



AMKASYN

Servo Drives KE/KW

Compact, powerful, modular.

AMK



The most compact servo drives.

The intelligent servo drives KE/KW open up new dimensions of power density. With these drives, control cabinets can be built extremely compact. In some cases they can even be integrated directly into the machine. This saves space and also reduces costs. The innovative cooling system with cold plate technology guarantees optimum heat dissipation and increases service life.

Harmonized individual components interact seamlessly to provide customized solutions: whether centralized or decentralized. The utilization of those modules that are actually needed, equipped with the functions that are actually required, paves the way for optimum cost effectiveness.

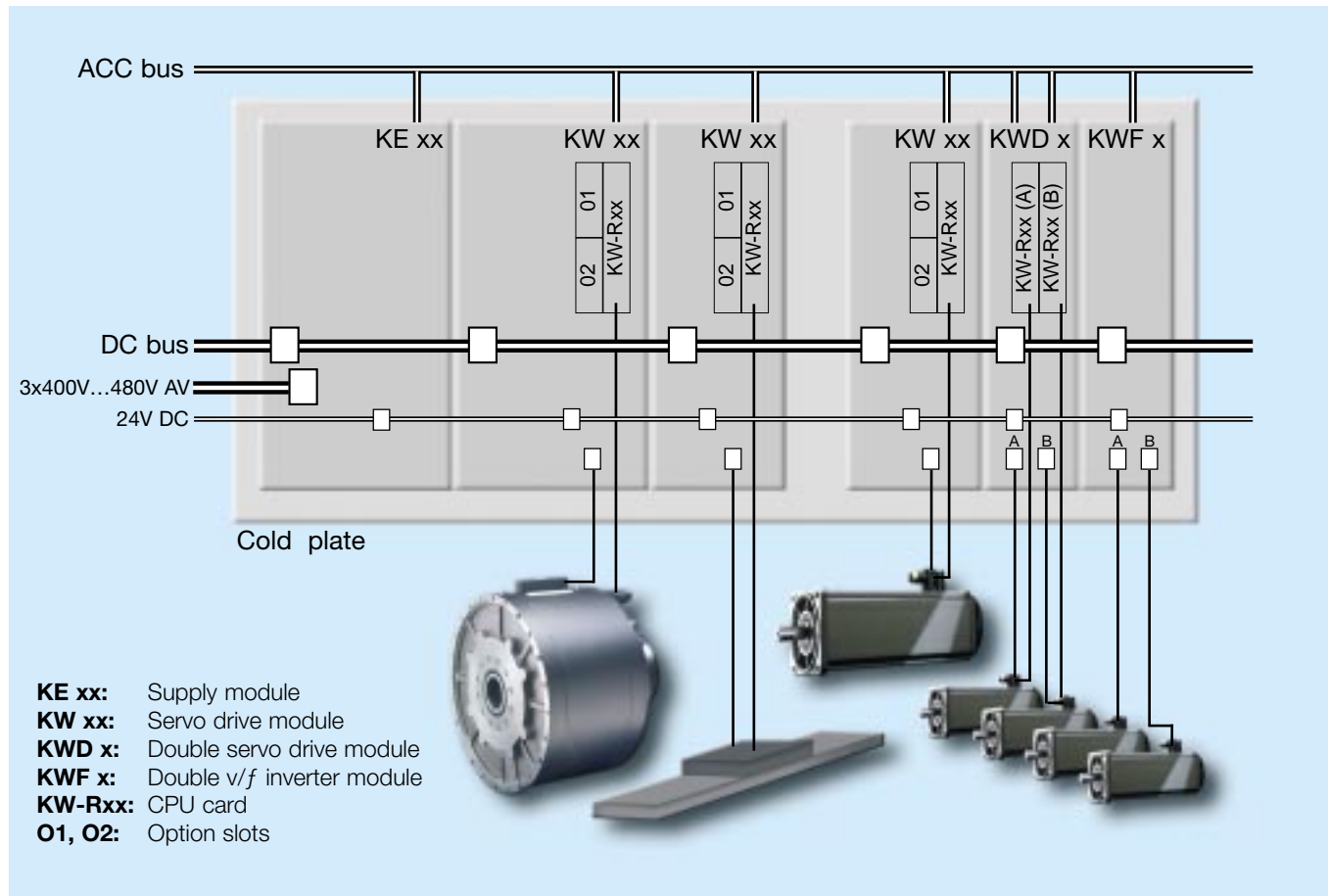
All types of synchronous or asynchronous servo-motors, high-torque or linear motors with various encoder systems can be operated in a highly dynamic and precise manner. Using the ACC system bus, any required number of axes can be interconnected hardware synchronous with a jitter of less than 1 μ s.

Programming in compliance with IEC 61131-3 coupled with the function blocks of the AMK library greatly simplify the utilization of AMK's PLC and Motion Control technology. Programming takes place independent of the AMK hardware platform that is being used. The basis for visualization already exists.

The drives not only offer the highest degree of AMK standard functions, they also offer maximum and intrinsic safety: locking to protect against accidental motor start-up takes place without external components in compliance with Safety Category 4, the highest safety level under EN 954-1.



Interface overview KE/KW



The most important advantages at a glance

- Compact components reduce control cabinet space
- Cost savings through possible integration of the control cabinet as a part of the machine
- Cost-optimized solutions due to modular system structure
- Design of complex, interconnected machines utilizing AMK's real-time synchronization
- Simple implementation of Motion Control functions through the integratable PLC
- Integrated safety function in compliance with Safety Category 4

Features

- Power ratings up to 120 kVA
- Modular structure
- Extremely flexible module arrangement
- The number of servo axes per supply module is only limited by the rated power output
- Cooling in cold plate technology
- Line regenerative braking optional
- Various encoder technologies available: standard feedback inputs for resolver, square-wave encoder, sine-wave encoder, EnDat®, Hiperface®
- Pulse transmission
- Multifunctional interconnection via efficient ACC bus
- PLC functionality optional
- Field busses
 - SERCOS
 - Profibus DP
 - CAN - Ethernet

Standard functions

- Torque control
- Speed control
- Position control
- Machine homing routines in many variations
- Synchronous control
- Electronic line shafting
- Brake control

Applications

- In all areas of machine design incl.
- injection molding machines
 - printing presses
 - packaging machines
 - tobacco processing machines
 - paper machines
 - machine tools
 - handling systems

Compact supply module KE

Maximum power in minimum space.

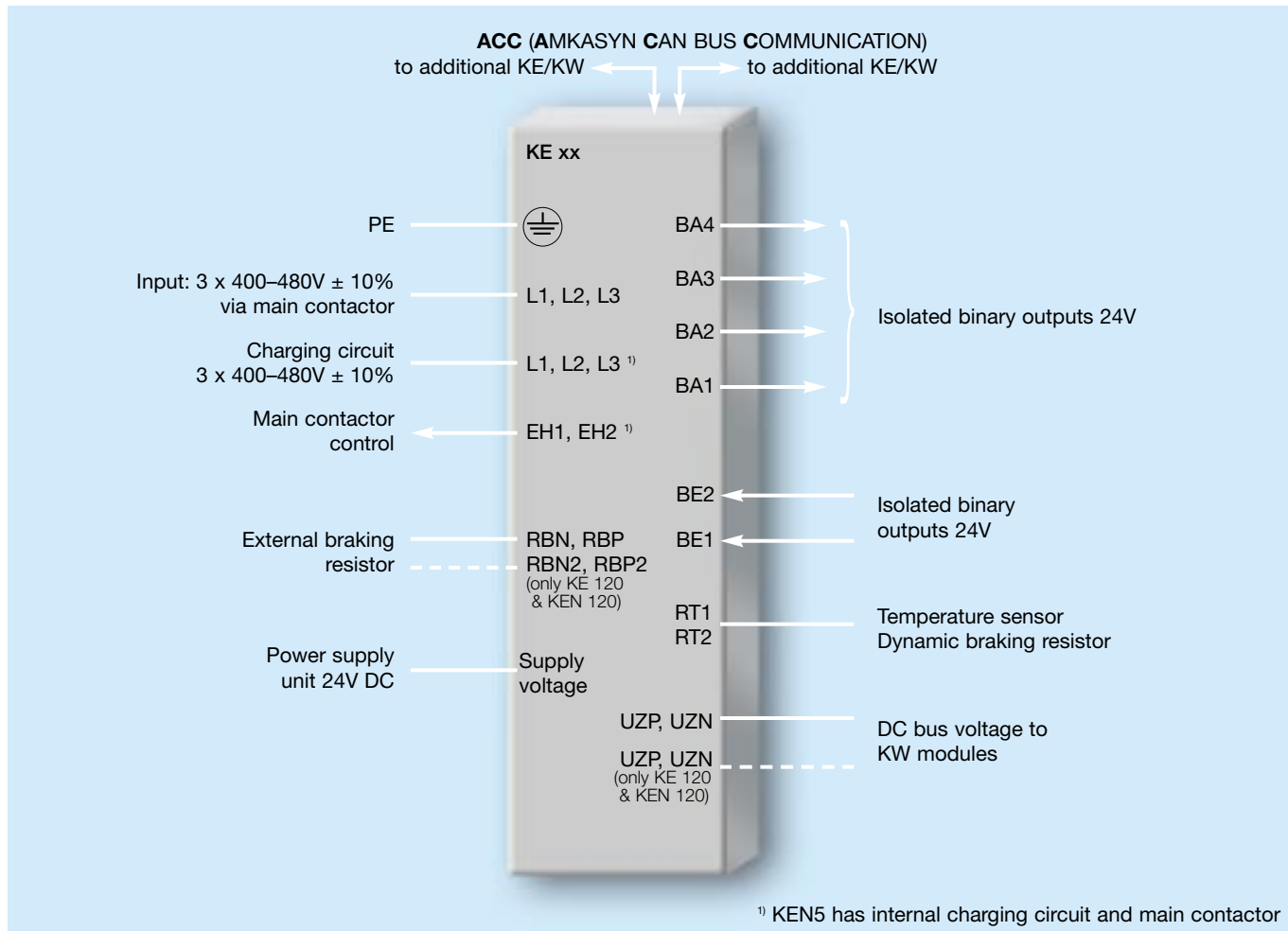


The compact supply modules KE generate the DC bus voltage for all connected drive modules

Features:

- Power ratings up to 120 kW
- Cooling in cold plate technology
- Line regenerative braking optional
- Braking chopper integrated
- Protective functions
 - Overtemperature
 - Power failure
 - Input current
 - Short circuit protected
 - DC bus overcurrent
- Function control and diagnostics via ACC bus
- Control and monitoring of charging process
- Main contactor control

Interface overview KE



Technical data KE/KW

Type		KEN 5	KE 10	KE 20	KE 40	KE 60	KEN 60	KE 120	KEN 120
Rated input voltage	V AC	3 x 400...480 +/- 10%							
Mains frequency	Hz	47...63							
Input current	A	7.5	15	30	60	90	90	180	180
Rated output power	kW	5	10	20	40	60	60	120	120
Maximum output power (for 60s)	kW	10	20	40	80	120	120	200	200 *)
Efficiency	%	ca. 98							
Power factor	–	> 0.9							
Cooling system	–	Cooling surface (liquid cooling)							
Regeneration	–	No	Yes	Yes	Yes	Yes	No	Yes	No
Ext. dynamic braking resistor (Option) min. Ω		110	20	20	8	8	8	8	2x8
Protective functions	–	Overtemperature, Mains fail, Mains over current, bleed resistor short circuit							
Mains filter	–	integrated according EN61800-3 Tab. 11				external			
Weight	kg	3	4.2	4.2	8	8	8	14	14
Dimensions: Width (H = 333, D = 255)	mm	55	85	85	170	170	170	255	255
AMK Part No.		E793	E716	E717	E718	E719	E785	E807	E781

*) motoring, max. 160 kW regenerative

Inverter module KW

Excellent dynamic response and precision.
With intrinsic safety.

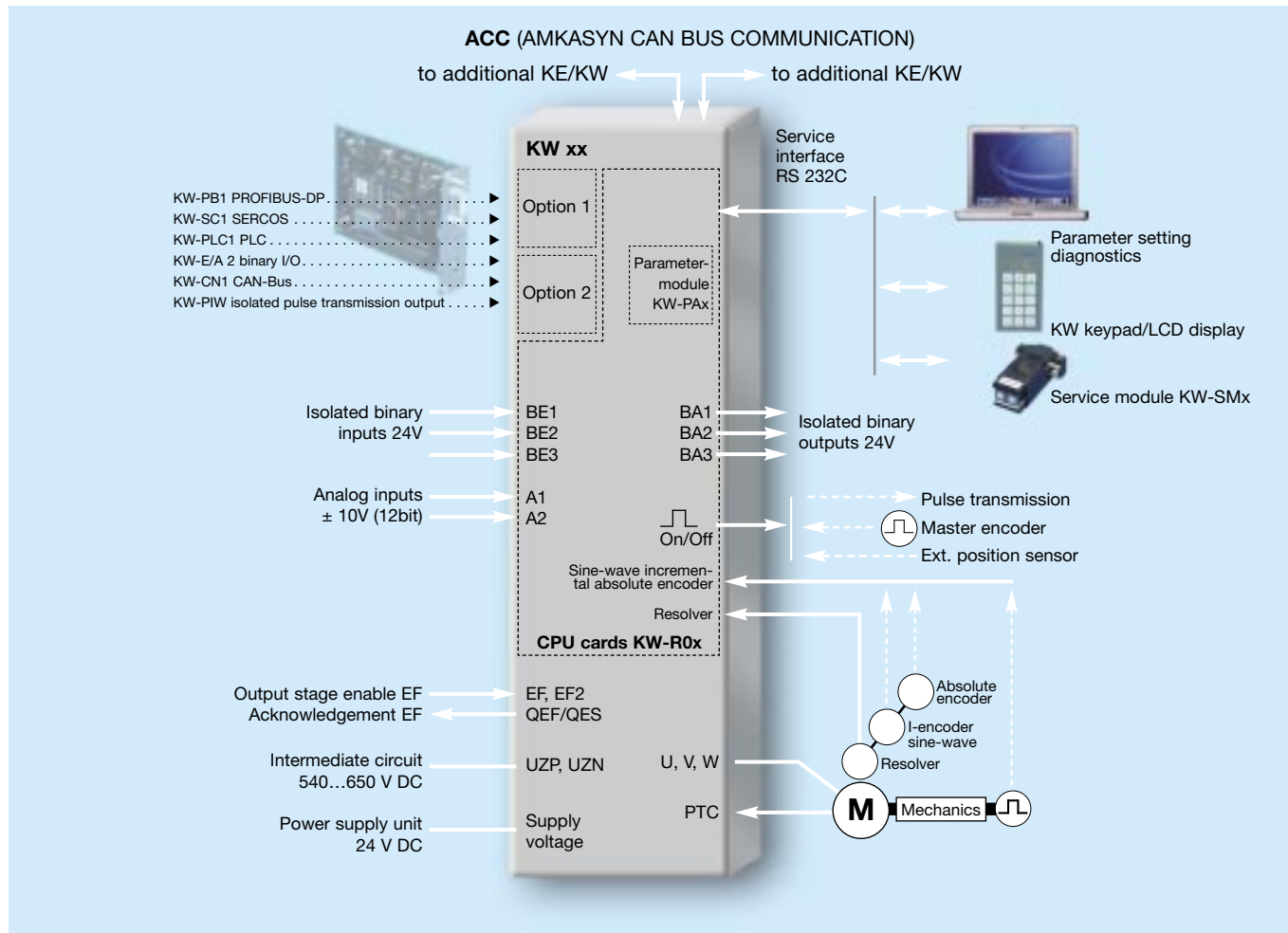


The digital compact servo drive modules KW control the motors in 4-quadrant mode precisely and with high dynamic response. A multifunctional connection to a higher-level control unit via the internal ACC bus or via various field busses is possible.

Features:

- Power ratings up to 100 kVA
- Cooling in cold plate technology
- Precise and highly dynamic control of all three-phase motors (synchronous, asynchronous, torque, spindle motor, linear or rotary)
- Safeguarding to protect against undesired motor start-up (Safety Category 4) via output stage enable (EF) handshakes.
- Accommodates 1 CPU card (KW-R03, KW-R03P or KW-R04) and up to 2 option cards (CPU cards and option cards must be ordered separately)

Interface overview KW with KW-R03 or KW-R03P



Technical data

Type		KW 2	KW 5	KW 10	KW 20	KW 40	KW 60	KW 100
Input voltage	V DC	540.....650						
Input current	A	3.8	9.3	18.5	37	74	112	187
Rated output voltage	V AC	3 x 350 for sinusoidal currents						
Output frequency	Hz	0.....800 ¹⁾						
Rated output power	kVA	2	5	10	20	40	60	100
Maximum output power (for 10s)	kVA	4	10	20	40	80	120	200 ²⁾
Rated output current	A	3.3	8.3	16.5	33	66	99	165
Maximum output current (for 10s)	A	6.6	16.6	33	66	132	198	330 ³⁾
Efficiency	%	> 97						
Cooling system	–	Cooling surface (liquid cooling)						
Protective function	–	Motor overcurrent, short circuit, ground fault, overtemperature, I ² T monitoring						
Switching frequency	kHz	8 (4)						
Weight	kg	3	3	4.2	4.2	8	8	14
Dimensions: Width (H = 333, D = 255)	mm	55	55	85	85	170	170	255
AMK Part No. not incl. EF (not incl. controller card)		E764	E766	–	–	–	–	–
AMK Part No. incl. EF (incl. controller card)		E765	E767	E768	E769	E770	E771	E779

¹⁾ 0...400 at 4 kHz PWM

²⁾ at 4 kHz PWM, 150 kVA at 8 kHz PWM

³⁾ at 4 kHz PWM, 247.5 A at 8 kHz PWM

Double Servo Drive KWD

Two drives in one enclosure.

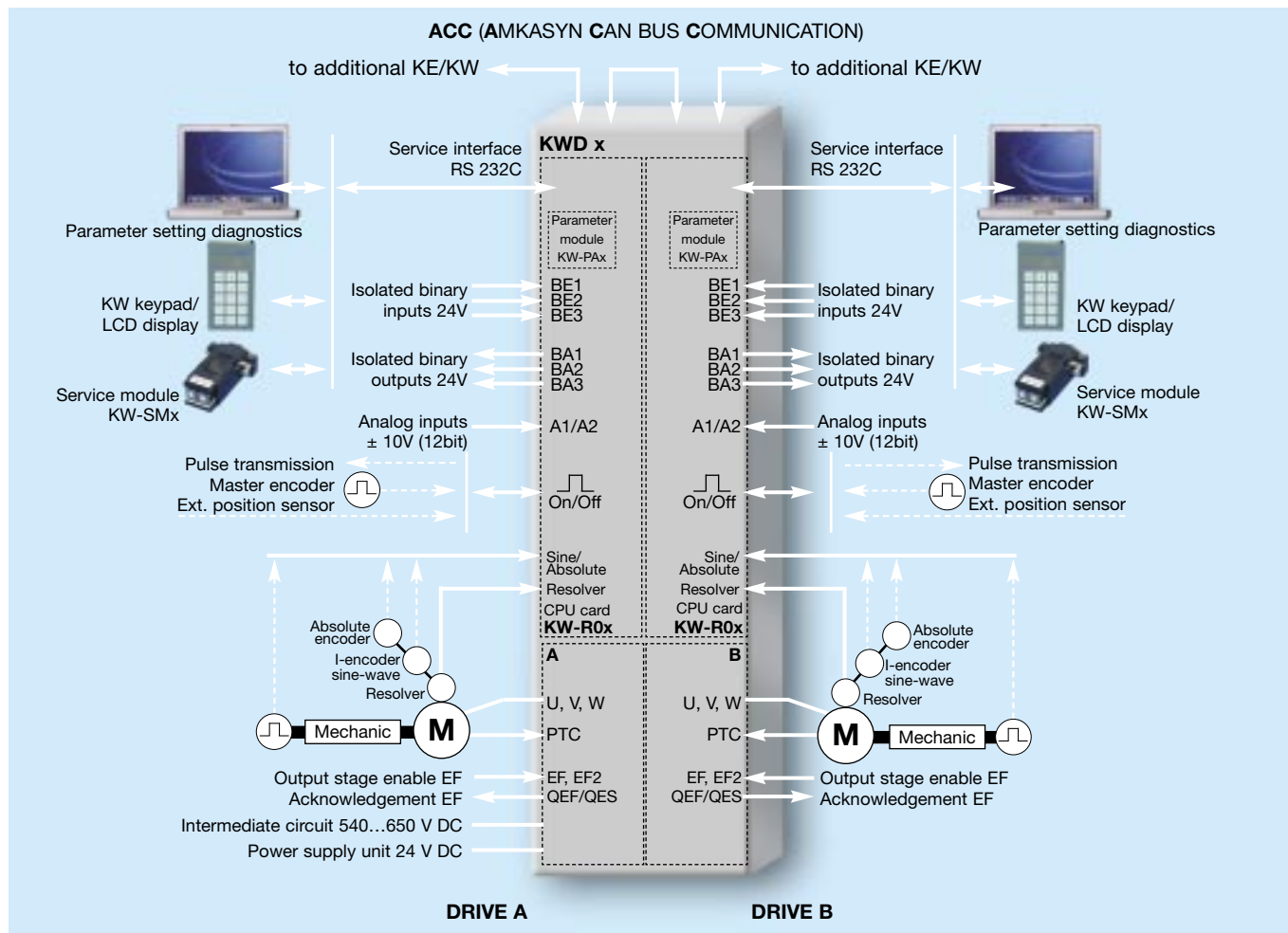


The compact servo drive module KWD contains two independent KW drives in one enclosure. This represents a low-cost and extremely compact solution for servo drives with low power ratings.

Features:

- Power ratings up to 4 kVA
- Very compact dimensions
- Cooling in cold plate technology
- Precise and highly dynamic control of all three-phase motors (synchronous/asynchronous motor, torque/spindle motor, linear or rotary)
- Safeguarding to protect against undesired motor start-up (Safety Category 4) via output stage enable (EF) handshakes.
- Accommodates 2 CPU cards (KW-R03 or KW-R03P or KW-R04), no option cards (cards must be ordered separately)

Interface overview KWD, with KW-R03 or KW-R03P



Technical data

Type		KWD 1	KWD 2	KWD 4
Input voltage	V DC		540...650	
Input current	A	3.8	7.6	15.2
Rated output voltage	V AC	3 x 350 for sinusoidal currents		
Output frequency	Hz	0...800 *)		
Rated output power	kVA	2 x 1	2 x 2	2 x 4
Maximum output power (for 10s)	kVA	2 x 2	2 x 4	2 x 8
Rated output current	A	2 x 1.65	2 x 3.3	2 x 6.6
Maximum output current (for 10s)	A	2 x 3.3	2 x 6.6	2 x 13.2
Efficiency	%	> 97		
Cooling system	–	Cooling surface (liquid cooling)		
Protective function	–	Motor overcurrent, short circuit, ground fault, overtemperature, I ² T monitoring		
Switching frequency	kHz	8 (4)		
Weight	kg	3		
Dimensions: Width (H = 333, D = 255)	mm	55		
AMK Part No. not incl. EF (not incl. controller card)		E762	E763	–
AMK Part No. incl. EF (incl. controller card)		E759	E760	in preparation

*) 0–400 at 4 kHz PWM

CPU cards

Functionality made to measure



The CPU cards are inserted into the card plug-in slot of the compact servo drive module KW. The entire control of the drives including all monitoring and communication, is realized via the digital signal processor on the card.

The CPU cards KW-R03 and KW-R03P offer 2 connectors for option cards (e.g. I/O card, field bus card, SERCOS-interface, PLC card...). The option cards are connected using a bus connector in the appropriate position on the CPU card.

General functions:

- Field orientation / Current regulation
- Parameter management
- ACC bus communication
- Torque control
- Speed control
- Position control
- Absolute/Relative positioning
- Spindle positioning
- Machine homing
- Angle synchronous operation
- Stepping motor simulation



CPU card KW-R03

(AMK Part No. O688)

Interfaces:

- Resolver input (D-SUB, 9-pole)
- Sine-wave encoder input incremental, singleturn, multiturn, EnDat® Hiperface® (D-SUB, 15-pole)
- Pulse generator input/output
- 2 probe inputs
- Binary output for control of a holding brake $I_{max}=2A$
- Monitoring of holding brake
- 2 analog inputs
- Serial interface RS232 (D-SUB, 9-pole for PC/operator panel/service module)
- ACC bus connector (2x FireWire)
- KW-PA1 parameter module (pluggable) saves the drive parameters, with LED status display
- 2 option slots



CPU card KW-R04

(AMK Part No. O689)

Interfaces:

- Resolver input (D-SUB, 9-pole)
- Pulse generator input/output
- 2 probe inputs
- Binary output for control of a holding brake $I_{max}=2A$
- Monitoring of holding brake
- 2 analog inputs
- Serial interface RS232 (D-SUB, 9-pole for PC/operator panel/service module)
- ACC bus connector (2x FireWire)
- KW-PA1 parameter module (pluggable), saves the drive parameters, with LED status display
- No option slots



CPU card KW-R03P

(AMK Part No. O690)

Interfaces: see KW-R03

Integrated PLC functionality:

PLC programming in compliance with IEC 61131-3. The CPU card KW-R03P requires the parameter module KW-PA2 with an additional 79 kByte program memory for the PLC program.

Multiple function blocks from the AMK library support the program when creating the PLC program, e.g. through Motion Control components for faster functions such as electronic cam switch, electronic cam motion profile, set-point generator and virtual master or through application modules such as winders, print-mark control and many more.

Option cards

Individual function enhancement.



KW-EA2

(AMK Part No. O664)

This option card paves the way for a low-cost enhancement of the KE/KW system with binary inputs and outputs, which can also be used to control motion profiles.

Features:

- 12 binary 24V inputs in compliance with VDI 2880
- 8 optically isolated 24V outputs each rated at 100mA
- Short-circuit monitoring of the outputs
- Bit information within the drives configurable for outputs.
- Triggering of various drive functions configurable through inputs.
- With "Configurable Control PLC", the I/O can be used as PLC inputs and outputs.



KW-SC1

(AMK Part No. O669)

The interface card KW-SC1 transforms the drive into a SERCOS interface® slave. This slave is based on the SERCOS interface® Version V 1.02. in compliance with DIN EN / IEC 61491.

Features:

- SERCOS Class C
- Communication cycle time minimum 0.5 ms
- Transfer rate up to 16Mbit/s
- Broadcast Message to all drives available



KW-PB1

(AMK Part No. O667)

The interface card KW-PB1 PROFIBUS-DP allows communication between a PROFIBUS master and the drive via the AMK field bus protocol AFP for drive commanding.

Features:

- Connection of the inverter to a PROFIBUS-DP MASTER in compliance with DIN 19245, Part 3
- Maximum 32 slaves per line (can be enhanced to max. 122 slaves with repeater)
- Baud rate 12Mbit/s
- Address assignment via rotary encoding switch
- Max. 48 input and 48 output bytes
- AFP driver component for Siemens S7 PLC available



KW-PLC1

(AMK Part No. O698)

KW-PLC1 is a programmable logic controller (PLC) in compliance with IEC 61131-3 that can be used for the implementation of all complex machine control functions including visualization as well as the execution of axis-specific tasks.

In addition, the option card offers a hardware synchronous CANopen interface called CAN-S for connecting to a CAN bus network.

Features:

- CAN bus interface in compliance with CiA CAN 2.0B with CANopen in accordance with DS301 Version 4.01.
- CAN BUS MASTER or SLAVE functionality
- Hardware-synchronized signal scanning, jitter < 1µs
- Programming in compliance with IEC 61131-3



- Comprehensive AMK Motion Control libraries available with drive functions such as positioning function, table interpolation, PID controller, cam controller, print-mark control etc.
- 2 fast binary inputs with a resolution of up to 200 ns for the realization of measuring functions, print-mark control and much more.
- RS422 MODBUS interface for data exchange between PLC and an external operator panel/visual display unit
- CAN bus status display via LEDs
- CAN address preselection via rotary encoding switch possible
- Approx. 3500 commands/ms
- 127 kByte program memory (not volatile)
- 128 kByte data memory (volatile)
- 32kByte RETAIN memory, non-volatile data memory for application data which should be retained in the event of a power failure

Double v/f inverter KWF

Frequency inverter in twin format.

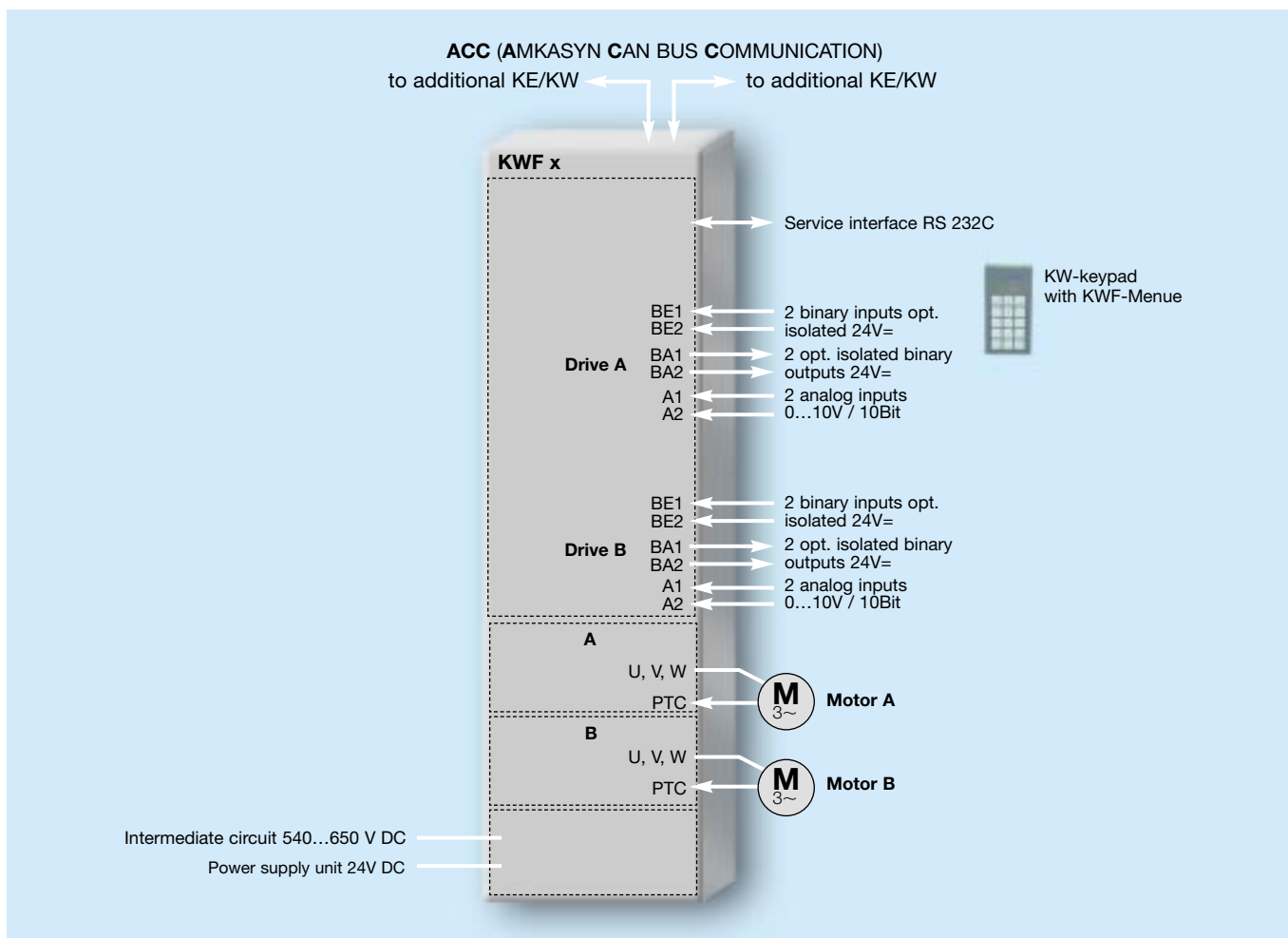


The double frequency inverter KWF is a cost-effective solution for all simple servo and variable-speed drives, e.g. for material feeding equipment and conveyors as well as complete materials handling systems within a servo-drive-based machine. This results in a uniform and compact assembly and a common communications system for all servo and auxiliary drives.

Features:

- 2 autonomous inverters in a narrow bookshelf design
- Can be combined with all other KE/KW modules
- Requires very small space
- Cold plate technology
- Parameter setting and commanding via ACC bus
- ACC bus interface for both drives
- RS232 interface for standard keypad/LCD display
- All functions are available separately for each inverter
- Each equipped with 2 analog inputs 0...10V
- Each equipped with 2 binary I/Os
- Fast response due to 1 ms scan times for inputs
- Frequency resolution internally (digital) 0.04 Hz
- Minimum frequency 5Hz
- Accel/Decel functions

Interface overview KWF



Technical data

Type		KWF 1	KWF 2
Input voltage	V DC	540...650	
Rated output voltage	V AC	3 x 0...350	
Output frequency	Hz	5...511	
Rated output power	kVA	2 x 1	2 x 2
Rated output current	A	2 x 1.6	2 x 3.3
Maximum output current (for 60s)	A	2 x 3.3	2 x 6.6
Recommended motor power	W	500	1000
Cooling system	–	Cooling surface (liquid cooling)	
Protective function	–	Motor overcurrent, short circuit, ground fault, overtemperature, I ² T monitoring	
Weight	kg	3	
Dimensions: Width (H = 333, D = 255)	mm	55	
AMK Part No.		E778	E774

AIPEX **Start-up and** **parameter setting.**

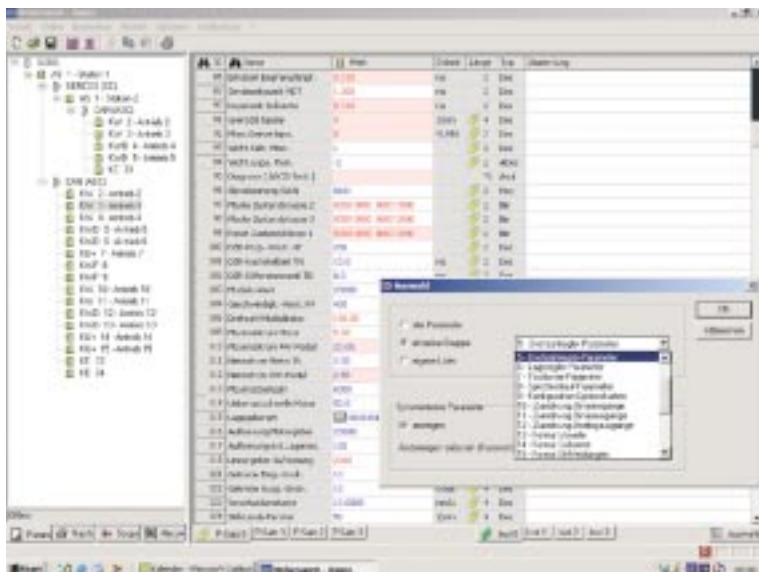
Fast, simple, intelligent.

With AIPEX, even a complex KE/KW system can easily be configured and put into operation using a standard PC.

AIPEX also allows full access to all the devices within the machine via the ACC bus master. The number of individual devices in the machine is not limited.

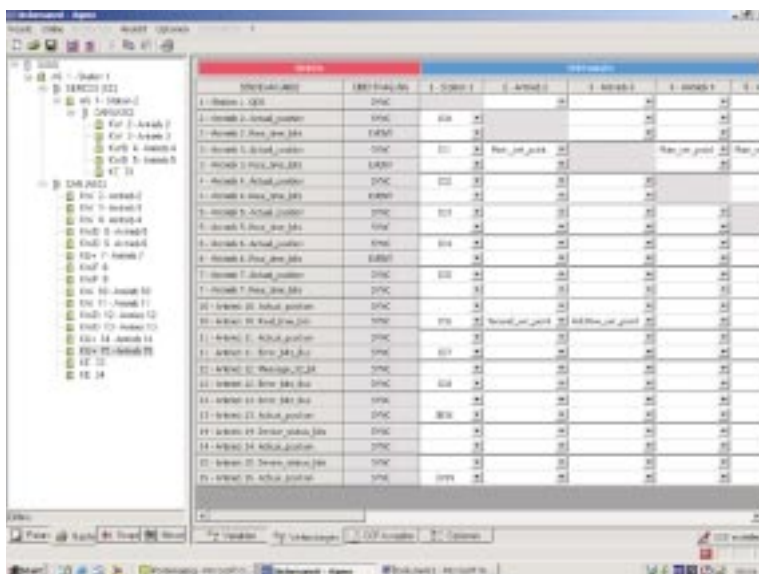
AIPEX can handle all combinations of KE, KW, KWD, KWF and KU devices.





Parameter processing

- Full support for projects which can be created online or offline
- A project file for the complete machine with simple data management (save, duplicate, archive)
- Full access to all parameters of the individual devices via ACC master
- Support wizards
- Extensive diagnostic possibilities with online help
- Integrated motor database



Accessories

General

Accessories	Type	AMK Part No.	Remark
Cold plate	KW-CP340	O704	Length: 340 mm Right connection
	KW-CP340R	O705	Length: 340 mm Rear connection
	KW-CP510	O706	Length: 510 mm Right connection
	KW-CP510R	O707	Length: 510 mm Rear connection
	KW-CP680	O708	Length: 680 mm Right connection
	KW-CP680R	O709	Length: 680 mm Rear connection
ACC bus connection cable	KW-ACC210	2931	Length: 210 mm for all modules Frame width 55.....170 mm
	KW-ACC300	200053	Length: 300 mm for all modules Frame width 255 mm
	KW-ACC1000	29523	Length: 1 m
	KW-ACC2000	29543	Length: 2 m
	KW-ACC4000	29544	Length: 4 m
	KW-ACC10000	29545	Length: 10 m
	KW-ACCT	29240	Bus terminating resistor connector
DC bus cable	KW-UZ85	46254 46255	Red + Blue L= 45 mm, 10 mm ² for KW 10, KW 20
	KE-UZ170	46256 46257	Red + Blue L= 117 mm, 10 mm ² connection cable 85 mm module to KE 40, KE 60
	KW-UZ170	46258 46259	Red + Blue L= 114 mm, 25 mm ² module to KW 40, KW 60
	KW-UZ 380	46634 46635	Red + Blue L= 380 mm, 50 mm ² for KW 100
PC commissioning tools	AIPEX	46600	AMK start-up and parameter explorer
	Flash Tool	46629	For updating firmware
Mounting hardware	upon request		Shield terminals, terminal blocks, screws etc.

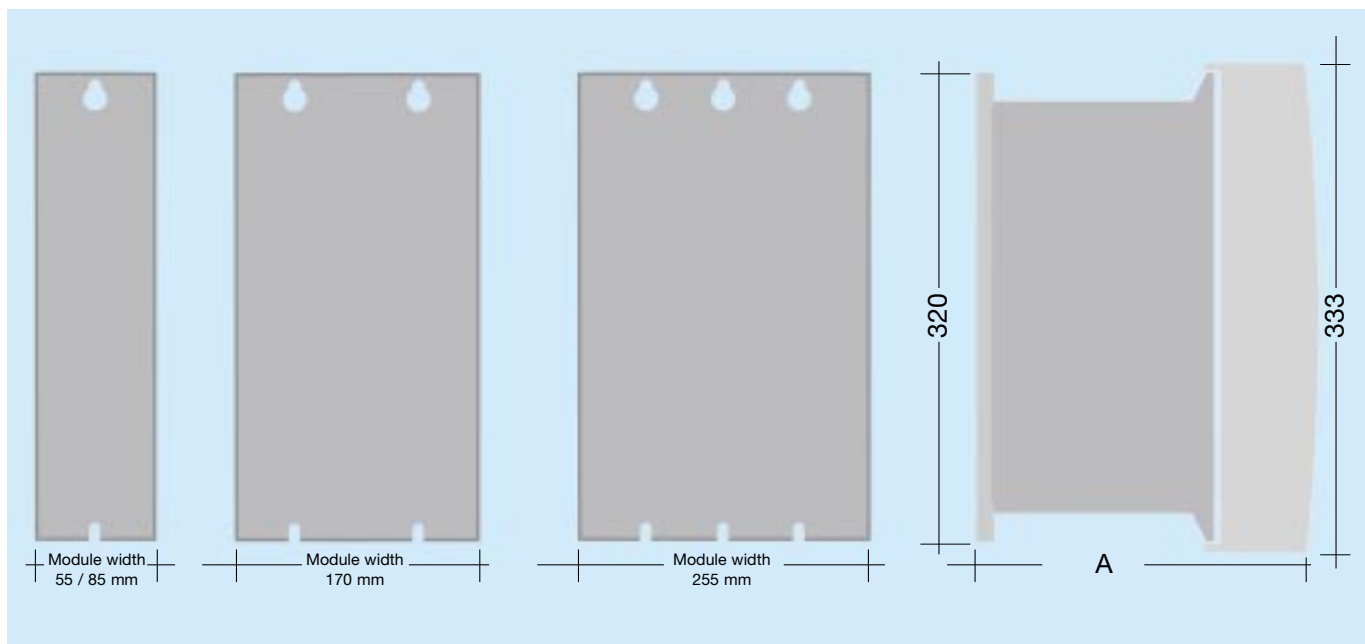
Accessories KW

Accessories	Type	AMK Part No.	Remark
Optional modules	KW-CN1	O662	CAN interface
	KW-PIW	O682	Isolated pulse processing
	KW-SM1	O677	AMK service module: D/A converter for interface X135 (RS 232)
	KW-SM2	O676	AMK service module: Bus device addressing
Operator panel	KU-BF1	E628	Operator panel

Accessories KE

Accessories	Type	AMK Part No.	Remark
Line reactors	ALN 36	O726	(3x500V AC, 36A) for KE 10
	ALN 36/1000	O727	(3x500V AC, 36A) for KE 20
	ALN 63	O728	(3x500V AC, 63A) for KE 40
	ALN 85	O729	(3x500V AC, 85A) for KE 60, KEN 60
	ALN 180		(3x500V AC, 180A) for KE 120, KEN 120
Braking resistors	AR 45	O536	110 ohm for all supply modules
	AR 4000-20-0	E591	20 ohm, 0.6kW for KE 10, KE 20
	AR 4000-20-F	E593	20 ohm, 1.5kW for KE 10, KE 20
	AR 4000-8-0	E584	8 ohm, 1.5kW for KE 40.....KEN 120
	AR 4000-8-F	E585	8 ohm, 4kW for KE 40.....KEN 120
Mains contactor		29295	for KE 10 : coil 24V
		29296	for KE 20 : coil 24V
		29297	for KE 40 : coil 24V
		29298	for KE 60 : coil 24V
		200446	for KE 120 : coil 24V
		29299	Surge Suppressor for 29295 + 29296
		29300	Surge Suppressor for 29297 + 29298
Mains filter	AF 90	29294	TN/IT-network : 3x480V AC, 90A for KE 60, KEN 60
	AF 180	200447	TN/IT-network : 3x480V AC, 180A for KE 120, KEN 120

Frame dimensions



Module	Module width in mm	Module depth (A) in mm
KEN5 / KW2 / KW5 / KWD1 / KWD2 / KWD 4 / KWF 1 / KWF 2	55	255
KE10 / KE20 / KW10 / KW20	85	255
KE40 / KE 60 / KW 40 / KW 60 / KEN 60	170	255
KE120 / KEN 120 / KW 100	255	270

Directives and standards

- Low Voltage Directive 73/23/EEC and 93/68/EEC
- EN 50178 "Electronic equipment for use in power installations"
- EN 61800-2 "Adjustable speed electrical power drive systems - Part 2: General"
- 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:

- Machine Directive 89/392/EEC
- EMC Directive 89/336/EEC
- EN 60204 "Electrical equipment of machines".



General technical data

Input to network KE:

3 x 400V...480V \pm 10%, 47... 63 Hz

General operating requirements in compliance with 61800-2 Chap. 4.1.1 and EN 60204-1 Chap. 4.3

- Symmetrical three-phase input voltage, max. permitted voltage asymmetry 3% TN- and TT-network, grounded neutral
- Suitable for IT networks

Reference potential:

PE, circuit GND of low voltage circuit is connected internally with the frame ground.

Power supply unit for supply voltage

24V DC \pm 15%, ripple max. 5%, with integrated starting current limitation.

Limit values for radio interference voltage in compliance with EN 61800-3: (2000)

in accordance with Section 6.3.2 Tab. 11 and Tab.12 (external filter required from KE 60 upwards)

Ambient conditions

Protection type in compliance with EN 60529:

IP 20, contamination level 2

Storage / transport temperature:

-25°C to +75°C

Ambient temperature:

+5°C to +40°C

Cold plate temperature:

max. 40°C

Relative humidity:

5% to 85 %, without condensation

Setup height:

Up to 1000 m above sea level. In the case of altitudes over 1000 m up to max. 2000 m, the ratings must be reduced by 1% per 100 m.

Shock resistance:

15 g for 11ms in compliance with EN 60068-2-27

Vibration stress:

1g at 10...150Hz in compliance with EN 60068-2-6

Control your Motion.



- **Intelligent
Motion Control Technology**

- **Multi-axis controller**

- **CNC controller**

- **Linear-motion drives**

- **Geared motors**

- **Built-in motors**

- **Custom-designed
special motors**

- **Frequency inverters**

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