AMKASYN
Mains Choke
ALN xx, ALN xx-S, ALN xx-SI

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AMKmotion
MEMBER OF THE ARBURG FAMILY

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Publisher: AMKmotion GmbH + Co KG
Gaußstraße 37-39
73230 Kirchheim unter Teck
Germany

Phone +49 7021 50 05-0
Fax +49 7021 50 05-176

E-mail: info@amk-motion.com

Registration court: AG Stuttgart, HRA 230681, Kirchheim unter Teck,
Tax Id no.: DE 145 912 804

Complementary: AMKmotion Verwaltungsgesellschaft mbH, HRB 774646

Service: Phone +49 7021 50 05-190, Fax -193

For fast and reliable troubleshooting, you can help us by informing our Customer Service about the following:

- Type plate data for each unit
- Software version
- Device configuration and application
- Type of fault/problem and suspected cause
- Diagnostic messages (error messages)

E-mail service@amk-motion.com

Internet address: www.amk-motion.com

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1 About this documentation

1.1 Keeping this document

This document must permanently be available and readable at the place where the product is in use. If the product is used at another place or changed the owner, the document must be passed on.

1.2 Target group

Any person who is entitled and intends to carry out one of the following works must read, understand, and observe this documentation.

- Transportation and storage
- Unpacking and installation
- Projecting
- Connection
- Parameterisation and startup
- Testing and maintenance
- Service and repair
- Decommissioning and disposal

1.3 Purpose

The documentation at hand describes the functional safety of the KW-R07 / -R17 controller cards.
It is intended to qualify the user to parameterise and command safety functions.

This documentation is addressed to any person who handles the product. It gives information about the following topics.

- Safety messages which are absolutely necessary to take care of during handling the product.
- Product identification
- Projecting, planning, and dimensioning of the application
- Environmental conditions for storage, transportation, and operation
- Installation
- Electrical connections
- Startup and operation
- Decommissioning and disposal
- Technical data and conformity with standards

Display conventions

Display	Meaning
	This symbol points to parts of the text to which particular attention should be paid.
"ID0815 parameter text" "1234 diagnostic message"	Parameter names, e.g. "ID2 SERCOS cycle time" Diagnostic message, e.g. "1234 Mains failure"
0x	0x followed by a hexadecimal number, e.g. 0x500A
'Name'	Calling up the 'Delete PLC program' function for example.
'bold'	Menu items and buttons in a software or on a control unit, for example. Click the **'OK'** button in the **'Options'** menu to call up the 'Delete PLC program' function.
>Input variables<	A variable that is entered in the operator interface.

1.4 Appendant documents

Standards and guidelines

Name	Title
EG Richtlinie Niederspannung 2014/35/EU	Low voltage directive
EG Richtlinie EMV 2014/30/EU	EMC directive

Certificates

Name	Title
Z10 16 12 23303 008	TÜV certificate; power output stage enable for protection against restart
Certificate of Compliance 1441318	CSA certificate; KE/KW modules, switch on components, cooling plates

Device descriptions

AMK part-no.	Title
28932	Servo drives KE/KW

2 For your safety

2.1 Design of safety information

Any safety information is configured as follows:

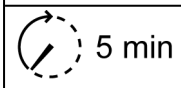
⚠ SIGNAL WORD	
 Symbol	**Type and source of risk** Consequence(s) of non-observance **Steps to prevent:** • ...

2.2 Classes of hazard

Safety and warning messages are graduated into classes of hazard (according to ANSI Z535). The class of hazard defines the potential risk of harm and is described by a single word, if the safety information is ignored. The signal word is followed by a safety alert symbol (ISO 3864, DIN EN ISO 7010). In accordance with ANSI Z535, the following signal words are used to define the class of hazard.

Safety alert symbol and signal word	Class of hazard and its meaning
⚠ DANGER	DANGER indicates a hazardous situation which, if not avoided, **will** result in death or serious injury
⚠ WARNING	WARNING indicates a hazardous situation which, if not avoided, **could** result in death or serious injury
⚠ CAUTION	CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, **could** result in minor or moderate injury
NOTICE	NOTICE is used to address preventions to avoid material damage, but not related to personal injury.

2.3 Used safety symbols

Safety symbol	Meaning
	Warning of a danger!
	Warning against dangerous electrical voltage!
 5 min	Warning against dangerous electrical voltage! It will last up to 5 minutes until the energy storage is discharged after it has been electrically disconnected.
	Warning against crushing hazard!
	Warning against hot surface!

2.4 General safety instructions

- The electricity, mechanical movements and high temperatures in electrical drive systems present hazards that can result in fatal injuries and material damage. These hazards are present while starting up and operating the unit, and also during servicing or maintenance work.
- Personnel must have read and understood the safety instructions before installing and operating the unit. In the documentation included with the product, the usage warnings pertain to direct hazards and must therefore be followed directly when operating or handling the unit by the operator.
- Compliance with all of the instructions given in the documentation included with the product will ensure safe and fault-free operation of the unit and is a prerequisite for asserting warranty claims.
- AMK Arnold Müller GmbH & Co. KG shall not be held liable for any damages ensuing from using the unit in a manner contrary to the intended use, from faulty installation or from using the unit beyond the specified operating characteristics and conditions.
- Do not start the system in which the AMK products are installed (begin of intended use) until you can determine that all relevant standards, laws and directives have been complied with.

2.5 Requirements for the Personnel and their Qualification

Only authorised and qualified personnel may work on and with the AMKmotion drive systems.

Specialised personnel must:

- Perform mechanical and electrical work that is described in this documentation, such as mounting and connecting
- Observe all information in the documentation accompanying the product in order to work with the product safely and in an error-free manner
- Understand and know hazards that occur when handling the product
- Know connections and functions of the system
- Be familiar with the control concept in order to operate the drive system
- Be authorised to switch circuits and devices on and off, earth and label them
- Observe local specific safety requirements

2.6 Intended use

The mains choke of the ALN type series have been designed for installation in a closed, well-sized switch cabinet, which provides protection against direct contact acc. to EN 50178.

2.7 Safety rules

In particular on drive systems, the instructions pertaining to safety and the following five safety rules have to be kept in the specified sequence:

1. Switch off electrical circuits (also electronic and auxiliary circuits).
2. Secure against being switched on again.
3. Determine that there is no voltage.
4. Ground and short circuit.
5. Cover or close off neighboring parts that are under voltage.

Reverse the measures taken in reverse order after completing the work.

3 Product overview

3.1 Product description

The switch-on components mains choke, mains filter and upstream mains choke limit the interferences that electrical devices transfer into the public mains. Conversely, they improve the electromagnetic compatibilities of the devices in the face of interferences from the electricity network.

The mains chokes of the type series ALN recommended by AMK feature a higher saturation current and greater inductance that is optimised for AMK devices. They reduce the induced distortion on the mains (harmonics) and improve the power factor of the downstream devices.

For all AC/DC converters KE / KEN / KES as of a nominal power of 10 kW, it is necessary to switch the mains choke up-stream.

3.2 Product name and ordering data

Product name	Order number
ALN 12	O911
ALN 17	O742
ALN 36	O726
ALN 36/1000	O727
ALN 63	O728
ALN 85	O729
ALN 125	O730
ALN 150-2,5	O731
ALN 180	O739
ALN 270	O965

Product name	Order number
ALN 15-SI	O968
	O892 1)
	O829 1)
ALN 45-SI	O889
ALN 60-SI	O790
ALN 60-SI	O942
ALN 150-SI	O943
ALN 30-S	O893
ALN 90-S	O770
ALN 180-S	O771
ALN 180-S	O958

1) Not available for new applications!

3.3 Delivery

- Please check whether the delivered parts correspond with the delivery note. If the delivery is incomplete, please contact your nearest AMK representative.
- Check the components for signs of transport damage after their arrival. Do not install and operate any damaged components.
- If there is any transport damage, immediately inform the delivering freight carrier and inform your AMK representative.

3.4 Type code

3.4.1 Mains chokes for compact power supplies KE and KEN

ALN	xxx	
	12	Nominal current 12 A
	17	Nominal current 17 A
	36	Nominal current 36 A
	36/1000	Nominal current 36 A
	63	Nominal current 63 A
	85	Nominal current 85 A
	125	Nominal current 125 A
	150-2,5	Nominal current 150 A
	180	Nominal current 180 A
	270	Nominal current 270 A

3.4.2 Mains chokes for compact power supply KES

Mains choke for pulse operation, reduced nominal current during greater overload capacity

ALN	xxx - SI	
	15	Nominal current 15 A
	45	Nominal current 45 A
	60	Nominal current 60 A
	150	Nominal current 150 A

Mains choke for continuous operation

ALN	xxx - S	
	30	Nominal current 30 A
	90	Nominal current 90 A
	180	Nominal current 180 A

3.5 Technical data

3.5.1 Mains chokes ALN xx

Designation	ALN 12	ALN 17	ALN 36	ALN 36 / 1000	ALN 63
Nominal voltage U_N	3 x 500 V, 50 / 60 Hz*				
Nominal current I_N	3 x 12 A	3 x 17 A	3 x 36 A	3 x 36 A	3 x 63 A
Maximum current [rms]	30 A for 20 s (2.5 x I_N)	54 A for 60 s (3.17 x I_N)	54 A for 60 s (1.5 x I_N)	100 A for 60 s (2.77 x I_N)	94 A for 60 s (1.5 x I_N)
Short circuit voltage u_k	4 % at 50 Hz	3.9 % at 50 Hz	4 % at 50 Hz	4 % at 50 Hz	4 % at 50 Hz
Inductance/Line	3 mH	2.1 mH	1 mH	1 mH	0.58 mH
Power loss	50 W	60 W	80 W	80 W	120 W
Protection class	IP 00				
Weight	3.6 kg	4 kg	6 kg	7 kg	10 kg
Dimensions	Siehe 'Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S' auf Seite 17.				
AMK part no.	O911	O742	O726	O727	O728

Designation	ALN 85	ALN 125	ALN 150-2,5	ALN 180	ALN 270
Nominal voltage U_N	3 x 500 V, 50 / 60 Hz*				
Nominal current I_N	3 x 85 A	3 x 125 A	3 x 150 A	3 x 180 A	3 x 270 A
Maximum current [rms]	127 A for 60 s (1.5 x I_N)	187 A for 60 s (1.5 x I_N)	300 A for 60 s (2 x I_N)	330 A for 60 s (1.83 x I_N)	480 A for 60 s (1.77 x I_N)
Short circuit voltage u_k	4 % at 50 Hz	4 % at 50 Hz	2.5 % at 50 Hz	2 % at 50 Hz	4 % at 50 Hz
Inductance/Line	0.43 mH	0.295 mH	0.15 mH	0.125 mH	0.137 mH
Power loss	180 W	210 W	300 W	300 W	425 W
Protection class	IP 00				
Weight	16 kg	20 kg	27 kg	27 kg	62 kg
Dimensions	Siehe 'Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S' auf Seite 17.			Siehe 'Mains chokes ALN 180(-S)' auf Seite 19.	Siehe 'Mains choke ALN 270' auf Seite 20.
AMK part no.	O729	O730	O731	O739	O965

* IT network: Voltage range is restricted here to
3 x 400 V -20%... 440 V + 10 %, 47 ... 63 Hz

3.5.2 Mains chokes ALN xx-S / -SI

Designation	ALN 15-SI		ALN 45-SI	ALN 60-SI		ALN 150-SI
Nominal voltage U_N	3 x 500 VAC, 50 / 60 Hz					
Nominal current I_N	3 x 15 A		3 x 45 A	3 x 60 A		3 x 150 A
Maximum current [amplitude]	85 A for 10 s ($4 \times I_N \times \sqrt{2}$)		255 A for 10 s ($4 \times I_N \times \sqrt{2}$)	425 A for 10 s ($5 \times I_N \times \sqrt{2}$)		680 A for 10 s ($3.2 \times I_N \times \sqrt{2}$)
Short circuit voltage u_k	4 % at 50 Hz		4 % at 50 Hz	2.66 % at 50 Hz		4.4 % at 50 Hz
Input current during overload I_{max}	3 x 60 A		3 x 180 A	3 x 300 A		3 x 480 A
Inductance/Line	2.46 mH		0.82 mH	0.41 mH		0.273 mH
Power loss	100 W		190 W	230 W		530 W
Protection class	IP 00					
Weight	10 kg	12 kg	21 kg	25 kg		66 kg
Dimensions	Siehe 'Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S' auf Seite 17.					Siehe 'Mains chokes ALN 150-SI' auf Seite 18.
AMK part no.	O968	O829	O889	O790 1)	O942 1)	O943

Designation	ALN 30-S		ALN 90-S	ALN 180-S	
Nominal voltage U_N	3 x 500 VAC, 50 / 60 Hz				
Nominal current I_N	3 x 30 A		3 x 90 A	3 x 180 A	
Maximum current [amplitude]	85 A for 10 s ($2 \times I_N \times \sqrt{2}$)		255 A for 10 s ($2 \times I_N \times \sqrt{2}$)	425 A for 10 s ($1.66 \times I_N \times \sqrt{2}$)	
Short circuit voltage u_k	8 % at 50 Hz		8 % at 50 Hz	8 % at 50 Hz	
Input current during overload I_{max}	3 x 60 A		3 x 180 A	3 x 300 A	
Inductance/Line	2.46 mH		0.82 mH	0.41 mH	
Power loss	178 W		320 W	490 W	
Protection class	IP 00				
Weight	16 kg		43 kg	75 kg	69 kg
Dimensions	Siehe 'Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S' auf Seite 17.			Siehe 'Mains chokes ALN 180 (-S)' auf Seite 19.	
AMK part no.	O893		O770	O771 2)	O958 2)

1) The devices are different in dimensions and mounting hole
Dimensions: Siehe 'Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S' auf Seite 17.
Detail of mounting hole: Siehe 'Detail of mounting hole' auf Seite 16.

2) The devices are different in dimensions and mounting hole
Dimensions: Siehe 'Mains chokes ALN 180(-S)' auf Seite 19.
Detail of mounting hole: Siehe 'Detail of mounting hole' auf Seite 16.

4 Transport, storing, environment, maintenance, disposal

4.1 For Your safety

⚠ DANGER	
	**Risk of injury from crushing, cutting and hitting.** When transporting and mounting sharp-edged and / or heavy components, there is a risk of crushing, cutting and bruising of the persons involved. Suspended loads can fall down and people suffer fatal injuries. **Steps to prevent:** • Utilize suitable assembly and transport equipment, such as hoists and carriages. • Wear protective clothing, e.g. safety gloves and boots, during the assembly. • Use only appropriate tools during the assembly. • Make sure that there are no persons or body parts located under suspended loads during the transport or assembly. • Prevent catching and crushing by mechanical devices.

4.2 Transport

- Transport the device in its original packaging and use shock-absorbing padding.
- Protect the device against condensation and prevent sudden changes in temperature and humidity.

4.3 Storing

- Store the device in its original packaging.
- Store the device in a clean and dry location where it is protected against weather conditions.
- Protect the device against condensation and prevent sudden changes in temperature and humidity.
- Protect the device against salt fog, industrial fumes, corroding liquids, vermin and mildew.

4.4 Environmental conditions

NOTICE	
Material Damage!	**Short circuit due to penetrating foreign objects or water** Foreign objects such as metal shavings, screws, etc. cause short circuits. In particular it needs to be prevented that water, e.g. condensation water, seeps in through the cooling units. A temporary forming of dew may only occur as long as the devices are out of operation. **Steps to prevent:** • The modules need to be protected against penetrating foreign objects or water. • When applying mains voltage, no dew may be present any longer.

Storage/Shipping temperature:	- 25 °C to +75 °C
Ambient temperature in operation:	+5 °C to +40 °C
Relative humidity:	5 % to 85 %, without condensation
Installation altitude:	≤ 1000 m above sea level.

4.5 Maintenance

- The device does not require any maintenance.

4.6 Disposal

Clarify with your local waste disposal company which materials and chemicals need to be separated and how to dispose of them. Observe the local regulations for disposal.

Examples of materials to be disposed of separately:

Components

- Electronic scrap, e. g., encoder electronics
- Iron scrap
- Aluminium
- Non-ferrous metal, e. g., motor windings
- Insulating materials

Chemicals

- Oils (disposal as hazardous waste, in acc. with the pertinent legislation; in Germany, the Waste Oil Ordinance (AltölV) applies)
- Grease
- Solvents
- Paint residue
- Coolant

5 Assembly

5.1 For Your safety

⚠ DANGER	
	**Risk of injury from crushing, cutting and hitting.** When transporting and mounting sharp-edged and / or heavy components, there is a risk of crushing, cutting and bruising of the persons involved. Suspended loads can fall down and people suffer fatal injuries. **Steps to prevent:** • Utilize suitable assembly and transport equipment, such as hoists and carriages. • Wear protective clothing, e.g. safety gloves and boots, during the assembly. • Use only appropriate tools during the assembly. • Make sure that there are no persons or body parts located under suspended loads during the transport or assembly. • Prevent catching and crushing by mechanical devices.

5.2 Avoiding material damage

NOTICE	
Material Damage!	**Electronic components could be destroyed through static discharge!** Therefore touching of the electrical connections (e. g. signal and power supply cable) must be avoided. Otherwise you can be damaged the components when touching by static discharge. **Steps to prevent:** • Avoid touching electrical connections and contacts. • During handling the electronic component discharge yourself by touching PE. • Pay attention to the ESD-notes (electrostatic discharge).

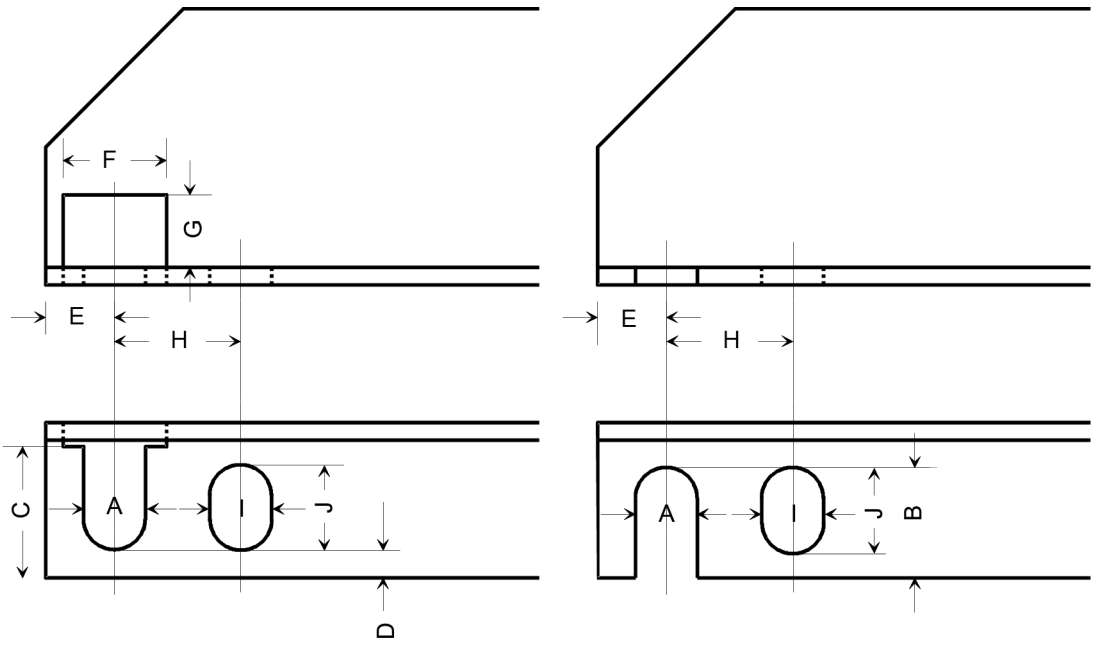
NOTICE	
Material Damage!	**Short circuit due to penetrating foreign objects or water** Foreign objects such as metal shavings, screws, etc. cause short circuits. In particular it needs to be prevented that water, e.g. condensation water, seeps in through the cooling units. A temporary forming of dew may only occur as long as the devices are out of operation. **Steps to prevent:** • The modules need to be protected against penetrating foreign objects or water. • When applying mains voltage, no dew may be present any longer.

5.3 Mounting in switch cabinet

The mains choke is intended for assembly on the mounting plate or the floor of the switch cabinet. It needs to be installed with a minimum distance of 80 mm to the KE/KW module.

5.3.1 Detail of mounting hole

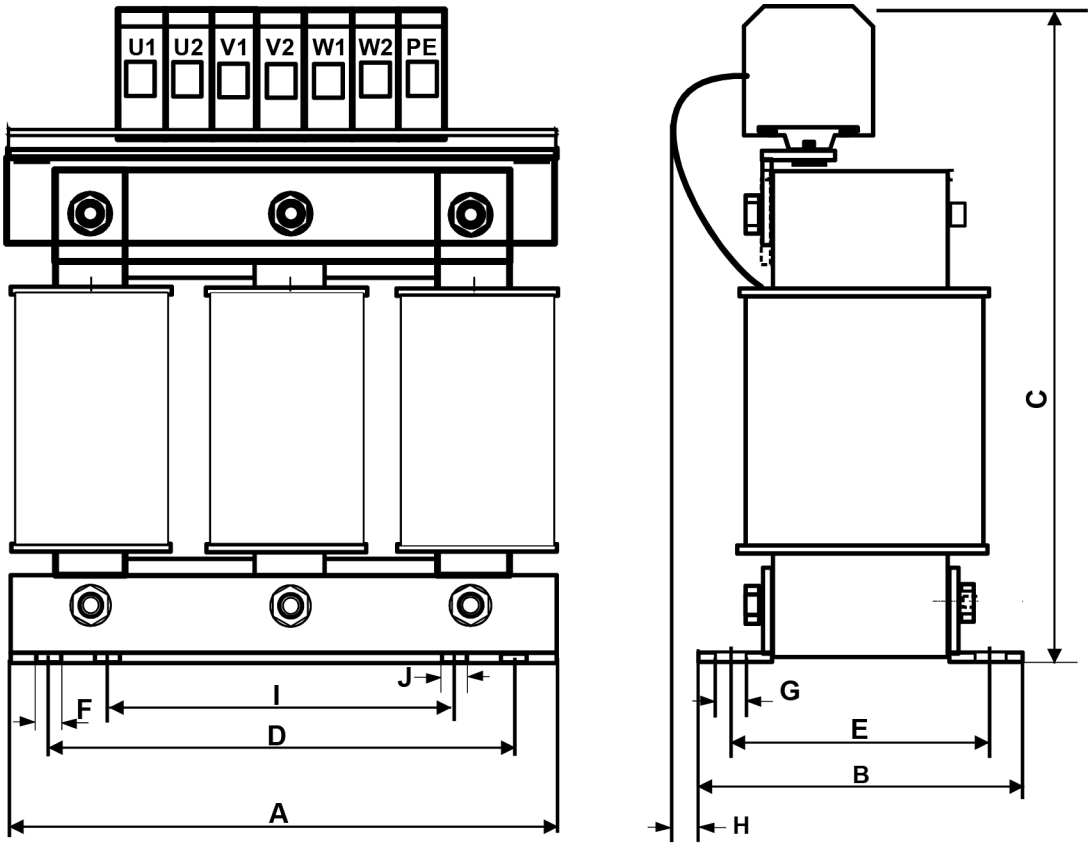
In order to simplify the mounting of the chokes especially on vertical mounting plates, some chokes are constructed with open mounting grooves.



Dimensions / mm	ALN 15-SI	ALN 30-S	ALN 45-SI	ALN 60-SI	ALN 150-SI	ALN 180-S	ALN 270
A	7.0	9.0	9.0	9.0	12.0	12.0	12.0
B	13.0	13.0	16.0	16.5	18.0	18.0	18.0
C	19.0	19.0	19.0	32.0	71.5	24.0	24.0
D	6.0	6.0	4.0	5.5	10.0	6.0	6.0
E	10.0	15.0	10.0	15.0	15.0	15.0	15.0
F	13.0	15.0	15.0	15.0	20.0	20.0	20.0
G	9.5	14.5	10.5	11.5	13.0	13.0	13.0
H	-	-	-	20.5	-	-	-
I	-	-	-	9.0	-	-	-
J	-	-	-	14.0	-	-	-
AMK part no.	O968	O893	O889	O942	O943	O958	O965

5.4 Views and dimensions

5.4.1 Mains chokes ALN 12 ... ALN 150 / ALN 15-SI ... ALN 90-S



The position of the terminal blocks can vary.

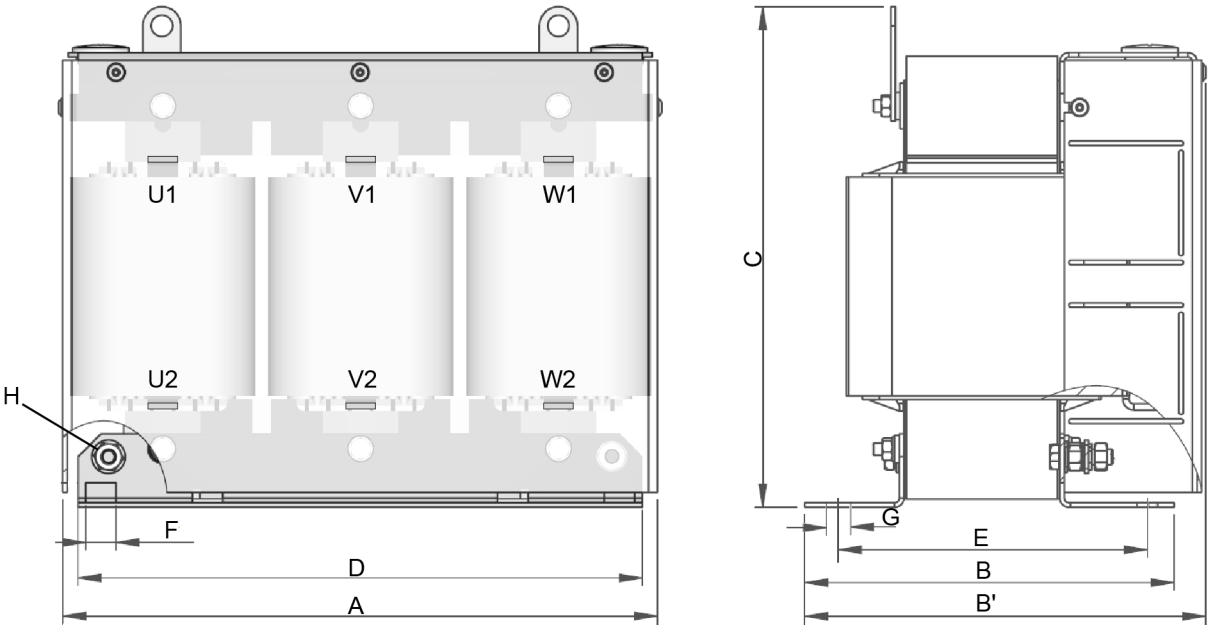
Dimensions / mm:

	ALN 12	ALN 17	ALN 36	ALN 36/1000	ALN 63	ALN 85	ALN 125	ALN 150-2,5
A	155 ±2	155 ±2	155 ±2	190 ±2	190 ±2	210 ±2	233 ±2	240 ±2
B	77 ±2	77 ±2	92 ±2	90 ±2	100 ±2	120 ±2	113 ±2	130 ±2
C	137 ±10	175 ±10	≤ 225	220 ±5	≤ 225	240 ±10	286 ±10	310 ±10
D	130 ±1	130 ±1	130 ±1	170 ±1	170 ±1	175 ±1	175 ±1	185 ±1
E	57 ±2	58 ±2	71 ±2	67 ±2	77 ±2	97 ±1	90 ±2	108 ±2
F	8	8	8	8	8	8	7	10
G	12	12	12 +1	12 +1	12 +1	12 +1	13	18
H	0	0	0	0	0	≤ 15	≤ 15	≤ 20
I	-	-	-	-	-	-	-	-
J	-	-	-	-	-	-	-	-
AMK part no.	O911	O742	O726	O727	O728	O729	O730	O731

	ALN 15-SI	ALN 15-SI	ALN 45-SI	ALN 60-SI	ALN 60-SI	ALN 30-S	ALN 90-S
A	190 ±1	190 ±2	250 ±2	300 ±2	295 ±1	300 ±2	300 ±2
B	101 ±3	102 ±2	113 ±2	122 ±2	137 ±2	107 ±2	165 ±2
C	215 ±10	215 ±10	270 ±10	335 ±10	340 ±5	243 ±10	335 ±10
D	190 ±1	170 ±1	230 ±1	224 ±1	265 ±1	270 ±1	240 ±1
E	85 ±1	77 ±1	93 ±3	94 ±2	115 ±2	77 ±2	133 ±1
F	*)	8	*)	10	*)	*)	11
G	*)	12	*)	18	*)	*)	17
H	0	0	0	0	0	0	0
I	-	-	-	-	224 ±1	-	-
J	-	-	-	-	*)	-	-
AMK part no.	O968	O829	O889	O790	O942	O893	O770

*) Siehe 'Detail of mounting hole' auf Seite 16.

5.4.2 Mains chokes ALN 150-SI

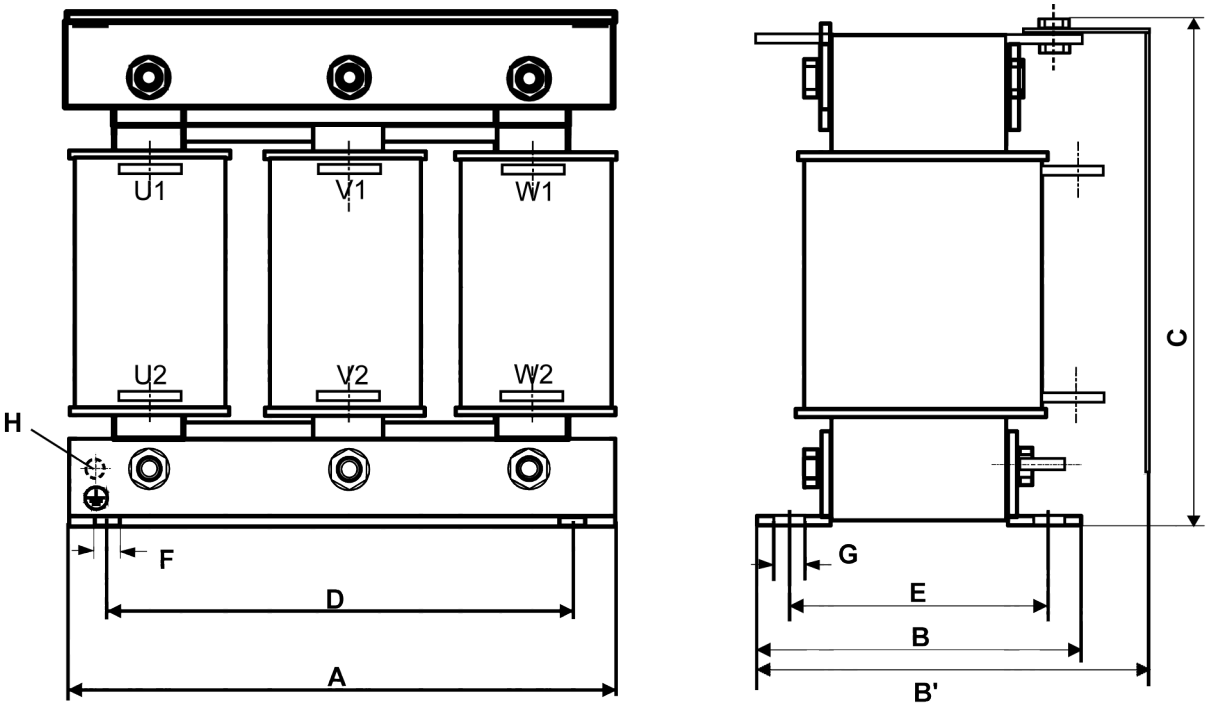


Dimensions / mm:

	ALN 150-SI
A	390
B	242 ±2
B'	264 ±4
C	328 ±3
D	340
E	214 ±2
F	*)
G	*)
H (PE)	M10
AMK part no.	O943

*) Siehe 'Detail of mounting hole' auf Seite 16.

5.4.3 Mains chokes ALN 180(-S)

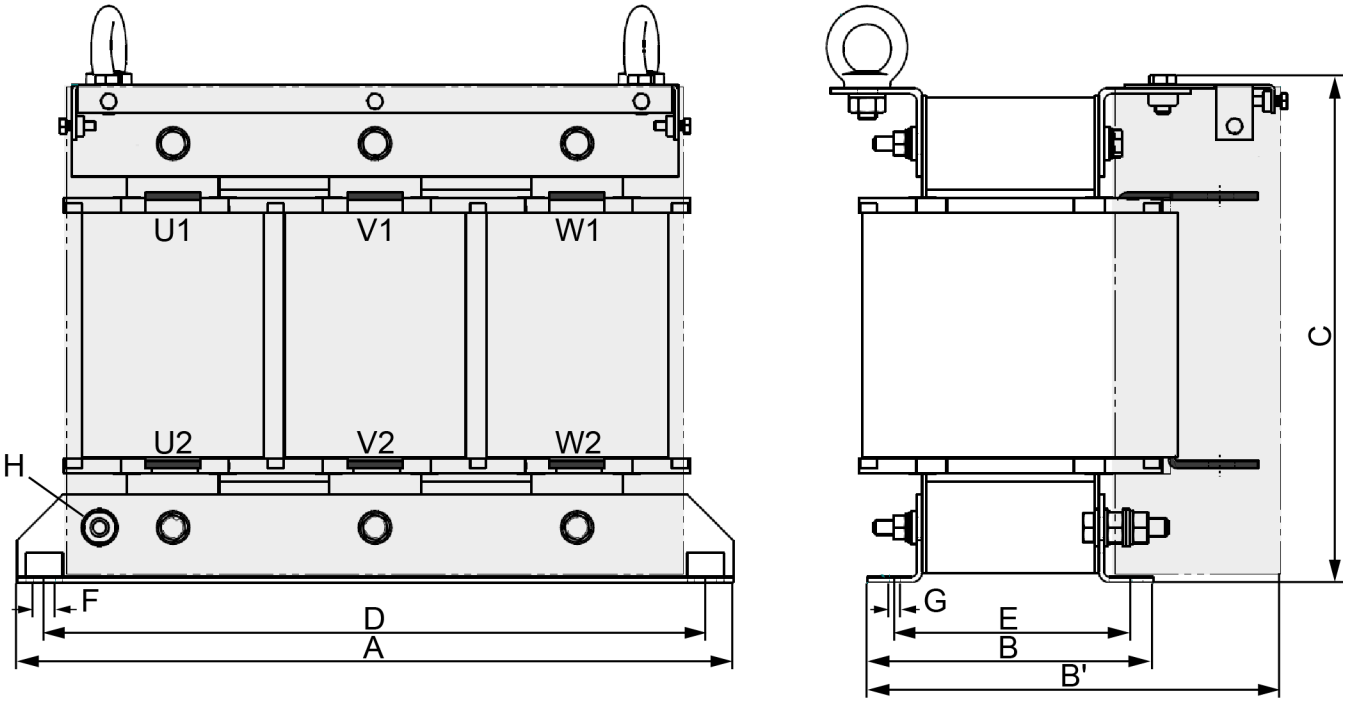


Dimensions / mm:

	ALN 180	ALN 180-S	ALN 180-S
A	265 ±2	390 ±2	455 ±2
B	151 ±1	197 ±2	157 ±2
B'	200 ±10	258 ±3	230 ±7
C	≤ 245	337 ±5	330 ±5
D	215 ±1	310 ±1	425 ±1
E	125 ±2	159 ±1	133 ±1
F	11	11	*)
G	15	15	*)
H (PE)	M8x30	M8x40	M8x40
AMK part no.	O739	O771	O958

*) Siehe 'Detail of mounting hole' auf Seite 16.

5.4.4 Mains choke ALN 270



Dimensions / mm:

	ALN 270
A	390 ±2
B	156 ±2
B'	228 ±7
C	271 ±10
D	360 ±1
E	132 ±1
F	*)
G	*)
H (PE)	M10x40
AMK part no.	O965

*) Siehe 'Detail of mounting hole' auf Seite 16.

5.5 Tightening torque

The following tables list the tightening torques for the mechanical fastening of the mains chokes on the mounting plate or the floor of the switch cabinet.

	ALN 12	ALN 17	ALN 36	ALN 36/1000	ALN 63	ALN 85
Diameter	M6	M6	M6	M6	M6	M6
Tightening torque / Nm	9.6	9.6	9.6	9.6	9.6	9.6
AMK part no.	O911	O742	O726	O727	O728	O729

	ALN 125	ALN 150-2,5	ALN 180	ALN 270
Diameter	M6	M8	M10	M10
Tightening torque / Nm	9.6	23	46	46
AMK part no.	O730	O731	O739	O965

	ALN 15-SI	ALN 15-SI	ALN 45-SI	ALN 60-SI	ALN 60-SI	ALN 150-SI
Diameter	M6	M6	M8	M8	M8	M10
Tightening torque / Nm	9.6	9.6	23	23	23	46
AMK part no.	O968	O829	O889	O790	O942	O943

	ALN 30-S	ALN 90-S	ALN 180-S	ALN 180-S
Diameter	M8	M10	M10	M10
Tightening torque / Nm	23	46	46	46
AMK part no.	O893	O770	O771	O958

6 Electrical connections

6.1 For Your safety

⚠ DANGER	
	**Danger to life from touching electrical connections!** Electrical terminals and connectors carry voltages that may cause death or serious injury upon contact. **Steps to prevent:** • Prior to any work on the device: Observe the 5 safety rules. • Measure the terminal voltages. There may be no voltage present. • Plug and pull connections only when there is no voltage. • For devices that are connected to a DC bus, or generate it yourself, you need to consider the discharge times of the dc bus capacitors mentioned in the converter documentation • Before commencing work, the connections must be isolated from the voltage supply at both ends! (both ends mean: AC and DC bus supply side)

6.2 Avoiding material damage

NOTICE	
Material Damage!	**Electronic components could be destroyed through static discharge!** Therefore touching of the electrical connections (e. g. signal and power supply cable) must be avoided. Otherwise you can be damaged the components when touching by static discharge. **Steps to prevent:** • Avoid touching electrical connections and contacts. • During handling the electronic component discharge yourself by touching PE. • Pay attention to the ESD-notes (electrostatic discharge).

NOTICE	
Material Damage!	**Observe the tightening torques.** Note the tightening torques specified in the documentation for screw connections and screw terminals, otherwise the conductivity and the security of the connection are not ensured.

6.3 Connections

6.3.1 PE connection

⚠DANGER

Danger to life from electrical shock!

In the event of an interruption to the PE connection, avoid touching the casing because life-threatening levels of voltage may be present!

Steps to prevent:

- EN 61800-5-1 requires that the devices be firmly connected on the power side.
- The PE conductor must have a cross-section of at least 10 mm^2 or must have a second PE connection with a cross-section at least equal to the mains feeder (cf. EN 61800-5-1).

Cross-section AC wire	Cross-section PE wire
≤ 10 mm^2	= 10 mm^2
10 ... 16 mm^2	= Cross-section AC wire
16 ... 35 mm^2	= 16 mm^2
≥ 35 mm2	≈ 1/2 x Cross-section AC wire

Description:

On the mains chokes up to ALN 90(-S), the PE connection is constructed as a terminal.

The PE connection of the ALN 30-S, ALN 150-SI and the ALN 180(-S) is constructed as a screw bolt on the casing.

Connection:

Module	ALN 12	ALN 17	ALN36	ALN 36/1000
Recommended cable type	1-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Recommended wire cross-section	10 mm^2 AWG 7	10 mm^2 AWG 7	10 mm^2 AWG 7	10 mm^2 AWG 7
Tightening torque	Depends on used terminal type			

Module	ALN 63	ALN 85	ALN 125	ALN 150-2,5
Recommended cable type	1-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Recommended wire cross-section	16 mm^2 AWG 5	16 mm^2 AWG 5	16 mm^2 AWG 5	35 mm^2 AWG 1
Tightening torque	Depends on used terminal type			

Module	ALN 15-SI	ALN 45-SI	ALN 60-SI	ALN 150-SI
Recommended cable type	1-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			Ring cable lug
Recommended wire cross-section	10 mm^2 AWG 7	25 mm^2 AWG 3	25 mm^2 AWG 3	35 mm^2 AWG 1/0
Earth connection	-			M10 x 35
Tightening torque	Depends on used terminal type			46 Nm

Module	ALN 30-S	ALN 90-S
Recommended cable type	1-wire, unshielded	
Cable assembly	Ring cable lug	Wire end ferrule with plastic sheath
Recommended wire cross-section	10 mm^2 AWG 7	35 mm^2 AWG 1
Earth connection	M8 x 30	-
Tightening torque	23 Nm	Depends on used terminal type

Module	ALN 180	ALN 180-S	ALN 270
Recommended cable type	1-wire, unshielded		
Cable assembly	Ring cable lug		
Recommended wire cross-section	50 mm^2 AWG 1/0	50 mm^2 AWG 1/0	95 mm^2 AWG 4/0
Earth connection	M8	M8	M10
Tightening torque	23 Nm	23 Nm	46 Nm

6.3.2 [X01] Mains supply

⚠ DANGER

Lethal electrical hazard when touching electrical connections!

The connections carry voltages that may cause death or serious injury upon contact. The connections themselves are not protected against contact.

Steps to prevent:

- The connections need to be secured by a cover against being touched.

Description:

Mains-side connection

Technical data:

- Mains voltage: 3 x 500 V, 50/60 Hz (symmetric three-phase power supply)

Version:

	Type	Pins
ALN 12 ... ALN 150 ALN 30-S ... ALN 90-S ALN 15-SI ... ALN 60-SI	Screw terminal	3
ALN 180 ... ALN 270 ALN 180-S ALN 150-SI	Copper tab	3

Assignment:

Designation	Connection
U1	Mains-side connection line phase L1
V1	Mains-side connection line phase L2
W1	Mains-side connection line phase L3

Connection:

Module	ALN 12	ALN 17	ALN 36	ALN 36/1000
Recommended cable type	3-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Shield connection	If available, attach on both sides			
Recommended wire cross-section	4 mm^2 AWG 11	4 mm^2 AWG 11	10 mm^2 AWG 7	10 mm^2 AWG 7
Tightening torque	Depends on used terminal type			

Module	ALN 63	ALN 85	ALN 125	ALN 150-2,5
Recommended cable type	3-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Shield connection	If available, attach on both sides			
Recommended wire cross-section	25 mm^2 AWG 3	35 mm^2 AWG 1	35 mm^2 AWG 1	70 mm^2 AWG 3/0
Tightening torque	Depends on used terminal type			

Module	ALN 15-SI	ALN 45-SI	ALN 60-SI	ALN 150-SI
Recommended cable type	3-wire, unshielded			1-wire, unshielded
Cable assembly	Wire end ferrule with plastic sheath			Ring cable lug
Shield connection	If available, attach on both sides			
Recommended wire cross-section	10 mm^2 AWG 7	25 mm^2 AWG 3	50 mm^2 AWG 1/0	70 mm^2 AWG 1/0 max. 70 °C
Copper tab: Borehole for	-			M8
Tightening torque	Depends on used terminal type			23 Nm

Module	ALN 30-S	ALN 90-S
Recommended cable type	3-wire, unshielded	
Cable assembly	Wire end ferrule with plastic sheath	
Shield connection	If available, attach on both sides	
Recommended wire cross-section	10 mm^2 AWG 7	35 mm^2 AWG 1
Tightening torque	Depends on used terminal type	

Module	ALN 180	ALN 180-S	ALN 270
Recommended cable type	1-wire, unshielded		
Cable assembly	Ring cable lug		
Shield connection	If available, attach on both sides		
Recommended wire cross-section	95 mm^2 AWG 4/0	95 mm^2 AWG 4/0	150 mm^2 kcmil 300
Copper tab: Borehole for	M8	M8	M12
Tightening torque	23 Nm	23 Nm	40 Nm

Note	
	When using pin cable lug: Siehe 'Terminal connection technology' auf Seite 28. The connection tabs of the mains chokes ALN 150-SI, ALN 180(-S) and ALN 270 need to be secured by a cover against being touched.

6.3.3 X02] Load connection

⚠ DANGER	
	**Lethal electrical hazard when touching electrical connections!** The connections carry voltages that may cause death or serious injury upon contact. The connections themselves are not protected against contact. **Steps to prevent:** • The connections need to be secured by a cover against being touched.

Description:
Load-side connection

Technical data:

- Mains voltage: 3 x 500 V, 50/60 Hz (symmetric three-phase power supply)

Version:

	Type	Pins
ALN 12 ... ALN 150 ALN 30-S ... ALN 90-S ALN 15-SI ... ALN 60-SI	Screw terminal	3
ALN 180 ... ALN 270 ALN 180-S ALN 150-SI	Copper tab	3

Assignment:

Designation	Connection
U2	Load-side connection load phase L1
V2	Load-side connection load phase L2
W2	Load-side connection load phase L3

Connection:

Module	ALN 12	ALN 17	ALN 36	ALN 36/1000
Recommended cable type	3-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Shield connection	If available, attach on both sides			
Recommended wire cross-section	4 mm^2 AWG 11	4 mm^2 AWG 11	10 mm^2 AWG 7	10 mm^2 AWG 7
Tightening torque	Depends on used terminal type			

Module	ALN 63	ALN 85	ALN 125	ALN 150-2,5
Recommended cable type	3-wire, unshielded			
Cable assembly	Wire end ferrule with plastic sheath			
Shield connection	If available, attach on both sides			
Recommended wire cross-section	25 mm^2 AWG 3	35 mm^2 AWG 1	35 mm^2 AWG 1	70 mm^2 AWG 3/0
Tightening torque	Depends on used terminal type			

Module	ALN 15-SI	ALN 45-SI	ALN 60-SI	ALN 150-SI
Recommended cable type	3-wire, unshielded			1-wire, unshielded
Cable assembly	Wire end ferrule with plastic sheath			Ring cable lug
Shield connection	If available, attach on both sides			
Recommended wire cross-section	10 mm^2 AWG 7	25 mm^2 AWG 3	50 mm^2 AWG 1/0	70 mm^2 AWG 1/0 max. 70 °C
Copper tab: Borehole for	-			M8
Tightening torque	Depends on used terminal type			23 Nm

Module	ALN 30-S	ALN 90-S
Recommended cable type	3-wire, unshielded	
Cable assembly	Wire end ferrule with plastic sheath	
Shield connection	If available, attach on both sides	
Recommended wire cross-section	10 mm^2 AWG 7	35 mm^2 AWG 1
Tightening torque	Depends on used terminal type	

Module	ALN 180	ALN 180-S	ALN 270
Recommended cable type	1-wire, unshielded		
Cable assembly	Ring cable lug		
Shield connection	If available, attach on both sides		
Recommended wire cross-section	95 mm^2 AWG 4/0	95 mm^2 AWG 4/0	150 mm^2 kcmil 300
Copper tab: Borehole for	M8	M8	M12
Tightening torque	23 Nm	23 Nm	40 Nm

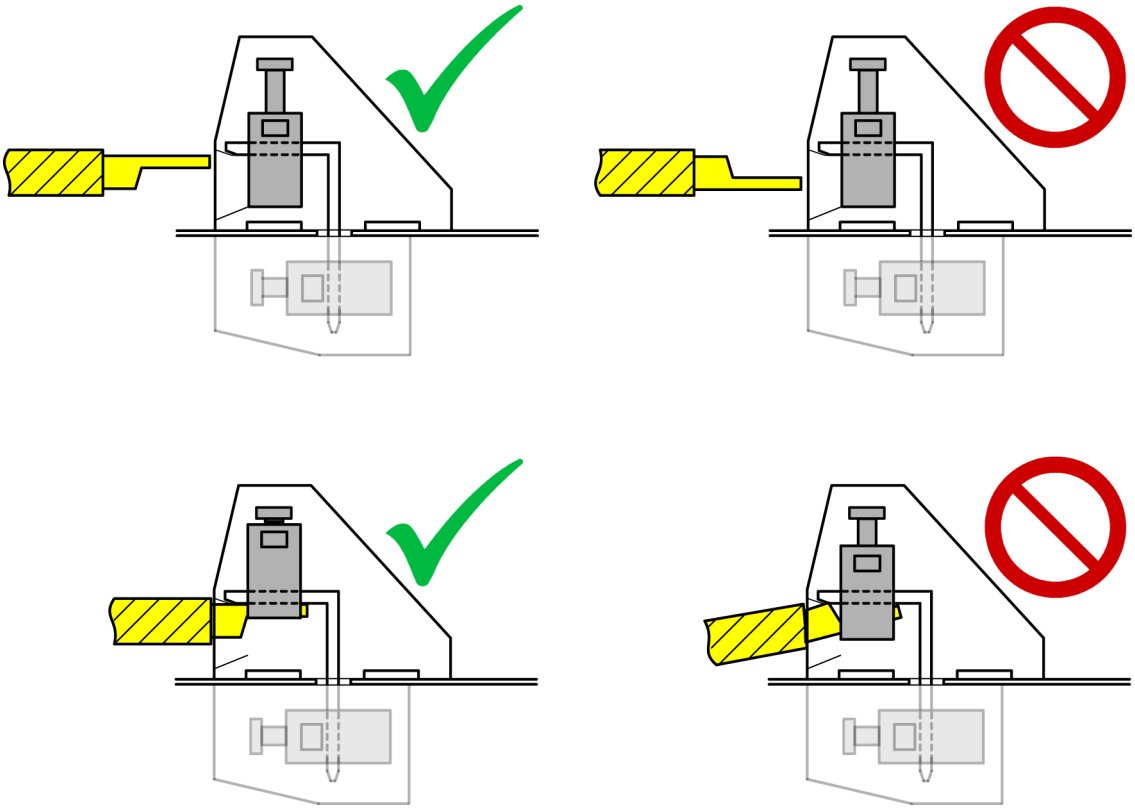
Note	
	When using pin cable lug: Siehe 'Terminal connection technology' auf Seite 28. The connection tabs of the mains chokes ALN 150-SI, ALN 180(-S) and ALN 270 need to be secured by a cover against being touched.

6.3.4 Terminal connection technology

When using pin cable lugs please note!

Connection	Description	Device
[X01]	Mains Supply	ALN 12 ... ALN 150 ALN 30-S ... ALN 90-S ALN 15-SI ... ALN 60-SI
[X02]	Load Connection	ALN 12 ... ALN 150 ALN 30-S ... ALN 90-S ALN 15-SI ... ALN 60-SI

Based on example: HDFKV terminal



7 Operation

7.1 For Your safety

⚠ WARNING	
	**Risk of burns when touching hot surfaces!** The casing temperature, for example of the line filter, the choke or the brake resistor, can be more than 70 °C during and even after operation. Contact causes burns. **Steps to prevent:** • Make sure that the surfaces have cooled down before you touch. • Wear protective clothing such as gloves if hot parts need to be touched. • Fit a warning sign with warning hot surface. • Do not mount any flammable objects near the device.

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AMKmotion GmbH + Co KG
Phone : +49 7021/50 05-0, fax: +49 7021/50 05-199
E-Mail: info@amk-motion.com
Homepage: www.amk-motion.com