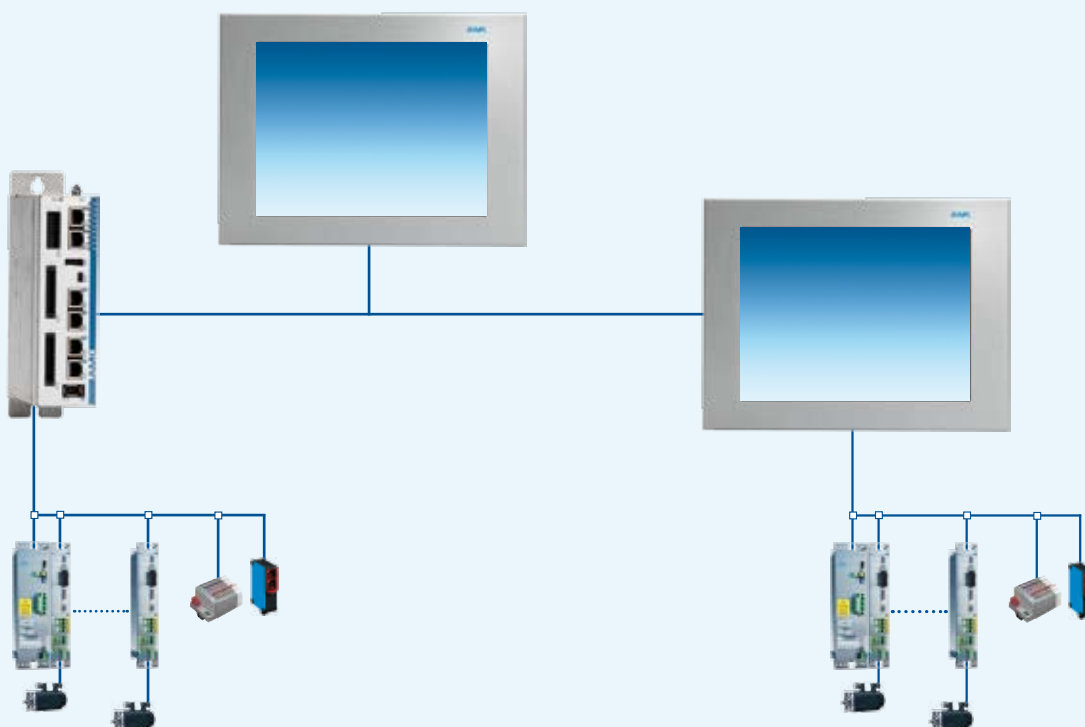
Printing industry

Maximum precision and dynamics.
1 000 axes, web speed of up to 18 meters per second

Enveloping

Maximum speed and productivity. Envelope up to 22 000 letters per hour. They can be modular as well as equipped with a wide range of such as rotary, shuttle and friction feeders.

Food industry.

Rotary labeling machines for flexible use of a wide range of bottle sizes.

INDUSTRIES

▶ Printing industry
▶ Food industry
▶ Plastics industry
▶ Packaging

BENEFITS

• Easy to expand
• Modular systems easy to expand
• Jitter of less than 30 ns
• All from one source

Control your Motion.

- ■ **AMKAMAC**
  Controllers

- ■ **AMKASYN**
  Servo inverters

- ■ **DYNASYN**
  Servo motors

- ■ **AMKASMART**
  Inverter-integrated
  motors

- ■ **SPINDASYN**
  Hollow shaft motors

- ■ **AMKAVERT**
  Frequency inverters

Subject to technical changes. 01FA12