

# AMKASYN KE/KW SERVO INVERTER

Compact, powerful, modular



# SERVO



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## **AMKASYN KE/KW servo inverter**

Make use of your space-saving potential!  
With the most compact of servo inverters

### **The most compact way to demonstrate your expertise**

Discover the added value of "power density". The intelligent servo inverter KE/KW enables efficient use to be made of valuable installation space. AMK's sophisticated cooling technology ensures optimum heat dissipation and increases service life. This allows a saving of up to 50% by volume. The unrestricted positioning of the modules also provides the freedom you need for ergonomic machine design.

### **The drive system for excellent dynamic performance in positioning tasks**

The controller platform in the AMK KE/KW drive system opens up completely new possibilities for higher performance using the latest processor technology. Real-time Ethernet (RTE) via EtherCAT or VARAN provides powerful system communication for machine automation. Using only the modules actually needed with the desired range of functions delivers an extremely favourable price/performance ratio. All types of synchronous or asynchronous servo, high torque or linear motors coupled with a wide variety of encoder systems can be operated in a highly dynamic and precise manner.

### **Be on the safe side**

The units have the highest safety standard. The KW inverters are available with the integrated OSE safety function:

TÜV-certified against re-start for systems up to PLe in accordance with ISO 13849-1 (analogous to STO). Functional safety, also up to PLe in accordance with ISO 13849-1, can be implemented with the safe controller cards.

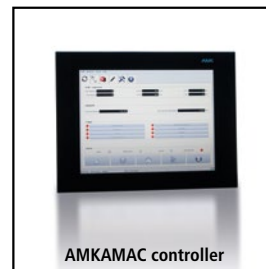
### **Sustainability through maximum energy efficiency**

The power supply is regenerative and therefore particularly energy-efficient. This saves energy costs. The units in the KES product series feed the energy generated during regenerative braking back into the energy grid in a sinusoidal form and with the highest possible efficiency. A regulated DC link voltage also provides higher speeds and power for the drives. The line currents are limited to within their peaks and a power factor of almost 1 is achieved. Heat recovered by the cold plate technology enables systemic power losses to be used to power other processes.

## **ADVANTAGES**

- **Safety inside**
- **Motion control**
- **Up to 50% less control cabinet volume**
- **Energy saving**
- **Cold plate / heat recovery**
- **Control performance**

# System overview

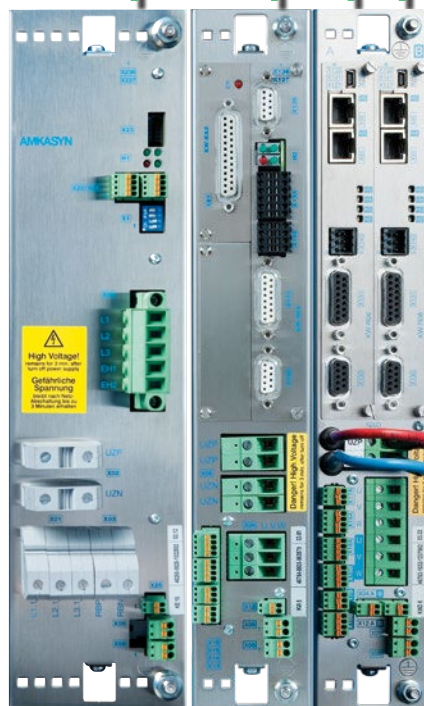


AMKAMAC controller



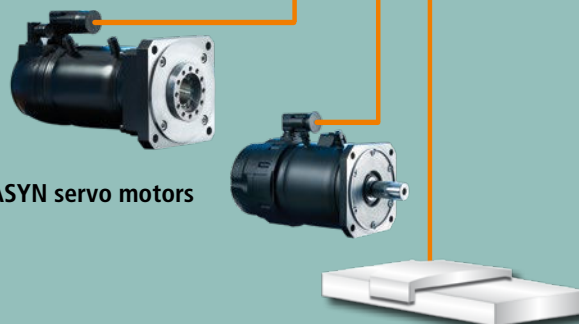
OPC UA  
AIPEX PRO  
Remote maintenance  
Development environment

Fieldbus communication



KE KW KWD

DYNASYN servo motors



KE Compact power supply KE(S)  
KW KW inverter

## Compact power supply

Compact power supply, optionally with or without regenerative power recovery. Units with regenerative power recovery in versions with block commutated regenerative power recovery or with sinusoidal infeed and regenerative power recovery.

## Compact inverters

Central inverters in scalable module widths depending on the power classes for units as single or double inverters with plug-in controller cards.

## Controller cards

The controller cards are inserted into a slot in the compact inverter. A suitable variant is available for the particular bus system and performance in question.

## Trendsetting cooling technology

Their efficient heat dissipation has resulted in AMK inverters leading the market in terms of compactness and power density for many years. The cold plate design modules are simply mounted on a liquid-cooled or air-cooled plate.

The liquid-cooled cold plate offers significant benefits, especially for large power ratings. The units can be installed very easily without interrupting the cooling circuit. The dissipation of heat via the liquid-cooled plate considerably reduces the need for cooling the interior of the enclosure. Modules with integrated air cooling offer a cost-effective alternative for smaller power ratings.

## Communication

Fieldbuses:

- EtherCAT
- SERCOS III
- Varan

## Multifunctional I/O

- Digital inputs and outputs
- Analogue input
- Measurement input
- Pulse output

## Standard functions

- Torque control
- Speed control
- Position control
- Positioning function
- Reference point run in many variants
- Synchronous control
- Electronic gearbox
- Brake control
- Protective functions

## Functional safety

KW units with integrated OSE safety function: TÜV-certified against re-start for systems up to PLe ISO 13849-1 (analogous to STO).

## Design

Ultra-compact size. The system can be ideally adapted to any machine ergonomics with space savings of up to 50 %. The absence of busbar connections for module cabling allows flexible installation in the control cabinet

## Sustainable energy management

High degree of efficiency and regenerative capability reduce energy consumption and costs.

## ADVANTAGES

- **Functional safety**
- **Reduction of the required control cabinet space by up to 50%**
- **Opportunity to save costs by integrating the control cabinet into the machine**
- **Cost-optimised solutions provided by modular system design**
- **Setup of complex, networked machines through precise synchronisation in real time**
- **Application-specific cooling technology**



ACC bus connection



- LED
- Digital inputs/outputs
- Fieldbus configuration

- Charging circuit Mains 400...480VAC - 50/60Hz
- Main contactor controller

DC link voltage

Mains connection 400...480VAC

Braking resistor connection

- PTC thermistor
- 24 VDC supply, Power loop-through 24VDC

# KE compact power supply

## High performance in the smallest space

The KE compact power supply generates the DC link voltage for the connected inverters and is available in the following variants:

### KEN:

Power supply (no regeneration).

### KE:

Block commutated power supply and regeneration. ACC bus or EtherCAT communication interfaces with the control voltage UPS.

### KES:

Sinusoidal power supply/regeneration. The KES product series with sinusoidal power supply and regeneration generates a regulated DC link voltage. This makes the unit robust against mains fluctuations and disturbances regardless of the mains voltage. The voltage boost in the DC link enables an increased speed and performance of the drives. Communication interfaces ACC bus or EtherCAT with the control voltage UPS

### Features:

- Power range up to 180 kW
- Cooling using cold plate technology
- Optional (block or sinusoidal) power regeneration
  - ✓ Integrated monitoring
  - ✓ Overtemperature
  - ✓ Mains failure
  - ✓ Mains current
  - ✓ Braking resistor short circuit
  - ✓ Overvoltage intermediate circuit
  - ✓ Main contactor controller

## ADVANTAGES

- High power density
- High degree of efficiency
- Supports sustainability through regenerative capability.
- KES: Reduced mains regeneration
- KES: Limit value for harmonic currents 15 g for 11 ms according to EN 61000-3-12

### Technical data

Type	KEN 5	KEN 10	KEN 20	KEN 120	KE 20	KE 40	KE 60	KE 120	KE 180	KES 20	KES 60	KES 120	KES 180
Rated input voltage VAC	3 x 400 ... 480 ± 10 %												
Line frequency Hz	47... 63												
Input current A	13	15		180	30	60	90	180	270	30	90	180	270
Rated output power kW	5	10		120	20	40	60	120	180	20	60	120	180
Maximum output power (for 60s) kW	10	20		200 <sup>1)</sup>	40	80	120	200	320	40 <sup>2)</sup>	120 <sup>2)</sup>	200 <sup>2)</sup>	320 <sup>2)</sup>
Efficiency %	approx.99									approx.98			
Power factor	0.55	> 0.9								> 0.98			
Cooling	Cold plate design												
Power regeneration	No				Yes					Yes, sinusoidal			
Ext. Brake resistor (Option) min. Ω	47	47		2x8	20	8	8	8	5.4	20	8	8	5.4
Protective function	Mains failure, overcurrent device and brake resistor, overtemperature device and brake resistor												
Line filter	Integrated		External	External	Integrated			External					
Weight kg	3	3		16	4.2	8	8	16	20	4.2	8	16	20
Unit width	55	55	55	255	85	170	170	255	425	85	170	255	425

<sup>1)</sup> Power supply via braking resistor max. 160 kW for 2.5 s <sup>2)</sup> for max. 10s





Option card 1

Option card 2

Output stage enable OSE

Controller card

DC bus DC link voltage and loop-through

Motor connection

Motor PTC thermistor

24 VDC supply, loop-through



# KW compact inverter

Dynamics and precision. With safety.

The digitally operating KW compact inverters control the drives in 4-quadrant operation precisely and with high dynamic performance. They can be multi-functionally networked to the higher-level controller via various fieldbuses.

## Features:

- Power range up to 200 kVA
- Cooling using cold plate technology
- Integrated OSE safety function: TÜV-certified against re-start for systems up to PLe ISO 13849-1 (analogous to STO).
- Accommodates 1 KW-Rxx controller card (see p. 14). Controller cards must be ordered separately

## ADVANTAGES

- **Integrated OSE safety function**
- **New dimensions in power density**
- **Effective heat dissipation and long service life using cold plate technology**
- **High degree of efficiency**
- **Compact machine design**

## Technical data

Type		KW 2	KW 3	KW 5	KW 8	KW 10	KW 20	KW 40	KW 60	KW 100	KW 150	KW 200
Input voltage	VAC	540 ... 650										
Shut-off threshold	VDC	850										
Input current	A	3.8	5.6	9.3	15	18.5	37	74	112	187	280	37
Rated output voltage	VAC	3 x 350 for sinusoidal currents										
Output frequency	Hz	0...599 <sup>1)</sup>										
Rated output power	kVA	2	3	5	8	10	20	40	60	100	150	200
Maximum output power	kVA	4	6	10	16	20	40	80	120	165 <sup>2)</sup>	300	340
Rated output current	A	3.3	5	8.2	13.2	16.5	33	66	99	165	247	330
Maximum output current (for 10s)	A	6.6	10	16.5	26.4	33	66	132	198	247 <sup>3)</sup>	495	561 <sup>4)</sup>
Efficiency	%	>98										
Cooling		Cold plate design										
Protective function		Motor overcurrent, short circuit, earth fault, device and motor overtemperature, I <sup>2</sup> T monitoring										
Switching frequency	kHz	8 (4)										
Weight	kg	3	3	3	3	4.2	4.2	8	8	16	20	25
Unit width	mm	55	55	55	55	85	85	170	170	255	425	425
<sup>1)</sup> 0...400 at 4 kHz PWM <sup>2)</sup> at 8 kHz PWM, 200 kVA at 4 kHz PWM <sup>3)</sup> at 8 kHz PWM, 330 A at 4 kHz PWM <sup>4)</sup> for max. 7 s												



Controller card 1

Controller card 2

Output stage enable OSE

DC bus DC link and loop-through

Motor A

Motor B

Motor A/B PTC thermistor

24 VDC supply,  
loop-through

## KWD double inverters

Two inverters in one housing.

The KWD compact inverter contains two independent KW inverters inside one housing. It represents an economic and extremely compact solution for servo drives with low power ratings.

### Features:

- Power range up to 2 x 5 kVA
- Very compact dimensions
- Cooling using cold plate technology
- Integrated OSE safety function: TÜV-certified against re-start for systems up to PLe ISO 13849-1 (analogous to STO).
- Accommodates 2 controller cards KW-Rxx (see p. 14), controller cards must be ordered separately

## ADVANTAGES

- Economic and extremely compact solution for servo drives with low power ratings.
- Integrated OSE safety function
- High degree of efficiency
- Enhanced compact machine design

### Technical data

Type		KWD 1	KWD 2	KWD 5
Input voltage	VAC	540... 650		
Shut-off threshold	VDC	850		
Input current	A	3.8	7.6	19
Rated output voltage	VAC	3 x 350 for sinusoidal currents		
Output frequency	Hz	0...599 <sup>1)</sup>		
Rated output power	kVA	2 x 1	2 x 2	2 x 5
Maximum output power	kVA	2 x 2	2 x 4	2 x 10
Rated output current	A	2 x 1.65	2 x 3.3	2 x 8.3
Maximum output current (for 10s)	A	2 x 3.3	2 x 6.6	2 x 16.5
Efficiency	%	approx.98		
Cooling		Cold plate design		
Protective function		Motor overcurrent, short circuit, earth fault, device and motor overtemperature, I <sup>2</sup> T monitoring		
Switching frequency	kHz	8 (4)		
Weight	kg	3	3	3
Unit width	mm	55	55	55

<sup>1)</sup> 0...400 at 4 kHz PWM

## Controller card

Functionality as a variable

The controller cards for the AMKASYN KE/KW central inverter system enable a cost and function optimised selection to match your specific application.

As a result, we are able to offer you a varied selection with numerous functionalities.



Functions	KW-R06	KW-R16	KW-R07
<b>Drive control</b>			
Minimum fieldbus cycle time	250 µs	250 µs	250 µs
Resolver	✓	–	✓
Sinusoidal encoder	✓	✓	✓
EnDat 2.1 / 2.2 light	✓	✓	✓
Hiperface	✓	✓	✓
Hiperface DSL*	–	–	–
Hall sensor (via resolver input)	✓	–	✓
Square wave signals (input/forwarding)	✓	–	✓
2nd encoder connection, e.g. load encoder	✓	–	✓
Encoderless U/F operation	✓	✓	✓
<b>I/O interfaces</b>			
Analogue inputs ±10 V (resolution)	2 (12 Bit)	2 (12 Bit)	2 (12 Bit)
Local digital inputs	3	3	3
Local digital outputs	3	3	3
Square pulse output/SIWL, f <sub>max</sub>	2 MHz	–	2 MHz
<b>Fieldbus interfaces</b>			
Real-time bus ACC (CANopen)	Master	–	Master
EtherCAT (SoE)	–	Slave	–
<b>Service</b>			
Service Port	USB 1.1		
AIPEX PRO connection	USB/EtherCAT		
Functional safety	–	–	✓



KW-R17	KW-R24	KW-R25	KW-R26
250 µs	250 µs	250 µs	250 µs
-	-	-	-
✓	-	✓	✓
✓	-	✓	✓
✓	-	✓	✓
-	-	-	✓
-	-	-	-
-	-	-	-
-	-	-	-
✓	✓	✓	✓
2 (12 Bit)	-	-	-
3	3	3	3
3	3	3	3
-	-	-	-
-	-	-	-
Slave	✓	✓	✓
USB 1.1	✓	✓	✓
USB/EtherCAT	✓	✓	✓
✓	-	-	-

\* Single cable solution/hybrid cable



## Drive related functional safety



Compliance with the Machinery Directive is mandatory for every machine manufacturer in the European Economic Area. This means that machine manufacturers are legally bound to build safe machines.

The decisive question is how this safety is achieved. Effort and costs naturally play a major role here.

Ideally, safety functions are integrated into the drive. This not only saves time and money, but is also a much simpler solution.

AMK offer drives with integrated functional safety features certified by TÜV for systems ranging from PLe (ISO 13849-1:2008) and up to SIL 3 (IEC 62061).

Depending on the unit in question safety functions can be commanded either by local safety inputs or by the FSoE protocol.

## ADVANTAGES

- Functional safety at unit level
- A simple and most economical solution
- Everything from one source
- Functional safety can be commanded via local I/Os or the FSoE protocol
- Standard versions with OSE (analogue STO)
- TÜV-certified for systems up to PLe (ISO 13849-1:2008) and up to SIL 3 (IEC 62061)



## Products with safety



### Central inverters

- KW units with an integrated OSE safety function:  
Certified against restart analogous to STO
- for systems up to PLe



### Controller cards KW-R07

#### and KW-R17 for central

#### inverters

- Functional safety
  - ✓ Safe normal operation
  - ✓ Safe operating modes
  - ✓ Safe stop functions
- TÜV-certified for systems up to PLe (ISO 13849-1) and up to SIL 3 (IEC 62061)
- Command via FSoE protocol
- Command via safe I/Os
- Parameterisation using Safety Editor

## Safety functions

### Safety in normal operation

- Safe Encoder Monitoring (SEM)
- Safe Maximum Speed (SMS)

### Safe operating modes

- Safe Operating Stop (SOS)
- Safe Speed Range (SSR)
- Safely Limited Speed (SLS)
- Safe Direction (SDI)
- Safely Limited Increment (SLI)

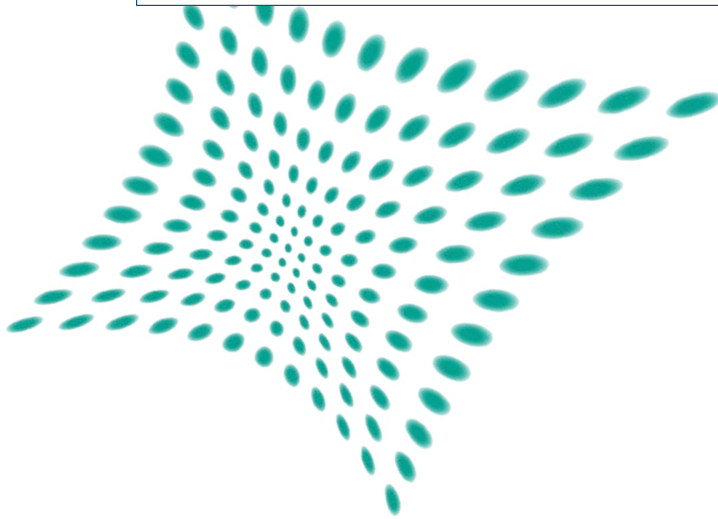
### Safe stop functions

- Safe Torque Off (STO)
- Safe Stop 1 (SS1)
- Safe Stop 2 (SS2)



# AIPEXPRO

ENGINEERING TOOL



- PLC programming
- Visualisation
- Motion control
- Technology functions
- Automatic fieldbus configuration
- Machine setup
- Diagnosis and remote maintenance
- Safety

## New:

- Object-oriented programming
- Editor for functional safety parameters
- Autotuning

## Engineering and application using **AIPEXPRO**

### Configuration

The hardware configuration function is used to compile all of the drive system components from a database (motor, inverter, controller module, option cards, controllers, I/O modules).

- **Automatic fieldbus configuration**
- **Parameterisation**
- **Commissioning**

### Programming

AIPEX PRO integrates the internationally renowned CoDeSys V2 programming platform and CODESYS for object-oriented programming. All programming languages according to IEC 61131-3 are supported and can even be combined within a project. Program in your preferred language.

Modules for programming are available in numerous libraries.

The development environment contains the visualisation and the basic library and is used as the cornerstone for the automation solution. The basic library contains extensive basic components, such as mathematical functions and logic components (timers, counters, etc.).

### Visualisation

Create your machine visualisation with the graphic functions of the integrated visualisation editor and also make use of prefabricated visualisation modules. The web visualisation in the AMK controllers can be accessed from anywhere in the world.

AIPEX PRO integrates all of the engineering tools required over the lifecycle of a machine, e.g. programming, parameterisation, commissioning, optimisation and diagnostics. This saves time-consuming coordination, such as between the PLC program and the drive parameters and the configuration of the user data exchange via the fieldbus.

AIPEX PRO works fully automatically in this respect and releases you from everything that is not directly related to your application. You are free to concentrate on the really important things regarding the application.



## ADVANTAGES

- All programming languages according to IEC 61131-3
- Economical creation of your machine software
- Shortening the time-to-market of your machine
- Implement innovative machine concepts via drag & drop
- Extensive pre-programmed AMK technology functions
- Integrated web visualisation accessible worldwide

### Libraries

This tool provides extensive pre-programmed motion control and technology functions.

#### Motion control libraries

These modules contain the basic machine control functions, such as the electronic cam controller and cam function.

#### Technology functions

Engineering processes are further simplified using the technology functions provided, such as the form/fill/seal, register mark control, winder and cross-cutter functions.

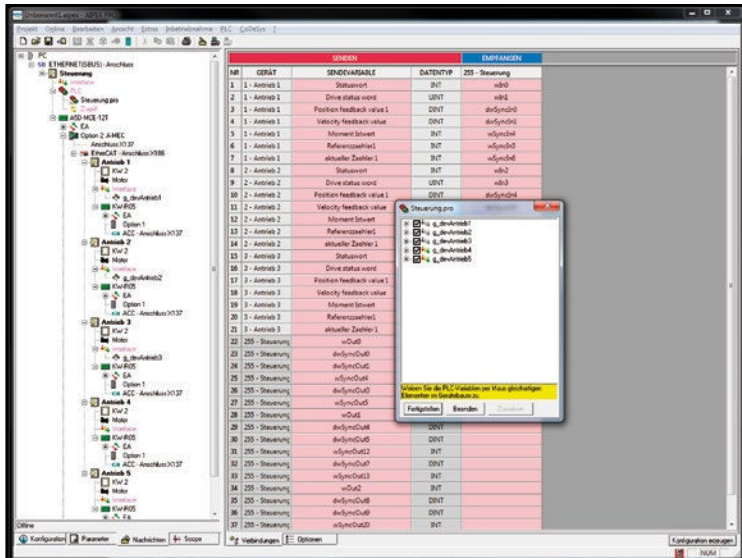
### Remote maintenance and diagnostics

The machine control and drives can be accessed from any location.

Firmware updates can be incorporated quickly and easily using the update tool included in AIPEX PRO

### Safety Editor

AMK's safe drives can be parametrised using the certified Safety Editor. The selected safety functions are logged and output in PDF format. This enables the safety information to be printed out and kept with the machine.

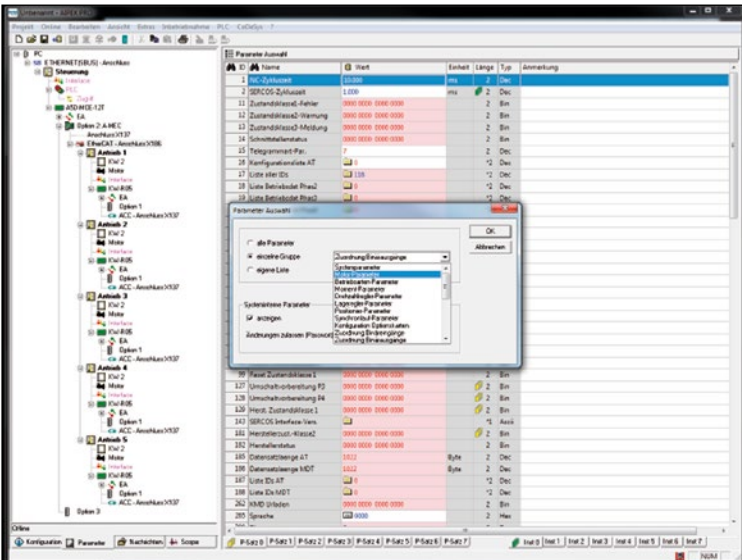


## Automatic fieldbus configuration

The revolutionary coupling of component configuration and programming environment has made fieldbus configuration foolproof. AIPEX PRO identifies all of the data to be transmitted and automatically creates the configuration of the fieldbus. Data is made available either synchronously or asynchronously, depending on its intended use in the PLC program. Fully automatic and reliable.

The programmer is relieved of a cumbersome task and can devote their full attention to the more important parts of machine control.

Both drive data and I/O data are configured fully automatically.



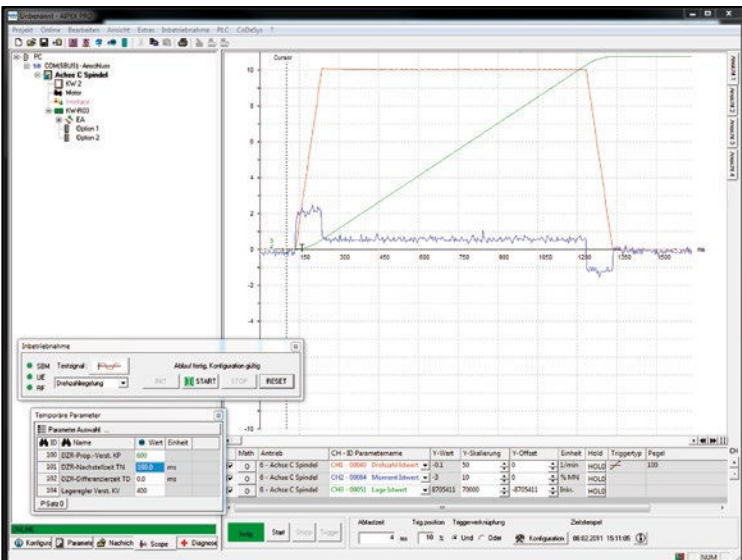
## Simple drive parameterisation

The drive system consists of servo inverters and motors that must perform the given task to the optimum.

Wizards help with the parameterisation of standard drive functions. The parameter explorer gives access to all parameters in the system. Adjustment and optimisation can also be performed during ongoing operation. The temporary changes are implemented directly.

AIPEX PRO has access to all participants in the fieldbus network. All parameters and configuration data can be both read and written from one central point.

Central access with AIPEX PRO makes troubleshooting easier. As soon as a message is generated it is displayed in plain text with further information.



## Commissioning

- Internal setpoint generator with sine, triangle, trapezoidal and step function generator for torque, speed and position setpoints.
- Temporary parameter access for online tuning of all control parameters
- Integrated oscilloscope
  - ✓ Measurement of all internal data such as position, speed, currents, torques, digital I/O voltages, etc.
  - ✓ up to 8 variables can be recorded per unit
  - ✓ - Various triggers (edge, event, level)
  - ✓ - Cursor measurement function (time, absolute values, difference)
  - ✓ - Hold function of the measured values
  - ✓ - 4 different views possible per unit
  - ✓ - Storage and export of measured values for evaluation

## Safety Editor

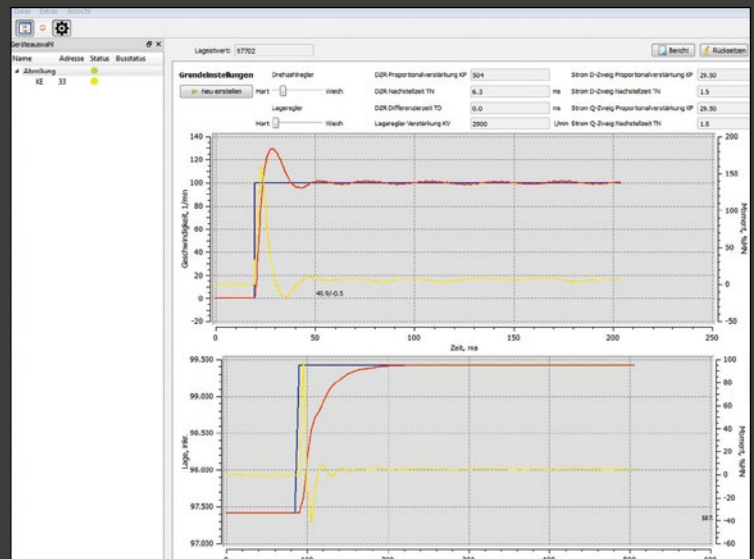
A new certified Editor has been introduced in AIPEX PRO, which offers the functionality to create and manage safety-relevant parameters:

- Parameterisation of AMK's safe drives
- Logging of the safety functions
- Automatic documentation in PDF format

Nr.	Parameter	Wert	Einheit	min.	max.	Beschreibung
14	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
15	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
16	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
17	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
18	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
19	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
20	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
21	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
22	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
23	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
24	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
25	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
26	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
27	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
28	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
29	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
30	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
31	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
32	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
33	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
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40	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
41	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
42	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
43	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
44	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
45	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
46	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
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49	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
50	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
51	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
52	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
53	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
54	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
55	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
56	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
57	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
58	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
59	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
60	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
61	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
62	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
63	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
64	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
65	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
66	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
67	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
68	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
69	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
70	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
71	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
72	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
73	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
74	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
75	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
76	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
77	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
78	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
79	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
80	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
81	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
82	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
83	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
84	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
85	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
86	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
87	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
88	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
89	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
90	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
91	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
92	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
93	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
94	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
95	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
96	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
97	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
98	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
99	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
100	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
101	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3
102	Sicherheitsfunktion SE1_SF_SE1	57%		0	100	Sicherheitsfunktion für den Eingang SE1
103	Sicherheitsfunktion SE2_SF_SE2	55%		0	100	Sicherheitsfunktion für den Eingang SE2
104	Sicherheitsfunktion SE3_SF_SE3	57%		0	100	Sicherheitsfunktion für den Eingang SE3
105	Nachfunktion SE3_SF_SE3	57%		0	100	Nachfunktion für den Eingang SE3

## Automatic controller optimisation

- Connected AMK drive systems are automatically recognised and identified. All relevant values for motor, motor encoder and gearbox are displayed.
- Determination and setting of parameter values for current, speed and position controllers
- Recording and graphical display of the measured control response to a setpoint step.
- Capable of application-specific adaptation of the controller settings



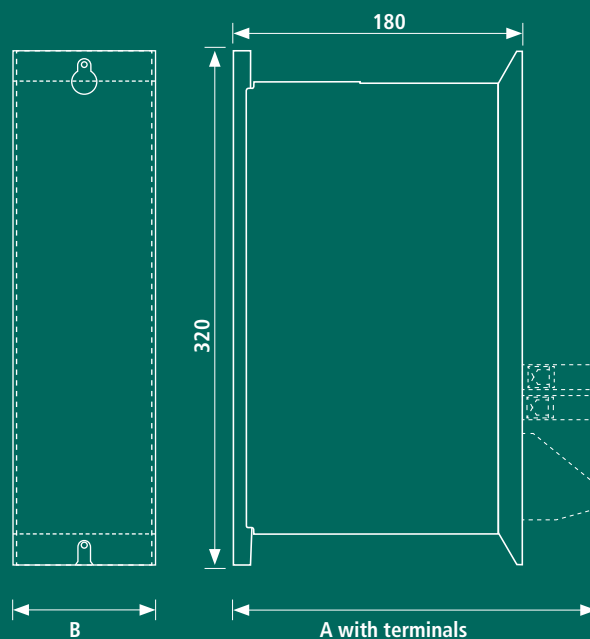
# Accessories

Designation	Product information
<b>KE/KW cold plate with cooling connection on the side for devices in cold plate design</b>	
KW-CP340	L=340 mm
KW-CP510	L=510 mm
KW-CP680	L=680 mm
KW-CP680-V	L=680 mm, stainless steel tubes
<b>KE/KW cold plate with cooling connection on the back for devices in cold plate design</b>	
KW-CP340R	L=340 mm
KW-CP420R	L=420 mm
KW-CP510R	L=510 mm
KW-CP680R	L=680 mm
KW-CP680R-V	L=680 mm, stainless steel tubes
KW-CP1035R	L=1035 mm
<b>KE/KW cold plate with fan for devices in cold plate design</b>	
KW-LK110	110 x 418 x 46 (cooling surface)
KW-LK250	250 x 465 x 84 (cooling surface)
KW-LK400	400 x 465 x 84 (cooling surface)
KW-LK500	500 x 465 x 84 (cooling surface)
<b>Brake resistors</b>	
AR 45	All power supplies
AR 80-20-0	KE 20
AR 140	KEN 5, KEN 10
AR 1000-50-F	All power supplies
AR 4000-8-F	KE 40, KE 60, KE (N/S) 120
AR 4000-8-O	KE 40, KE 60
AR 4000-20-F	KE 20
AR 4000-20-O	KE 20
AR 4000-40-F	KE 10
<b>Line contactors</b>	
	For KE 20, KES 20, coil 24 V
	For KE 40, coil 24 V
	For KE 60, KES 60, coil 24 V
	For KE 120, KES 120, coil 24 V
<b>Line filter</b>	
AF 90	KE 60, 3 x 480 VAC, 90 A
AF 180	KE 120, KEN 120, 3 x 480 V, 180 A
AF 90-S	KES 60, 3 x 480 V, 90 A
AF 180-S	KES 120, 3 x 480 V, 180 A
AF 300	KE 180, 3 x 480 V, 300 A
<b>AMKASYN line reactors</b>	
ALN 12	For KEN 5-ON without fieldbus
ALN 17	For KEN 10
ALN 30-S	KES 20, 30A/continuous operation
ALN 36/1000	For KE 20, 36 A
ALN 63	For KE 40, 63 A
ALN 85	For KE 60, 85 A
ALN 180	For KE 120, KEN 120
ALN 15-SI	For KES 20, 15 A/pulse loading
ALN 45-SI	For KES 60, 45 A/pulse loading
ALN 60-SI	For KES 120, 60 A/pulse loading
ALN 90-S	For KES 60, 90 A/continuous operation
ALN 150-I	KE 180, 150A/pulse operation
ALN 180-S	For KES 120, 180 A/continuous operation

Designation	Product information
<b>AMKASYN line series reactors</b>	
ALNV 15-SI	For KES 20, 15/60 A
ALNV 30-S	KES 20, 30A/continuous operation
ALNV 90-S	For KES 60, 90/180 A
ALNV 180-S	For KES 120, 180/300 A
<b>DC link cable sets blue/red</b>	
KW-UZ55	L=180mm, 10mm <sup>2</sup>
KW-UZ85	L=45mm, 10mm <sup>2</sup>
KE-UZ170	L=117mm, 10mm <sup>2</sup>
KW-UZ170	L=114mm, 25mm <sup>2</sup>
KW-UZ255	L=380mm, 50mm <sup>2</sup>
KE-UZ255	L=350mm, 25mm <sup>2</sup>
<b>ACC bus cable</b>	
KW-ACC140	L=140 mm
KW-ACC210	L=210 mm
KW-ACC300	L=300 mm
KW-ACC1000	L=1000 mm
KW-ACC1800	L=1800 mm
KW-ACC5000	L=5000 mm
KW-ACC10000	L=10000 mm
KW-ACCT	Terminating connector
<b>EC bus cable</b>	
Cable RJ45 0.2 m	L=200 mm
Cable RJ45 0.3 m	L=300 mm
Cable RJ45 0.4 m	L=400 mm
Cable RJ45 1.0 m	L=1000 mm
Cable RJ45 2.0 m	L=2000 mm
Cable RJ45 5.0 m	L=5000 mm
Cable RJ45 10.0 m	L=10000 mm
<b>Additional accessories</b>	
AP-CI3	Adapter ACC to Wago
AP-CI4	Adapter ACC general CAN connection
AP-CI6	Adapter ACC for general CAN connection



## Device dimensions in cold plate design



Module	B (module width in mm)	A (module depth in mm)
KEN 5, KEN 10, KEN 20, KW 2, KW 3, KW 5, KW 8, KWD 1, KWD 2, KWD 5	55	205
KE 20, KES 20, KW 10, KW 20	85	212
KE 40, KE 60, KES 60, KW 40, KW 60	170	235
KE 120, KEN 120, KES 120, KW 100	255	259
KE 180, KES 180, KW 150, KW 200	425	228

# Industry solutions

Economical, modular and extremely efficient

AMK's innovative drive and control solutions have precisely the right products for your machines and plants:

- Printing industry
- Paper processing
- Machine tool industry
- Textile industry
- Plastics industry
- Packaging industry
- Food industry

No matter which industry sector you are in, our application engineers have a wide range of theoretical and practical knowledge and will be happy to work out a customised solution for you.

## ADVANTAGES

- Complete drive and control system from a single source
- Extensive industry expertise for innovative machine concepts
- AMK technology library with motion control function blocks for every application

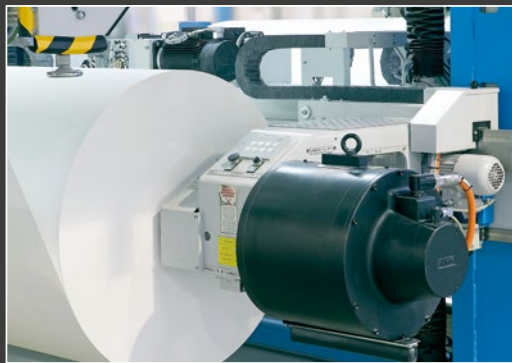
### Printing industry

Highest precision and dynamic performance  
1000 axes, 18 metres per second



### Paper decoiler

Flying changeover at full production speed.



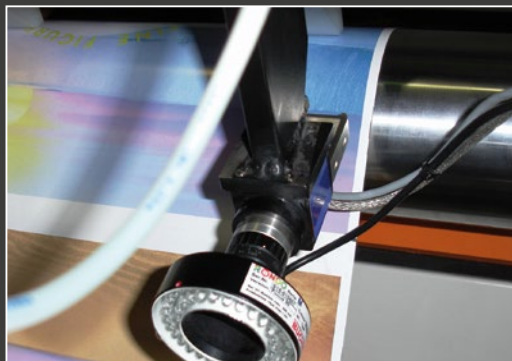
### Food industry

Rotary labellers for the flexible use of a wide range of bottle formats.



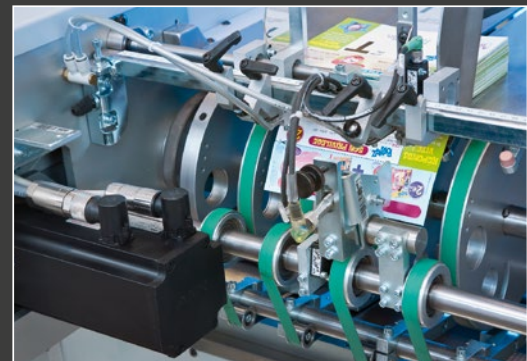
### Plastics industry

Cycle times of 1.6 seconds. Highest demands on precision and reproducibility.



### Paper processing

2x2 mm print marks are detected with an accuracy of +/- 30 µm at processing speeds of 10 m/s.



### Packaging industry

Bag forming, filling, and sealing machines, inserters, blister machines and film packaging machines or palletises.

## Service, training and consulting

### Our expertise at your service

#### Service

Comprehensive service is our second nature. Our "Technical Support" specialists are there for you whenever you need assistance - from planning, design, installation and commissioning through programming and operating a plant to the possible replacement of system components.

#### Consulting

We also provide you with individual and project-related advice on all aspects of your drives and controls.

You will receive precisely the information you require, entirely tailored to your

specific needs.

#### Training

Our comprehensive training programme covering the theory and practice of drive and control technology includes various training options, either in our training centre or on-site at your premises.

The courses range from basic training to expert workshops. On request, we can also provide individual project-optimised training.

## General technical data

### Directives and standards

- Low voltage directive 3/23/EEC and 93/68/EEC
- EN 50178 "Electronic equipment for use in power installations"
- EN 61800-2 "Adjustable speed electrical power drive systems, General requirements"
- EN 61800-3 "Adjustable speed electrical power drive systems, EMC product standard"
- UL 508C "Power Conversion Equipment"
- CSA C22.2 "Industrial Control Equipment"

#### Machine standards:

- Machinery directive 89/392/EEC
- EMC directive 89/336/EEC
- EN60204 "Electrical equipment of machines"

#### KE: incoming supply

3 x 400 V...480 V  $\pm$  10%, 47... 63Hz Line-powered operation conditions according to EN61800-2 Section 4.1.1 or EN60204-1 Section 4.3

- Symmetrical three-phase line, max. permissible voltage unsymmetry 3% TN or TT system, neutral point grounded
- Suitable for IT systems

#### Reference potential:

PE, circuit GND of the low voltage circuit is connected internally to the housing ground

#### Power unit for supply voltage

24VDC  $\pm$  15%, max. 5% ripple, with integrated inrush-current limiting

#### Limit values for radio interference voltage according to EN 61800-3: (2000)

in accordance with Section 6.3.2 Tab. 11 and Tab.12 (external filter required

from KE 60 onwards)

### Ambient conditions

#### Protection class according to EN 60529:

IP20, degree of pollution 2

#### Storage/transport temperature:

-25°C to +75°C

#### Ambient temperature:

+5°C to +40°C

#### Cold plate temperature with liquid cooling:

max. 40°C

#### Relative humidity:

5% to 85%, without condensation

#### Installation altitude:

Up to 1000m above sea level For installation altitudes above 1000 m up to max. 2000 m, the nominal data must be reduced by 1% per 100 m.

#### Shock resistance:

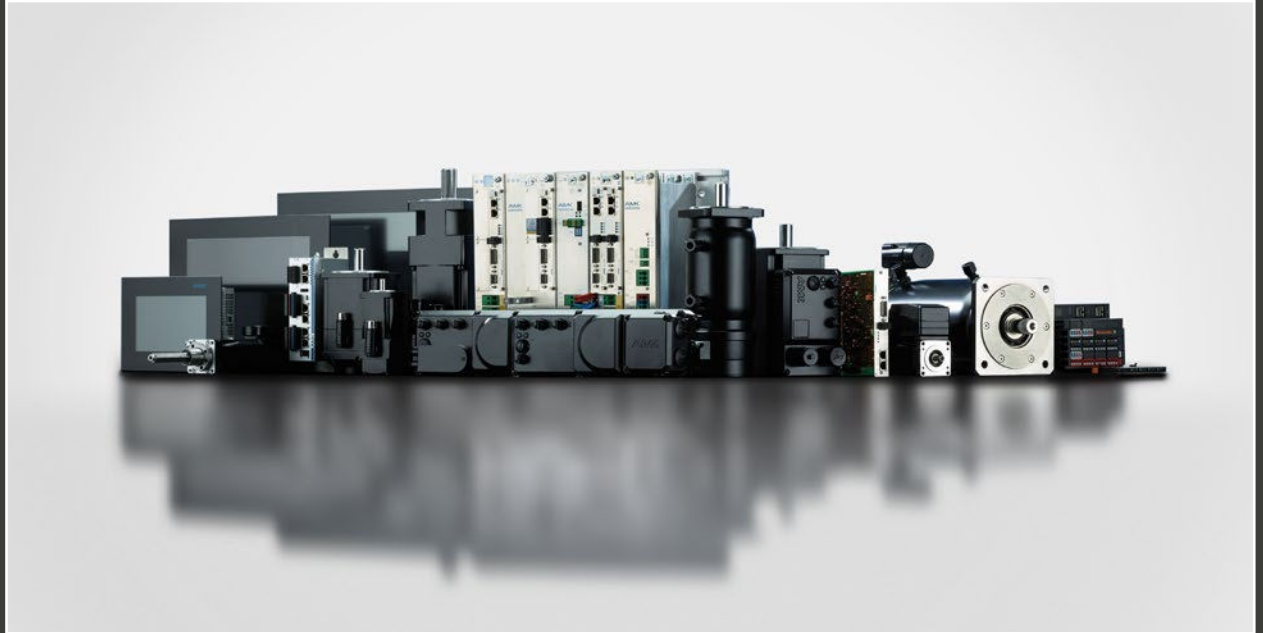
15 g for 11 ms according to EN 60068-2-27

#### Vibration stress:

1g at 10...150Hz according to EN 60068-2-6



## Control your Motion



- **AMKAMAC**  
Control technology
- **AMKASMART**  
Decentralised drive technology
- **AMKASYN**  
Servo inverter
- **DYNASYN**  
Servo motors
- **SPINDASYN**  
Linear drives

The information in this brochure is intended solely as a series product description. Deviations are possible due to specific products and continuous further developments. Before using data for calculations or designs, please check in advance the latest status and request product-specific dimension and data sheets.

We reserve the right to make technical changes. 10/2021

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