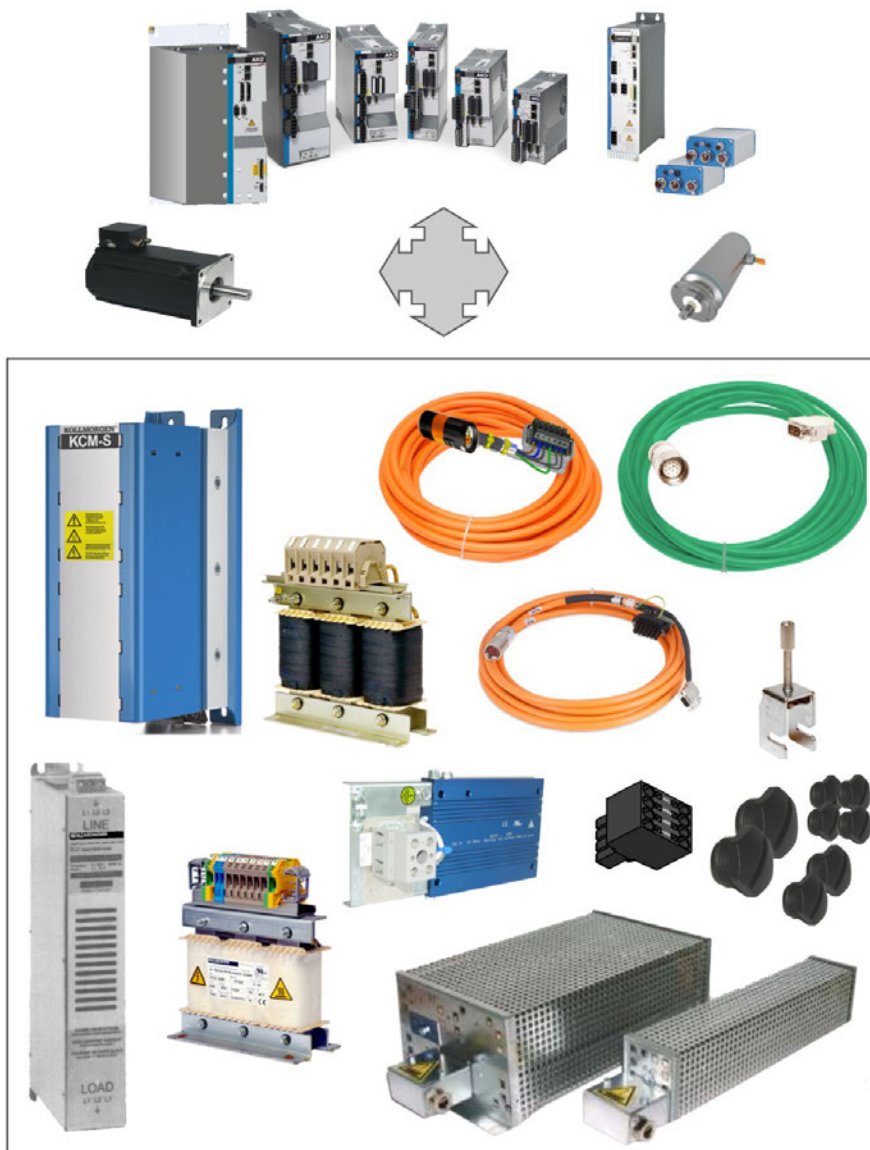


Accessories for digital drive systems with AKD

Manual



Edition: September 2016
Translation of the original document
European Version (CE region)

Keep all manuals as a product component during the life span of the product.
Pass all manuals to future users and owners of the product.

Record of Document Revisions

Edition	Comments
...	Table with lifecycle information of this document see "Record of Document Revisions" (→ p. 59)
09/2015	Motor cables for AKD-x04807 added, mating connector X5-JUMP for AKD-N new, cabinet connector coupling for decentral drive system removed, notes for slip rings and IP67 grommets, revision history restructured, CFD5A1 cable added. Sxyz contents removed. First AKD-only revision.
12/2015	Cable section restructured, Order code Heat conducting film AKD-N updated, KCM 24A limitation
09/2016	AKD-N012 accessories added, warning notes format updated, Speedtec cables added

Technical changes which improve the performance of the device may be made without prior notice!

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2 General

2.1 About this manual

This manual describes accessories for Kollmorgen AKD drives. It contains essential technical data. The manual is only valid in conjunction with the instructions manual for the drive and servo motor you are using in your application.

You will find copies of the instructions manual for Kollmorgen drives and servo motors on the CD ROM included in the scope of supply and on our Internet site. The documents are available in Acrobat Reader format in multiple languages (system requirements: WINDOWS, Internet browser, Acrobat Reader).

More detail information can be found in the "Kollmorgen Developers Network" available at kdn.kollmorgen.com.








2.2 Hints for the online edition (PDF format)

Bookmark: Table of contents and index are active bookmarks.

Table of contents and index in the text: The lines are active cross references. Click on the desired line and the appropriate page is indicated.

Page/chapter numbers in the text: Page/chapter numbers with cross references are active. Click at the page/chapter number to reach the indicated target.

2.3 Symbols Used

Symbol	Indication
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates situations which, if not avoided, could result in property damage.
NOTE	This symbol indicates important notes.
	Warning of a danger (general). The type of danger is specified by the text next to the symbol.
	Warning of danger from electricity and its effects.
	Warning of danger from suspended loads.
	Warning of danger from high temperature.

2.4 Safety Notes

This section helps you to recognize and avoid dangers to people and objects.

Read the documentation!

Read the available documentation before installation and commissioning. Improper handling of the devices can cause harm to people or damage to property. The operator must therefore ensure that all persons entrusted to work on the devices have read and understood the manual and that the safety notices in this manual are observed.

Always observe the whole drive system built with drive, cables, motor, accessories (filters, chokes, etc.). This means, that all documentation which exist for the components, must be available, must be read and must be understood.

Pay attention to the technical data!

Adhere to the technical data and the specifications on connection conditions (rating plate and documentation). If permissible voltage values or current values are exceeded, the devices can be damaged, e.g. through overheating.

Specialist staff required!

Only properly qualified personnel are permitted to perform such tasks as transport, assembly, setup and maintenance. Qualified specialist staff are persons who are familiar with the transport, installation, assembly, commissioning and operation of power electronics and who bring their relevant minimum qualifications to bear on their duties. The qualified personnel must know and observe IEC 60364 / IEC 60664 and national accident prevention regulations.

Additional requirements on specialist staff may also result from the risk assessment.

Hot surface!



Some devices can reach temperatures of up to 250°C during operation. Touching them can result in burns. Observe the permissible mounting position and ensure that a sufficient distance is maintained from neighboring assemblies.

Earthing!



It is vital that you ensure that the device housing is safely earthed to the PE (protective earth) busbar in the switch cabinet. Without low-resistance earthing no personal protection can be guaranteed and there is a risk of death from electric shock.

High voltages!



Keep the switching cabinet closed when the equipment is in operation. Not having optical displays does not guarantee an absence of voltage. Power connections may carry voltage even if the motor is not turning.

Do not unplug any connectors during operation. There is a risk of death or severe injury from touching exposed contacts. Power connections may be live even when the motor is not rotating. This can cause flashovers with resulting injuries to persons and damage to the contacts.

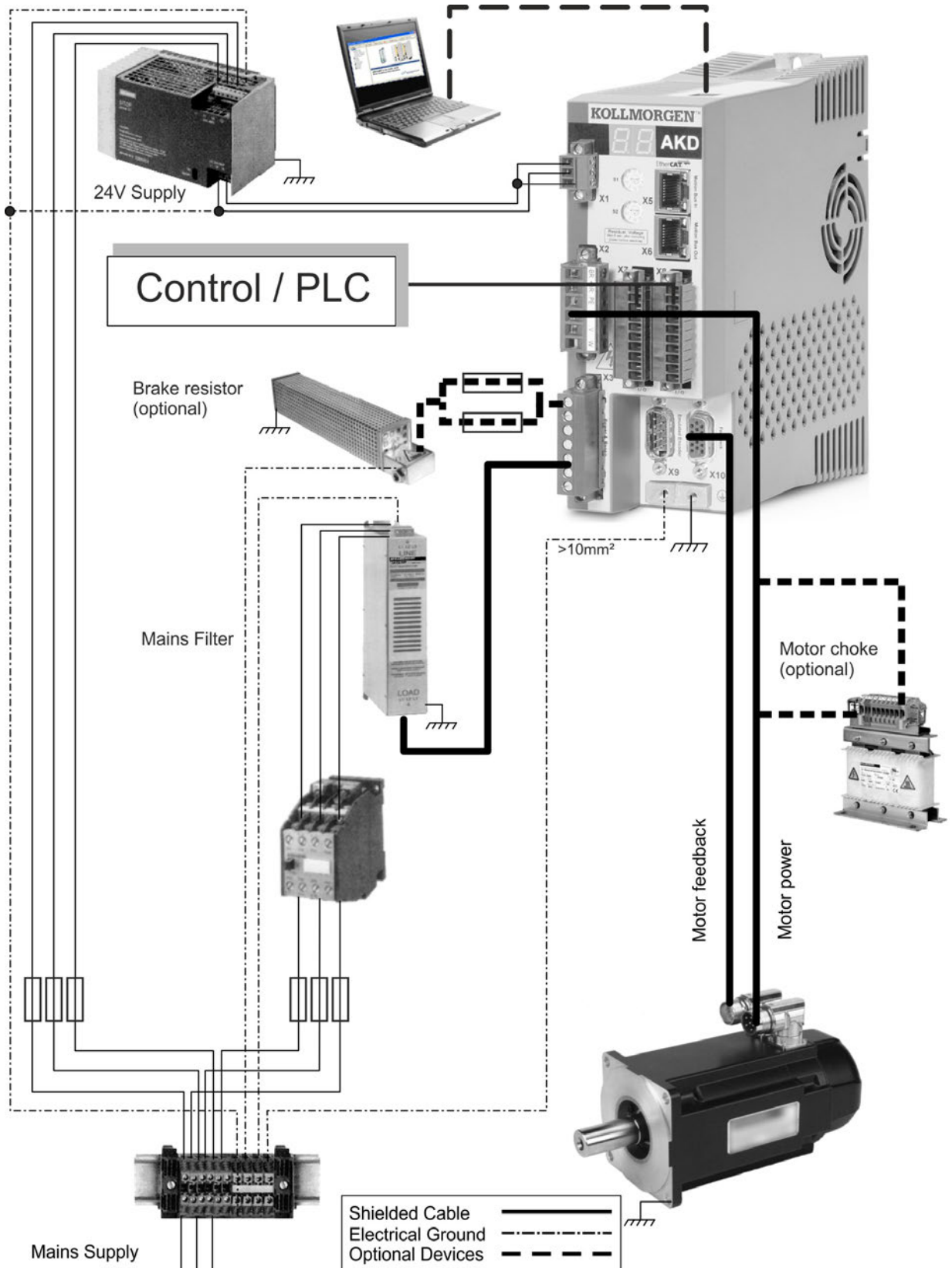
DC Bus link connections can carry dangerous voltage levels over an hour after the line voltage has been switched off (self-discharge time). Danger of death from electric shock.

Before commencing work on the modules' power terminals, check the voltage at the connection terminals is de-energized to ground and to each other.

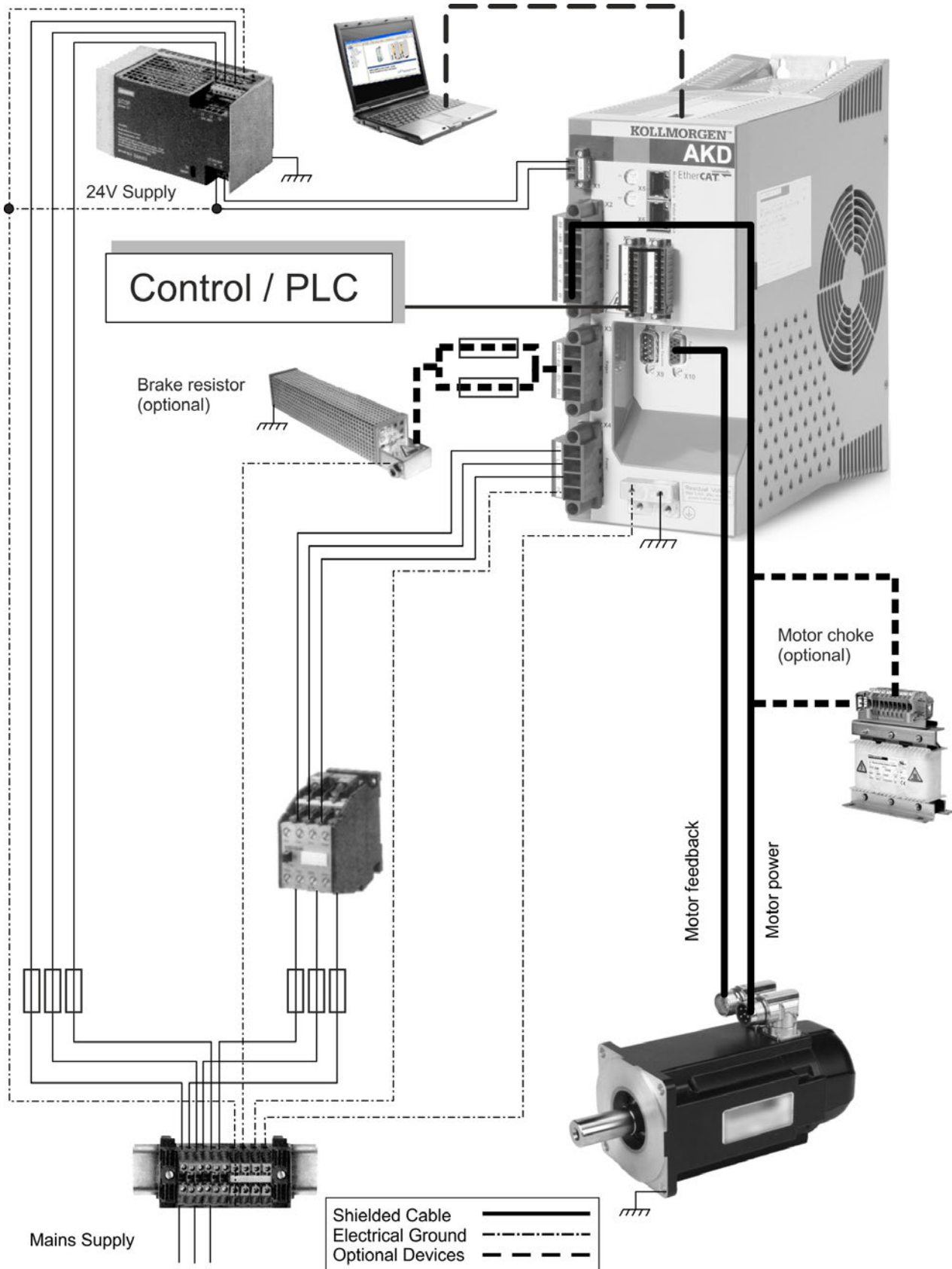
3 Digital Drive Systems

The systems shown are simply a possible scenario for setting up a digital drive system with relevant drive components.

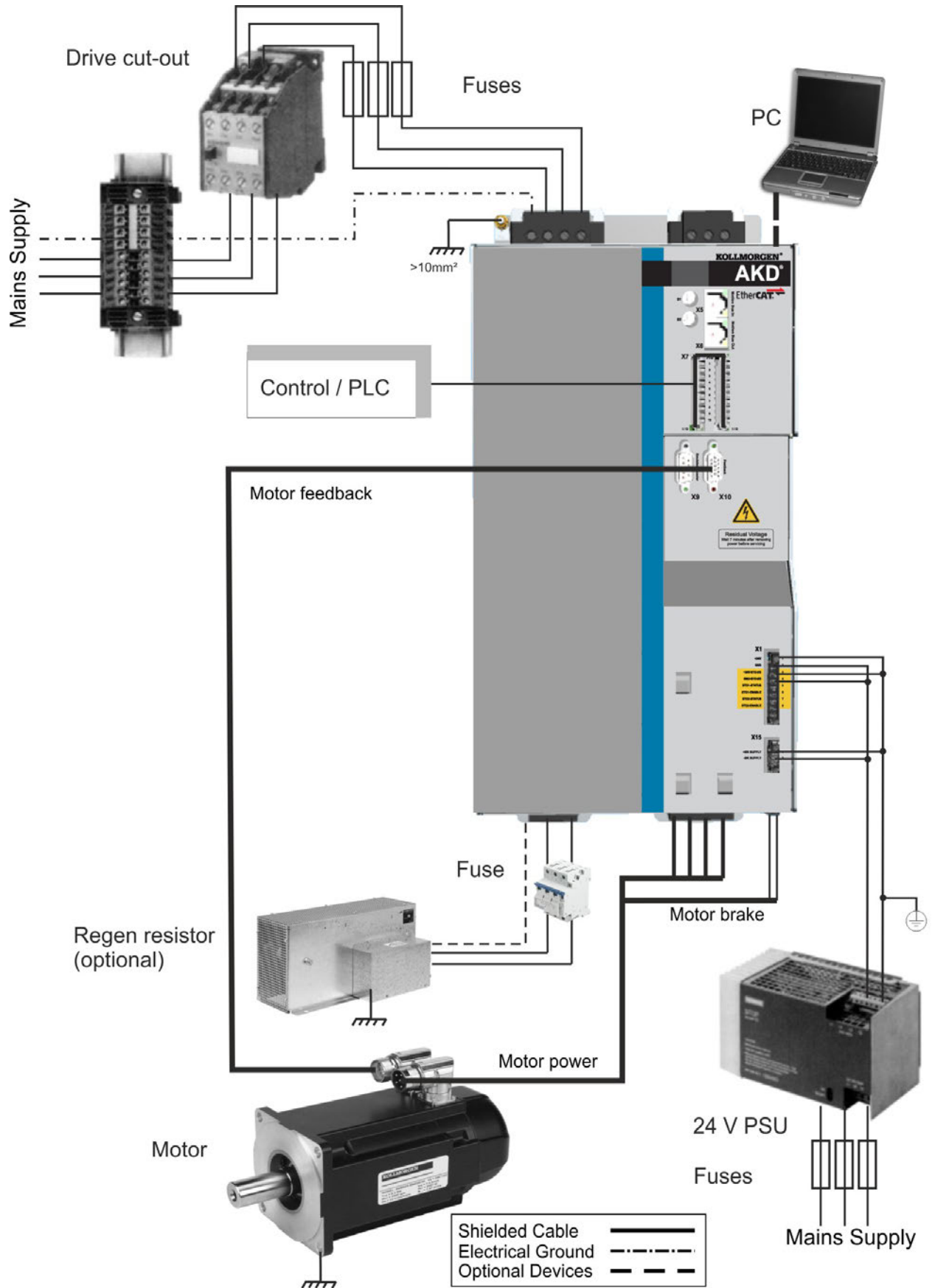
3.1 Drive System with AKD-x00306...02406



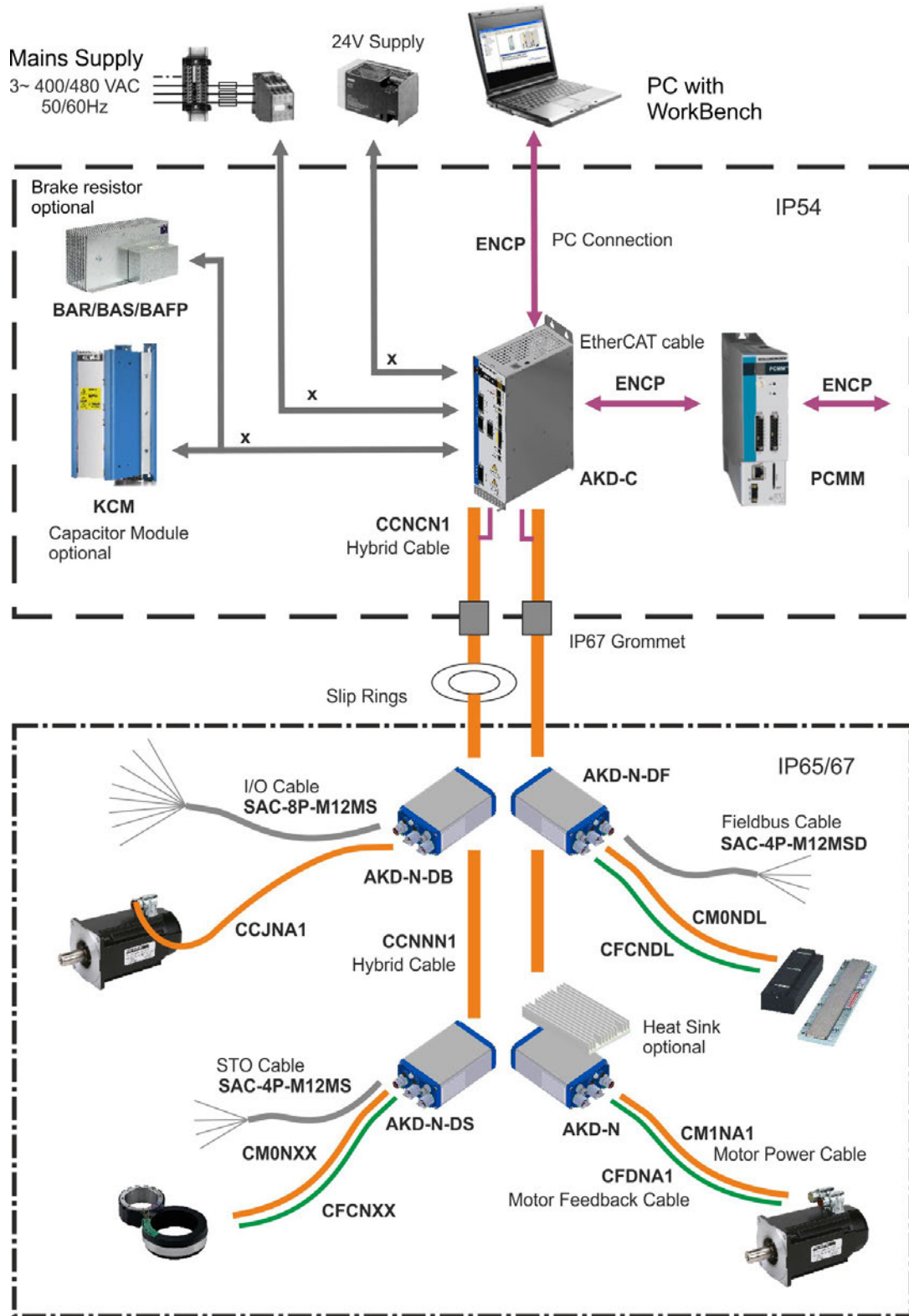
3.2 Drive System with AKD-x00307...02407



3.3 Drive System with AKD-x04807



3.4 Decentralized Drive System with AKD-C and AKD-N



All components inside the borders are supplied by Kollmorgen with the exception of cables signed with "x". These cables are not supplied by Kollmorgen, you should use cables or wires according to EN 60204.

4 Mechanical Accessories

4.1 Mounting Kit for AKMH Motors

IEC mounting kits with 1 shaft center screw and 4 flange screws. Hygienic mounting is possible only with these screws.

Description	Order Code
Mounting Hardware AKMH2, Ax flange / Cx front mounting	MTG-KIT-AKMH2-IEC
Mounting Hardware AKMH3, Ax flange / Cx front mounting	MTG-KIT-AKMH3-IEC
Mounting Hardware AKMH4, Ax flange / Cx front mounting	MTG-KIT-AKMH4-IEC
Mounting Hardware AKMH5, Ax flange / Cx front mounting	MTG-KIT-AKMH5-IEC
Mounting Hardware AKMH6, Ax flange / Cx front mounting	MTG-KIT-AKMH6-IEC

NEMA mounting kits are described in the US selection guide, available from the Kollmorgen website www.kollmorgen.com).

4.2 Suspension Unit for AKM motors



! DANGER

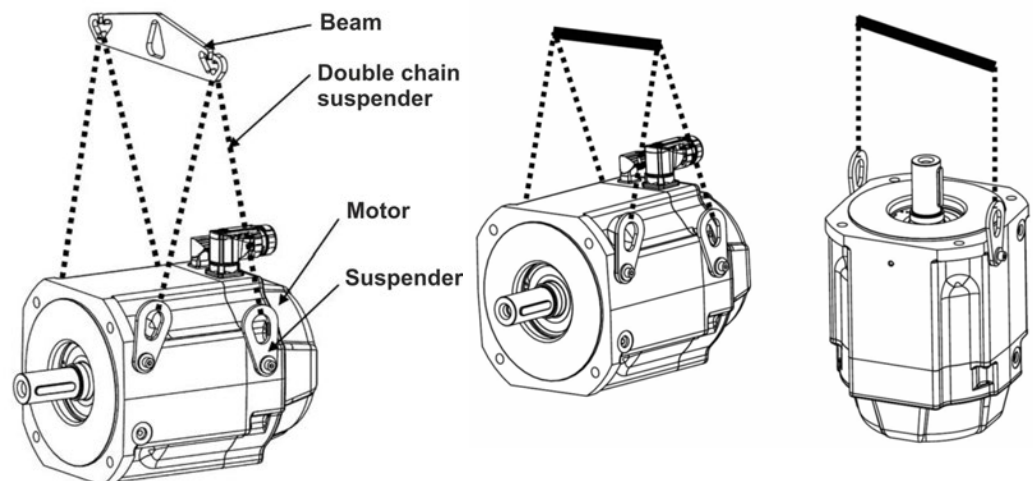
Suspended load. Risk of death if load falls.

- Never step under the load, while the motor is raised!

NOTICE

You must read the instructions manual for the suspension unit ZPMZ 120/292. Observe the "safety instructions" and "use as directed" hints before starting transportation work.

The Suspension Unit ZPMZ 120/292 is designed for suspended handling exclusively of motors (i.e., without attached units such as gearboxes, clutches, etc.) with a maximum weight of 120 kg and maximum nominal span of the extreme suspension hooks of 292 mm.



The suspended unit consists of a Beam, suspended off the crane hook and two double-run chain suspenders. The motor may be borne on two or four runs of the chain suspender.

The suspenders (number depends on the motor type) are delivered with the motor.

Technical Data			
Lifting capacity	120 kg	Weight	0,83 kg
Nominal span	292 mm	Number of cycles a year	20.000
Lug width	44,7 mm	Average load	60 %
Lug height	51 mm	Order code	FA00092

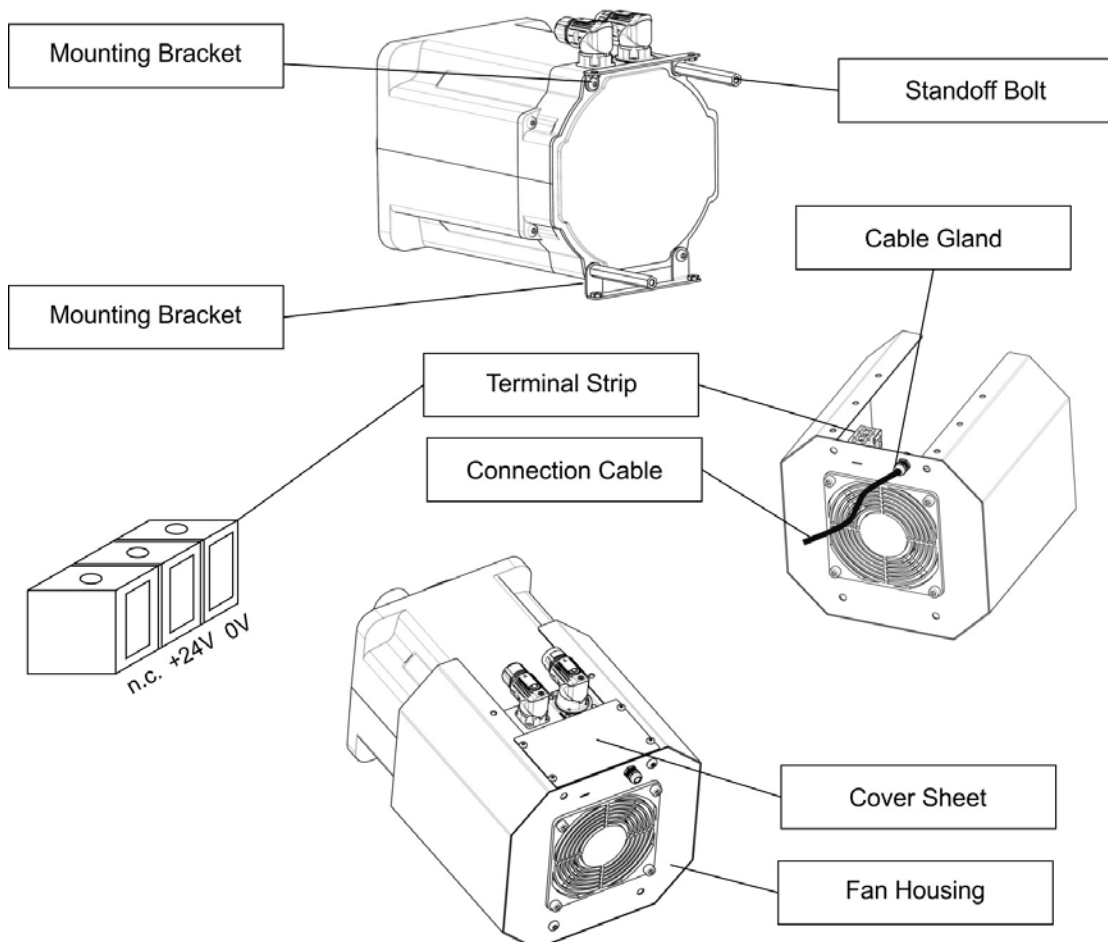
4.3 Fan Kit for AKM7 motors

NOTICE

Observe the mounting instructions delivered with the fan kit. The fan housing can be mounted either with both the supplied brackets and spacers or with the brackets only. The choice of mounting method depends on the application. If strong vibrations are expected, you should use both brackets and spacers. Motors with integrated brakes require the long spacers.

Mounting the fan kit enlarges the motor by approximately 65 mm. The detailed final dimensions of AKM7 motors with mounted fan kit can be found in the instructions manual of the AKM motor series. Ventilation of AKM7 motors allow increased current of the motors. This higher current usually requires larger wiring cross section compared to not ventilated motors. The necessary data for current and wiring cross section can be found in the technical data section of the AKM instructions manual.

Technical Data	
Supply voltage	24 VDC
Supply current	270 mA
Electrical power	6.5 W
Surface	Coated with polyester powder coating in matt black, not resistant against solvents
Protection class	IP 20
Connection	Cable gland 10 mm, cable diameter 4 mm to 6 mm, recommended cable 3x0.75 mm ² (not part of delivery)
Terminals	0.33 mm ² to 4 mm ²
Weight	2.52 kg
Order code	AKM7-FAN



4.4 Mechanical accessories for AKD-N and AKD-C

NOTICE

You must read the AKD-N/AKD-C installation manuals. Observe the safety instructions given there before commencing mounting/installation work.

4.4.1 Heat Sink for AKD-N

When mounting AKD-N to the machinery, temperature management is important to ensure maximum performance of the drive system. In case of medium or bad cooling situation (as described in the AKD-N Installation Manual), you can mount a heat sink to the AKD-N.

Heat flow is optimized by a heat conducting film, which must be placed between heat sink and AKD-N.

Mounting holes in the heat sink and winding holes in the AKD-N are prepared for M4x16 hexagon socket screws to ISO 4762. Use a 3 mm T-handle Allen key for mounting.

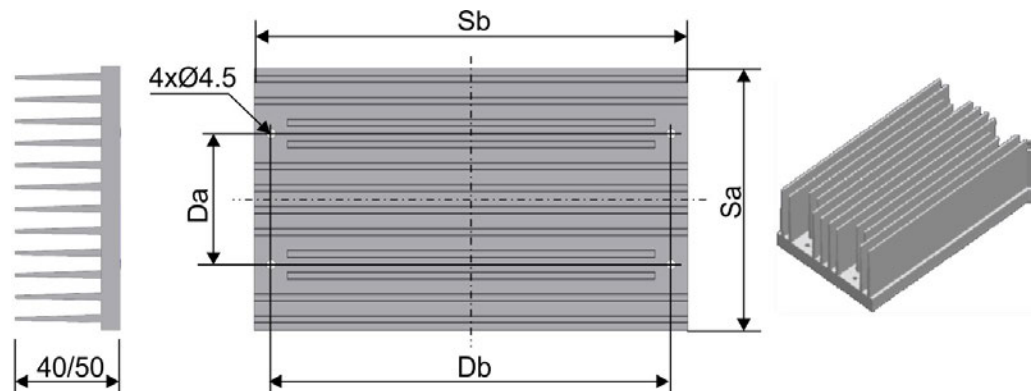


Figure similar to reality. Heat sink for AKD-N12 with 31 cooling fins.

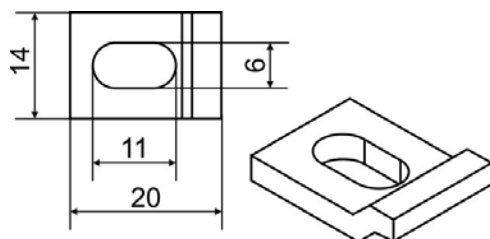
Usable for	Outer dimensions			Drill dimensions	
	Sa / mm	Sb / mm	Height / mm	Drill Da / mm	Drill Db / mm
AKD-N003/006	120	200	40 or 50	60	184.4
AKD-N012	120	250	50	60	234.4

Order Codes

Article	Usable for	Order codes
Heat sink Kit 40 mm with heat conducting film and 4 screws M4x16	AKD-N003/006	AKD-N 3,6 HEATSINK KIT 40MM
Heat sink Kit 50 mm with heat conducting film and 4 screws M4x16	AKD-N003/006	AKD-N 3,6 HEATSINK KIT 50MM
Heat sink Kit 50 mm with heat conducting film and 4 screws M4x16	AKD-N012	AKD-N 12 HEATSINK KIT 50MM
Heat conducting film	AKD-N003/006	849-373001-04
Heat conducting film	AKD-N012	849-374001-04

4.4.2 Mounting clamps for AKD-N

The AKD-N drive is mounted to the machine with special mounting clamps. The delivery package contains 4 clamps. In case of lost or damaged clamps, you can order a set of four clamps.



Order Codes

Article	Order codes
AKD-N Mounting Clamps Set, 4 clamps	AKD-N-M/C-Set

4.4.3 Sealing plugs for AKD-N connectors

The sealing plugs in the delivery package are screwed to unused AKD-N connectors to ensure the IP class for the machine environment. In case of lost plugs, you can order a set with 3 different plug sizes.



Order Code

Article	Order Codes
AKD-N Sealing Plug Set, 4xM12, 2xM23, 2xM17	AKD-N-S/P-Set

4.4.4 Jump-X5 connector for AKD-N-DS/DF with single cable connection

For sufficient voltage supply of the digital feedback systems Hiperface DSL or SFD3 connected to AKD-N-DS/DF connector X4, a dongle must be plugged to X5.

Order Code

Article	Order Codes
AKD-N X5 sealed mating connector with jumper 4-5	AKD-N-JUMP-X5

4.4.5 Connector Kit for AKD-C

Mating connectors X12, X13, X14, X15, and X16 are part of delivery. If a mating connector is lost or damaged, you can order the AKD-C Connector Kit.

Order Code

Article	Order Codes
AKD-C Connector Kit, included mating connectors X12, X13, X14, X15, and X16	AKD-C-CONKIT

4.4.6 Cabinet grommets

The hybrid cable between AKD-C and the first AKD-N leads through the cabinet wall. To ensure IP67 protection class, Kollmorgen recommends cable entry system KDL/S combined with cable entry grommet KDT/S manufactured by Murrplastik Systemtechnik GmbH.

Please contact:

Murrplastik Systemtechnik GmbH

Fabrikstraße 10, D-71570 Oppenweiler, Germany

Phone: +49 (0)7191 482-0, Website: www.murrplastik.de, E-Mail: info@murrplastik.de

4.4.7 Slip rings

If AKD-N must be mounted on a rotary table, it is necessary to use slip ring assemblies for energy and data transfer between AKD-C in the cabinet and AKD-N on the rotary table. Kollmorgen cooperates with company STEMMANN-TECHNIK for user specific slip ring assembly solutions. Please contact:

STEMMANN-TECHNIK GmbH

Niedersachsenstraße 2, D-48465 Schüttorf, Germany

Phone: +49 (0)592381-0, Website: www.stemmann.com, E-Mail: sales@stemmann.de

4.5 Shield clamps

NOTICE

You must read the instructions manuals for the drive/servo motor you are using in your application. Observe the safety instructions they contain before commencing mounting/installation work.



These drives feature slots on the front panel for the connection of additional shield clamps.

Article	Tension range	Order Codes
SK14	6-13mm	DE-108248

5 Mains chokes

NOTICE

You must read the instructions manuals for the drive and servo motor you are using in your application. Observe the safety instructions given there.

5.1 General

In special cases, if mains voltage is more than 3% asymmetrical, then the AKD-48A must be used with a mains choke. In unfavorable combination of mains impedance and DC bus capacitance the unloaded DC bus may reach voltage up to 800V without choke. For EMC reasons the chokes should be mounted isolated to the cabinet. Single conductors can be used for wiring, shielded cables are not required. Purpose of mains choke:

- Prevents impermissible loading of semiconductors in the event of rapid current rise during commutation.
- Prevents voltage dips in the mains voltage caused by commutation.
- Reduces current ripple in the DC link, thereby increasing the service life of the DC link capacitors.

More information can be found on our "KDN" page "[Mains Choke](#)".

5.2 Important notes



DANGER

High Voltage up to 480 V!

Risk of electric shock. Power terminals are capable of conducting hazardous voltage up to 10 minutes after the mains voltage has been disconnected.

- Before starting work on power terminals, check that the phase-to-earth and phase-to-phase voltages have de-energised.

NOTICE

Due to the high earth leakage currents induced by the system, you should observe the requirements of EN 61800-5-1 (e.g. fixed installation, $\geq 10 \text{ mm}^2$ or double protective earth) when carrying out mounting and installation work. You must read the instructions manual for the drive/servo motor you are using in your application and observe the safety instructions they contain before commencing mounting/installation work.

Mounting: 50mm free space required above and below the device.

Connection diagram: see drive instructions manual.

5.3 Type assignment and order codes

Drive	Mains choke
AKD-x04807 (with asymmetrical mains >3% only)	2% uk
AKD other types	not required

Order Codes

Article	uk	Order codes
Mains choke 3L0,24-50-2 (0.24mH, 50A)	2%	DE-201476
Mains choke 3L0,2-75-2 (0.20mH, 75A)	2%	DE-201477

5.4 Mains choke 3L

NOTICE

A number of drives can be connected to one and the same mains choke; the rated current of the mains choke must be greater than or at least equal to the total current of the connected drives.

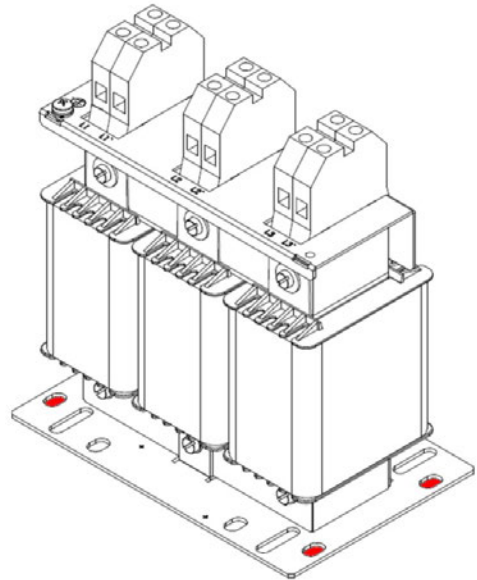
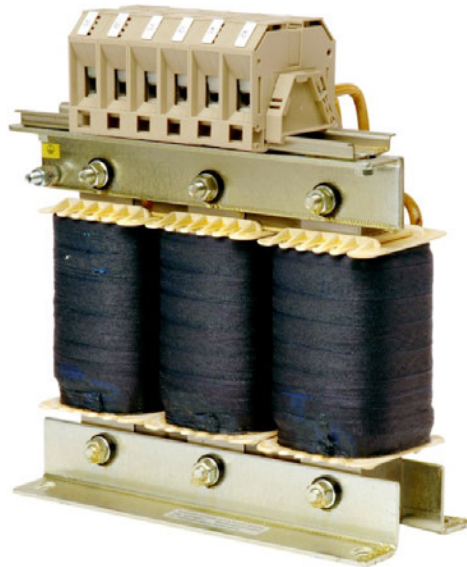
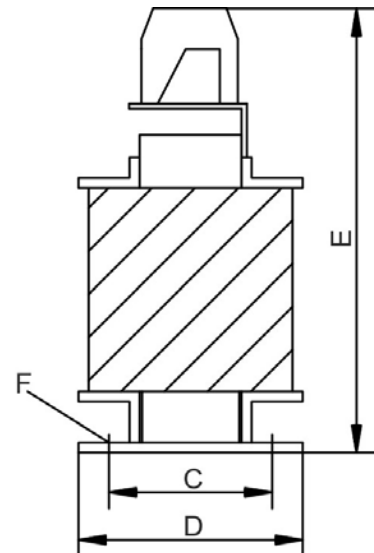
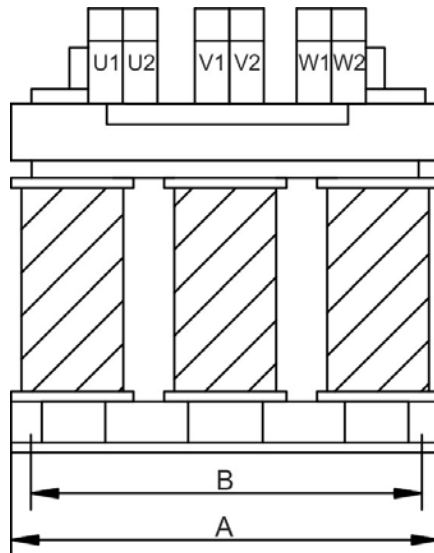


Photo: all models are similar



Technical Data

Type	Inductivity [mH]	Nominal Current [A]	uk [%]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	Terminals [mm ²]	Weight [kg]
3L 0,24-50-2	0.24	50	2	152.5	114.3	88.9	114.3	163	6.5	10	5.9
3L 0,2-75-2	0.20	75	2	185	170	77	122	220	8x12	35	9.9

6 Mains filters

6.1 General

AKD-x00306 to AKD-x02406 drives require an external mains filter. All other drives feature built-in mains filters (see the relevant instructions manual). The filtering effect of the mains filters can only be assured if the permissible throughput rating of the mains filters is not exceeded even on peak loading of the drives with I_{peak} .

The max. available throughput rating of the mains filter must be higher than the max. power consumption of the drives and higher than the maximum power consumption of the motors. More information can be found on our "KDN" page "[Mains Filter](#)".

6.2 Important notes



DANGER

High Voltage up to 480 V!

Risk of electric shock. Power terminals are capable of conducting hazardous voltage up to 10 minutes after the mains voltage has been disconnected.

- Before starting work on power terminals, check that the phase-to-earth and phase-to-phase voltages have de-energised.

NOTICE

Due to the high earth leakage currents induced by the system, you should observe the requirements of EN 61800-5-1 (e.g. fixed installation, $\geq 10 \text{ mm}^2$ or double protective earth) when carrying out mounting and installation work. You must read the instructions manuals for the used components and observe the safety instructions they contain before commencing mounting/installation work. See drive instructions manual for connection diagrams.

6.3 Type assignment and order codes

Drive	Mains filter
AKD-x00307...04807 (240 to 480V)	not required
AKD-B/P/T/M 00306...02406 (120 to 240V)	1NF, 3NF

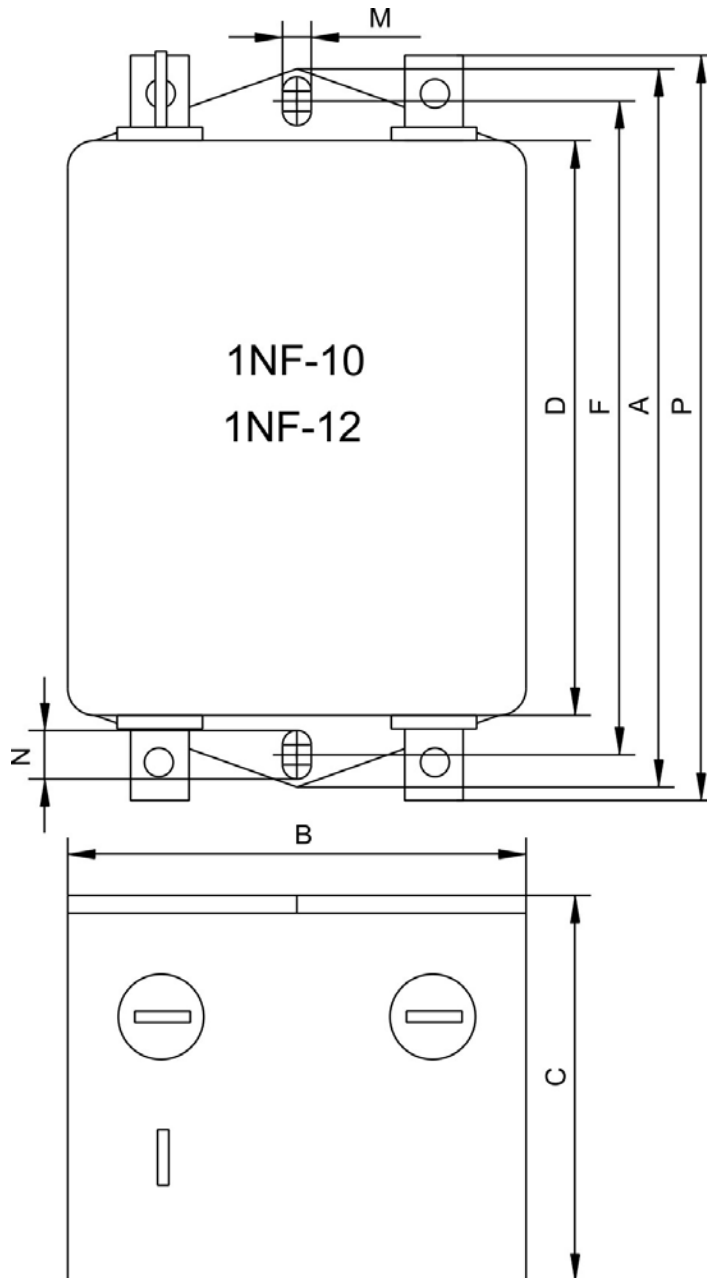
Order Codes

Article	Order code	Remarks
Mains filter 1NF-10 (230 VAC, 10A)	DE-201565	1~, 230V AC, CE*, UL
Mains filter 1NF-12 (230 VAC, 12A)	DE-201566	1~, 230V AC, CE*, UL
Mains filter 1NF-20B (125V/230 VAC, 20A)	DE-201865	1~, IEC 230V AC, UL 125 V AC, CE*
Mains filter 1NF-25 (230 VAC, 25A)	DE-201568	1~, 230V AC, CE*, UL
Mains filter 3NF-07 (480 VAC, 07A)	DE-201569	3~, 480V AC, CE*, UL
Mains filter 3NF-16 (480 VAC, 16A)	DE-201570	3~, 480V AC, CE*, UL
Mains filter 3NF-30 (480 VAC, 30A)	DE-201571	3~, 480V AC, CE*, UL

* No EC directive matches mains filters actually. You can use the filters in Europe, they are manufactured according to harmonized standards concerning creeping and voltage distances.

6.4 Mains filters 1NF-10...12

Observe the safety instructions → p. 20.
For single-phase operation only.



Technical Data

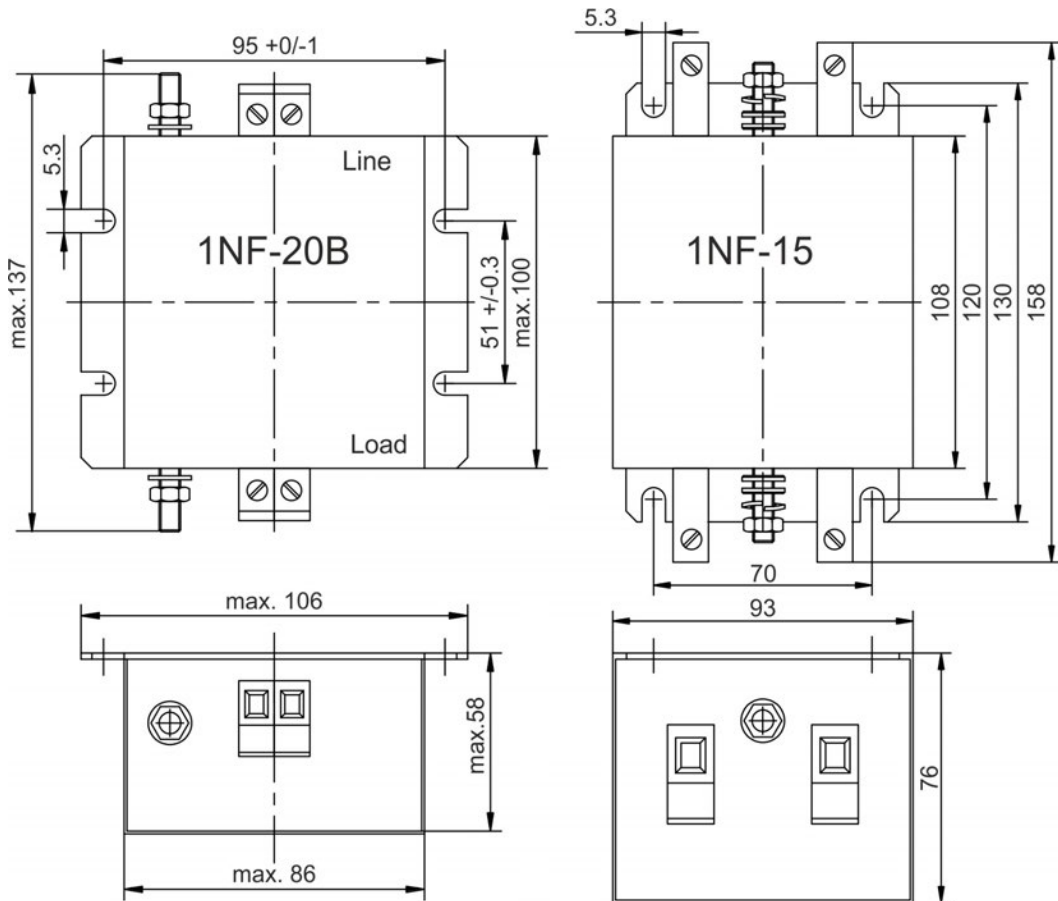
Type	Nominal Current [A]*	Nominal Voltage [V]	A [mm]	B [mm]	C [mm]	D [mm]	F [mm]	M [mm]	N [mm]	P [mm]	Weight [kg]	Connection
1NF-10	10	230	85	49	40.3	54	75	5.3	6.3	87	0.29	Fast-on
1NF-12	12	230	156	57.5	45.4	130.5	143	5.3	6	156	0.73	Fast-on

* at 40°C environment temperature

6.5 Mains filters 1NF-20B, 1NF-25



Observe the safety instructions → p. 20.
For single-phase operation only.



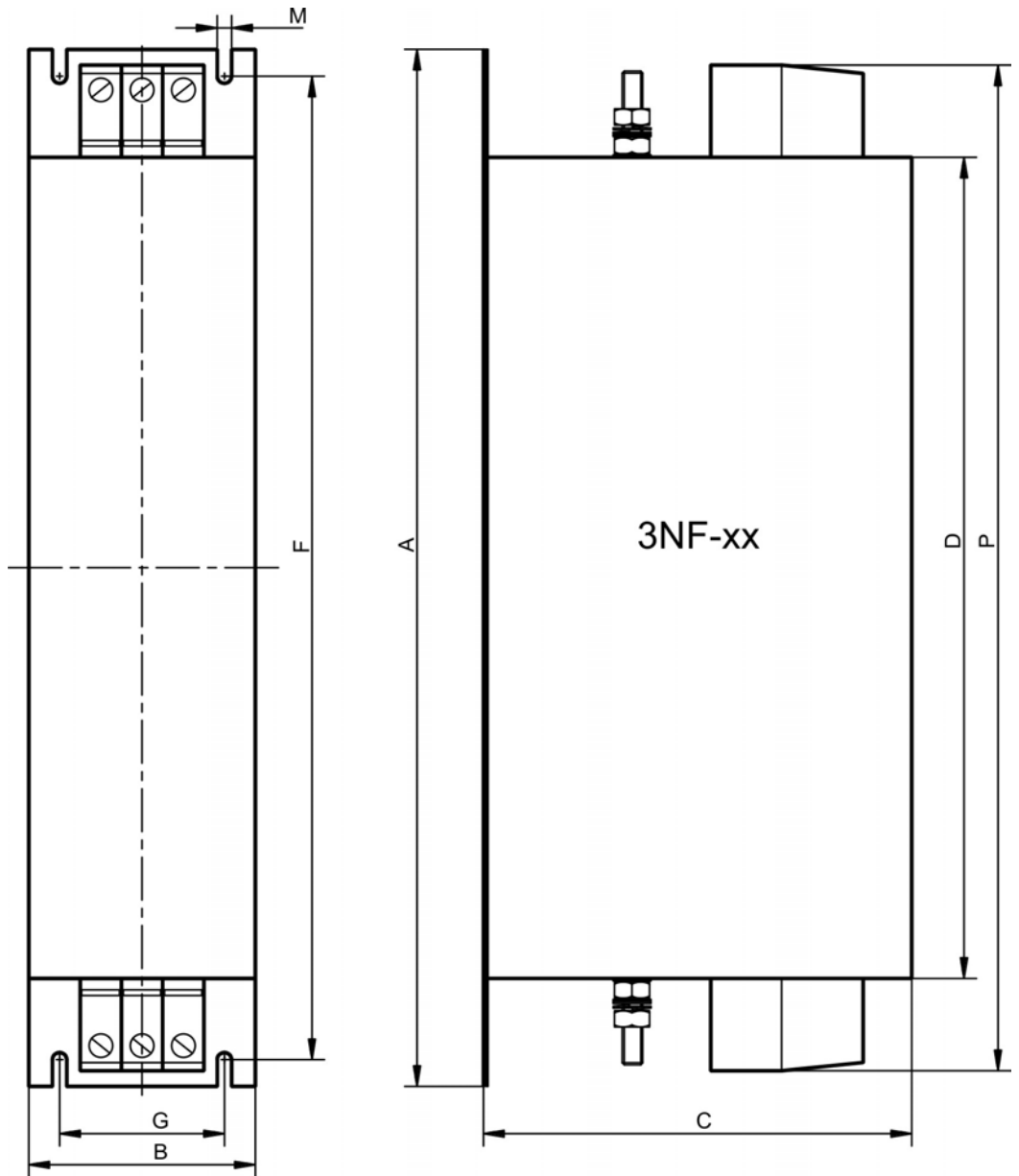
Technical Data

Type	Nominal Current [A]*	Nominal Voltage		Weight [kg]	Connection Phase Terminals	Connection PE
		IEC	UL/CSA			
1NF-20B	20	230V	125V	0.93	Wires up to 4mm ² Torque 0.6 to 0.8 Nm	Bolt M 6 Torque 3.5 to 4 Nm
1NF-25	25	230V	230V	0.7	Wires up to 10mm ² Torque 1.5 to 1.8 Nm	

* at 50°C environment temperature

6.6 Mains filters 3NF-07...30

Observe the safety instructions → p. 20.



Technical Data

Type	Nom. Current*	A [mm]	B [mm]	C [mm]	D [mm]	F [mm]	G [mm]	M [mm]	P [mm]	Weight [kg]	Terminals	PE Bolt
3NF-07	7 A	190	40	70	160	180	20	4.5	180	0.5	4mm ² ,	M5, 2.2Nm
3NF-16	16 A	250	45	70	220	235	25	5.4	240	0.8	0.7..0.8Nm	
3NF-30	30 A	270	50	85	240	255	30	5.4	260	1.2	10mm ² , 1.9..2.2Nm	

* at 50°C environment temperature

7 Regen resistors

7.1 General

During braking with the aid of the motor, energy is fed back into the drive. This regenerative energy is dissipated as heat in the regen resistor (also called brake resistor). The regen resistor is switched on by the regen circuit. Different resistance values have to be used depending on the drive. All resistors meet the requirements of CE directives and are UL-registered.

More information to the resistors are given on KDN page "[Brake Resistor](#)".

7.2 Important notes



! DANGER

High Voltage up to 900 V!

Risk of electric shock. Power terminals are capable of conducting hazardous voltage up to 10 minutes after the mains voltage has been disconnected.

- Before starting work on power terminals, check that the phase-to-earth and phase-to-phase voltages have de-energised.



! WARNING

High Temperature!

Risk of burns. The regen resistor surface temperature can exceed 250°C.

- Measure the temperature and wait until temperature dropped down below 40°C, before touching the resistor housing.

NOTICE

Inadequate levels of cooling air or incorrect installation can lead to overheating and destruction of the resistor and surrounding components.

- May only be installed in switchgear cabinets, comply with the permissible installation types and clearances (see dimensional drawing).
- Ensure there is unobstructed convection for cooling purposes.
- Use temperature-resistant materials in the vicinity of the resistor.
- The connection terminals must never be located within the flow range of the heated waste air.

The following requirements must be met to ensure the regen resistors work properly:

- Compliance with required installation clearances
- Compliance with permissible installation type
- Unhindered access of cooling air
- Unhindered diverting of warmed up air
- Rated data with maximum ambient temperature 40°C, in case of ambient temperature higher than 40°C, power must be reduced by 4% per 10K temperature rise

NOTICE

You must read the instructions manual for the drive/servo motor you are using in your application and observe the safety instructions they contain before commencing mounting/installation work.

A connection diagram appears in the drive's instructions manual.

7.3 Type assignment and order codes

Drive*	Brake resistor	Resistance/ Ω	Remarks
AKD-x00306	BAFP(U)/BAR(U)/BAS(U)	33	usually required
AKD-x00606	BAFP(U)/BAR(U)/BAS(U)	33	usually required
AKD-x01206	BAR(U)/BAS(U)	15	optional
AKD-x02406	BAR(U)/BAS(U)	15	optional
AKD-x00307	BAR(U)/BAS(U)	33	optional
AKD-x00607	BAR(U)/BAS(U)	33	optional
AKD-x01207	BAR(U)/BAS(U)	33	optional
AKD-x02407	BAR(U)/BAS(U)	23	optional
AKD-x04807	BAS(U)	10	usually required
AKD-C01007	BAR(U)/BAS(U)	33	optional

Order codes

Article	Drive*	Resistance [Ω]	Rated Power [W]	Max. Power [W]	Order code
Brake resistor BAS(U) 2000-10	AKD-x04807	10	2000	3200	DE-103874
Brake resistor BAS(U) 3000-10		10	3000	4800	DE-103875
Brake resistor BAS(U) 6000-10		10	6000	9600	DE-103876
Brake resistor BAR(U) 500-15	AKD-x01206 & x02406	15	500	800	DE-201439
Brake resistor BAR(U) 1000-15		15	1000	1600	DE-201440
Brake resistor BAS(U) 2000-15		15	2000	3200	DE-103871
Brake resistor BAS(U) 3000-15		15	3000	4800	DE-103872
Brake resistor BAS(U) 6000-15		15	6000	9600	DE-103873
Brake resistor BAR(U) 600-23		AKD-x02407	23	600	960
Brake resistor BAR(U) 1000-23	23		1000	1600	DE-200614
Brake resistor BAS(U) 2000-23	23		2000	3200	DE-200615
Brake resistor BAS(U) 3000-23	23		3000	4800	DE-200616
Brake resistor BAS(U) 4000-23	23		4000	6400	DE-200617
Brake resistor BAFP(U) 100-33	AKD-x00306 to -x00606 AKD-x00307 to -x01207, AKD-C01007	33	100	160	DE-201437
Brake resistor BAFP(U) 200-33		33	200	320	DE-201438
Brake resistor BAR(U) 250-33		33	250	400	DE-106254
Brake resistor BAR(U) 500-33		33	500	800	DE-106255
Brake resistor BAR(U) 1500-33		33	1500	2400	DE-106258
Brake resistor BAS(U) 3000-33		33	3000	4800	DE-201407

*= AKD-x means AKD variants -B, -P, -T or -M

7.4 External regen resistor BAFP(U)

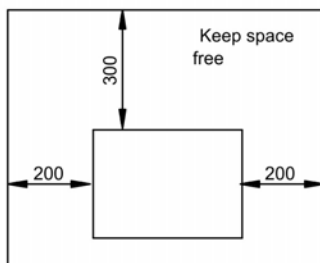
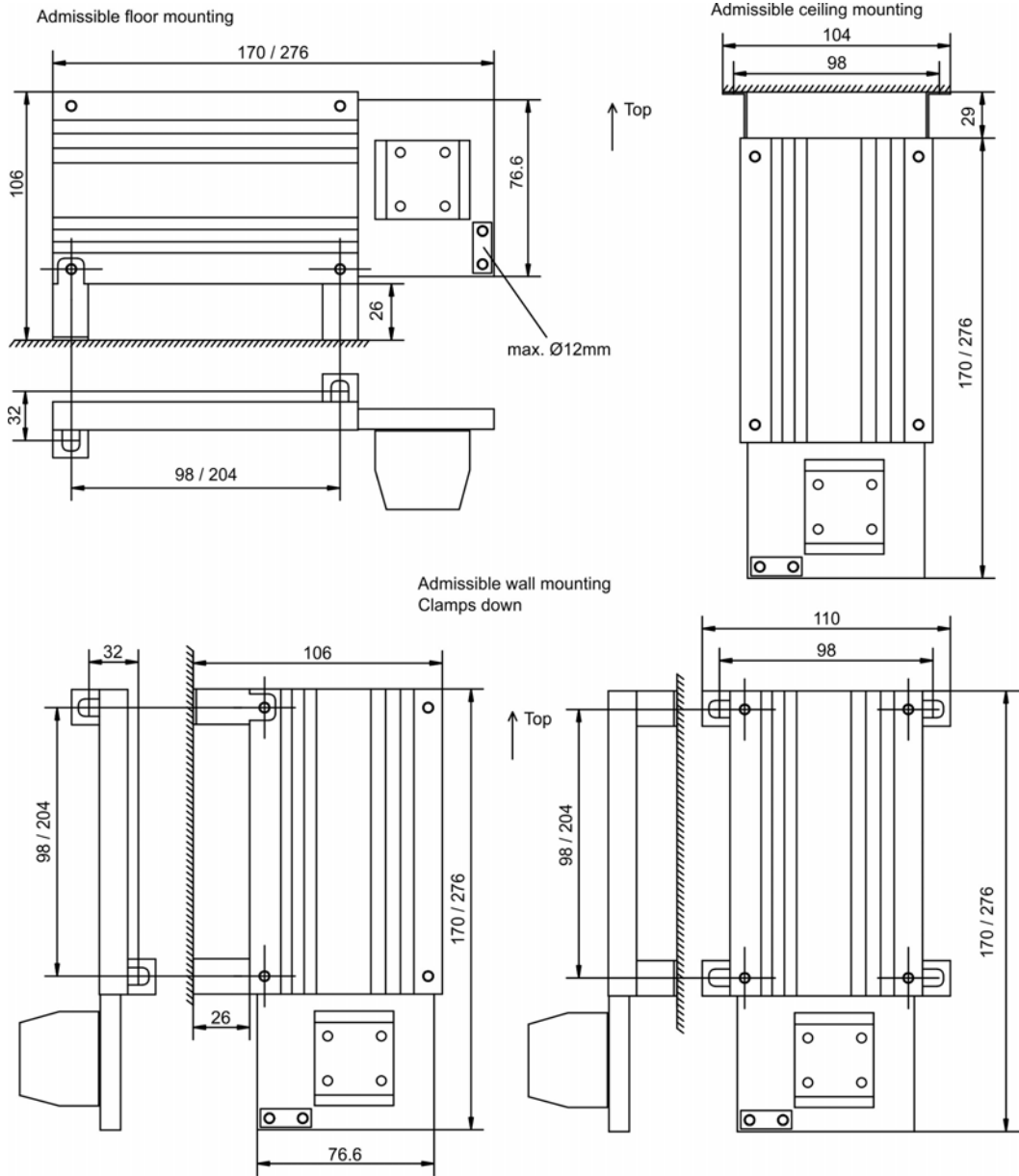


Protection class: IP40



WARNING

The surface temperature can exceed 250°C. Risk of burns and fire! Measure the temperature before touching.



Typ	R	Length	Power	Weight
	Ω	mm	W	Kg
BAFP(U) 100-33	33	170	100	0,3
BAFP(U) 200-33	33	276	200	0,55

Other types of mounting are not admitted !

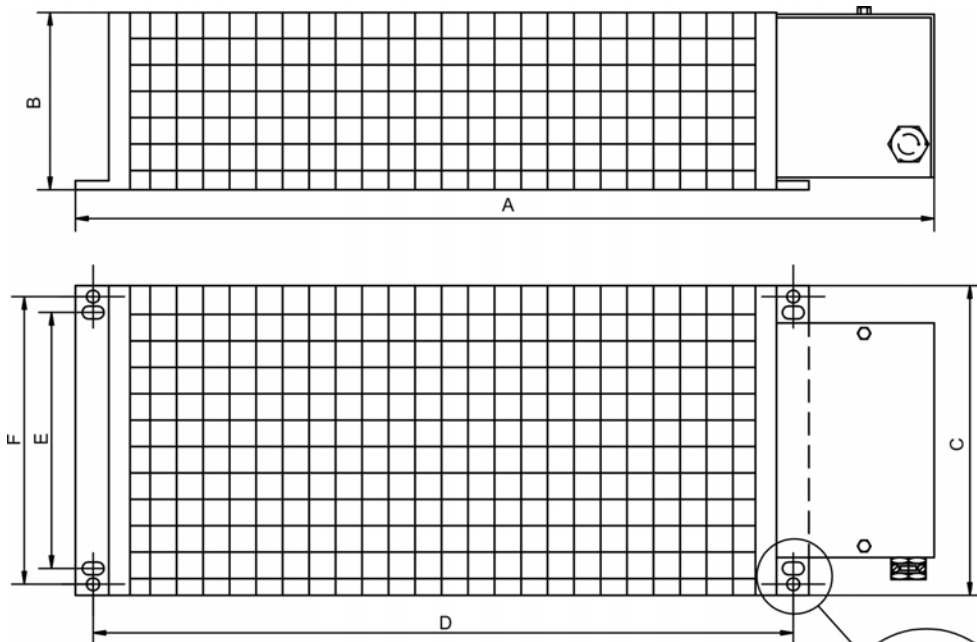
7.5 External regen resistor BAR(U)



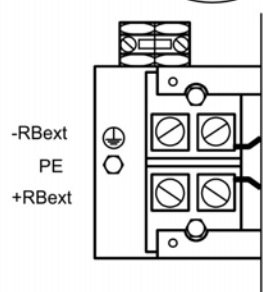
Protection class: IP20



The surface temperature can exceed 250°C. Risk of burns and fire! Measure the temperature before touching.

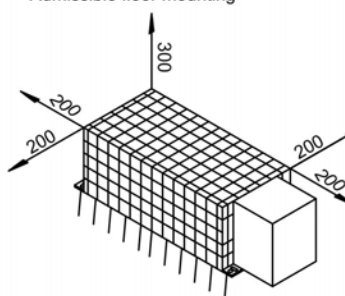


Type	R Ω	Power W	A mm	B mm	C mm	D mm	E mm	F mm	weight Kg
BAR(U) 500	15	500	549	120	92	430	64	80	3
BAR(U) 1000	15	1000	749	120	92	630	64	80	4
BAR(U) 600	23	600	549	120	92	430	64	80	3
BAR(U) 1000	23	1000	749	120	92	630	64	80	4
BAR(U) 250	33	250	349	120	92	230	64	80	2
BAR(U) 500	33	500	549	120	92	430	64	80	3
BAR(U) 1500	33	1500	649	120	185	530	-	150	5,8
BAR(U) 300	66	300	349	120	92	226	64	80	1,5
BAR(U) 600	66	600	549	120	92	426	64	80	2,3
BAR(U) 1000	66	1000	749	120	92	626	64	80	3,4
BAR(U) 300	91	300	349	120	92	226	64	80	1,5
BAR(U) 600	91	600	549	120	92	426	64	80	2,3
BAR(U) 1000	91	1000	749	120	92	626	64	80	3,4

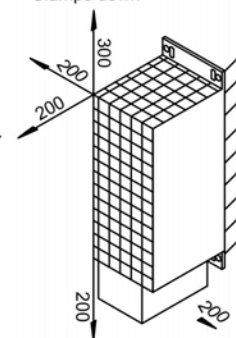


±10%, temperature drift approx. 1%
Cold approx. +8%, 320°C approx. -7%

Admissible floor mounting



Admissible wall mounting
Clamps down



Other types of mounting are not admitted !

7.6 External regen resistor BAS(U)

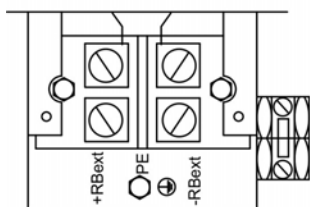
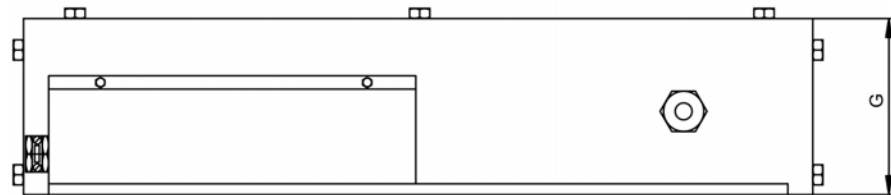
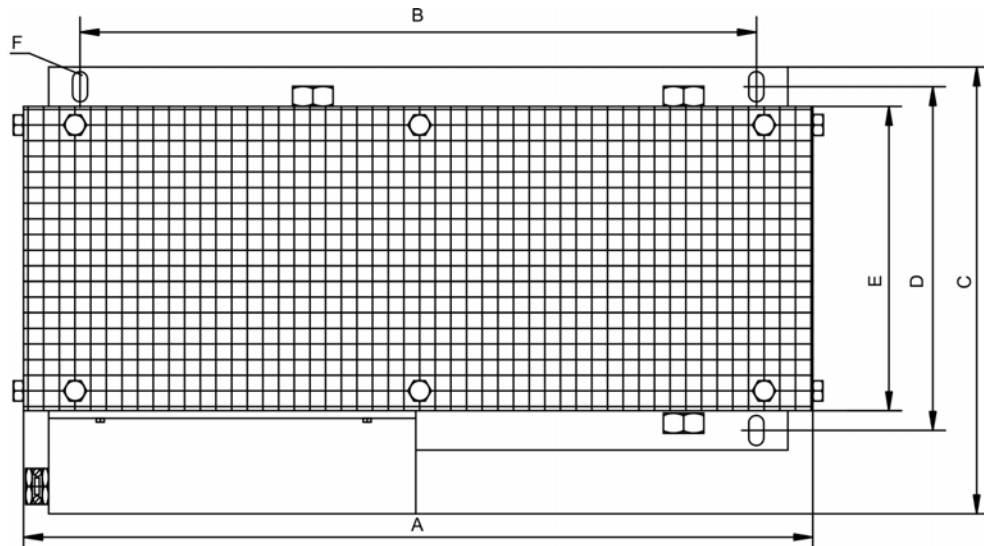


Protection class: IP20



WARNING

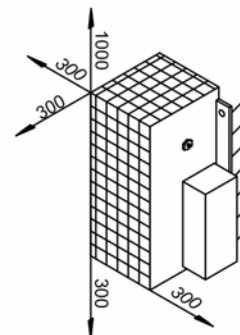
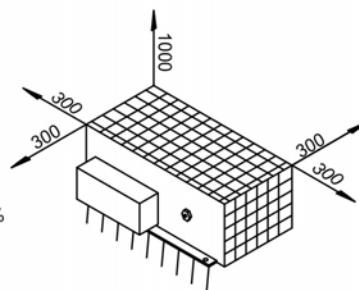
The surface temperature can exceed 250°C. Risk of burns and fire! Measure the temperature before touching.



±10%, temperature drift approx. 1%
Cold approx. +8%, 320°C approx. -7%

Admissible floor mounting

Admissible wall mounting
Clamps down



Other types of mounting are not admitted !

	R	Rated power W	A mm	B mm	C mm	D mm	E mm	F mm	G mm	weight Kg
	Ω									
BAS(U)2000-10	10	2000	490	380	255	170	150	Ø10,5	260	7
BAS(U)3000-10	10	3000	490	380	355	270	250	Ø10,5	260	8
BAS(U)6000-10	10	6000	490	380	455	370	350	Ø10,5	260	11
BAS(U)2000-15	15	2000	490	380	255	170	150	Ø10,5	260	7
BAS(U)3000-15	15	3000	490	380	355	270	250	Ø10,5	260	8
BAS(U)6000-15	15	6000	490	380	455	370	350	Ø10,5	260	11
BAS(U)2000-23	23	2000	490	380	255	170	150	Ø10,5	260	7
BAS(U)3000-23	23	3000	490	380	355	270	250	Ø10,5	260	8
BAS(U)4000-23	23	4000	490	380	355	270	250	Ø10,5	260	9
BAS(U)3000-33	33	3000	490	380	355	270	250	Ø10,5	260	8

8 Capacitor Modules

8.1 General

KCM modules (**K**OLL**M**ORGEN **C**apacitor **M**odules) absorb energy generated by the motor when it is operating in generator mode. Normally, this energy is dissipated as waste via regen resistors. KCM modules, however, feed the energy they have stored back into the DC Bus link as and when it is required.

KCM-S	Saves energy: The energy stored in the capacitor module during generative braking is available the next time acceleration happens. The module's inception voltage is calculated automatically during the first load cycles.
KCM-P	Power in spite of power failure: If the power supply fails, the module provides the drive with the stored energy that is required to bring the drive to a standstill in a controlled manner (this only applies to the power supply voltage; battery-back the 24 V supply separately).
KCM-E	Expansion module for both applications. Expansion modules are available in two capacitance classes.

More information can be found on our KDN page "[KCM Capacitor Module](#)".

8.2 Important notes



! DANGER

High DC Voltage up to 900 V!

There is a danger of serious personal injury or death by electrical shock or electrical arcing. It can take over an hour for the modules to self-discharge.

- Switch off (disconnect) the line voltage. You must only work on the connections when the system is disconnected.
- Check the state of charge with a measuring device that is suitable for a DC voltage of up to 1,000 V.
- When measuring a voltage of over 50 V between the DC+/DC- terminals or to ground, discharge the modules as described in the KCM Instructions Manual.

NOTICE

You must read the instructions manual for the drive/servomotor you are using in your application and observe the safety instructions they contain before commencing mounting/installation work.

Wiring diagram and more important notes concerning wiring can be found in the KCM instructions manual and in the instructions manual of the used drive.

8.3 Type assignment and order codes

NOTE

The KCM modules may only be connected to drives with 400/480 V rated voltage.

Drive*	KCM Module	Drive*	KCM Module
AKD-x00307...02407	all Modules	AKD-x00306...02406	not allowed
AKD-C01007	all Modules	AKD-x04807	contact customer support

*= x means variants -B, -P, -T or -M

Order codes

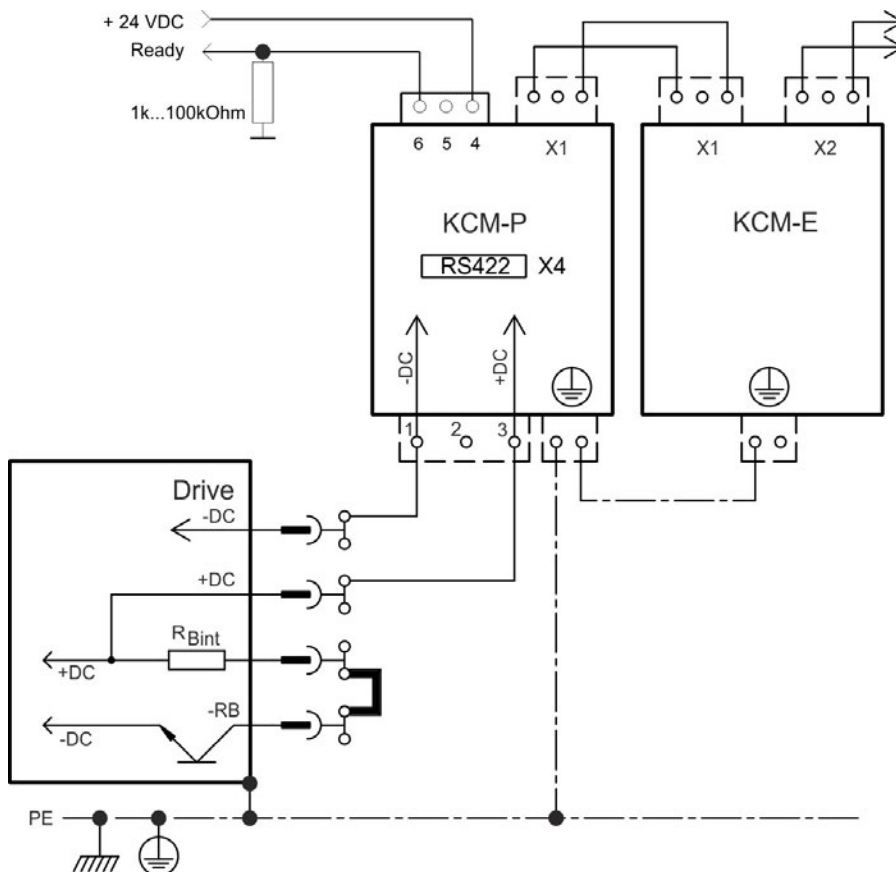
Type	Remarks	Order Code
KCM-S200	Energy Saving Module, 1.6 kW	KCM-S200-0000
KCM-P200	Power Module, 2 kW	KCM-P200-0000
KCM-E200	Expansion Module 2 kW	KCM-E200-0000
KCM-E400	Expansion Module 4 kW	KCM-E400-0000

8.4 Example installation

NOTICE

Maximum cable length between drive and KCM: 500 mm. The DC+ and DC- lines should always be twisted, maximum cross section is 6 mm².

RS422 interface X4 allows data exchange controlled by a terminal software of your choice. Interface setting: 115200 Baud, 8 Data Bits, 1 Stop Bit, No Parity&Flow Control. The X4 mating connector is in the package. The ready signal reports the ready to operate (high level).



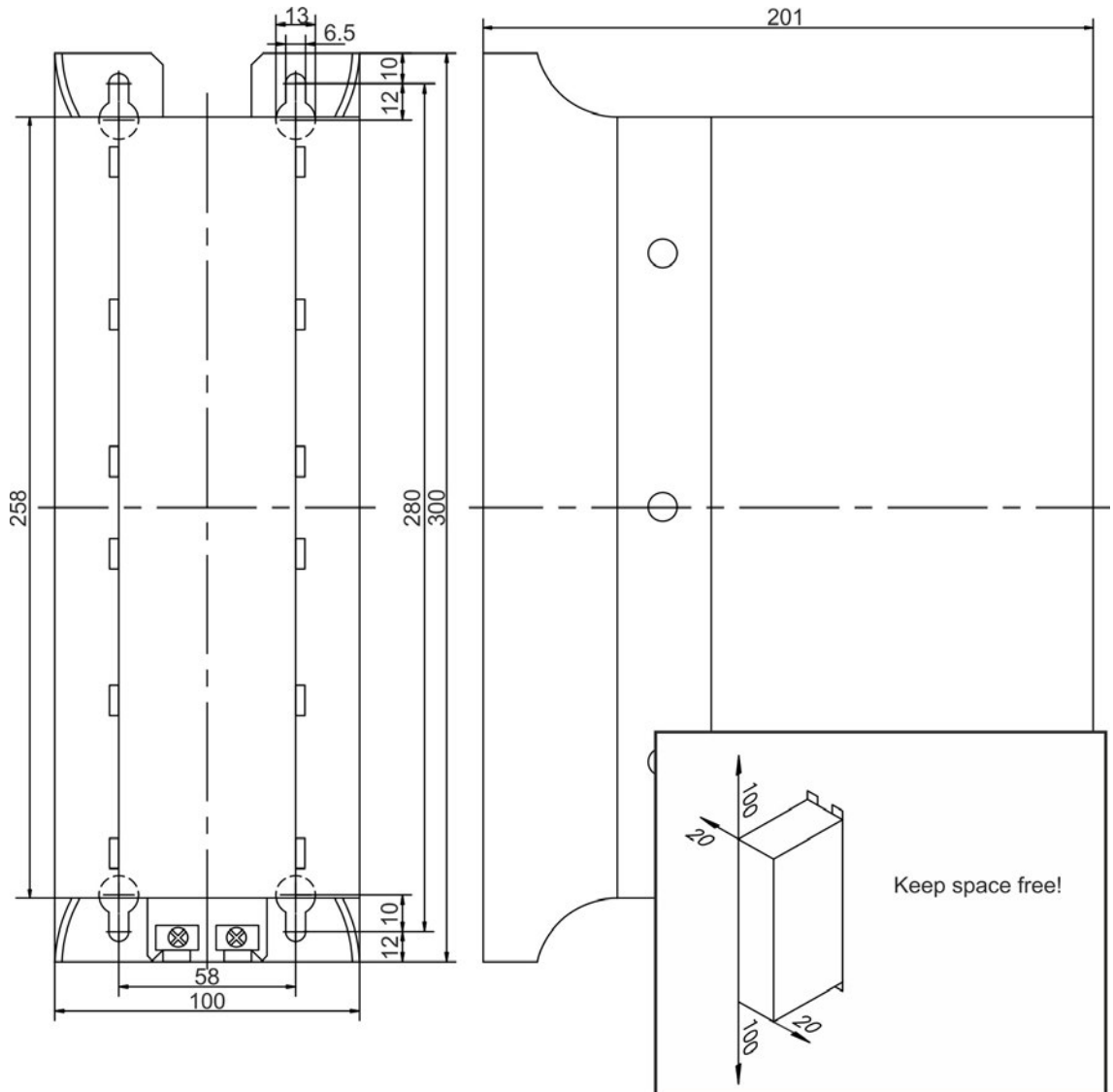
More information is given in the KCM Instructions Manual.

8.5 KCM Module



Observe the safety instructions and in the instruction manual of the drive.

Permissible assembly type: Vertical, ground connections at the bottom. Other assembly positions are not permitted. Observe the required free space to next device. Ensure there is unobstructed convection for cooling purposes.



Technical Data

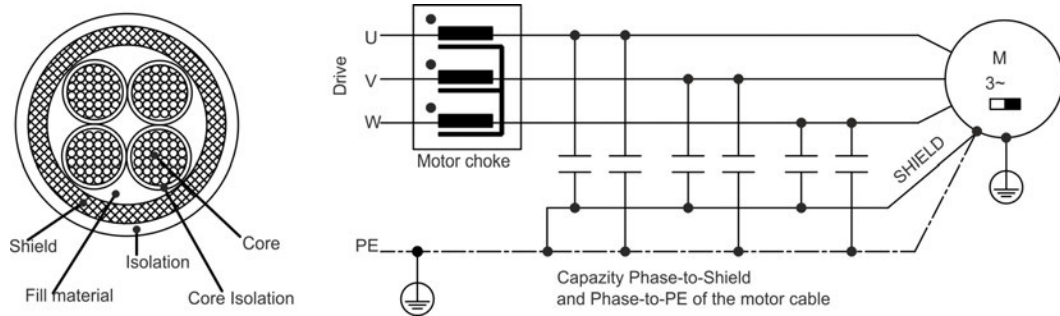
Type	Storage Capacity [Ws]	Rated supply voltage [V=]	Peak supply voltage [V=]	Power [kW]	Protection Class	Inception voltage [V=]	Weight [kg]
KCM-S200	1600	max 850 VDC	max 950VDC (30s in 6min)	18	IP20	calculated	6.9
KCM-P200	2000					470 VDC	6.9
KCM-E200	2000					-	4.1
KCM-E400	4000					-	6.2

9 Motor chokes

9.1 General

Shielded motor cables

For reasons of electromagnetic compatibility, the motor must be supplied with power via a shielded cable. The structure of a cable with 100% shielding and the capacity equivalent circuit diagram (to earth) are shown below.



Why use motor chokes?

- To compensate high capacitive charge/discharge currents typical of shielded motor cables approximately 25 m and longer.
- To reduce current alternation noise in the motor.
- To reduce current ripple in the motor.

The digital drives high switching frequencies and steep switching edges give rise to the transfer of capacitive currents to the shield by the three phases (U, V, W). These currents flow from the shield to earth. Depending on the cable length and cable capacity (determined by design), this can lead to the generation of shield currents with peak values of up to 20 A.

These shield currents place a load on the drives and motor and, on large systems, lead to shifts in potential which can damage other components.

This effect is evident in particular on systems with multiple drives operating in parallel on the same mains filter.

The motor chokes slow down the rate of rise of the motor current (reduce edge steepness), thereby reducing the current transferred to the shield.

Why is the cross-section of the motor cable important?

Motor cables longer than 50 m with a small cross-section (e.g. 4 x 1.0 mm²) and therefore a higher equivalent resistance are able to reduce the oscillation tendency of the LCR oscillating circuit (drive/choke/cable/motor). This cross-section can also be advantageous for cable lengths shorter than 50 m if the cable capacity and motor inductance are very high. However, the current loading of the cable must always be within the limits specified by EN 60204.

9.2 Important notes



CAUTION

High Temperature!

Risk of light burns and fire. The regen resistor surface temperature can exceed 80°C.

- Therefore, you should make sure that the choke is mounted a sufficient distance away from neighbored components.
- Provide the requisite conditions for unobstructed convection to cool the choke.

NOTICE

You must read the instructions manual for the drive/servo motor you are using in your application and observe the safety instructions they contain before commencing mounting/installation work. This manual is only valid in conjunction with the instructions manual for the drive and servo motor you are using in your application.

Mount the motor choke 3YLN on a conductive earthed assembly plate in the switchgear cabinet.

The motor choke is wired into the cable close to the drive. When laying the motor cable, allow about 400 mm for the connection to the choke.

Connection diagram see the drive instructions manual.

9.3 Type assignment and order codes

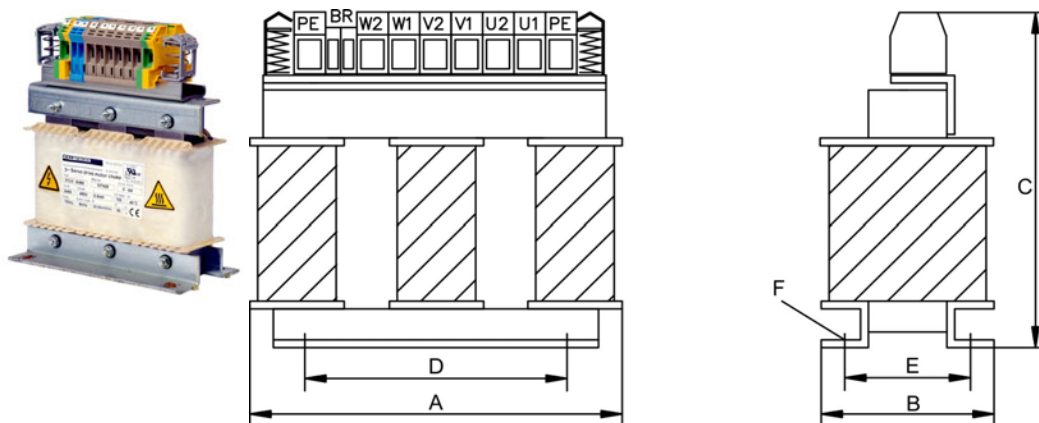
Drive*	Motor choke	Condition
AKD-x003 to AKD-x006	3YLN-06	Motor cable \geq 25m
AKD-x012	3YLN-14	Motor cable \geq 25m
AKD-x024	3YLN-24	Motor cable \geq 25m

*= x means variants -B, -P, -T or -M

Order codes

Article	Nominal Current	Approvals	Order code
Motor choke 3YLN-06	6 A	CE, UL	DE-107929
Motor choke 3YLN-14	14 A	CE, UL	DE-107931
Motor choke 3YLN-24	24 A	CE, UL	DE-201447

9.4 Motor choke 3YLN-xx



Technical Data:

Rated Data	Sym	DIM	3YLN-06	3YLN-14	3YLN-24
Rated current	I_{0rms}	A	6	14	24
Rated voltage	U_{nom}	V	480		
Rated frequency	f_{nom}	Hz	0 to 150		
Max. frequency	f_{max}	kHz	8		
Inductivity	L	μH	900	900	450
Power loss	P	W	12	19.4	23.2
Protection class	-	-	IP00		
Temperature class	-	-	F		
Operation class	-	-	S1		
Weight	G	kg	4.5	10	10
Cable diameter (Shield clamp)	-	mm	4 to 13.5		
Wiring cross section max. (Terminals)	-	mm^2	10	16	16
Width	A	mm	155	190	190
Depth	B	mm	90	125	125
Height	C	mm	195	230	230
Mounting hole distance	D	mm	130	170	170
Mounting hole distance	E	mm	56.5	78	78
Mounting screws	F	-	4xM6	4xM6	4xM6

10 Cables

NOTICE

Kollmorgen assumes no liability for errors or damage to equipment caused by cables manufactured by customers.

10.1 Technical data for cables

Information on the chemical, mechanical and electrical characteristics of the cables can be found in our KDN page "[Cables](#)".

Insulation material

- Sheathing: PUR (polyurethane, code 11Y)
- Core insulation: PETP (polyesteraphthalate, code 12Y)

Capacitance (phase to shield)

- Motor cable: less than 180 pF/m (cross sections >6mm² have larger capacitance)
- Feedback cable: less than 120 pF/m
- Hybrid Cable: special requirements

Technical data

- The brackets in the core definition indicate the shielding
- All cables are suitable for use as trailing cables
- The technical data refer to use as moveable cables
- Operating life : 10 million bending cycles
- All cables are UL recognized

10.2 Tools

Only work with the special tools that are required for the used connectors. You can obtain these special tools from the manufacturer of the connectors or contacts.

10.3 PC connection

The AKD is connected by a standards net cable with RJ45 connectors to the PC or to a Switch/Hub.

Article	Order Code
Ethernet Cable PC-AKD	→ p. 40

10.4 Power Voltage Supply, external regen resistor, DC bus link

The connectors used (40 A and higher fixed terminals) are included in the drive package. If necessary, the connectors are coded .

NOTE We do not deliver configured cables for these interfaces.

NOTICE You must always observe the specifications in respect of cable cross-sections contained in the instructions manual for the drive you are using in your application. Fit suitable wire end ferrules or plug connectors to stripped conductors. Connection diagrams can be found in the drive instructions manual.

10.4.1 Recommended cable type

The table indicates the type of cable required for each intended purpose.

Purpose	max. length	recommended cable @ drive rated output current		
		In=1.5...10A	In=14...24A	In=40...70A
AC-supply*	-	H07V-K 1.5	H07V-K 4	H07VVC4-K 3G 25
DC-bus link*	0.5 m	H07V-K 1.5	H07V-K 4	H07V-K 25
	2m	H07VVC4-K 2X 1.5	H07VVC4-K 2X 4	H07VVC4-K 2X 25
Ext. regen resistor*	5m	H07VVC4-K 2G 1.5		H07VVC4-K 2G 25

* valid only for single-axis systems. For multi-axis systems, please consult our customer support.

10.4.2 Mating connector (part of delivery)

Drive*	Mains supply		DC-link bus / Regen Resistor	
	#	Order Code	#	Order Code
AKD-x00306/00606	X3	CON- AKDX3A-SL	X3	CON- AKDX3A-SL
AKD-x01206	X3	CON- AKDX3B-SL	X3	CON- AKDX3B-SL
AKD-x02406	X4	CON- AKDX4-SL	X3	CON- AKDX3C-SL
AKD-x00307...02407	X4	CON- AKDX4-SL	X3	CON- AKDX3C-SL
AKD-x04807	X4	CON- AKD4807X4-SL	X14 / X3	CON- AKD4807X14-SL CON- AKD4807X3-SL
AKD-C01007	X12	Connector Kit → p. 16	X14	Connector Kit → p. 16

*= x means variants -B, -P, -T or -M

10.4.3 Mating connector (optional)

Drive*	DC-link bus	
	#	Order Code
AKD-x02406/00307...02407	X3Y	CON-AKDX3C-SL-Y
AKD-x04807	X14Y	CON-AKD4807X14-SL-Y

With Y-connectors you can daisy-chain DC-bus link to several drives. For details see *AKD Instructions Manual*.



10.5 24V auxiliary voltage supply

Connectors are used, that are included in the delivery package of the drives. If necessary, the connectors are coded and printed with the corresponding terminal designation.

NOTE

We do not deliver configured cables for this interface.

NOTICE

You must always observe the specifications in respect of cable cross-sections contained in the instructions manual for the drive you are using in your application. Fit suitable wire end ferrules or plug connectors to stripped conductors. A connection diagram appears in the drive instructions manual.

10.5.1 Mating connector (part of delivery)

Drive	Connector	Order Code
AKD-B/P/T/M-003...24	X1	CON-AKDX1-SL
AKD-B/P/T/M-04807	X1	CON-AKD4807X1-SL
AKD-C	X13	Connector Kit → p. 16

10.5.2 Recommended cable type

Purpose	recommended cable
24V Aux. Voltage	H07V-K 1.5 or H07V-K 2.5
Observe voltage drop!	

10.6 Digital/analog Inputs/Outputs

10.6.1 Digital In/Outputs for AKD-C

The digital control signals are connected to X15 and X16 with single lines.

NOTE

We do not deliver configured cables for this interface.

Mating connector (part of delivery)

Signals	Connector	Order Code
I/O Signals	X15	Connector Kit → p. 16
STO Signals	X16	Connector Kit → p. 16

Recommended cable type

Purpose	max. length	Recommended cable
Digital I/O, STO	30m	H07VK 0.5

10.6.2 Digital I/O cable for AKD-N



All AKD-N drives have one 8 poles M12 connector to connect digital control signals.

Maximum cable length 5m.

Kollmorgen recommends pre-configured Phoenix SAC cables.

Order codes for I/O cables, one end configured

Amplifier	Order Code	Description
AKD-N all types	SAC-8P-M12MS	5m, M12 mating connector, unconfigured wires

Other length can be ordered from Phoenix Contact Deutschland GmbH.

10.6.3 STO cable for AKD-N-DS/DT



AKD-N-DS/DT drives (devices with local STO input) have an additional 4 poles M12 connectors to connect the local STO signals.

Maximum cable length 5m.

Kollmorgen recommends pre-configured Phoenix SAC cables.

Order codes for I/O cables, one end configured

Amplifier	Order Code	Description
AKD-N-DS/DT	SAC-4P-M12MS	5m, M12 mating connector, unconfigured wires, A-coded

Other length can be ordered from Phoenix Contact Deutschland GmbH.

10.6.4 Fieldbus cable for AKD-N-DF/DG



AKD-N-DF/DG drives (devices with local fieldbus input) have an additional 4 poles M12 connectors to connect the local fieldbus signals.

Maximum cable length 5m.

Kollmorgen recommends pre-configured Phoenix SAC cables.

Order codes for I/O cables, one end configured

Amplifier	Order Code	Description
AKD-N-DF/DG	SAC-4P-M12MSD/5,0	5m, M12 mating connector, unconfigured wires, D coded

Other length can be ordered from Phoenix Contact Deutschland GmbH.

10.6.5 Digital/analog I/O for AKD-B/P/T/M

The cables for analog signals must be twisted pairs, and shielded. The digital signals can be connected by single wires.

NOTE

We do not deliver configured cables for this interface.

Mating connector (part of delivery)

Amplifier	Digital / analog signals				STO Signals	
	#	Order Code	#	Order Code	#	Order Code
AKD-B/P/T	X7	CON-AKDX7-SL	X8	CON-AKDX8-SL	X1	CON-AKDX1-SL
AKD-T-IC	X7	CON-AKDX7-SL	X8	CON-AKDX8-SL	X1	CON-AKDX1-SL
	X21	CON-AKDX21-SL	X22	CON-AKDX22-SL	-	-
	X23	CON-AKDX23-SL	X24	CON-AKDX24-SL	-	-
AKD-M	X7	CON-AKDX7-SL	X8	CON-AKDX8-SL	X1	CON-AKDX1-SL
	X35	CON-AKDX35-SL	X36	CON-AKDX36-SL	-	-

Recommended cable type

Purpose	max. length	recommended cable
Digital I/O	30m	H07VK 0,5
BTB	30m	
Digital GND	30m	
Analog Setpoint	30m	LiYCY (TP) 4x2x0.25
Analog GND	30m	

10.7 Encoder Emulation, Stepper motor control, Master-Slave

This interface can be used for several applications ("AKD Instruction Manual"). The material requirements are always the same.

NOTE

We do not deliver configured cables for this interface.

10.7.1 Mating connector, cable type

Article	Description	Order Code
Cable	4x2x0.25 (per meter)	DE-92186
Connector kit, drive end AKD-B/P/T/M, X9/X10	X10 male connector 15 pin high density, X9 female connector 9 pin, 2 housings, screws	AKD-X9+X10-Kit

10.7.2 Connection

The cable used must be shielded, with twisted pairs to (suggestion according to DIN 47100). Since it is important which signal pairs are twisted together, the following table shows the colors of the individual cores (to IEC 60757). The connector assignment is determined by the use of the interface; see the drive instructions manual.

SubD9, X9 AKD-B/P/T/M	ROD	Core color @ 5x2x0.25 SSI, Stepper motor control, Master-Slave
3	WH	WH
7	GN	n.c.
8	YE	n.c.
1	GY	GN
2	PK	YE
4	BU	GY
5	RD	PK
6	BK	BK
9	BN	n.c.

Connector pin-out depends on the interface usage, see "AKD Instruction Manual".

10.8 Ethernet cable

Connection to an Ethernet network is possible via two RJ45 connectors in the drives. These cables can be used for all fieldbus connections with standard RJ45 connectors like EtherCAT, PROFINET, SynqNet and also for the EtherNet TCP/IP Service Port connection of an AKDdrive.

Order codes Ethernet cable, configured

Article	Length	Order code
Ethernet cable	0.17 m	ENCP-0017-000
Ethernet cable	0.26 m	ENCP-0026-000
Ethernet cable	0.30 m	ENCP-0030-000
Ethernet cable	0.50 m	ENCP-0050-000
Ethernet cable	1.00 m	ENCP-0100-000
Ethernet cable	2.00 m	ENCP-0200-000
Ethernet cable	3.00 m	ENCP-0300-000
Ethernet cable	4.00 m	ENCP-0400-000
Ethernet cable	5.00 m	ENCP-0500-000
Ethernet cable	10.00 m	ENCP-1000-000

10.9 CAN bus cable

According to ISO 11898 you should use a bus cable with a characteristic impedance of 120 Ω . The usable cable length depends on the transmission rate. The values that we have measured can be taken as a guide, but they should not be interpreted as limits:

Cable data:

- Characteristic impedance: 100-120 Ω
- Cable capacitance: max. 60 nF/km
- Conductor (loop) resistance: 159.8 Ω /km

Cable length, depending on the transmission rate:

Transmission rate / kbps	1000	500	250
max. cable length / m	20	70	115

The table refers to the total cable length between the ends of the bus. Longer transmission distances can be achieved with a lower cable capacitance (max. 30 nF/km) and lower loop resistance (115 Ω /km).



We deliver configured CAN bus cables for AKD-xyyyzz-xxCN and AKD-xyyyzz-xxCC.

Article	Length	AKD Order code
CAN Bus cable	0.15 m	CBP000-002-m15-00
CAN Bus cable	0.30 m	CBP000-002-m30-00
CAN Bus cable	1.00 m	CBP000-002-001-00
CAN Bus cable	3.00 m	CBP000-002-003-00

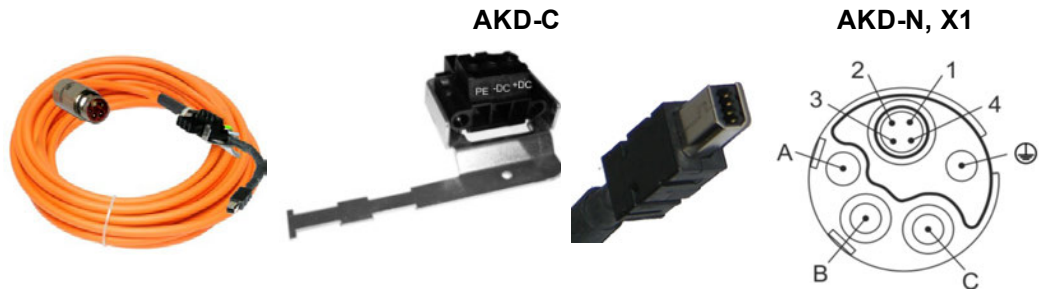
The CAN Termination connector is required for bus termination of the last AKD connected to the CAN bus. For connecting an AKD to a CAN device with SubD9 connector the CAN RJ12-SubD9 Adapter can be used.

Article	Order code
CAN Termination connector	AKD-CAN-Termination
CAN RJ12->SubD9 adapter	AKD-CAN-RJ12-SubD9

10.10 AKD-C/N String, Motor Power, and Motor Feedback Cables

10.10.1 AKD-C/N String Cables

10.10.1.1 String cable AKD-C to AKD-N



Length definition: xx=meters, yy=centimeters.

Defined cable lengths: 3 m, 6 m, 12 m, 24 m, 36 m, 40 m

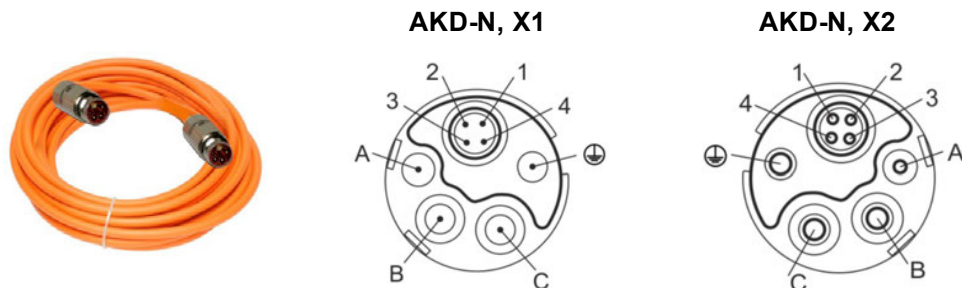
Maximum cable length 40 m.

You should use the configured Kollmorgen cables.

Article	Order code
Hybrid cable (3x2.5+(2x0.25)+(2x0.25))	CCNCN1-025-xxmyy-00

For replacement issues you can order a connector kit for X20A or X21A with order code CON-AKD-CX20/21A-SL with one connector and one metal shroud.

10.10.1.2 String cable AKD-N to AKD-N



Length definition: xx=meters, yy=centimeters.

Steps:

- 0.25 m steps from 0.25 m to 2 m,
- 0.5 m steps from 2.5 m bis 25 m
- Maximum cable length 25 m.

You should use the configured Kollmorgen cables.

Article	Order code
Hybrid cable (3x2.5+(2x0.25)+(2x0.25))	CCNNN1-025-xxmyy-00

10.10.2 Single (Hybrid) motor cables for AKD-N to AKM

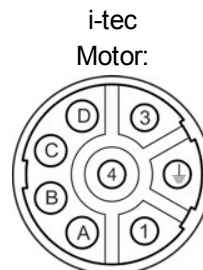
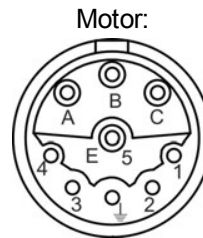
AKD-N series drives have an 8 pole round connector to connect both motor power and feedback.

Maximum cable length 5 m. Length definition: xx=meters, yy=centimeters.

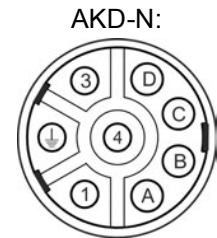
0.2, 0.3, ... , 1.0 (steps 0.1m up to 1m)

1.25, 1.5, ... , 2.0 (steps 0.25m up to 2m)

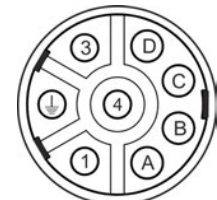
2.5, 3.0, ... , 5.0 (steps 0.5m up to 5m)



M23 / Speedtec



M23 / Speedtec
AKD-N:



M23 / Speedtec

Usable for AKM (connector option D, feedback options CA, GE, GF). SFD3/DSL & Brake.

Article	Motor end	Order code
Hybrid cable (4x1.5+(2x0.34)+(2x0.75))	M23	CCJNA1-015-xxmyy-00
Hybrid cable (4x2.5+(2x0.34)+(2x1))	M23	CCJNA1-025-xxmyy-00
Hybrid cable (4x1.5+(2x0.34)+(2x0.75))	Speedtec	CCJNA2-015-xxmyy-00
Hybrid cable (4x2.5+(2x0.34)+(2x1))	Speedtec	CCJNA2-025-xxmyy-00
Hybrid cable (4x1+(2x0.34)+(2x0.75))	i-tec	CCJNA3-010-xxmyy-00

NOTICE

AKD-Nzzz07-DS/DF: For sufficient voltage supply of the feedback system connected to AKD-N/X4, a special connector must be plugged to AKD-N/X5. This special connector is available with order code **AKD-N-JUMP-X5**.

10.10.3 Motor power cables for AKD-N-DF/DS to AKM Motor

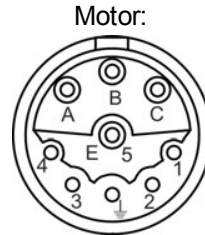
Maximum cable length 5 m. Define the required length in clear text.

Length definition: xx=meters, yy=centimeters

0.2, 0.3, ... , 1.0 (steps 0.1m up to 1m)

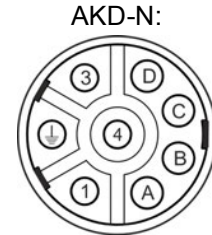
1.25, 1.5, ... , 2.0 (steps 0.25m up to 2m)

2.5, 3.0, ... , 5.0 (steps 0.5m up to 5m)



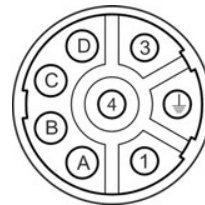
i-tec

Motor:

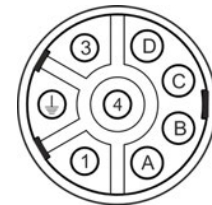


M23 / Speedtec

AKD-N:



M23 / Speedtec



M23 / Speedtec

Usable for AKM1 to AKM7 (connector option 1, 7, B, C, G, Y)

Article	Motor end	Order code
Motor cable (4x1.5)	M23	CM0NA1-015-xxmyy-00
Motor cable (4x1.5+(2x1))	M23	CM1NA1-015-xxmyy-00
Motor cable (4x2.5)	M23	CM0NA1-025-xxmyy-00
Motor cable (4x2.5+(2x1))	M23	CM1NA1-025-xxmyy-00
Motor cable (4x1.5)	Speedtec	CM0NA2-015-xxmyy-00
Motor cable (4x1.5+(2x1))	Speedtec	CM1NA2-015-xxmyy-00
Motor cable (4x2.5)	Speedtec	CM0NA2-025-xxmyy-00
Motor cable (4x2.5+(2x1))	Speedtec	CM1NA2-025-xxmyy-00
Motor cable (4x1)	i-tec	CM0NA3-010-xxmyy-00
Motor cable (4x1+(2x1))	i-tec	CM1NA3-010-xxmyy-00
Motor cable (4x1.5)	i-tec	CM0NA3-015-xxmyy-00
Motor cable (4x1.5+(2x1))	i-tec	CM1NA3-015-xxmyy-00

10.10.4 Motor Feedback Cables

The motor feedback should be connected with pre-assembled Kollmorgen cables. The cable shield is connected to drive and motor via the connector housings.

10.10.4.1 SFD feedback cables AKD-N-DF/DS to AKM Motors

All the standard AKM1...7 motoren in our range feature the same 12-pin Speedtec-Ready connector for the SFD connection. The AKM1 motor optionally supports a 12 pin y-tec connector.

Maximum cable length 5 m. Define the required length in clear text.

Length definition: xx=meters, yy=centimeters

0.2, 0.3, ... , 1.0 (steps 0.1m up to 1m) 2.5, 3.0, ... , 5.0 (steps 0.5m up to 5m)
 1.25, 1.5, ... , 2.0 (steps 0.25m up to 2m)



CFSNA1-002-xxmyy

CFSNA3-002-xxmyy

The AKD-N-DF/DS series drives have a round connector X5 to connect an SFD feedback.

Usable for AKM1 to AKM7 (connector option 1, 7, B, C, G, Y)

Article	Motor end	Order code
SFD Cable (2x(2x0.25))	M23	CFSNA1-002-xxmyy-00
SFD Cable (2x(2x0.25))	Speedtec	CFSNA2-002-xxmyy-00
SFD Cable (2x(2x0.25))	i-tec	CFSNA3-002-xxmyy-00

10.10.4.2 Encoder feedback cables AKD-N-DF/DS to AKM Motors

All the AKM standard motors in our range feature the same 17-pin Speedtec-Ready connector for the encoder connection (EnDat, HIPERFACE, BiSS etc.).

The AKM1 motor optionally supports a 12 pin y-tec connector for Hiperface encoder only.

0.2, 0.3, ... , 1.0 (steps 0.1m up to 1m) 2.5, 3.0, ... , 5.0 (steps 0.5m up to 5m)
 1.25, 1.5, ... , 2.0 (steps 0.25m up to 2m)



CFxNA1-002-xxmyy

CFHNA3-002-xxmyy

The AKD-N-DF/DS series drives have a round connector X5 to connect an encoder feedback and the thermal protection sensor.

Maximum cable length 5m.

Length definition: xx=meters, yy=centimeters.

Define the required length in clear text.

Usable for AKM1 to AKM7 (connector option 1, 7, B, C, G, Y)

Article	Motor end	Order codes		
		EnDat 2.2, BiSS C	EnDat 2.1, BiSS B	Hiperface
Encoder Cable (7x(2x0.25))	M23	CFDNA1-002-xxmyy-00	CFENA1-002-xxmyy-00	CFHNA1-002-xxmyy-00
Encoder Cable (7x(2x0.25))	Speedtec	CFDNA2-002-xxmyy-00	CFENA2-002-xxmyy-00	CFHNA2-002-xxmyy-00
Encoder Cable (7x(2x0.25))	i-tec	-	-	CFHNA3-002-xxmyy-00

10.10.4.3 ComCoder feedback cables AKD-N-DF/DS to AKM Motors

All AKM1 to AKM6 motors in our range feature the same 17-pin Speedtec-Ready connector for the comcoder connection. The AKM1 motor optionally supports a 15 pin y-tec connector.

0.2, 0.3, ... , 1.0 (steps 0.1m up to 1m) 2.5, 3.0, ... , 5.0 (steps 0.5m up to 5m)
 1.25, 1.5, ... , 2.0 (steps 0.25m up to 2m)



The AKD-N-DF/DS series drives have a round connector X5 to connect a ComCoder and thermal protection sensor.

Length definition: xx=meters, yy=centimeters.

Maximum cable length 5 m

CFCNA1-002-xxmyy CFCNA3-002-xxmyy Define the required length in clear text.

Usable for AKM1 to AKM7 (connector option 1, 7, B, C, G, Y)

Article	Motor end	Order code
Comcoder Cable (8x(2x0.25))	M23	CFCNA1-002-xxmyy-00
Comcoder Cable (8x(2x0.25))	Speedtec	CFCNA2-002-xxmyy-00
Comcoder Cable (8x(2x0.25))	i-tec	CFCNA3-002-xxmyy-00

10.11 AKD-B/P/T/M Motor Power and Feedback Cables

10.11.1 Single (hybrid) motor cables for AKD-B/P/T/M to AKM1 Motor (i-tec connector)

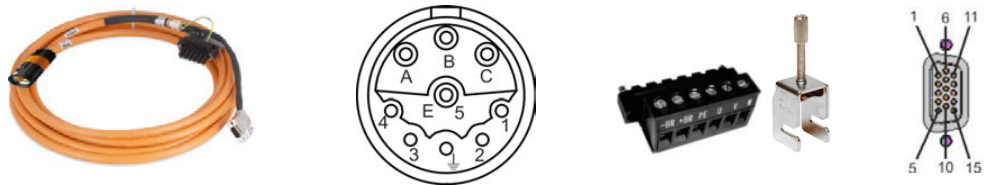
AKD-B/P/T/M series drives have a 15 pole high density SubD female connector to connect the feedback and a terminal connector for power wiring.

NOTE

For SFD3 connection to AKD-B/P/T/M, the feedback connector on the drive end contains electronics.

Usable for AKM1 (connector option D, feedback options C- and CA). A shield clamp is delivered with the cable.

Define the required length in clear text (steps of 1 m). Maximum cable length 25 m.



(4x1+(2x0.34)+(2x0.75))	Usable to connect	Order code
SFD	AKD-x00306 & x00606* and AKM1 (connector D, feedback C-)	CCS1A3-010-vvv-00
SFD3 & Brake	AKD-x00306 & x00606* and AKM1 (connector D, feedback CA)	CCJ1A3-010-vvv-00
SFD	AKD-x00307 & x00607* and AKM1 (connector D, feedback C-)	CCS2A3-010-vvv-00
SFD3 & Brake	AKD-x00307 & x00607* and AKM1 (connector D, feedback CA)	CCJ2A3-010-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.2 Single (hybrid) motor cables for AKD-B/P/T/M to AKM2-6 (M23/Speedtec)

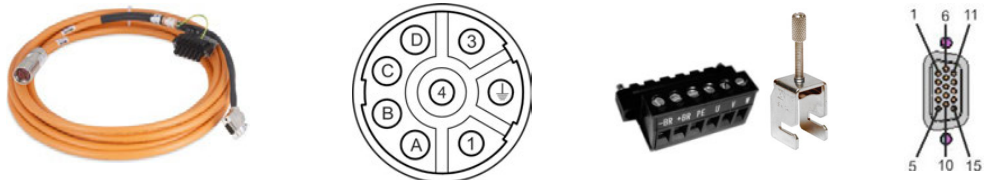
AKD-B/P/T/M series drives have a 15 pole high density SubD female connector to connect the feedback and a terminal connector for power wiring. The hybrid cable is splitted to power and feedback cables on the drive end. The cable shield can be connected to the drive front with the attached shield clamp.

NOTE For DSL and SFD3 connection to AKD-B/P/T/M, the feedback connector on the drive end contains electronics.

10.11.2.1 With shield clamp

Usable for AKM2 to AKM6 (connector option D, feedback option C-, CA, GE and GF). A shield clamp is delivered with the cable.

Define the required length in clear text (steps of 1m). Maximum cable length 25 m.

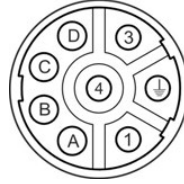


(4x1.5+(2x0.34)+(2x0.75))	Usable to connect	Motor end	Order code
SFD	AKD-x00306 & x00606* and AKM2-6 (connector D, feedback C-)	M23	CCS1A1-015-vvv-00
SFD3/DSL & Brake	AKD-x00306 & x00606* and AKM2-6 (connector D, feedback CA, GE, GF)	M23	CCJ1A1-015-vvv-00
SFD	AKD-x00306 & x00606* and AKM2-6 (connector D, feedback C-)	Speedtec	CCS1A2-015-vvv-00
SFD3/DSL & Brake	AKD-x00306 & x00606* and AKM2-6 (connector D, feedback CA, GE, GF)	Speedtec	CCJ1A2-015-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.2.2 With shield plate

Usable for AKM2 to AKM6 (connector option D, feedback option C-, CA, GE and GF). Drive connector with mounted shield plate. Define the required length in clear text (steps of 1 m). Maximum cable length 25 m.



(4x1.5+(2x0.34)+(2x0.75))	Usable to connect	Motor end	Order code
SFD	AKD-x01206 & x02406* and AKM2-6 (connector D, feedback C-)	M23	CCS2A1-015-vvv-00
SFD3 & Brake	AKD-x01206 & x02406 & x00307...x01207* and AKM2-6 (connector D, feedback CA)	M23	CCJ2A1-015-vvv-00
DSL & Brake	AKD-x01206 & x02406 & x00307...x01207* and AKM2-6 (connector D, feedback GE/GF)	M23	CCJ2A1-015-vvv-00
SFD	AKD-x01206 & x02406* and AKM2-6 (connector D, feedback C-)	Speedtec	CCS2A2-015-vvv-00
SFD3 & Brake	AKD-x01206 & x02406 & x00307...x01207* and AKM2-6 (connector D, feedback CA)	Speedtec	CCJ2A2-015-vvv-00
DSL & Brake	AKD-x01206 & x02406 & x00307...x01207* and AKM2-6 (connector D, feedback GE/GF)	Speedtec	CCJ2A2-015-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.3 Motor power cables

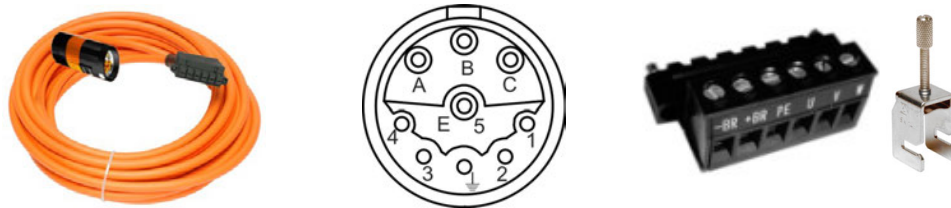
10.11.3.1 AKD-B/P/T/M (shield clamp), AKM1 motor connector y-tec

Connects AKD-x00306* and AKM1 (connector options 1, Y).

Define the required length in clear text (steps of 1m). Length definition vvv=meters.

Maximum cable length 50 m, in case of cable length \geq 25 m a motor choke (\rightarrow p. 32) should be used.

Cable is delivered with shield clamp.



Article	Order code
Motor cable (4x1)	CM01A3-010-vvv-00
Motor cable (4x1+(2x1))	CM11A3-010-vvv-00
Motor cable (4x1,5)	CM01A3-015-vvv-00
Motor cable (4x1,5+(2x1))	CM11A3-015-vvv-00

*= x means variants -B, -P, -T, or -M

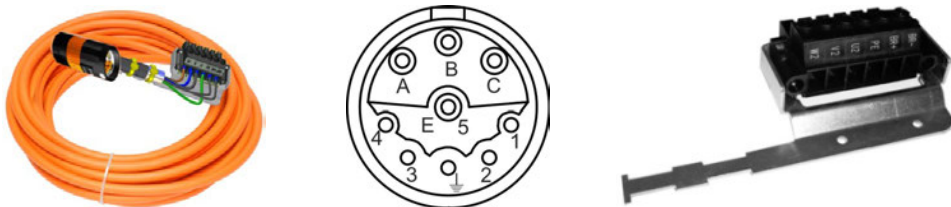
10.11.3.2 AKD-B/P/T/M (shield plate), AKM1 motor connector y-tec

Connects AKD-x00307* and AKM1 (connector options 1, Y).

Define the required length in clear text (steps of 1m). Length definition vvv=meters.

Maximum cable length 50 m, in case of cable length \geq 25 m a motor choke (\rightarrow p. 32) should be used.

Drive connector with mounted shield plate.

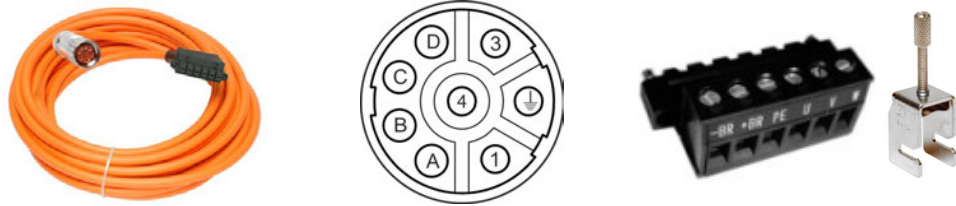


Article	Order code
Motor cable (4x1)	CM02A3-010-vvv-00
Motor cable (4x1+(2x1))	CM12A3-010-vvv-00
Motor cable (4x1,5)	CM02A3-015-vvv-00
Motor cable (4x1,5+(2x1))	CM12A3-015-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.3.3 AKD-B/P/T/M (shield clamp), motor connector size M23/Speedtec (up to 22A)

Connects AKD-x00306* & x00606* and AKM1 to AKM7 (connector options 1, 7, B, C, G). Define the required length in clear text (steps of 1m). Length definition vvv=meters. Maximum cable length 50 m, in case of cable length \geq 25 m a motor choke (\rightarrow p. 32) should be used.

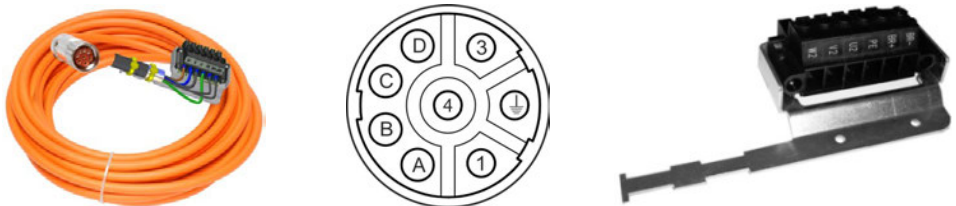


Article	Motor end	Order code
Motor cable (4x1,5)	M23	CM01A1-015-vvv-00
Motor cable (4x1,5+(2x1))	M23	CM11A1-015-vvv-00
Motor cable (4x1,5)	Speedtec	CM01A2-015-vvv-00
Motor cable (4x1,5+(2x1))	Speedtec	CM11A2-015-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.3.4 AKD-B/P/T/M (shield plate), motor connector size M23/Speedtec (up to 22A)

Connects AKD-x01206* & 02406*, AKD-x00307...x02407* and AKM1 to AKM7 (connector options 1, 7, B, C, G). Define the required length in clear text (steps of 1m). Length definition vvv=meters. Maximum cable length 50 m, in case of cable length \geq 25 m a motor choke (\rightarrow p. 32) should be used.



Article	Motor end	Order code
Motor cable (4x1.5)	M23	CM02A1-015-vvv-00
Motor cable (4x1.5+(2x1))	M23	CM12A1-015-vvv-00
Motor cable (4x2.5)	M23	CM02A1-025-vvv-00
Motor cable (4x2.5+(2x1))	M23	CM12A1-025-vvv-00
Motor cable (4x4)	M23	CM02A1-040-vvv-00
Motor cable (4x4+(2x1))	M23	CM12A1-040-vvv-00
Motor cable (4x1.5)	Speedtec	CM02A2-015-vvv-00
Motor cable (4x1.5+(2x1))	Speedtec	CM12A2-015-vvv-00
Motor cable (4x2.5)	Speedtec	CM02A2-025-vvv-00
Motor cable (4x2.5+(2x1))	Speedtec	CM12A2-025-vvv-00
Motor cable (4x4)	Speedtec	CM02A2-040-vvv-00
Motor cable (4x4+(2x1))	Speedtec	CM12A2-040-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.3.5 AKD-B/P/T/M-024 (shield plate), motor connector size M40 (> 22A)

Connects AKD-x02406* & x02407* and AKM7xQ / AKM82T (connector options 1, H). Define the required length in clear text (steps of 1m). Length definition vvv=meters. Maximum cable length 50 m, in case of cable length \geq 25 m a motor choke (\rightarrow p. 32) should be used.



Article	Order code
Motor cable (4x6)	CM02A4-060-vvv-00
Motor cable (4x6+(2x1.5))	CM12A4-060-vvv-00

*= x means variants -B, -P, -T, or -M

10.11.3.6 AKD-B/P/T/M-048 (shield plate), motor connector size M40 (> 22A)

Connects AKD-x04807* and AKM7xQ / AKM82T (connector options 1, H). Define the required length in clear text (steps of 1m). Length definition vvv=meters. Maximum cable length 25 m.



Article	Order code
Motor cable (4x10+(2x1.5))	CM13A4-100-vvv-00
Motor cable (4x16+(2x1.5))	CM13A4-160-vvv-00

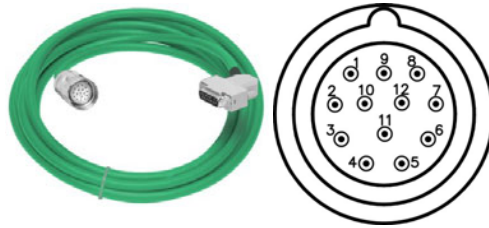
*= x means variants -B, -P, -T, or -M

10.11.4 Motor Feedback Cables

The motor feedback should be connected with pre-assembled Kollmorgen cables. The cable shield is connected to drive and motor via the connector housings.

10.11.4.1 Resolver feedback cables

All our standard motors feature the same 12-pin connector (M23/Speedtec) for the resolver connection. The AKM1 motor optionally supports a y-tec connector.

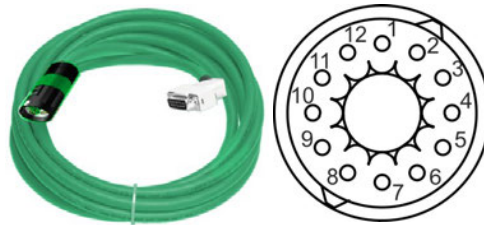


CFR0A1-002-vvv

The AKD-B/P/T/M series drives have a 15 pole high density Sub-D female connector for the connection of a resolver and the thermal protection sensor.

Length definition: vvv=meters.

Maximum cable length: 100 m.



CFR0A3-002-vvv

Order codes for resolver cables, pre-assembled

(4x(2x0.25))	Order code	Length
Resolver Cable M23	CFR0A1-002-vvv-00	Steps of 1m up to 100m
Resolver Cable Speedtec	CFR0A2-002-vvv-00	Steps of 1m up to 100m
Resolver Cable y-tec	CFR0A3-002-vvv-00	Steps of 1m up to 100m

Define the required length in clear text.

10.11.4.2 SFD feedback cables

On the motor end two connectors are available: standard Kollmorgen M23/Speedtec or y-tec for AKM1.



CFS0A1-002-vvv

CFS0A3-002-vvv

The AKD-B/P/T/M series drives have a 15 pole high density Sub-D female connector for the connection of an SFD feedback.

Length definition: vvv=meters.

Maximum cable length 50 m.

Order codes for SFD cables, pre-assembled

(2x(2x0.25))	Order code	Length
SFD Cable M23	CFS0A1-002-vvv-00	Steps of 1 m up to 50 m
SFD Cable Speedtec	CFS0A2-002-vvv-00	Steps of 1 m up to 50 m
SFD Cable y-tec	CFS0A3-002-vvv-00	Steps of 1 m up to 50 m

Define the required length in clear text.

10.11.4.3 Encoder feedback cables

All the standard motors in our range feature the same 17-pin M23/Speedtec connector for the encoder connection (EnDat, HIPERFACE, BiSS etc.).

The AKM1 motor optionally supports a 12 pin y-tec connector for Hiperface encoder only.



CFx0A1-002-vvv CFH0A3-002-vvv

The AKD-B/P/T/M series drives have a 15 pole high density Sub-D female connector (X10) for the primary feedback connection of an encoder and the thermal protection sensor.

Maximum cable length: 50 m. (BiSSC max. 25m)
Length definition: vvv=meters.



CFD5A1-002- vvv

The AKD-B/P/T/M series drives offer a second feedback interface with a 9 pole Sub-D male connector (X9) for the connection of EnDAT 2.2 encoders as primary feedback. Thermal protection must be connected to analog I/Os input located on connector X8. Maximum cable length: 50 m. Length definition: vvv=meters.

Order Codes Encoder cables, configured

(7x(2x0.25))	Order codes			Length, Remarks
	EnDat 2.2, BiSS C	EnDat 2.1, BiSS B	Hiperface	
Encoder cable M23	CFD0A1-002-vvv-00	CFE0A1-002-vvv-00	CFH0A1-002-vvv-00	Steps of 1 m up to 50 m
Encoder cable M23	CFD5A1-002-vvv-00	-	-	Steps of 1 m up to 50 m
Encoder cable Speedtec	CFD0A2-002-vvv-00	CFE0A1-002-vvv-00	CFH0A1-002-vvv-00	Steps of 1 m up to 50 m
Encoder cable Speedtec	CFD5A2-002-vvv-00	-	-	Steps of 1 m up to 50 m
Encoder cable y-tec	-	-	CFH0A3-002-vvv-00	Steps of 1 m up to 50 m

Define the required length in clear text.

10.11.4.4 ComCoder cables

On the motor end two connector types are possible for the comcoder connection (incremental encoder with Hall sensors):

- 17-pin M23/Speedtec connector for AKM1 to AKM8 or
- 15-pin y-tec connector for AKM1.



CFC0A1-002-vvv CFC0A3-002-vvv

The AKD-B/P/T/M series drives have a 15 pole high density Sub-D female connector for the connection of a ComCoder and the thermal protection sensor.

Length definition: vvv=meters.
Maximum cable length 25 m.

Order Codes ComCoder cables, configured

(8x(2x0.25))	Order code	Length
Comcoder cable M23	CFC0A1-002-vvv-00	Steps of 1 m up to 25 m
Comcoder cable Speedtec	CFC0A2-002-vvv-00	
Comcoder cable y-tec	CFC0A3-002-vvv-00	

10.11.5 Preparing motor power cables (motor end)

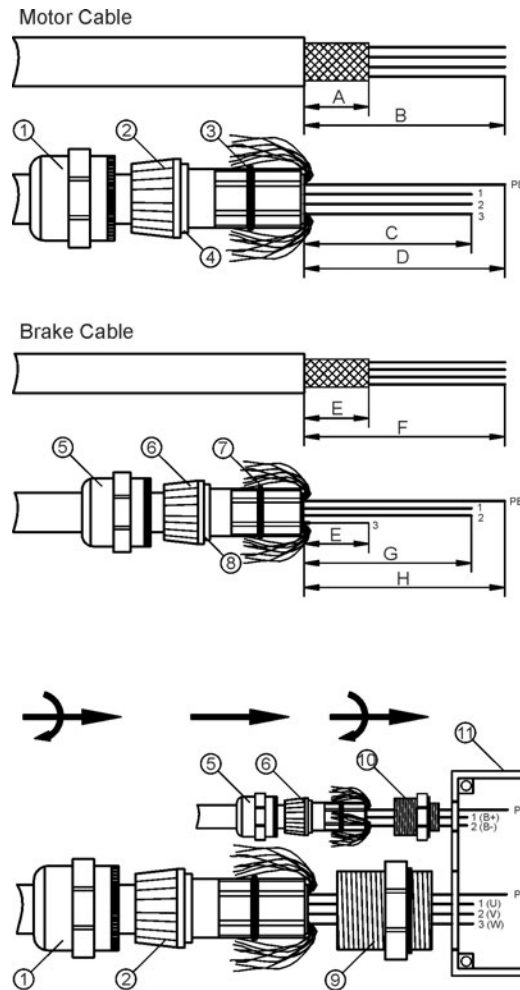
10.11.5.1 Motor series AKM1...8 with M23 or M40 connector

Motors with connectors should be connected with our pre-assembled cables.

10.11.5.2 Motor series AKM8 with terminal box

These motors are fitted with terminal boxes, in which there are bolts or terminals for connections. The terminal boxes have 2 screw glands, so that the power and brake cables can be routed separately. If a motor cable with integral brake is used, the unused screw gland must be replaced by a blanking plug. Please refer to the motor series instructions manual.

Preparing cables for terminal box, separate cables



Remove the outer covering over length B, without damaging the shielding braid. Shorten the shielding braid to length A.

Push the union nut (1) and the clamping ring (2) onto the cable and push the shielding braid back over the clamping ring. The shielding braid must cover the sealing ring (3), but must not stick out over the sealing edge (4). Cut off the cores to lengths C and D.

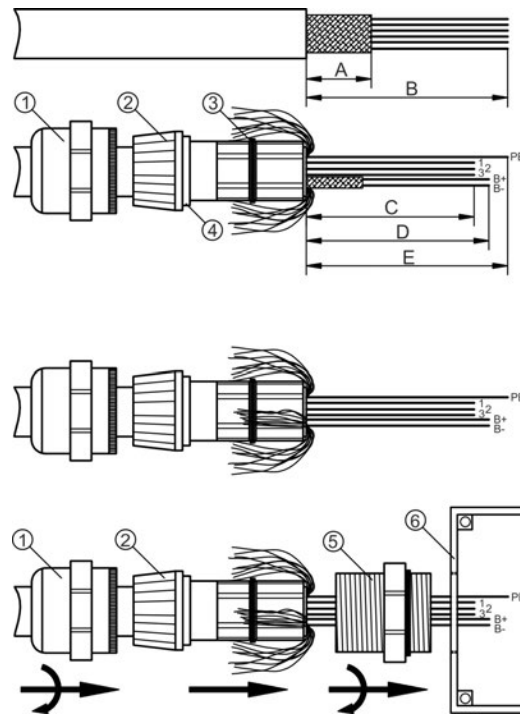
Remove the outer covering over length F, without damaging the shielding braid. Shorten the shielding braid to length E.

Push the union nut (5) and the clamping ring (6) onto the cable and push the shielding braid back over the clamping ring. The shielding braid must cover the sealing ring (7), but must not stick out over the sealing edge (8). Cut off the cores to lengths E/G/H. Remove the insulation from core 3 and lay it over the shielding braid.

Screw the threaded sleeve (9) or (10) into the terminal box (11, example: AKM8 Motor). Push the cores of the cables and the clamping rings (2) or (6) through the threaded sleeve and screw the union nut (1) or (5) tightly onto the threaded sleeve. Then fit bootlace ferrules or terminal pins to the ends of the cores for the brake connections, and ring terminals to the power connections and the PE.

A	B	C	D	E	F	G	H	Connection
20	140	110	140	20	140	130	140	Terminals (similar to drawing)

Preparing cables for terminal box, combined cables (AKM8)



Remove the outer covering over length B, without damaging the shielding braid. Shorten the shielding braid to length A.

Push the union nut (1) and the clamping ring (2) onto the cable and push the shielding braid back over the clamping ring. The shielding braid must cover the sealing ring (3), but must not stick out over the sealing edge (4). Cut off the cores to lengths C/D/E. Shorten the shielding braid for the brake cores to length A.

Push the shielding braid for the brake cores back over the clamping ring. The braid must cover the sealing ring (3) but must not stick out over the sealing edge (4).

Screw the threaded sleeve (5) into the terminal box (6, example: AKM8 Motor). Push the cores of the cable and the clamping ring (2) through the threaded sleeve and screw the union nut (1) tightly onto the threaded sleeve.

Then fit, depending on the motor type, bootlace ferrules or ring terminals to the ends of the cores.

A	B	C	D	E	Connection
20	140	110	130	140	Terminals

10.11.6 Preparing motor power cables (drive end), AKD-B/P/T/M

Material list

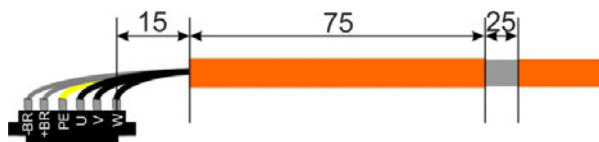
Part	Description	Order code
Cable	Overview (→ p. 35)	
Connector kit drive end AKD-x00306/x00606*, SK14	Power Combicon X2	AKD-X2+SK14-Kit
Connector kit drive end AKD-x01206/x02406/x00307-x02407*	Power Combicon X2	AKD-X2+Shield-Kit
Connector kit drive end AKD-x04807*	Power Combicon X2, Combicon X15 & X16	AKD-X2-X15-X16+ Shield-Kit

*= X means variants -B, -P, -T or -M

Connection scheme

Pin assignment is described in the instructions manual for the drive.

10.11.6.1 Preparing cables for AKD-x00306/x00606



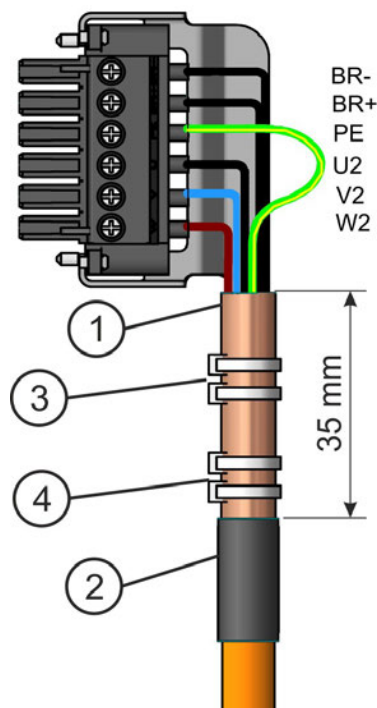
The motor is connected to the AKD-x00306/x00606 with a connector (→ p. 57). Please take note that the connector can accept a maximum conductor cross-section of 4 mm².

Use a shielding clamp (→ p. 17) to ensure an optimum shield connection to the drive.

Wire the connector as shown in the connection diagram in the installation manual. Plug in the connector to the socket on the front of the drive. Screw the connector in place.

10.11.6.2 Preparing cables for AKD-x01206/x02406/x00307 to x02407

The motor is connected to the AKD-x01206/x02406/x00307-x02407 by a Power Combicon connector (→ p. 57). You can obtain the connector kit from us (with connector, shield plate, rubber bushes, installation material).



Strip the external cable sheath to a length of approx. 120 mm, taking care not to damage the braided shield. Push the braided shield (1) back over the cable and secure with a rubber sleeve (2) or shrink sleeve.

Shorten all the wires apart from the protective earth (PE) wire (green/yellow) by about 20 mm so that the PE wire is now the longest wire. Strip all wires and fit wire end ferrules.

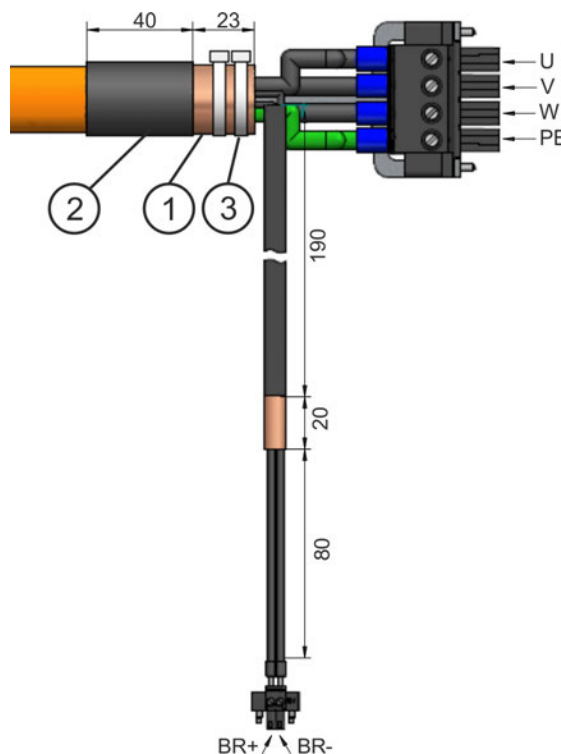
Secure the braided shield of the cable to the shroud with a cable tie or a hose clamp (3) and use a second tie (4) to fasten the cable.

Wire the connector as shown in the connection diagram. Plug in the connector to the socket on the front of the AKD.

Screw the connector in place. This ensures that there is conductive contact over a large surface area between the braided shield and the front panel.

10.11.6.3 Preparing cables for AKD-x04807

The motor is connected to the AKD-x04807 by two Combicon connectors (→ p. 57) either with a combined cable or with two separate cables. You can obtain the connector kit from us.



Strip the external cable sheath to a length of approx. 300 mm, taking care not to damage the braided shield. Push the braided shield (1) back over the cable and secure with a rubber sleeve (2) or shrink sleeve.

Split the power wires and brake wires.

Secure the braided shield of the cable to the shroud with cable ties or hose clamps (3) to fasten the cable.

Power wires:

Shorten all power wires to a length of approx. 100 mm. Shorten all the wires apart from the protective earth (PE) wire (green/yellow) by about 20 mm so that the PE wire is now the longest wire. Strip all wires and fit wire end ferrules.

Brake wires

Secure the shielded brake wires to a length of approx. 190 mm. Shorten the shield to a visible length of about 20 mm (used for shield connection to the drive). Strip the wires and fit wire end ferrules.

Wire the connectors (X2 and X16) as shown in the drive connection diagram. Plug in and screw the connector to the sockets on the bottom of the AKD-x04807.

11 Record of Document Revisions

Edition	Comments
09/2015	Motor cables for AKD-x04807 added, mating connector X5-JUMP for AKD-N new, cabinet connector coupling for decentral drive system removed, notes for slip rings and IP67 grommets, revision history restructured, CFD5A1 cable added. Sxyz contents removed. First AKD-only revision.
12/2015	Cable section restructured, Order code Heat conducting film AKD-N updated, KCM 24A limitation
09/2016	AKD-N012 accessories added, warning notes format updated, Speedtec cables added

Service

We are committed to quality customer service. In order to serve in the most effective way, please contact your local sales representative for assistance.

If you are unaware of your local sales representative, please contact the Customer Support.

Europe

KOLLMORGEN

Internet: www.kollmorgen.com/uk

E-Mail: technik@kollmorgen.com

Tel.: +49 (0)2102 - 9394 - 0

Fax: +49 (0)2102 - 9394 - 3155



KOLLMORGEN
UK Website



European
Product WIKI

North America

KOLLMORGEN

Internet: www.kollmorgen.com/en-us

E-Mail: support@kollmorgen.com

Tel.: +1 - 540 - 633 - 3545

Fax: +1 - 540 - 639 - 4162



KOLLMORGEN
US Website



KOLLMORGEN
Developer Network

South America

KOLLMORGEN

Internet: www.kollmorgen.com/pt-br

Tel.: +55 - 11 - 4191-4771



KOLLMORGEN
Brazil Website

Asia

KOLLMORGEN

Internet: www.kollmorgen.cn

E-Mail: sales.china@kollmorgen.com

Tel: +86 - 400 661 2802



KOLLMORGEN
CHINA Website