Altivar AFE

Active Front End
Option for Altivar 61 & Altivar 71

Mounting instructions for 120...860 kW

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Important Informations

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Mounting of the Active Front End

Altivar AFE

120...860 kW

Parameters and their settings refer to software version APSatvr_R1.1IE01 and higher

Theme Page

Safety informations

Important information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

WARNING
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury or equipment damage.

CAUTION
CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

NOTICE
REMARK explains a proceeding without any potentially hazardous situation.

The word "drive" as used in this manual refers to the control part of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this product.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read these instructions completely and carefully before installing and operating the Active Front End. Installation, adjustment, repairs and maintenance must be performed by qualified personnel.
- The user is responsible for conforming to all applicable code requirements with respect to grounding the equipment.
- Many parts in this drive controller, including printed wiring boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the drive controller:
  - Disconnect all power including external control power that may be present before servicing the drive controller.
  - Place a “DO NOT TURN ON” label on the drive controller disconnect.
  - Lock disconnect in the open position.
  - WAIT 15 MINUTES for the DC bus capacitors to discharge.
  - The DC bus voltage can exceed 1000 V DC. Use a properly rated voltage sensing device to measure the voltage of the DC bus.
  - Check whether the DC voltage is less than 42 V. The drive controller LEDs are not indicators of the absence of DC bus voltage.
  - If the DC bus capacitors have not discharged completely, contact your local Schneider Electric representative (do not repair or operate the drive).
- Install and close all covers before applying power or starting and stopping the drive controller.

Failure to follow these instructions will result in death or serious injury.

DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand the programming manual before operating the drive.
- Any changes made to the parameter settings must be performed by qualified personnel.
- Before turning on and configuring the Active Front End, ensure that the PWR (POWER REMOVAL) input is deactivated (at state 0) in order to prevent unintended operation.
- Before turning the controller on or upon exiting the configuration menus, ensure that the inputs assigned to the run command are deactivated (at state 0) since they can cause the motor to start immediately.

Failure to follow these instructions will result in death or serious injury.

WARNING

DAMAGE OF THE DEVICE

Do not install or operate the drive or accessories, when they are damaged.

Failure to follow this instruction can result in death, serious injury or equipment damage.

⚠ WARNING

ELECTROMAGNETIC FIELDS "ELECTRO SMOG"

Electromagnetic fields are generated by the operation of electrical power engineering installations such as transformers, inverters or motors.

Electromagnetic fields can interfere with electronic devices (like heart pacemakers), which could cause them to malfunction. It is therefore forbidden for persons with heart pacemakers to enter these areas.

The plant operator is responsible for taking appropriate measures, labels and hazard warnings to adequately protect operating personnel and others against any possible risk:

- Observe the relevant health and safety regulations.
- Display adequate hazard warning notices.
- Place barriers around hazardous areas.
- Take measures, e.g. using shields, to reduce electromagnetic fields at their source.
- Make sure that personnel are wearing the appropriate protective equipment.

Failure to follow this instruction can result in death, serious injury or equipment damage.

⚠ WARNING

RISK OF TOPPLING

Do not stand the drive upright. Keep the drive on the pallet until it is installed.

Use a hoist for installation. Therefore the components are equipped with handling lugs.

Failure to follow this instruction can result in death, serious injury or equipment damage.

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The existing nominal mains voltage must be set at the drive by means of a parameter. Thereby an optimal adjustment of the undervoltage protective function takes place. The drive may be damaged if the line voltage is not compatible.

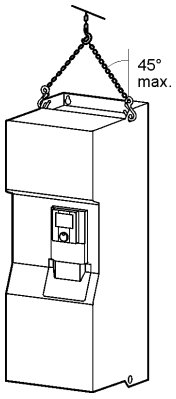
Failure to follow this instruction can result in injury or equipment damage.

Receiving the device

Handling

Before installation the components of the Active Front End should be packaged during movement and storage to protect the device. Ensure that the ambient conditions are permitted.

Open the packaging and check whether the components of the Active Front End were not damaged during transport.



The components of the Active Front End can be unpacked without any tools.

A hoist is necessary to install the components. Therefore they are equipped with handling lugs.

NOTICE
The manufacturer does not bear responsibility for damages which result from transport or unpacking. In this case please inform the insurance company.

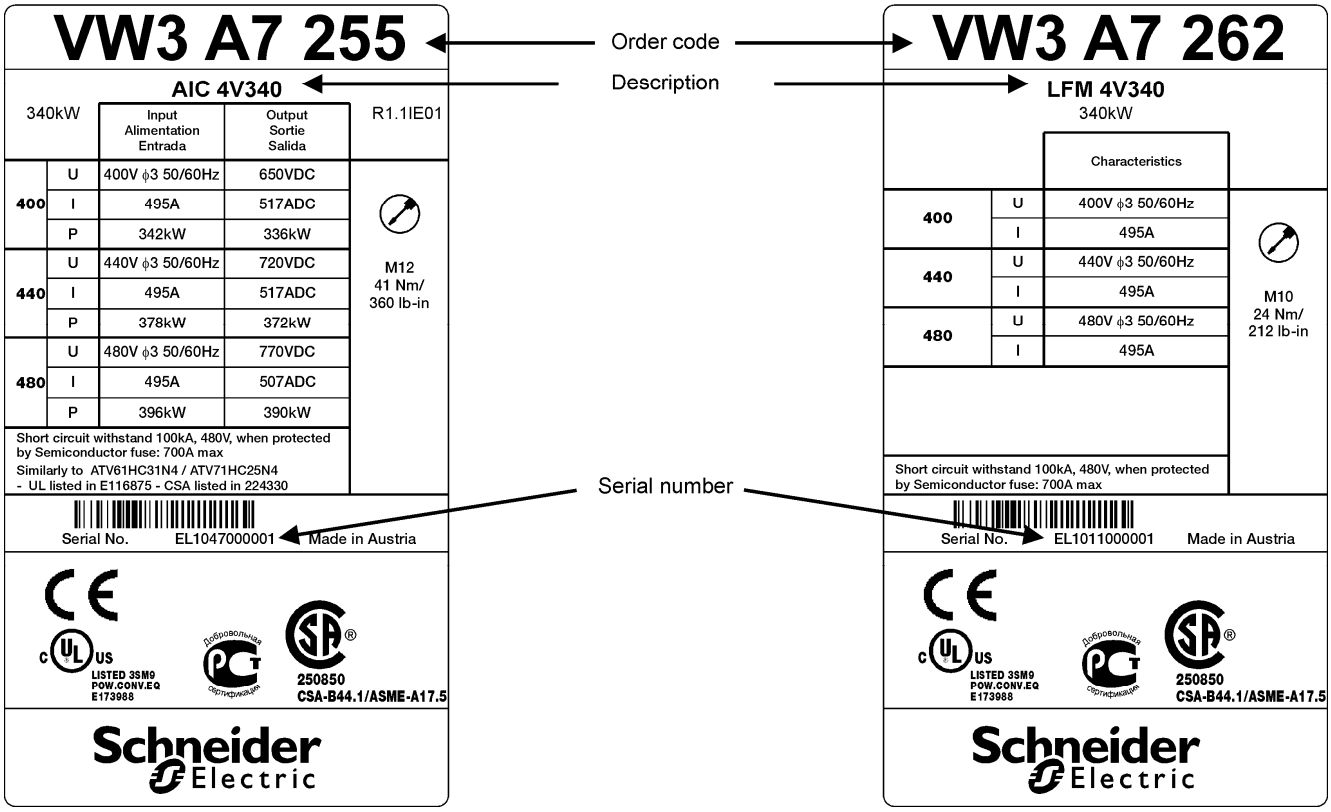
⚠ WARNING
DAMAGE OF THE DEVICE Do not install or operate the drive or accessories, when they are damaged. **Failure to follow this instruction can result in death, serious injury or equipment damage.**

⚠ WARNING
RISK OF TOPPLING Do not stand the drive upright. Keep the drive on the pallet until it is installed. Use a hoist for installation. Therefore the components are equipped with handling lugs. **Failure to follow this instruction can result in death, serious injury or equipment damage.**

Checking the scope of delivery

Check whether the specification on the name plate complies with those of the order.

Example:



Storage

Storage temperature -25°C...70°C

When the Active Front End was disconnected over a longer period, the performance of its electrolyte capacitors is reduced. But due to the "active balancing system" no special treatment is necessary when the maximum storage time has not been exceeded:

- 12 months at a maximum storage temperature of +50°C
- 24 months at a maximum storage temperature of +45°C
- 36 months at a maximum storage temperature of +40°C

CAUTION
EXCEEDING THE MAXIMUM STORAGE TIME After exceeding the maximum storage time, operate the Active Front End without load for minimum one hour. We recommend to execute this process already after a shutdown period of 6 months. **Failure to follow this instruction can result in injury or equipment damage.**

General specification

Quality

CE Marking

All devices and drives of the electric drive engineering may cause electromagnetic interferences and otherwise they may be influenced by such interferences. Therefore, they are subject to the **EMC directive 2004/108/EEC** since 1.1.1996.

The Active Front End units have an operating voltage which is clearly in the range of 50...1000 V AC or 75...1500 V DC. Therefore, they are also subject to the **Low-voltage directive 2006/95/EEC** since 1.1.1997.

Because of the line filter module of the Active Front End the device is in conformity with **EN 61800-3** and **EN 61800-5-1**.

Active Front End units are not considered as machines with at least one mechanically moving part. Therefore, they are not subject to the Machine directive 2006/42/EEC.

CAUTION
PROTECTION AGAINST HIGH-FREQUENCY INTERFERENCES Active Front End units are a product of the restricted sales according to IEC 61800-3. In a residential environment this product can cause radio frequency interferences whereupon the user can be called on to take suitable measures. **Failure to follow this instruction can result in equipment damage.**

The components of the Active Front End have a CE marking on the rating plate. However, it is necessary to observe the installation regulations to achieve the corresponding limits.

Installation regulations

- The Active Front End units AFE include a radio frequency interference filter in the line filter module LFM for use in industrial environments as standard. In case of long motor cables, when several inverters are operated on a common DC bus and for the use in residential environment the implementation of an additional external filter is necessary to reduce the radio interferences.

The installation regulations given in the respective device documentation are valid for the total drive unit:

- Use and proper connection of screened (shielded) control cables
- Consider the protective separation when preparing control lines and coupling relays
- Separate laying of power cables and control wiring

Special safety notes

Mains undervoltage

The Active Front End is very robust in respect of mains undervoltages. Voltage drops of up to 40 % (depending on the nominal voltage) can be balanced without interruption of operation.

As the low voltage is compensated by a higher current, there is an overload situation that is limited in time. Therefore a switch-off due to overload may take place when the Active Front End operates already close to the performance limit.

Supplying the fans during mains undervoltage is also only possible for a limited time.

Short-time mains interrupts – Automatic start

In case of 1- or 3-phase line fault, the Active Front End AFE can continue operation only for short time. The control system has to initiate a shutdown of the Active Front End and thus of the whole drive. When the mains returns within short time, a restart takes place as standard by means of the autoreset function when there is still a start command.

Locking of the Active Front End

The Active Front End can be locked by means of the logic input "PWR" so that a given or incoming start command is ignored. Independent therefrom also an external emergency off command can be integrated into the control of the Active Front End. Also this command leads to an immediate mains cut-off and helps to prevent a start. In both cases the device shows the device state "Lock" at the display.

Parameter settings

⚠ WARNING

WRONG PARAMETER SETTINGS

After device replacement, software update or reset to factory default, set all necessary parameters which helps to protect the equipment.

This is also valid for the inverter because it has to be adapted for the operation with an Active Front End.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Mains conditions

Mains voltage

The Active Front End AFE is designed for the following mains voltages:

- AFE 400 V:
  3 AC 380…400 V ±10 % (-30% for less than 1 min), 50 / 60 Hz ±5 %
  (30...70 Hz short-term or with separate fan supply)
  3 AC 440 V ±10 % (-40% for less than 1 min), 50 / 60 Hz ±5 %
  (30...70 Hz short-term or with separate fan supply)
- AFE 480V
  3 AC 480 V ±10 % (-40% for less than 1 min), 60 Hz ±5 %
  (30...70 Hz short-term or with separate fan supply)
- AFE 690 V:
  3 AC 500…525 V ±10 % (-20% for less than 1 min), 50 Hz ±5 %
  3 AC 600 V ±10 % (-30% for less than 1 min), 50 / 60 Hz ±5 %
  (30...70 Hz short-term or with separate fan supply)
  3 AC 690 V ±10 % (-40% for less than 1 min), 50 / 60 Hz ±5 %
  (30...70 Hz short-term or with separate fan supply)

The nominal mains voltage has to be set at the Active Infeed Converter AIC **and** the inverter INV. Thereby an optimal adjustment of the undervoltage protective function takes place in both devices.

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The existing nominal mains voltage must be set at the drive by means of a parameter. Thereby an optimal adjustment of the undervoltage protective function takes place. The drive may be damaged if the line voltage is not compatible.

Failure to follow this instruction can result in injury or equipment damage.

Radio frequency interferences

The Active Front End units include a radio frequency interference filter in as standard. This filter fulfils the requirements for category "C3 – industrial environments" according to EN/IEC 61800-3 (in the past: EN 55011 class A group 2).

CAUTION

PROTECTION AGAINST HIGH-FREQUENCY INTERFERENCES

Active Front End units are a product of the restricted sales according to IEC 61800-3. In a residential environment this product can cause radio frequency interferences whereupon the user can be called on to take suitable measures.

Failure to follow this instruction can result in equipment damage.

Mains current harmonics / Mains voltage distortion

Due to the Active Front End the typical harmonic currents of frequency inverters, caused by the mains supply via diode rectifier, do not occur. The remaining total current distortion factor THD(i) is clearly less than 4 % during mains supply operation as well as during regenerating operation.

Also the distortion of the mains voltage is very low according to the lower current harmonics.

This table represents typical values of the individual current harmonics at operation with the Active Front End.

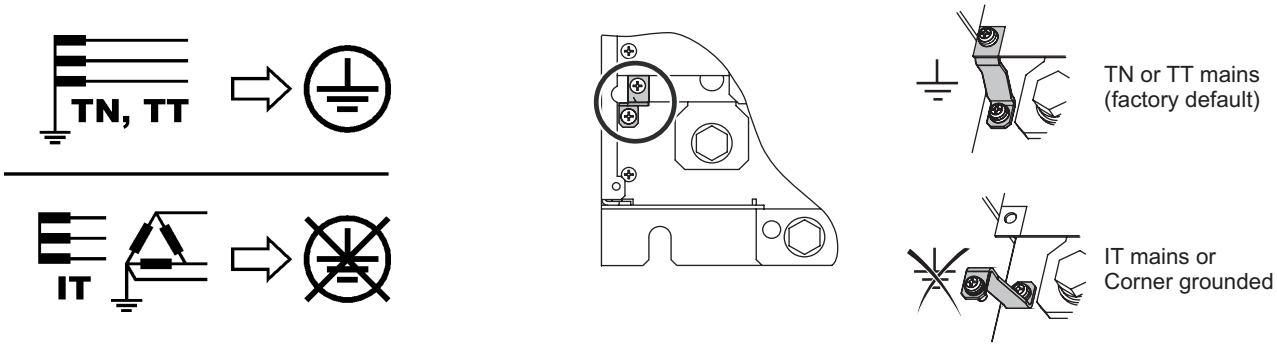
Operating mode	Current harmonics in %																	
	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	THD
motor	100	1.33	1.06	0.39	0.20	0.20	0.20	0.35	0.24	0.08	0.04	0.16	0.12	0.24	0.16	0.04	0.04	2.42
generator	100	1.30	0.55	0.39	0.39	0.71	0.63	0.24	0.43	0.20	0.24	0.16	0.20	0.16	0.08	0.04	0.04	2.40

Nongrounded mains

The use of the Active Front End units is basically in all mains variants permitted.

Necessary settings at the Line Filter Module LFM

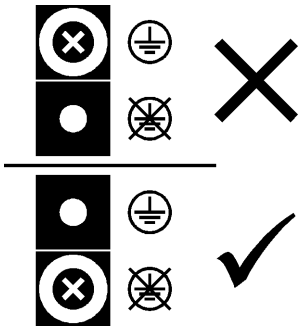
The radio frequency interference filter built-in into the line filter module LFM has to be adapted to the respective mains by means of switch-over/reconnection.

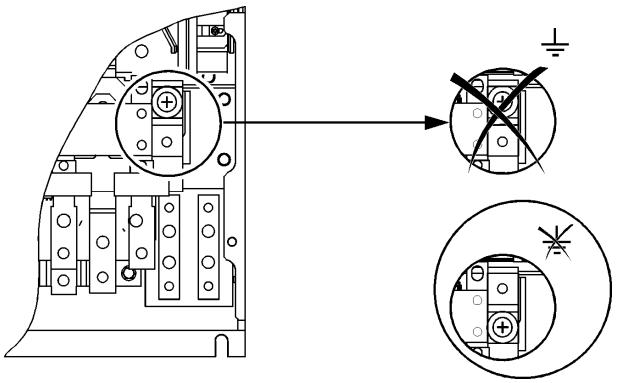


In case of nongrounded mains a single ground (earth) fault in the supplying mains has no effect to the function of the Active Front End. If the ground (earth) fault occurs in the motor or the motor cables, the inverter is switched off. But the recognition heavily depends on the ground (earth) capacitance of the mains.

Required settings at the Active Infeed Converter AIC and inverter INV

The integrated RFI filter has to be deactivated (position IT, non-grounded mains) at all devices (AIC, INV) because there exists no direct mains connection of the frequency inverter in case of operation with an Active Front End.





CAUTION
RISK OF DAMAGE OF THE INTERNAL RFI-FILTER The built-in radio frequency interference filters of the Active Infeed Converter AIC **and** the inverter INV must be always set to position "non-grounded mains". **Failure to follow this instruction can result in injury or equipment damage.**

Mains impedance / Short-circuit current

The Active Front End is designed for a maximum mains short-circuit current of 100 kA. A corresponding supply and correct protection with fuses must be provided.

DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH Install semiconductor fuses upstream to the line filter module LFM. See chapter "Fuses and cable cross sections" **Failure to follow these instructions will result in death or serious injury.**

Power factor correction systems

In spite of the heavily reduced harmonics, resonances in power factor correction systems without chokes cannot be excluded.

CAUTION
PROTECTION AGAINST RESONANCES We recommend the installation of chokes for the affected system parts, which helps to protect against overload due to resonances of the power factor correction system. **Failure to follow this instruction can result in equipment damage.**

Ripple control signals

The effects of the operation of Active Front End units on ripple control signals in a system have to be checked from the operator of the plant.

Switching rate

The maximum switching rate for the whole life cycle must not exceed 10 switching operations per hour.

Responsibility

All stated connection recommendations and planning remarks are to be taken merely as suggestions which must be adapted to the local conditions and regulations concerning installation and usage.

This applies especially to the safety regulations for machines, the EMC regulations and the general regulations for human protection.

⚠ WARNING

HUMAN PROTECTION AND MACHINE SAFETY

The users are responsible to integrate the Active Front End units into the protection and safety concept of the plant or machine.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Overvoltage protective circuit

A free-wheeling diode is provided for DC control circuits.

For AC control circuits the R/C wiring is preferable compared to a wiring with varistors because as a result not only the peak overvoltage is reduced but also the rise-time.

CAUTION

RISK OF MALFUNCTIONS IN THE CONTROL CIRCUITS

All inductances like relays, contactors, magnetic brakes, etc. have to be equipped with an overvoltage protective circuit. It helps to prevent malfunctions of the conventional device control as well as of the fieldbus.

The protective circuit must be qualified for inverter operation !

Failure to follow this instruction can result in equipment damage.

Residual current circuit breaker

The Active Front End as well as the inverter lead an increased leakage current against ground (earth).

Depending on the conditions, the leakage current of plants with high cable lengths can be absolutely higher than 100 mA !

The built-in residual current detection has no current-limiting effect. It only helps to protect the drive and is no human protection.

CAUTION

INCORRECT TRIGGERING OF THE RESIDUAL CURRENT CIRCUIT BREAKER

Particularly because of the capacitors of the radio frequency interference filter, an unintentional triggering of a residual current circuit breaker may occur at the moment of switching on. As well, the ground (earth) capacitances may cause an incorrect triggering during operation. On the other hand, it is possible that the triggering is blocked by means of DC components which are caused by the mains rectification at the input of the inverter.

Therefrom, you should observe following:

- Only use short-time delayed and pulse current sensitive residual current circuit breakers with considerably higher tripping current.
- Protect the other loads by means of a separate residual current circuit breaker.
- Residual current circuit breakers in front of an Active Front End AFE do not provide absolutely reliable protection in case of direct contact !! So they should be always used in combination with other protective measures.
- The frequency inverters have no current-limiting effect (in case of residual currents) and therefore they do not violate the protective multiple earthing.

Failure to follow this instruction can result in equipment damage.

Automatic restarting

By fixed wiring of a logic input and setting of the required parameters at the Active Infeed Converter AIC, the Active Front End is switched on automatically after each mains switch-on or mains recurrence. This function increases the availability, especially for drives that are not integrated into the plant control via a fieldbus system.

The automatic start of the Active Front End takes place in case of:

- Switch-on of the mains voltage and given start command (only in case of 2-wire control)
- After a line fault when there is still a start command (only in case of 2-wire control)
- After each trip confirmation and given start command (only in case of 2-wire control)

Connecting and disconnecting the inverter

CAUTION
RISK OF DAMAGE AT THE INVERTER Do not disconnect and connect the inverter INV to the DC bus when the Active Front End AFE is in operation and the DC bus is not discharged. **Failure to follow this instruction can result in equipment damage.**

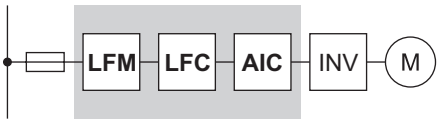
Connecting and disconnecting the Active Front End

CAUTION
RISK OF DAMAGE AT THE ACTIVE FRONT END IN CASE OF PARALLEL OPERATION In case of parallel operation at a common DC bus, do not disconnect and connect the Active Infeed Converter AIC to the DC bus when the DC bus is not discharged. **Failure to follow this instruction can result in equipment damage.**

Wiring and connection

Technical data

Active Front End AFE



The Active Front End AFE is used to reduce the mains current harmonics as well as to return excess energy to the mains.

It consists of following components:

- Line Filter Module LFM
- Line Filter Choke LFC
- Active Infeed Converter AIC

Active Front End AFE	400 V	480 V	500 V / 600 V / 690 V
Input			
Voltage	380...400 V ±10 % (during operation: -30 % for less than 1 min) for TT, TN or IT mains	480 V ±10 % (during operation: -40 % for less than 1 min) for TT, TN or IT mains	500...525 V ±10 % (during operation: -20 % for less than 1 min) for TT, TN or IT mains
	440 V ±10 % (during operation: -40 % for less than 1 min) for TT, TN or IT mains		600 V ±10 % (during operation: -30 % for less than 1 min) for TT, TN or IT mains
			690 V ±10 % (during operation: -40 % for less than 1 min) for TT, TN or IT mains
Frequency	50/60 Hz ±5 % (30...70 Hz short-term or with separate fan supply)	60 Hz ±5 % (30...70 Hz short-term or with separate fan supply)	50 Hz ±5 % at 500...525 V
			50/60 Hz ±5 % at 600 V (30...70 Hz short-term or with separate fan supply)
			50/60 Hz ±5 % at 690 V (30...70 Hz short-term or with separate fan supply)
Overvoltage class	Class III according to EN 61800-5-1		
Output			
Nominal output voltage	650 V DC at a mains voltage of 3AC 380V/400V	770 V DC at a mains voltage of 3AC 480V	840 V DC at a mains voltage of 3AC 500V/525V
	720 V DC at a mains voltage of 3AC 440V		960 V DC at a mains voltage of 3AC 600V
			1100 V DC at a mains voltage of 3AC 690V
Overload	20 % for 60 seconds per 10 minutes, 35 % for 2 seconds		

CAUTION

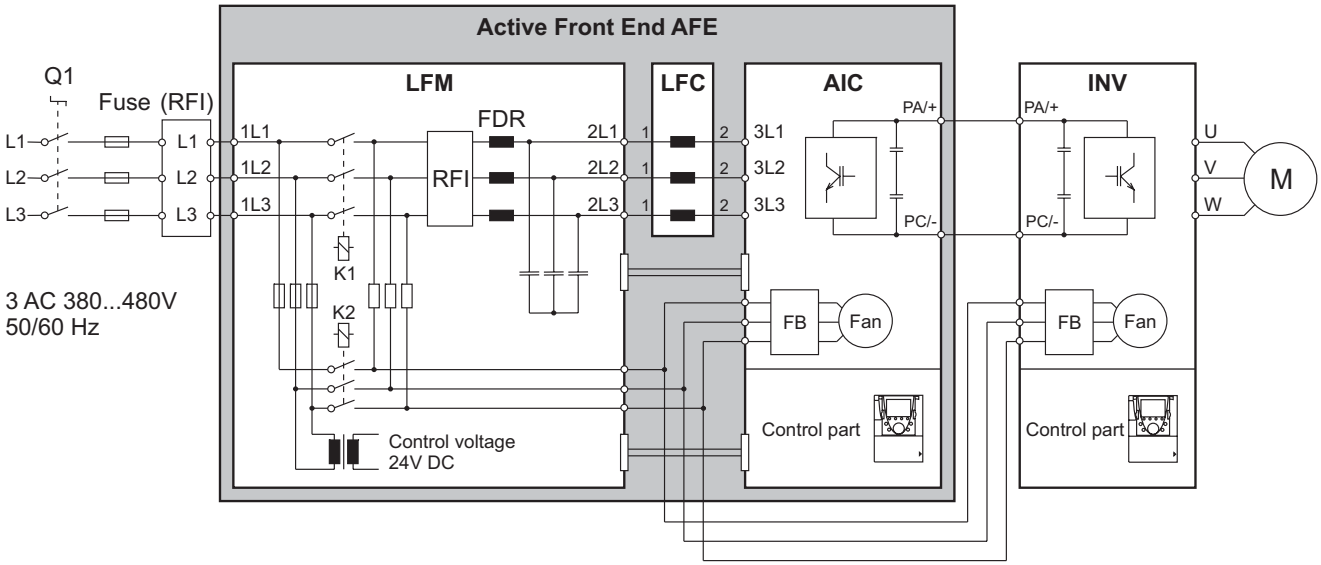
PROTECTION AGAINST HIGH-FREQUENCY INTERFERENCES

Active Front End units are a product of the restricted sales according to IEC 61800-3. In a residential environment this product can cause radio frequency interferences whereupon the user can be called on to take suitable measures.

Failure to follow this instruction can result in equipment damage.

Wiring diagram

The following presentation shows a typical wiring diagram of an Active Front End with a frequency inverter.



Q1 .....Main switch (to be used if required according to the local regulations)

Fuse .....Fuses according to table "Fuses and cable cross sections", page 20 (absolutely necessary)

RFI.....Optional radio interference filter for use in residential environment

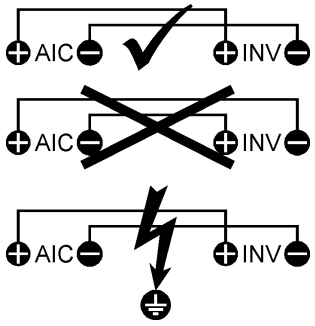
AFE .....consisting of
- Line Filter Module LFM
- Line Filter Choke LFC
- Active Infeed Converter AIC

INV .....Inverter

In case of a single drive an Active Front End AFE is directly connected to the DC link of the inverter (= standard frequency inverter).

In case of the common DC bar all inverters are connected to the DC output of the Active Front End AFE.

In case of parallel connection of Active Front End units they are connected to all inverters via a DC bus.



DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In case of faulty wiring of the DC link, e.g. due to exchanging terminals PA/+ and PC/- or a ground (earth) fault, the inverter as well as the Active Front End may be damaged or destroyed.

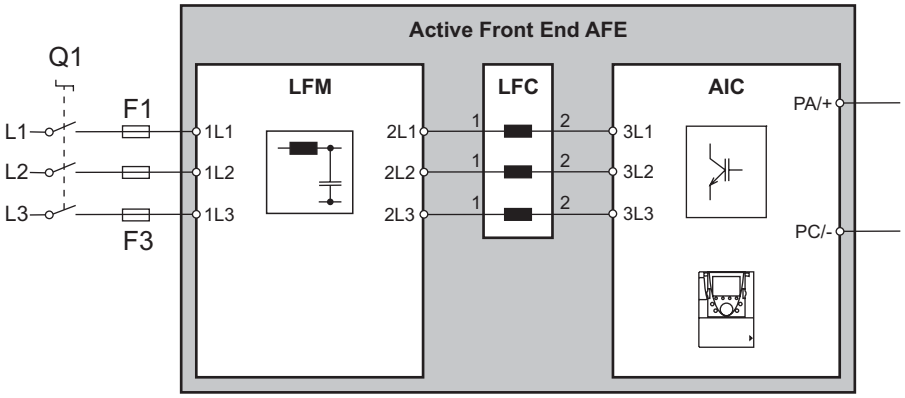
Check whether there is no reverse polarity, no short circuit and no ground (earth) fault in the DC connection between the Active Infeed Converter and the drive.

Failure to follow these instructions will result in death or serious injury.

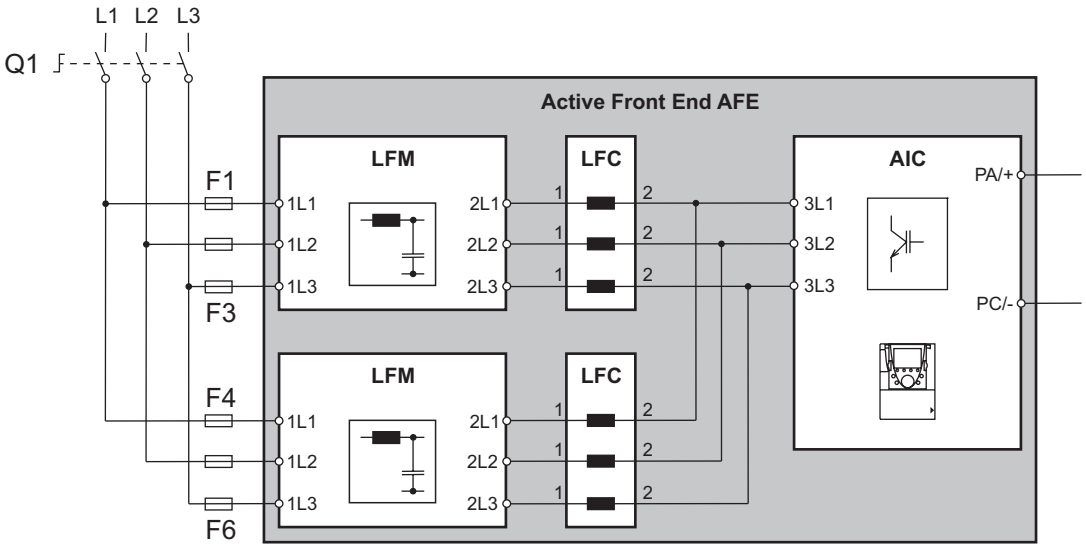
The Active Front End consists of three components in principle: the line filter module LFM, the line filter choke LFC and the Active Infeed Converter AIC.

The 3-phase mains connection is done at the line filter module LFM. Further power connection is done via the line filter choke LFC (3 single phase chokes) to the Active Infeed Converter AIC.

For 400 V devices up to 340 kW and for 500 / 690 V up to 430 kW **one** LFM and **one** LFC (consisting of three parts) is connected upstream to the Active Infeed Converter AIC.



For 400 V devices 430 kW and larger and for 500 / 690 V 540 kW and lager the Active Front End consists of an AIC, **two** LFMs and **two** LFCs (each consisting of three single phase chokes).



Fuses and cable cross sections

The Active Front End is equipped with comprehensive protective devices.

It is absolutely necessary to protect the mains side of the whole Active Front End AFE with superfast (semiconductor) fuses additionally as secondary protection. This helps to protect the individual components in case of an internal short-circuit or if the electronic protective mechanisms did not work. It is also a precondition for operation at mains with high short-circuit power.

The protection at the DC output side is only required in case of connection variant "Active Front End units parallel". When selecting the fuses, pay attention to the nominal voltage of the fuses and their special qualification to switch-off DC currents.

The mentioned diameters for 3-wire cables are recommended values for laying the cable in air at max. 40°C ambient temperature, based on the regulations ÖVN EN 1 and VDE 0100.

The lines in the cubicles are dimensioned according to the specification for single conductors XLPE/EPR copper 90°C.

Mains supply 3AC 400…440 V						AFE	DC output		
Pre- or conduit fuses	Cu cable [mm²]	Mains fuse "AFE protec-tion"	Wires in the cubicle [mm²] (per phase)	Cont. current AC [A]	Connection LFM	Type	Cont. current DC	Connection AIC	Cable for DC connection (per pole) [mm²]
250 A	3x120	250 A sf	95	177 A	1 x M10	**120**	185 A	1 x M12	95
315 A	3x185	315 A sf	120	212 A	1 x M10	**145**	220 A	1 x M12	120
400 A	2x (3x120)	350 A sf	150	255 A	1 x M10	**175**	265 A	1 x M12	150
500 A	2x (3x150)	500 A sf	2x95	348 A	1 x M10	**240**	366 A	1 x M12	2x95
630 A	2x (3x185)	550 A sf	2x95	395 A	1 x M10	**275**	412 A	2 x M12	2x95
800 A	3x (3x185)	700 A sf	2x150	495 A	1 x M10	**340**	517 A	2 x M12	2x150
1000 A	4x (3x185)	450 A sf	2x95	314 A	1 x M10	**430**	654 A	4 x M12	4x95
		450 A sf	2x95	314 A	1 x M10				
1250 A	4x (3x240)	550 A sf	2x95	390 A	1 x M10	**540**	815 A	4 x M12	4x120
		550 A sf	2x95	390 A	1 x M10				
1600 A	6x (3x240)	700 A sf	2x150	490 A	1 x M10	**675**	1023 A	4 x M12	4x185
		700 A sf	2x150	490 A	1 x M10				

Mains supply 3AC 480 V						AFE	DC output		
Circuit breaker Rated current	Cu cable	Mains fuse "AFE protec-tion"	Wires in the cubicle (per phase)	Cont. current AC [A]	Connection LFM	Type	Cont. current DC	Connection AIC	Cable for DC connection (per pole)
250	1x (3x250 MCM)	250 A sf	AWG 1/0	160 A	1 x M10	**120**	163 A	1 x M12	AWG 1/0
250	1x (3x 350 MCM)	315 A sf	AWG 3/0	200 A	1 x M10	**145**	203 A	1 x M12	AWG 3/0
400	2x (3x AWG 4/0)	350 A sf	AWG 4/0	200 A	1 x M10	**175**	203 A	1 x M12	AWG 4/0
400	2x (3x350 MCM)	500 A sf	300 MCM	348 A	1 x M10	**240**	366 A	1 x M12	350 MCM
600	2x (3x 400 MCM)	550 A sf	350 MCM	395 A	1 x M10	**275**	412 A	2 x M12	400 MCM or 2x AWG 4/0
600	2x (3x 400 MCM)	700 A sf	2x 250 MCM	495 A	1 x M10	**340**	517 A	2 x M12	2x 300 MCM
800	5x (3x 400 MCM)	500 A sf *)	300 MCM	314 A	1 x M10	**430**	654 A	4 x M12	2x 400 MCM
		500 A sf *)	300 MCM	314 A	1 x M10				
1000	6x (3x 500 MCM)	550 A sf *)	350 MCM	390 A	1 x M10	**540**	815 A	4 x M12	2x 600 MCM or 3x 350 MCM
		550 A sf *)	350 MCM	390 A	1 x M10				
1200	6x (3x 700 MCM)	700 A sf *)	2x 250 MCM	490 A	1 x M10	**675**	1023 A	4 x M12	3x 500 MCM
		700 A sf *)	2x 250 MCM	490 A	1 x M10				

*) Parallel connection of 2 LFM and 2 LFC

Mains supply 3AC 500/690 V						AFE	DC output		
Pre- or conduit fuse	Cu cable [mm²]	Mains fuse "AFE protec-tion"	Wires in the cubicle [mm²] (per phase)	Cont. current AC [A]	Connection LFM	Type	Cont. current DC	Connection AIC	Cable for DC connection (per pole) [mm²]
200 A	3x95	160 A sf	50	120 A	1 x M10	145	130 A	1 x M12	50
250 A	3x120	200 A sf	70	150 A	1 x M10	175	156 A	1 x M12	70
315 A	3x185	250 A sf	95	185 A	1 x M10	240	195 A	1 x M12	95
400 A	2x (3x120)	315 A sf	120	228 A	1 x M10	275	244 A	2 x M12	120
400 A	2x (3x120)	400 A sf	150	285 A	1 x M10	340	305 A	2 x M12	150
500 A	2x (3x150)	500 A sf	2x 95	360 A	1 x M10	430	386 A	2 x M12	2x 95
800 A	3x (3x185)	315 A sf *)	120	225 A	1 x M10	540	481 A	4 x M12	2x 120
		315 A sf *)	120	225 A	1 x M10				
800 A	3x (3x185)	400 A sf *)	150	282 A	1 x M10	675	604 A	4 x M12	2x 150
		400 A sf *)	150	282 A	1 x M10				
1000 A	4x (3x185)	500 A sf *)	2x 95	358 A	1 x M10	860	765 A	4 x M12	3x 150
		500 A sf *)	2x 95	358 A	1 x M10				

Mains supply 3AC 600 V						AFE	DC output		
Circuit breaker Rated current	Cu cable	Mains fuse "AFE protec-tion"	Wires in the cubicle (per phase)	Cont. current AC [A]	Connection LFM	Type	Cont. current DC	Connection AIC	Cable for DC connection (per pole)
160	1x (3x AWG 2/0)	160 A sf	AWG 2	120 A	1 x M10	145	130 A	1 x M12	AWG 2
250	1x (3x AWG 4/0)	200 A sf	AWG 1/0	150 A	1 x M10	175	156 A	1 x M12	AWG 1/0
250	1x (3x 300 MCM)	250 A sf	AWG 2/0	160 A	1 x M10	240	170 A	1 x M12	AWG 2/0
400	1x (3x 400 MCM)	315 A sf	AWG 3/0	228 A	1 x M10	275	244 A	2 x M12	AWG 3/0
400	2x (3x 250 MCM)	400 A sf	AWG 4/0	285 A	1 x M10	340	305 A	2 x M12	250 MCM
600	2x (3x 350 MCM)	500 A sf	350 MCM	360 A	1 x M10	430	386 A	2 x M12	350 MCM
600	3x (3x 350 MCM)	315 A sf *)	AWG 3/0	225 A	1 x M10	540	481 A	4 x M12	500 MCM or 2x250 MCM
		315 A sf *)	AWG 3/0	225 A	1 x M10				
800	3x (3x 500 MCM)	400 A sf *)	AWG 4/0	282 A	1 x M10	675	604 A	4 x M12	2x350 MCM
		400 A sf *)	AWG 4/0	282 A	1 x M10				
1000	6x (3x 400 MCM)	500 A sf *)	350 MCM	358 A	1 x M10	860	765 A	4 x M12	3x350 MCM
		500 A sf *)	350 MCM	358 A	1 x M10				

*) Parallel connection of 2 LFM and 2 LFC

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- In case of other ambient conditions and different regulations the cable diameters must be adjusted.
- As mains fuses for protection of the AFE superfast (semiconductor) fuses have to be used.
- If the mains fuses blow the Active Front End already has a primary defect. Therefore, exchanging the blown fuses and switching the Active Front End on again is not effective.
- In order to meet the requirements of UL/CSA, copper cables with temperature class 90°C have to be used.
- In order to meet the requirements of UL/CSA, a listed circuit breaker has to be used.

Failure to follow these instructions will result in death or serious injury.

Recommended mains fuses

Types of mains fuses for 400 V – 440 V mains

AFE Type 400V-440V	Mains fuse	Recommended type of fuse	
		Ferraz Shawmut, Protistor semiconductor fuse, PSC aR sizes 3x – 690/700Vac	Bussmann High speed fuse square body flush end contact – 690/700Vac
120	250 A	6.9 URD 30 TTF 0250	170M3416
145	315 A	6.9 URD 30 TTF 0315	170M3417
175	350 A	6.9 URD 30 TTF 0350	170M3418
240	500 A	6.9 URD 30 TTF 0500	170M3421
275	550 A	6.9 URD 30 TTF 0550	170M3422
340	700 A	6.9 URD 31 TTF 0700	170M4417
430	2x450	2x 6.9 URD 30 TTF 0450	2x 170M3420
540	2x550	2x 6.9 URD 30 TTF 0550	2x 170M3422
675	2x700	2x 6.9 URD 31 TTF 0700	2x 170M4417

Types of mains fuses for 480 V mains (UL)

AFE Type 480V	Mains fuse	Recommended type of fuse	
		Ferraz Shawmut, Protistor semiconductor fuse, PSC aR sizes 3x – 690/700Vac	Bussmann High speed fuse square body flush end contact – 690/700Vac
120	250 A	A070 URD 30 TTI 0250	170M3416
145	315 A	A070 URD 30 TTI 0315	170M3417
175	350 A	A070 URD 30 TTI 0350	170M3418
240	500 A	A070 URD 30 TTI 0500	170M3421
275	550 A	A070 URD 30 TTI 0550	170M3422
340	700 A	A070 URD 32 TTI 0700	170M4417
430	2x450	2x A070 URD 30 TTI 0450	2x 170M3421
540	2x550	2x A070 URD 30 TTI 0550	2x 170M3422
675	2x700	2x A070 URD 32 TTI 0700	2x 170M4417

Types of mains fuses for 500 V / 690 V mains

AFE Type 500V / 690V	Mains fuse	Recommended type of fuse	
		Ferraz Shawmut, Protistor semiconductor fuse, PSC aR sizes 3x – 690/700Vac	Bussmann High speed fuse square body flush end contact – 690/700Vac
145	160 A	6.9 URD 30 TTF 0160	170M3414
175	200 A	6.9 URD 30 TTF 0200	170M3415
220	250 A	6.9 URD 30 TTF 0250	170M3416
275	315 A	6.9 URD 30 TTF 0315	170M3417
340	400 A	6.9 URD 30 TTF 0400	170M3419
430	500 A	6.9 URD 30 TTF 0500	170M3421
540	2x315	2x 6.9 URD 30 TTF 0315	2x 170M3417
675	2x400	2x 6.9 URD 30 TTF 0400	2x 170M3419
860	2x500	2x 6.9 URD 30 TTF 0500	2x 170M3421

Types of mains fuses for 600 V mains (UL/CSA)			
AFE Type 500V / 690V	Mains fuse	Recommended type of fuse	
		Ferraz Shawmut, Protistor semiconductor fuse, PSC aR sizes 3x – 690/700Vac	Bussmann High speed fuse square body flush end contact – 690/700Vac
145	160 A	A070 URD 30 TTI 0160	170M3414
175	200 A	A070 URD 30 TTI 0200	170M3415
220	250 A	A070 URD 30 TTI 0250	170M3416
275	315 A	A070 URD 30 TTI 0315	170M3417
340	400 A	A070 URD 30 TTI 0400	170M3419
430	500 A	A070 URD 32 TTI 0500	170M3421
540	2x315	2x A070 URD 30 TTI 0315	2x 170M3417
675	2x400	2x A070 URD 30 TTI 0400	2x 170M3419
860	2x500	2x A070 URD 32 TTI 0500	2x 170M3421

NOTICE

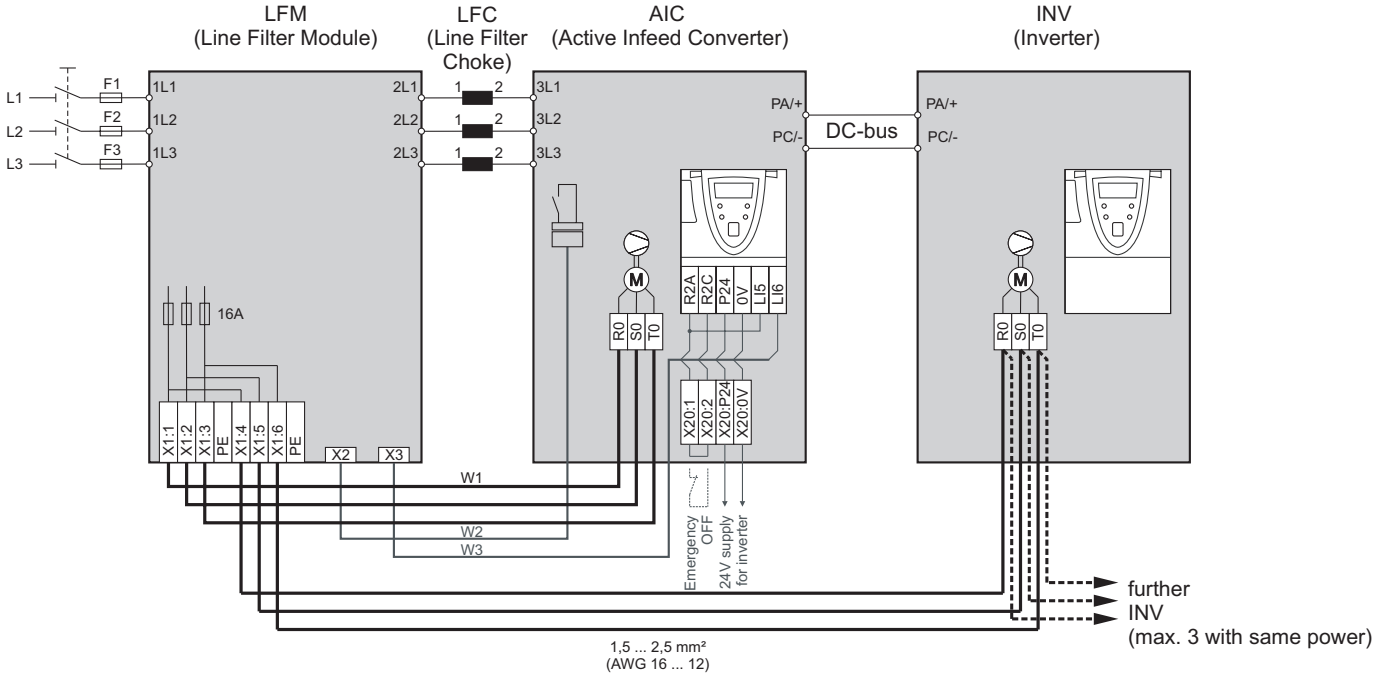
Generally also other models and types of fuses can be used provided that their electrical data are comparable.

In order to meet the requirements of UL/CSA, the specified fuse types have to be used.

Fan supply 400 / 480 V

Fan supply – 120kW to 340kW

The voltage for fan supply is generated in the line filter module LFM. With the fan supply it is possible to supply all fans of the Active Infeed Converter AIC and the fans of up to 4 inverters of same power.

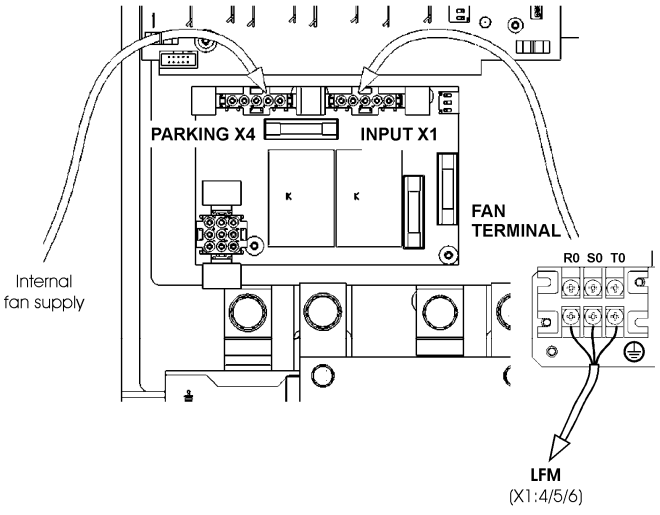


Active Infeed Converter AIC

The Active Infeed Converter AIC contains a ready-made cable W1, which is designed for a maximum distance of 1m between the AIC and LFM. Connect this cable W1 to the line filter module LFM (terminals X1:1/2/3) in order to supply the fans in the Active Infeed Converter AIC (except VW3 A7 250 – it contains DC fans).

Inverter INV

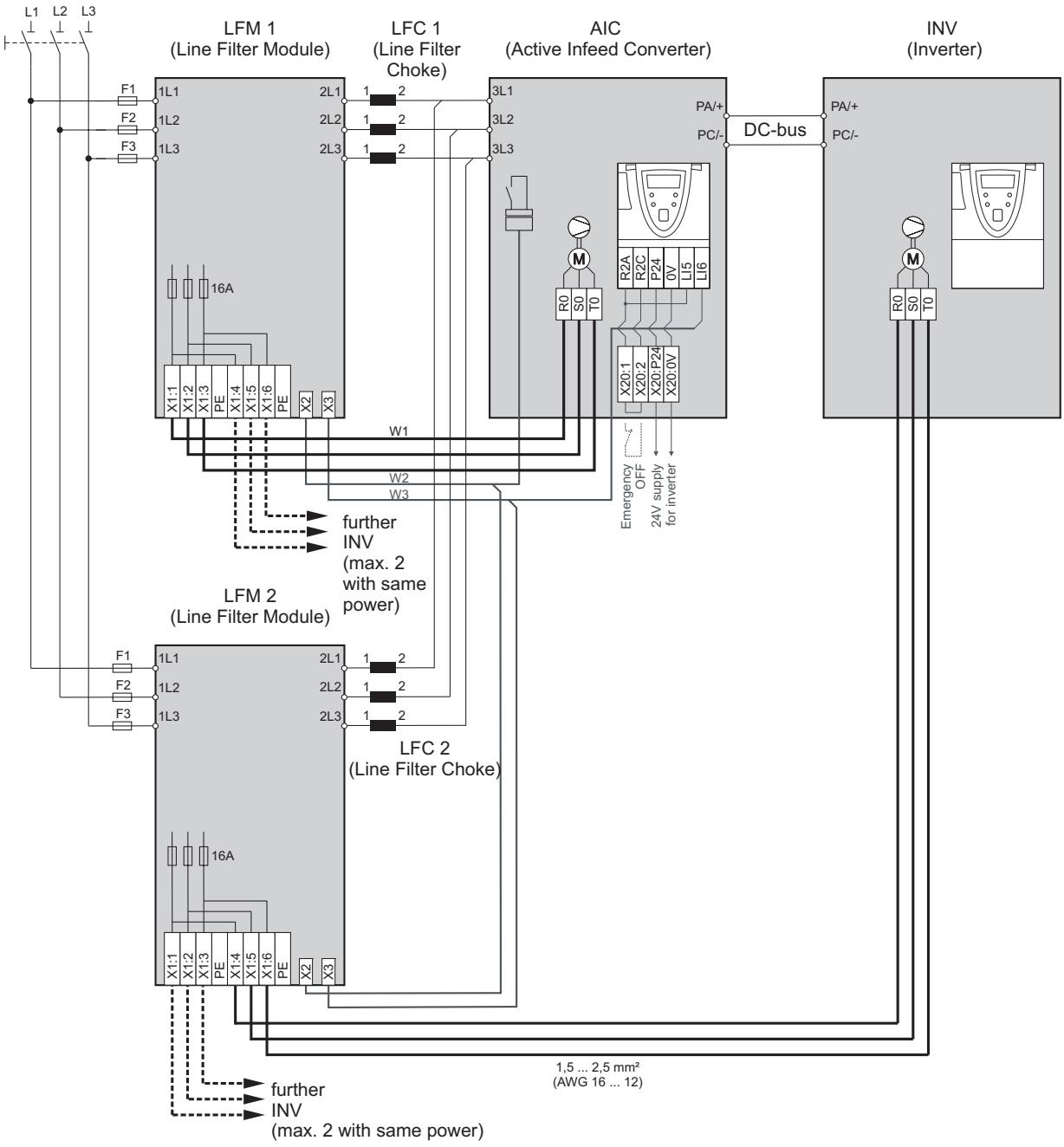
Establish a connection between the inverter INV (fan terminal block R0/S0/T0) and the line filter module LFM (terminals X1:4/5/6). Thereby the installation instructions of the inverter INV for external fan supply have to be observed (switching to external supply). The cable cross section for the fan supply has to be 1.5 ... 2.5 mm² (AWG 16 ... 12).



NOTICE
The inverters INV of the types ATV61H075N4 ... HC11N4 ATV71H075N4 ... HD90N4 do not require an external fan supply from the line filter module LFM, because these drives contain DC fans.

Fan supply - 430kW to 675kW

The voltage for fan supply is generated in the line filter module LFM. With the fan supply it is possible to supply all fans of the Active Infeed Converter AIC and the fans of up to 4 inverters of same power.

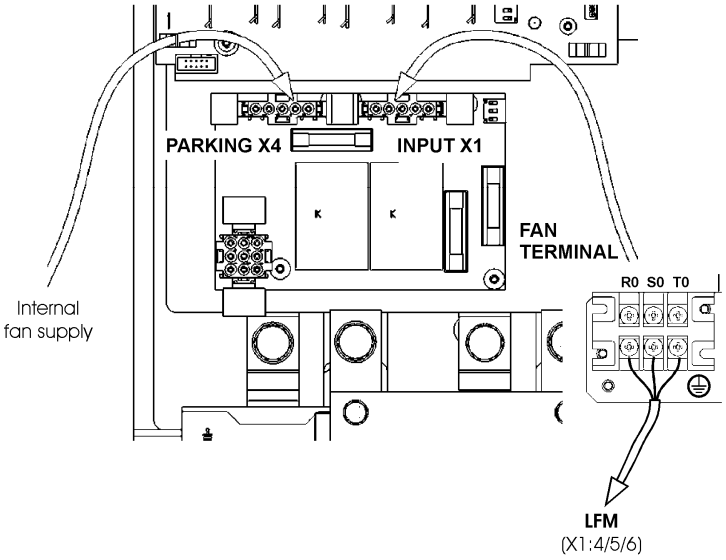


Active Infeed Converter AIC

The Active Infeed Converter AIC contains a ready-made cable W1, which is designed for a maximum distance of 1m between the AIC and LFM. Connect this cable W1 to the first line filter module LFM1 (terminals X1:1/2/3) in order to supply the fans in the Active Infeed Converter.

Inverter INV

Establish a connection between the inverter INV (fan terminal block R0/S0/T0) and the second line filter module LFM2 (terminals X1:4/5/6). Thereby the installation instructions of the inverter INV for external fan supply have to be observed (switching to external supply). The cable cross section for the fan supply has to be 1.5 ... 2.5 mm² (AWG 16 ... 12).

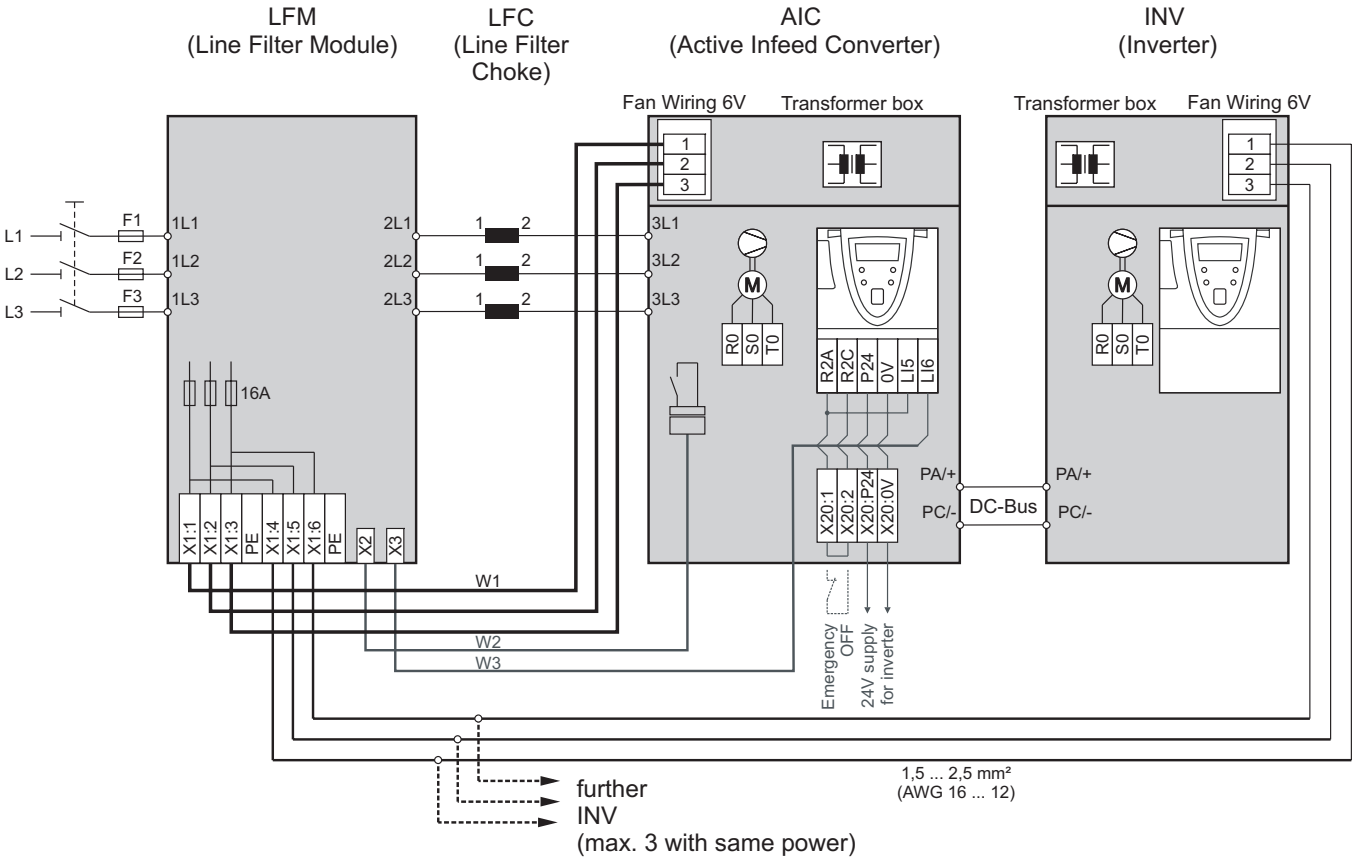


NOTICE
The inverters INV of the types ATV61H075N4 ... HC11N4 ATV71H075N4 ... HD90N4 do not require an external fan supply from the line filter module LFM, because these drives contain DC fans.

Fan supply 500 / 600 / 690 V

Fan supply – 145kW to 430kW

The built-in fans are supplied via the transformer box at the top side of the devices. With the fan supply it is possible to supply all fans of the Active Infeed Converter AIC and the fans of up to 4 inverters of same power.

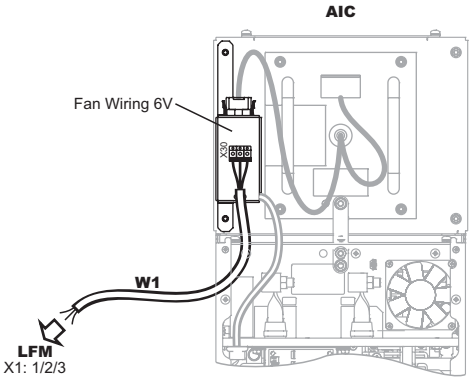


NOTICE
To wire the fan supply at the inverters ATV71HC11Y to HC31Y and ATV61HC11Y to HC40Y the option "Fan wiring 6V" (VW3 A7 280) has to be ordered.

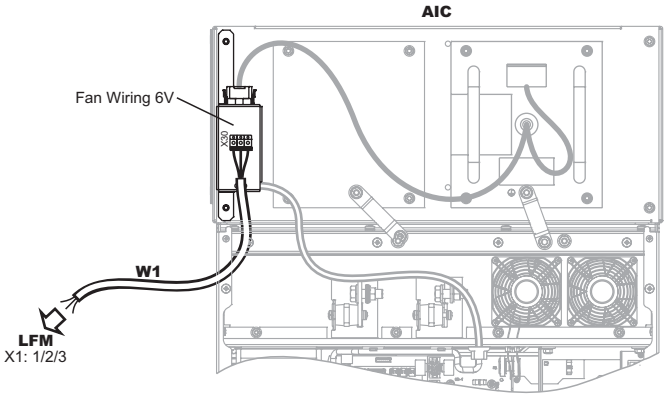
Active Infeed Converter AIC

The Active Infeed Converter AIC contains the terminal module (option Fan Wiring 6V) and a ready-made cable W1, which is designed for a maximum distance of 1m between the AIC and LFM. Connect this cable W1 to the line filter module LFM (terminal X1:1/2/3) in order to supply the fans of the Active Infeed Converter AIC.

up to 220 kW



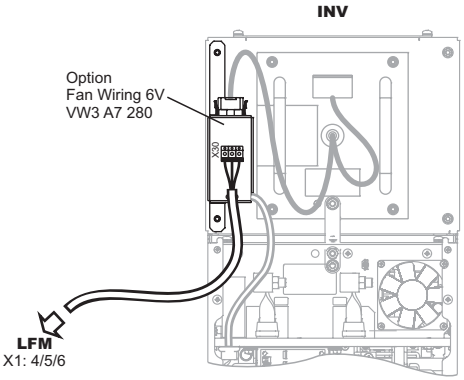
up to 430 kW



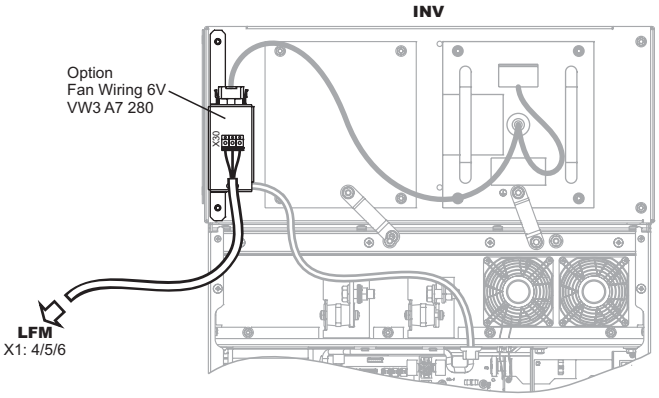
Inverter INV

Mount the mandatory terminal module (deliverable as option Fan wiring 6V - VW3 A7 280) into the inverter INV. Establish a connection between the option fan wiring 6V (terminal X30:1/2/3) and the line filter module LFM (terminal X1:4/5/6). The cable cross section for the fan supply has to be 1.5 ... 2.5 mm² (AWG 16...12).

up to 220 kW



up to 430 kW



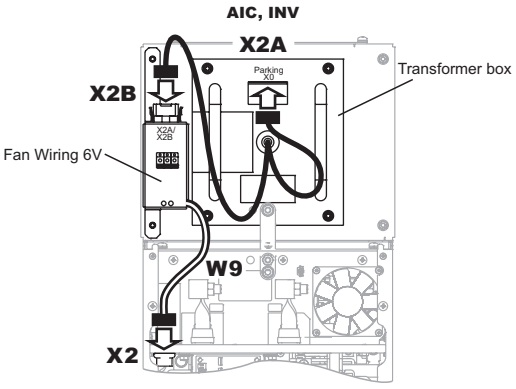
Setting the line voltage for 690 V or 500...600 V

Depending on the line voltage the wiring in the Active Infeed Converter AIC and in the inverter INV has to be done as follows:

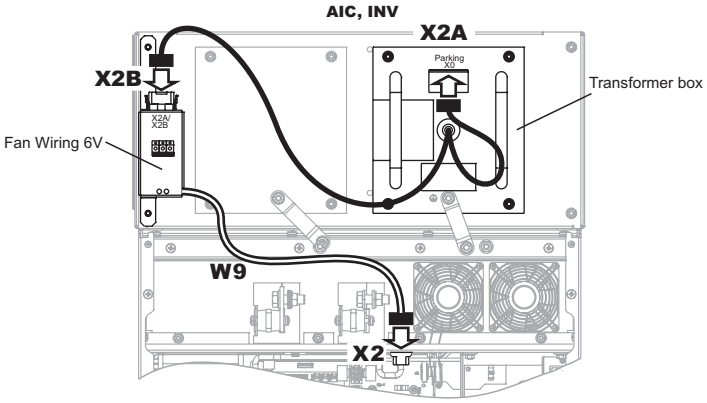
Line voltage 690 V

- Put the connector X2A from the built-in transformer box to the parking position X0.
- Connect plug X2B with the option Fan Wiring 6V.
- Connect the cable W9 of the option Fan wiring 6V to the socket X2 on the device.

up to 220 kW



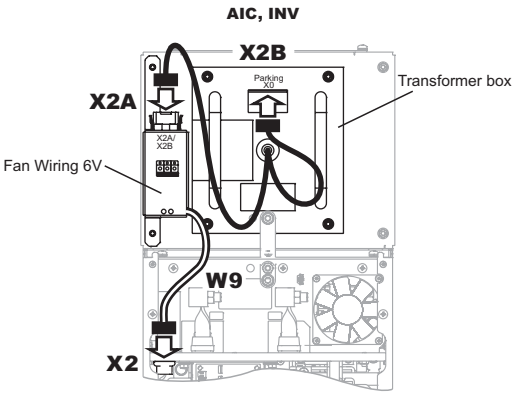
up to 430 kW



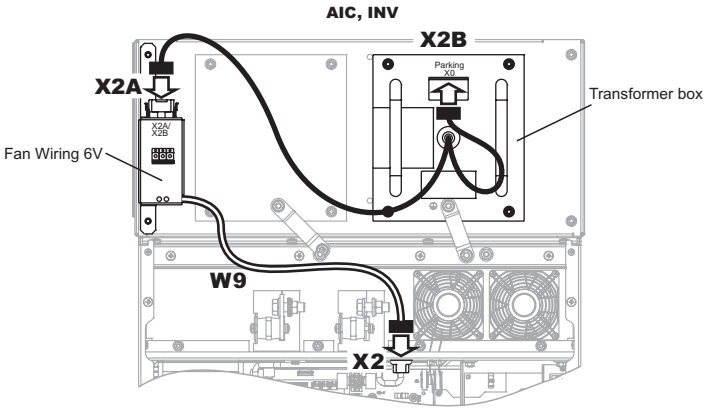
Line voltage 500…600 V

- Put the connector X2B from the built-in transformer box to the parking position X0.
- Connect plug X2A with the option Fan wiring 6V.
- Connect the cable W9 of the option Fan wiring 6V to the socket X2 on the device.

up to 220 kW

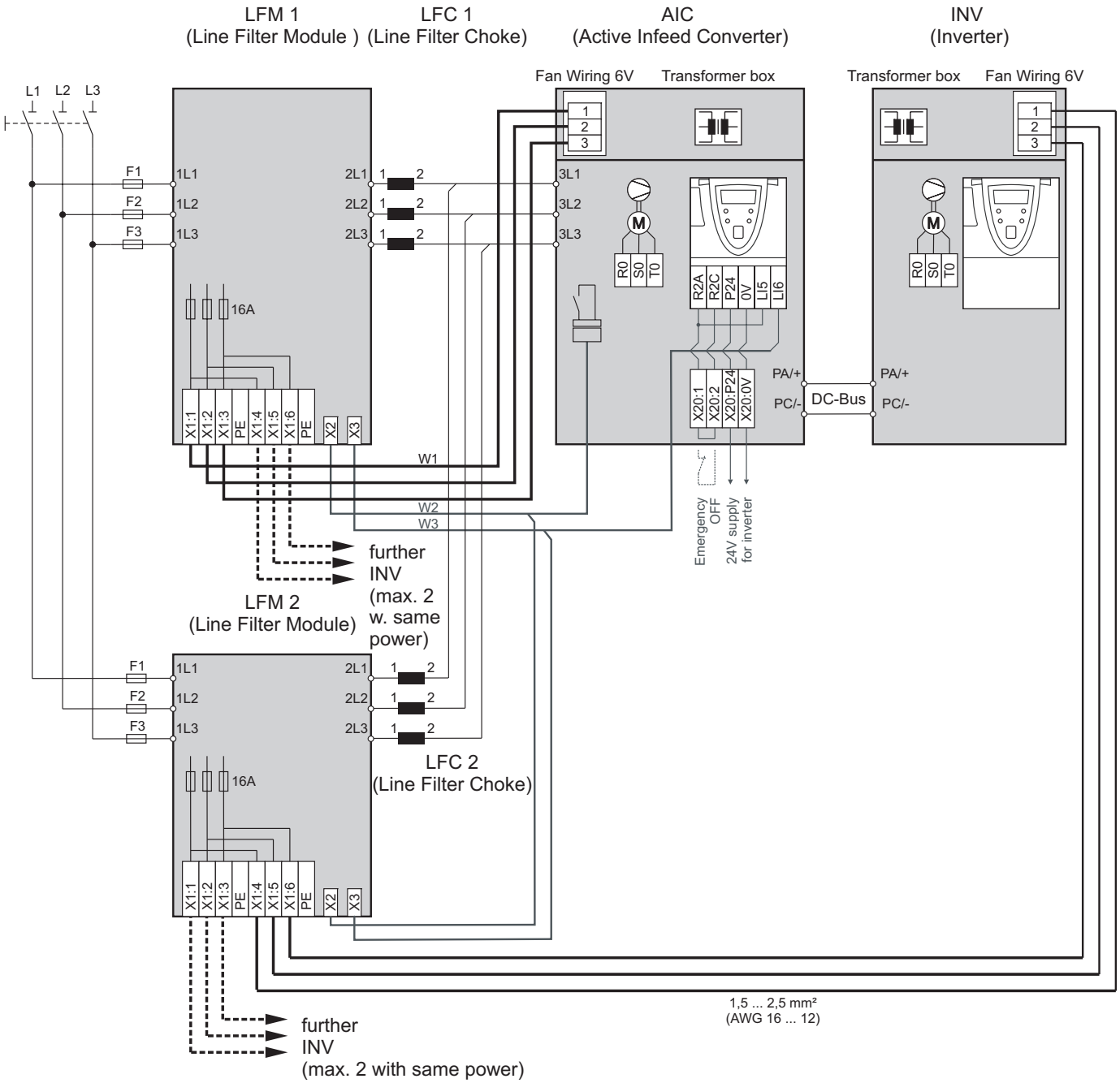


up to 430 kW



Fan supply – 540kW to 860kW

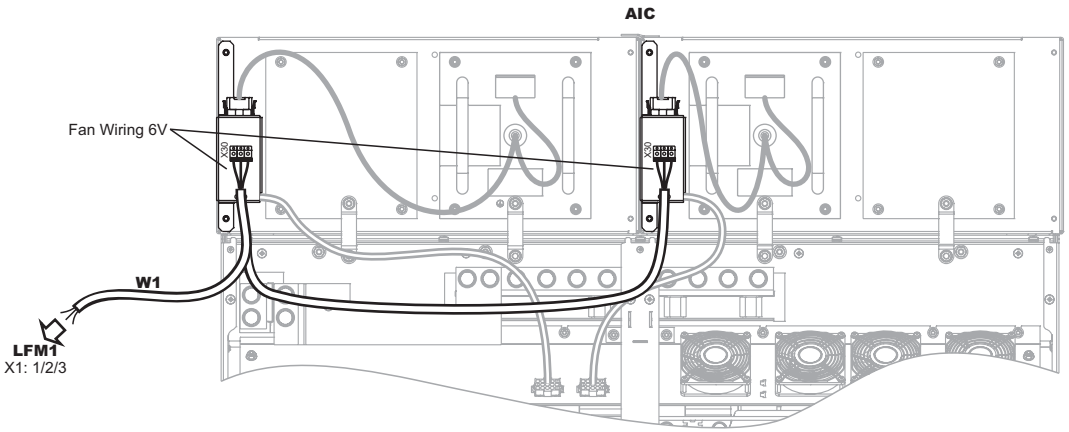
The built-in fans are supplied via the transformer box at the top side of the devices. With the fan supply it is possible to supply all fans of the Active Infeed Converter AIC and the fans of up to 4 inverters of same power.



NOTICE
To wire the fan supply at the inverters ATV71HC40Y to HC63Y and ATV61HC50Y to HC80Y respectively the option "Fan wiring 6V" (VW3 A7 280) has to be ordered twice.

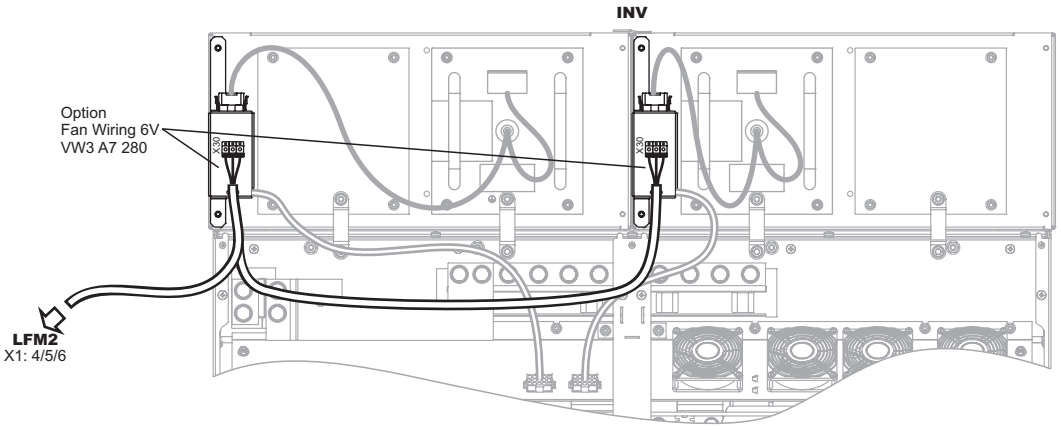
Active Infeed Converter AIC

The Active Infeed Converter AIC contains two terminal modules (2x option Fan Wiring 6V) and a ready-made cable W1, which is designed for a maximum distance of 1m between the AIC and LFM. Connect this cable W1 to the first line filter module LFM1 (terminal X1:1/2/3) in order to supply the fans of the Active Infeed Converter AIC.



Inverter INV

Mount the mandatory terminal modules (deliverable as option Fan wiring 6V - VW3 A7 280) into the inverter INV. Establish a connection between the option fan wiring 6V (terminals X30:1/2/3) and the second line filter module LFM2 (terminals X1:4/5/6). The cable cross section for the fan supply has to be 1.5 ... 2.5 mm² (AWG 16...12).

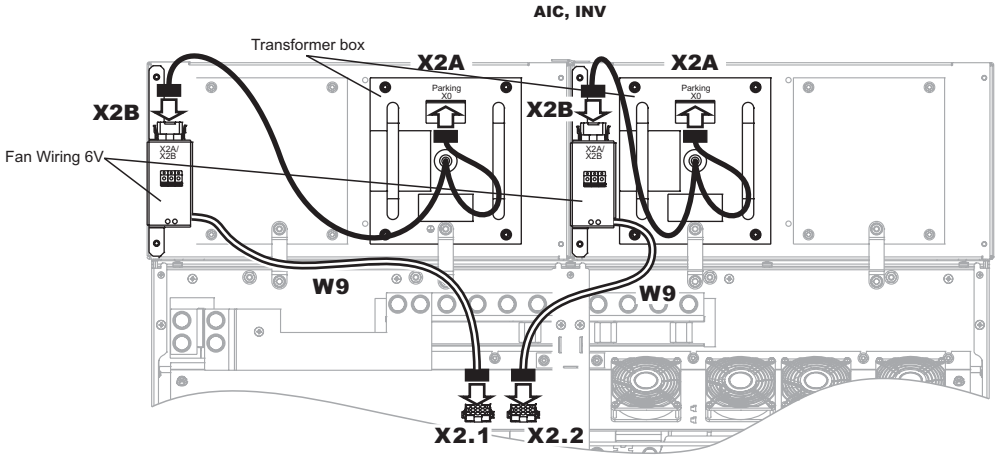


Setting the line voltage for 690 V or 500...600 V

Depending on the line voltage the wiring in the Active Infeed Converter AIC and in the inverter INV has to be done as follows:

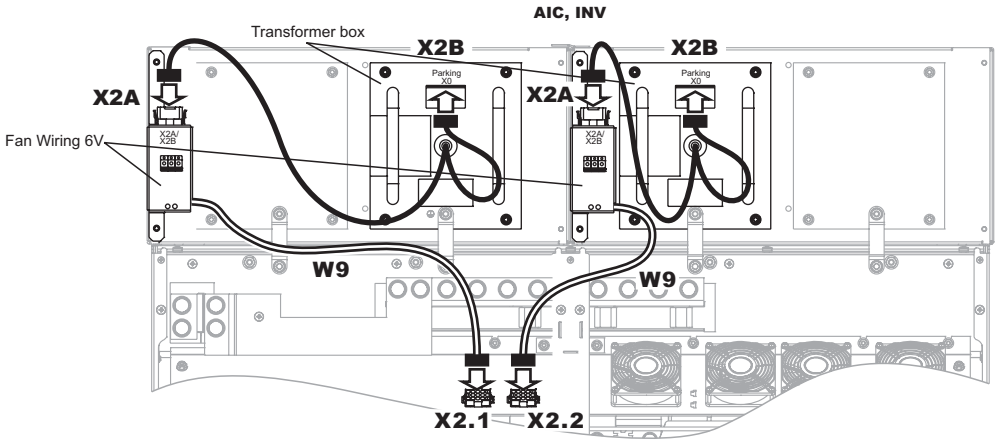
Line voltage 690 V

- Put the connectors X2A of the built-in transformer boxes to parking position X0.
- Connect plugs X2B with the respective option Fan wiring 6V.
- Connect the existing cables W9 of the options Fan wiring 6V to the sockets X2.1 and X2.2 on the device.



Line voltage 500…600 V

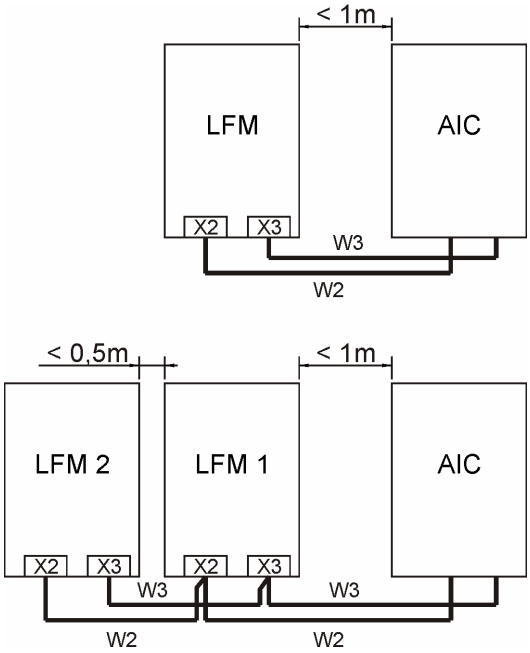
- Put the connectors X2B of the built-in transformer boxes to parking position X0.
- Connect plugs X2A with the respective option Fan wiring 6V.
- Connect the existing cables W9 of the options Fan wiring 6V to the sockets X2.1 and X2.2 on the device.



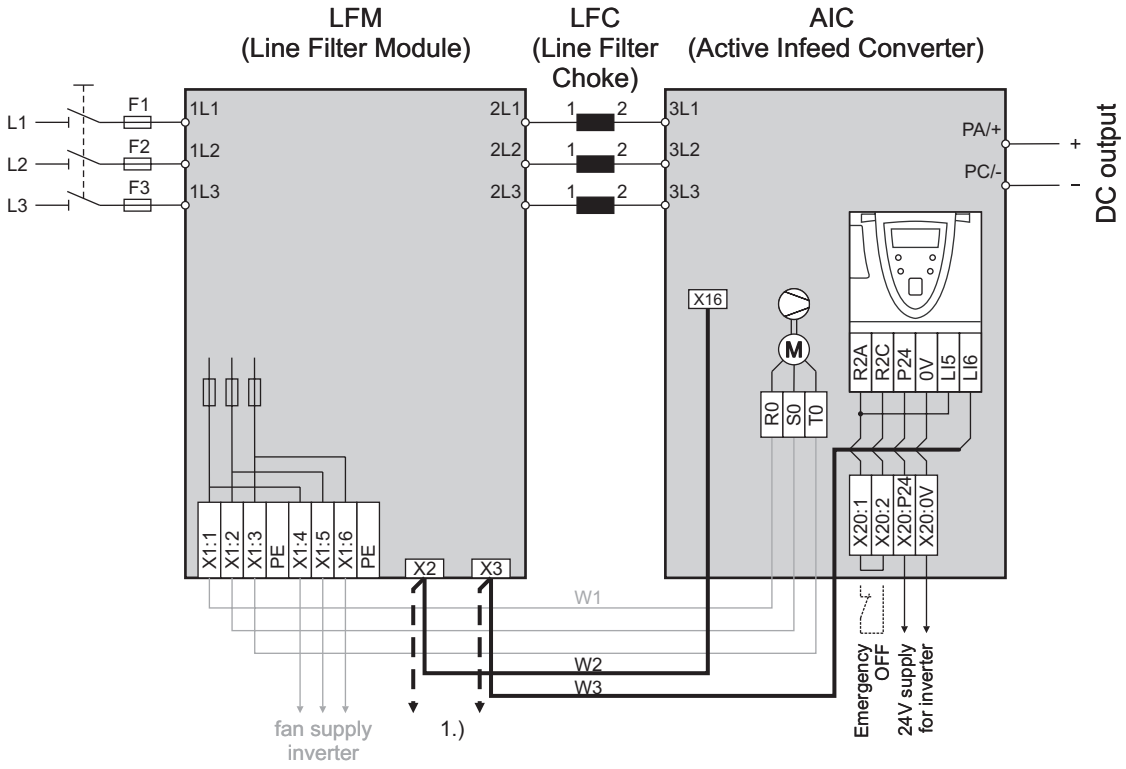
Wiring of the control terminals

The auxiliary voltages to control the Active Front End AFE are generated in the line filter module LFM. As soon as mains voltage is applied to the terminals 1L1, 1L2, 1L3, a 24 V auxiliary voltage is produced to supply the Active Infeed Converter AIC. It can be also used to buffer the control electronics of one inverter INV.

The control wiring between the line filter module LFM and the Active Infeed Converter AIC is realized by the provided connecting cables W2 (plug X2) and W3 (plug X3). These cables are designed for a maximum distance of 1 m between the Active Infeed Converter AIC and the Line Filter Module LFM.
At higher power from 430 kW (for 400V devices) and 540 kW (for 690V devices) the Active Infeed Converter AIC is wired to two Line Filter Modules LFM. Thereby the cables are designed for a maximum distance of 0.5 m between the Line Filter Modules LFM. The cables are designed, that there is enough reserve to mount the Active Infeed Converter AIC and the Line Filter Module LFM (or the Line Filter Modules) into two side by side standing cubicles and wire them.



For 400 V devices up to 340 kW and for 690 V devices up to 430 kW, the Active Infeed Converter AIC is connected with only one line filter module LFM. In case of higher power the Active Infeed Converter AIC is connected with two line filter modules LFM.

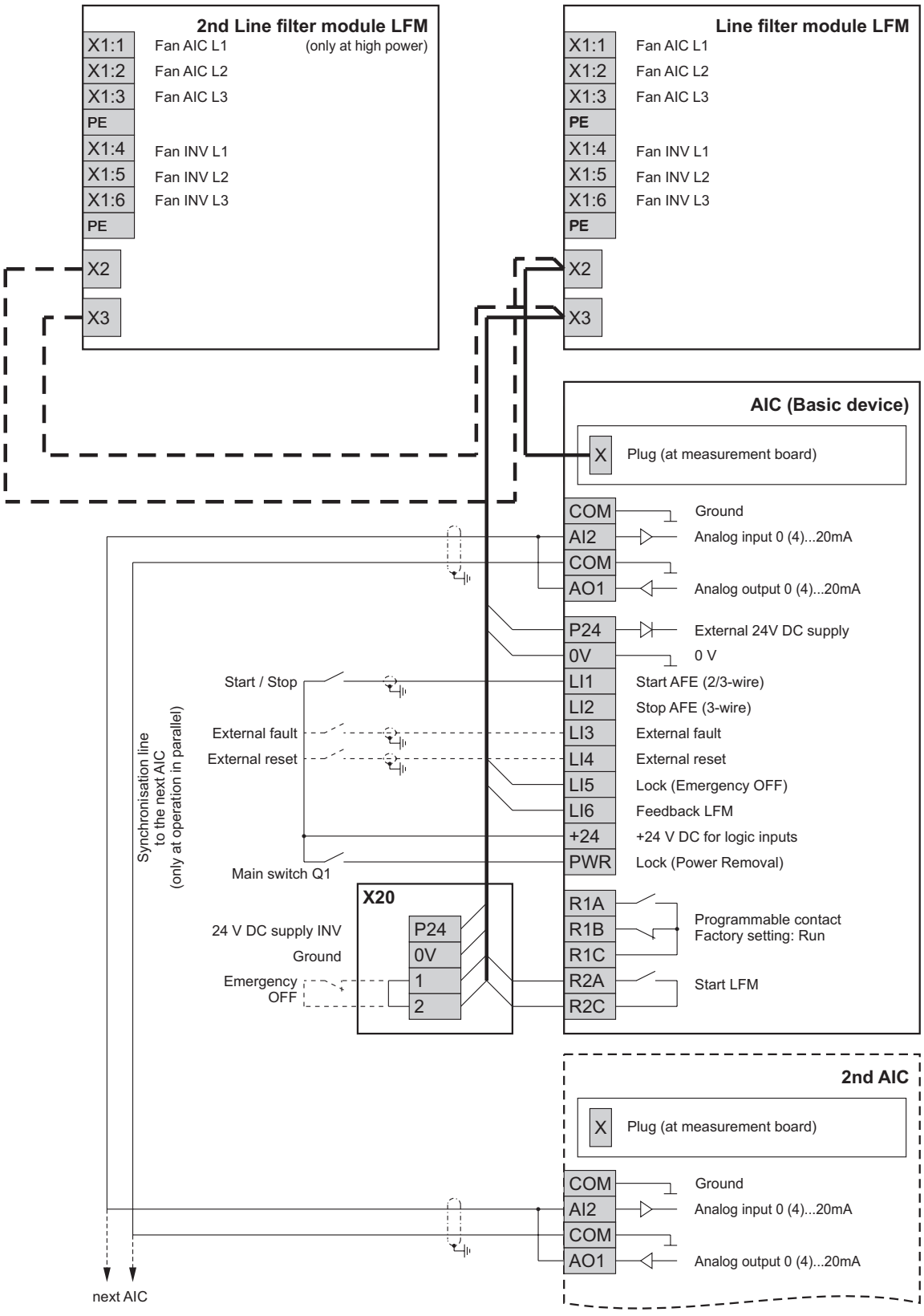


1.) Connection to the second line filter module LFM

The connecting cables W1, W2 and W3 are pre-assembled at the Active Infeed Converter AIC and only have to be connected (W1) or plugged-in (W2 and W3) at the line filter module LFM.

NOTICE
For parallel operation of Active Front End units an additional control line is required. It "synchronizes" the individual Active Front End units.

Standard control terminals



For an automatic operation, immediately after connecting the mains, the start command can also occur by a wire link (terminal +24 to L1).

Use a cable with a cross-section of 0.1...0.5 mm² (AWG 24...20) for the control lines.

Specification of the control terminals

The logic inputs of the Active Infeed Converter AIC can be only used with positive logic (Source). So the built-in sliding switch has to be in position "Source".

The synchronisation line is only required in case of parallel operation of two to four Active Front End units. It "synchronizes" the individual Active Front End units. Thereby the analog output is used for synchronisation and thus it is not any longer available for free use!

The ground (0 V) can float up to 35 V compared to PE. The connection 0 V - ground necessary to limit the voltage can therefore e.g. also occur far away in the PLC (if necessary by the analog output related to 0 V).

The device fulfills the requirements for protective separation between power and electronic connections according to EN 61800-5-1.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

All connected external equipments must fulfil the requirements for protective separation.

Failure to follow these instructions will result in death or serious injury.

Terminal marking Line Filter Module LFM

Terminal	Designation	Specification
X1:1	Terminals for external fan supply of the Active Infeed Converter AIC	400 / 440 / 480 / 500 / 600 / 690 V 3-phase current
X1:2		
X1:3		
X1:PE		
X1:4	Terminals for external fan supply of up to 4 inverters INV (same power as AIC)	400 / 440 / 480 / 500 / 600 / 690 V 3-phase current
X1:5		
X1:6		
X1:PE		
X2	2-pole plug	Pre-assembled for the connection to the Active Infeed Converter AIC
X3	5-pole plug	Pre-assembled for the connection to the Active Infeed Converter AIC

Terminal marking Active Infeed Converter AIC

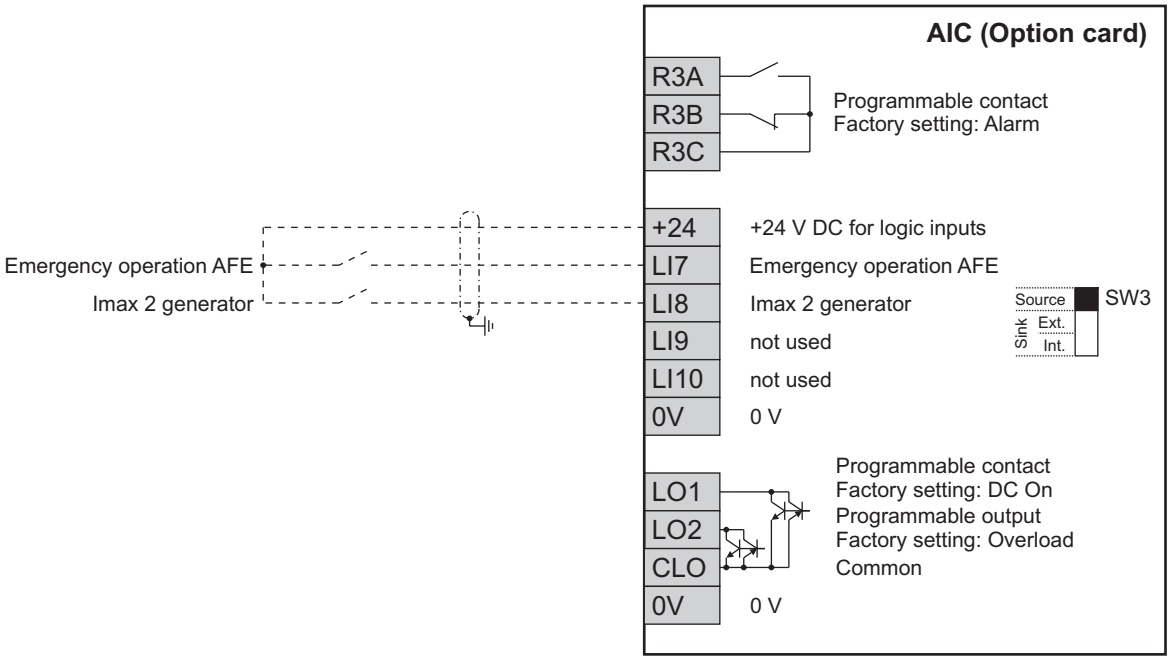
Terminal	Designation	Specification
+10	Not used	–
AI+ / AI-	Not used	–
COM	Ground	0 V reference potential for analog in-/outputs
AI2	Analog input	With parameter 2.1.02 Parallel operation the analog input is used for synchronisation.
COM	Ground	0 V reference potential for analog in-/outputs
AO1	Analog output AO1 (Selection, usage and limits can be parameterized)	0... +10 V DC, load impedance 500Ω or 0(4)... 20 mA, max load impedance 500 Ω Resolution 10 Bits, reaction time 2ms (0.5ms, Accuracy ±1% at Δϑ = 60°C, linearity ±0.2 % Remark: With parameter 2.1.02 Parallel operation the analog output is used for synchronisation and thus it is not any longer available for free use!
P24	Supply Buffer voltage	+24 V DC (min. 19 V, max. 30V) external supply of the control part, power demand 30 W
0V	Ground	Reference potential of the logic inputs and 0V of the external voltage supply P24
LI1	Start AFE (2/3 wire)	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 2 ms ±0.5 ms positive logic (Source) compatible with level 1 PLC standard IEC 65A-68 SW1 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW1 at Sink is not permitted
LI2	Stop AFE (3 wire)	
LI3	External fault	
LI4	External reset	
+24	Sampling voltage for logic inputs	Selector switch SW1 in position Source: +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 100 mA (incl. all options) Selector switch SW1 in position Sink not permitted
PWR	Input lock (Power removal)	Logic input 24 V DC (max. 30 V) Impedance 1.5 kΩ, filter time 10 ms, High > 17 V, Low < 2 V For release of the AIC 24V have to be applied to the input.
R1A R1B R1C	Relay output 1 (R1A N.O. contact, R1B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 7 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Voltage has to correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.

Maximum connection cross-section: 1.5 mm² (AWG16), 0.25 Nm (2.5 mm² (AWG14), 0.6 Nm for relay terminals)

Use screened (shielded) cables for all control wires and separate it from power cables.

Control terminals of the I/O extension card

With the I/O extension card (order number: VW3 A3 201) there are additional logic inputs and outputs as well as a relay output available.



Unlike the logic inputs of the basic device the inputs of the extension card can be switched between positive and negative logic using sliding switch SW3.
Parameters that belong to the outputs of the option cards are only available at the Active Infeed Converter when the card is plugged.

Specification of the control terminals at I/O extension card VW3 A3 201

Terminal	Designation	Specification
R3A R3B R3C	Relay output 3 (R3A N.O. contact, R3B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 7 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Voltage has to correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.
-10	Not used	–
+24	Sampling voltage for logic inputs (Sink/Source-switching with selector switch SW3)	– *Selector switch SW3 in position Source or Sink Int.:* +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 50 mA (incl. all options) – *Selector switch SW3 in position Sink Ext.:* Input for external voltage supply +24 V DC of the logic inputs
LI7	Emergency operation AFE	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 2 ms ±0.5 ms Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 SW3 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW3 at Sink Int. or Sink Ext.: High < 10 V DC, Low > 16 V DC
LI8	I max 2 generator	
LI9	Not used	
LI10	Not used	
0 V	Weight	0 V reference potential for logic inputs
LO1	Logic output LO1 (can be parameterized)	+24 V DC Open-Collector-Outputs, floating ground Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 Switching capacity max. 200 mA at 12...30 VDC Reaction time: 2 ms ±0.5 ms
LO2	Logic output LO2 (can be parameterized)	
CLO	Common	Reference potential of the logic outputs
0 V	Ground	0 V general use

Maximum connection cross-section: 1.5 mm^2 (AWG16), 0.25 Nm (2.5 mm^2 (AWG14), 0.6 Nm for relay terminals)

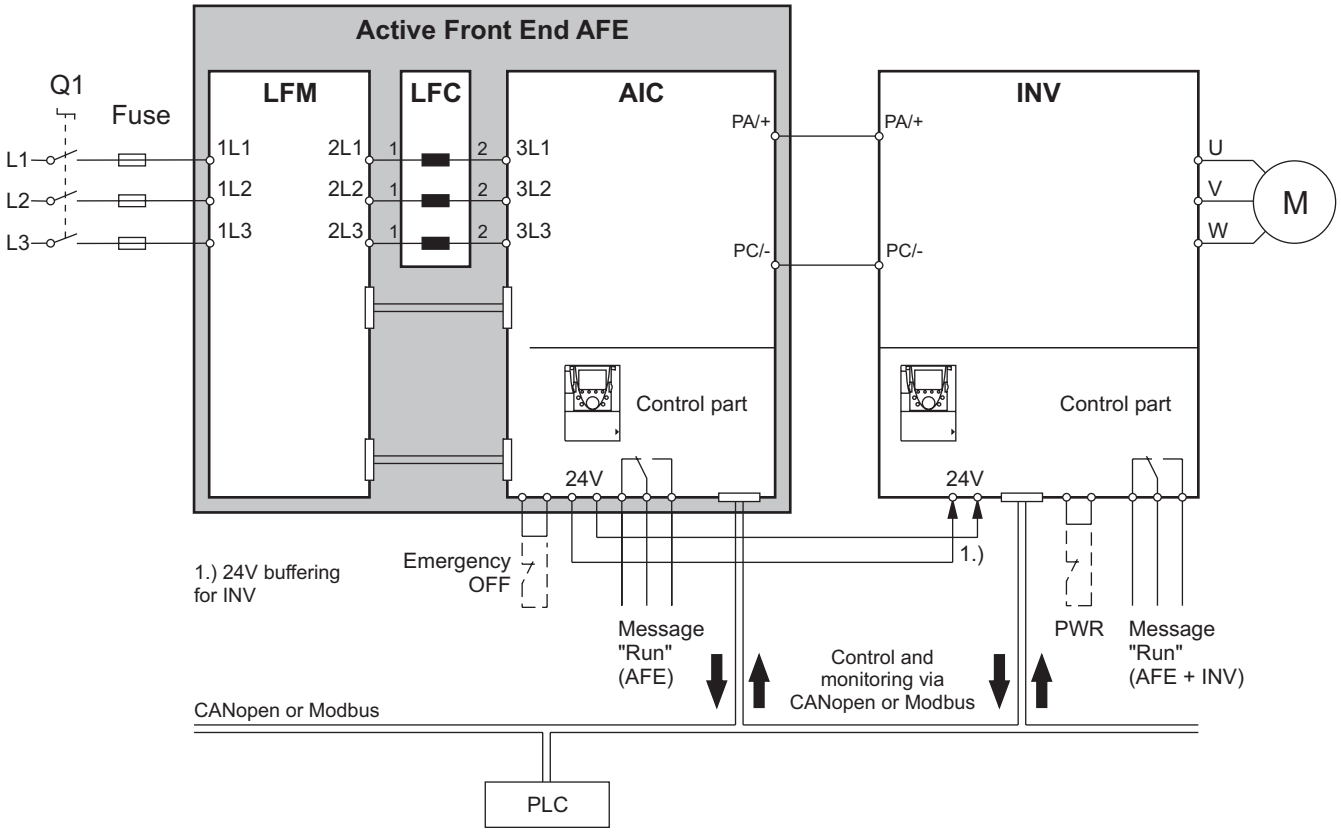
Use screened (shielded) cables for all control wires and separate it from power cables.

Control via the fieldbus

Next to the control terminals the Active Front End AFE units are equipped with a built-in interface for control via Modbus. In addition to the external wiring (connection to the T-pieces in the bus line) only the adjustment of few parameters is necessary.

Alternatively, this interface can be also used for the CANopen bus. Therefore, an adapter is required for conversion of the RJ45 plug to SUB-D (CANopen standard CiA DRP 303-1). The bus wiring is taken by connection to the next device.

When the communication at the PLC system takes place with CANopen or Modbus, the inverter and the Active Infeed Converter can be directly connected to and controlled by the bus system.



Installation

Installation remarks

Typical cubicle installation

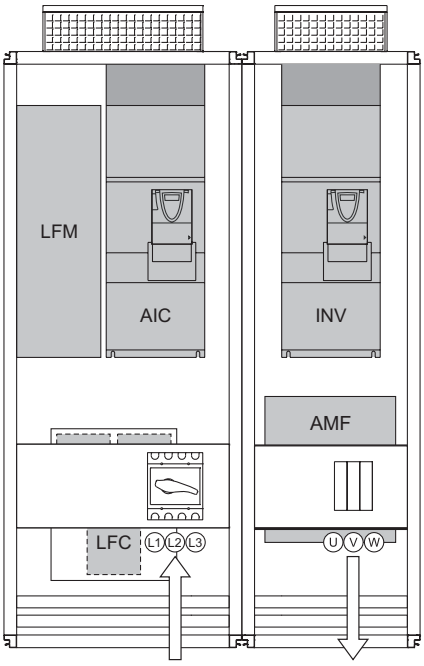
The components of the Active Front End AFE are designed in protection class IP00 and thus they are intended for cubicle installation.

The following illustrations show the recommended installation of the individual components into the cubicle. In order to avoid air short-circuits, it is necessary to install a suitable air guide above the Active Infeed Converter AIC. The losses of the line filter module LFM must be exhausted by means of filter fans in the cubicle door.

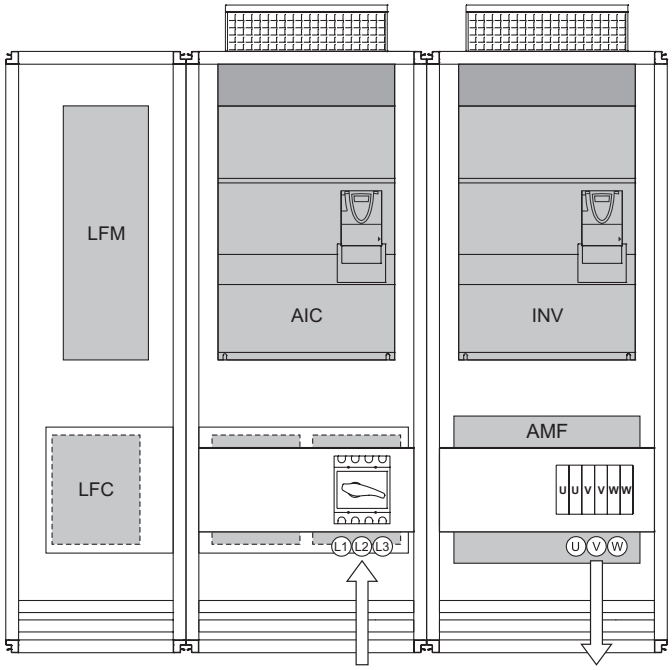
AFE 400V to 175kW

AFE 480V to 175kW

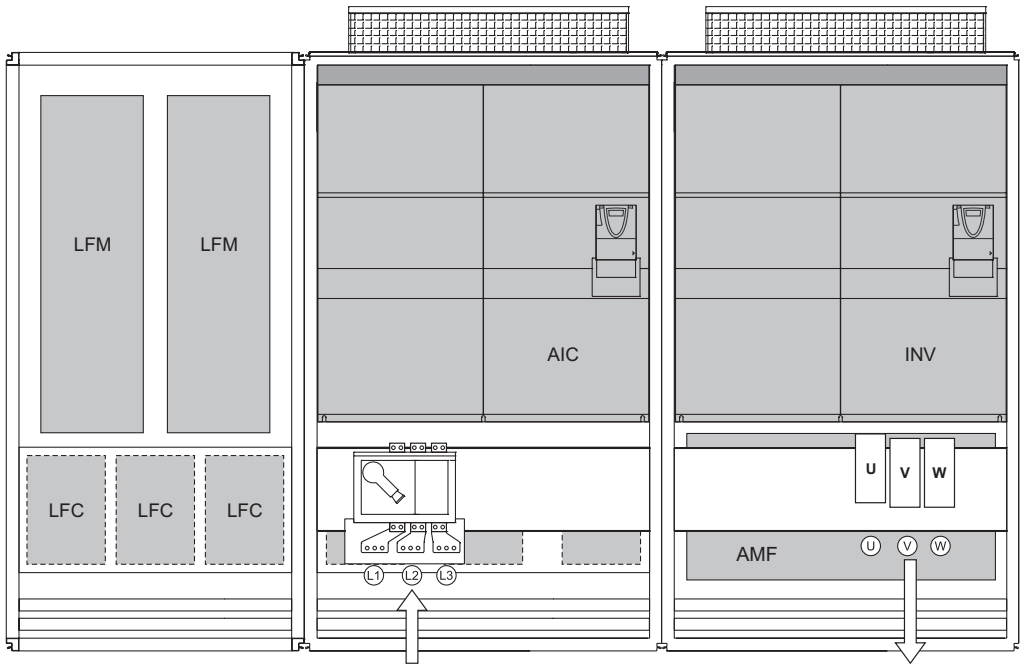
AFE 690V to 220kW



AFE 400V to 340kW
AFE 480V to 340kW
AFE 690V to 430kW

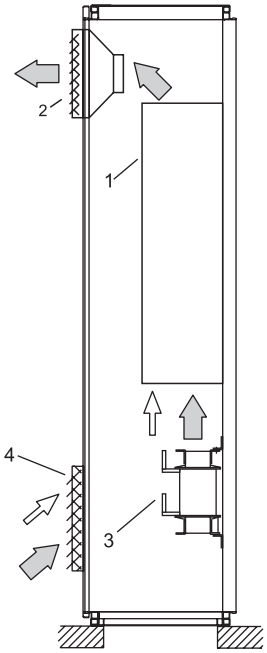


AFE 400V to 675kW
AFE 480V to 675kW
AFE 690V to 860kW



Exhaust concept for cubicle installation

Line Filter Module LFM



As the line filter module does not include an internal fan, it is necessary to provide a fan in the door of the cubicle for exhaust. This helps to prevent heat accumulation and it also provides cooling of the line filter choke LFC.

1. Line Filter Module LFM
2. Fan (without filter mat for IP23, with filter mat for IP54)
3. Line Filter Choke LFC
4. Air inlet grid (without filter mat for IP23, with filter mat for IP54)

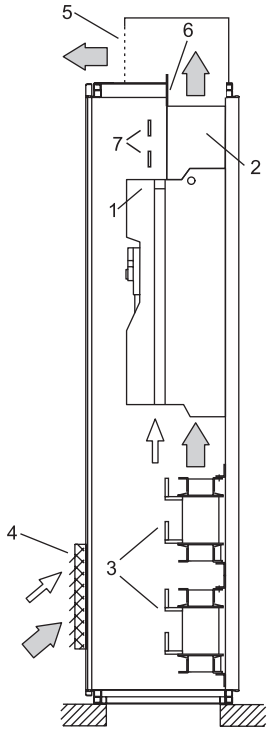
⚠ CAUTION

DAMAGE BY OVERHEATING

The air flow has to be determined regarding the ambient conditions and the losses in the line filter module LFM and the line filter choke LFC.

Failure to follow this instruction can result in injury or equipment damage.

Active Infeed Converter AIC



The illustration besides shows the typical cubicle design in protection degree IP23. The stated losses and minimum cross sections for air inlet are related to the Active Infeed Converter AIC. The fan of the power part, which is inside the device, provides the exhaust of the cubicle.

1. Active Infeed Converter AIC
2. Air guide or transformer-box
3. Line Filter Choke LFC
4. Air inlet grid (without filter mat)
5. Metal cover with splash water protection
6. Separation wall to avoid internal air short-circuits
7. DC bus

A design with higher protection degrees (e.g. IP54) can be realized similar to the inverter cooling strategies.

⚠ CAUTION

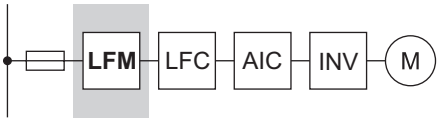
DAMAGE BY OVERHEATING

Provide a separation of the power part air to avoid internal air short-circuits.

Failure to follow this instruction can result in injury or equipment damage.

Line Filter Module LFM

Technical data



The line filter module LFM contains in addition to the real filter components also components of the charging circuit, the main contactor (= line contactor), the supply of fans and the required supply units for the control voltages.

Line Filter Module LFM	400 V / 480 V	500 V / 600 V / 690 V
General		
Design	Built-in unit for vertical mounting	
Cooling	Natural convection / no forced ventilation	
Switching rate	Max. 10 switching operations per hour	
Short circuit protection	Due to upstream semiconductor fuses	
Auxiliary voltage output	24 V DC, suitable to supply the control electronics of the AIC and of an inverter	
Fan supply	380...480 V (according to mains voltage) suitable to supply the fans in the AIC and 4 inverters of the same power (direct connection possible)	500...690 V (according to mains voltage) suitable to supply the fans in the AIC and 4 inverters of the same power (fan supply via transformer box in the AIC and INV)
Mechanical strength		
Mechanical vibration	According to IEC/EN 60068-2-6 1.5 mm in the range of 3...10 Hz, 0.6 g of 10...200 Hz (3M3 according to IEC/EN 60721-3-3)	
Shock	According to IEC/EN 60068-2-27 7 g for 11 ms (3M3 according to IEC/EN 60721-3-3)	
Ambient conditions		
Operating temperature	-10...+45°C (3K3 according to IEC/EN 60721-3-3) Beyond power decrease of 2 % per 1°C up to +60°C (140°F)	
Storage / Transport temperature	-25...+70°C	
Protection degree	IP00	
Environmental class / Humidity	Class 3K3 in accordance with IEC/EN 60721-3-3 / no condensation, max. 95 % relative humidity	
Altitude	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 3000 m	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 2400 m
Allowed pollution	Pollution degree 2 according to EN 61800-5-1 3C2 and 3S2 according to EN 60721-3-3	
Protection class	Class 1 according to EN 61800-5-1	
Standards		
Basic standard	The devices are designed, built and tested on the basis of EN 61800-5-1.	
Insulation	Galvanic insulation from the control electronics in accordance with EN 61800-5-1 PELV (Protective Extra Low Voltage)	
Approvals	CE, UL, GOST, CSA	

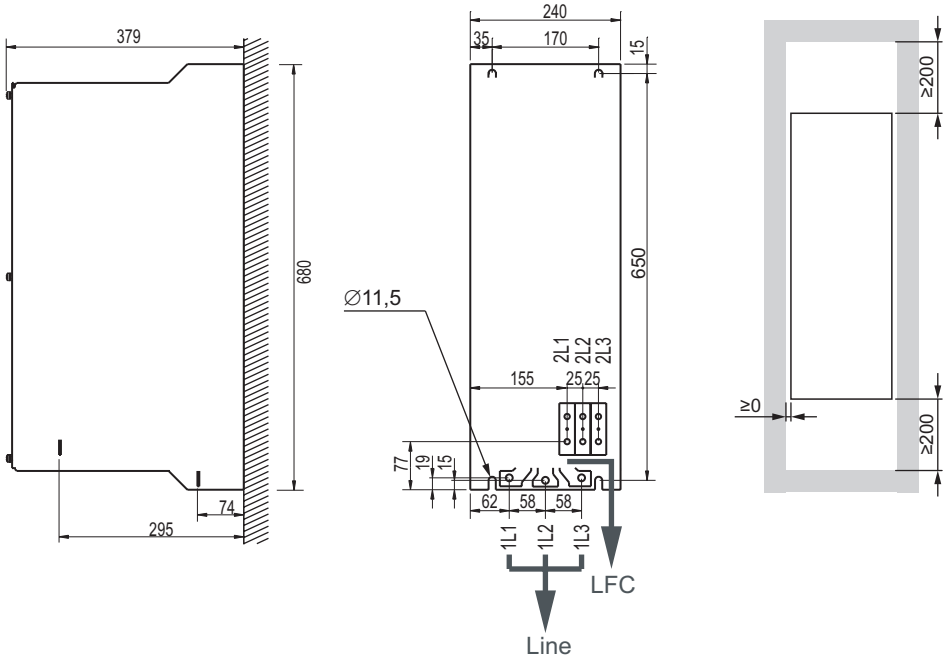
Losses regarding the Active Infeed Converter AIC

As the line filter module LFM is used in different Active Front End units AFE, its losses are varying. In the following table the losses of the line filter module LFM are given related to the respective Active Infeed Converter AIC.

Losses			
Active Front End	Line Filter Module LFM		
	Type	Order number	Losses
400V 120kW	LFM 4V120	VW3A7260	290 W
400V 145kW	LFM 4V175	VW3A7261	320 W
400V 175kW	LFM 4V175	VW3A7261	360 W
400V 240kW	LFM 4V340	VW3A7262	410 W
400V 275kW	LFM 4V340	VW3A7262	480 W
400V 340kW	LFM 4V340	VW3A7262	560 W
400V 430kW	2x LFM 4V340	2x VW3A7262	2x 410 W
400V 540kW	2x LFM 4V340	2x VW3A7262	2x 480 W
400V 675kW	2x LFM 4V340	2x VW3A7262	2x 560 W
480V 120kW	LFM 4V120	VW3A7260	290 W
480V 145kW	LFM 4V175	VW3A7261	320 W
480V 175kW	LFM 4V175	VW3A7261	360 W
480V 240kW	LFM 4V340	VW3A7262	410 W
480V 275kW	LFM 4V340	VW3A7262	480 W
480V 340kW	LFM 4V340	VW3A7262	560 W
480V 430kW	2x LFM 4V340	2x VW3A7262	2x 410 W
480V 540kW	2x LFM 4V340	2x VW3A7262	2x 480 W
480V 675kW	2x LFM 4V340	2x VW3A7262	2x 560 W
690V 145kW	LFM 6V220	VW3A7263	350 W
690V 175kW	LFM 6V220	VW3A7263	370 W
690V 220kW	LFM 6V220	VW3A7263	400 W
690V 275kW	LFM 6V430	VW3A7264	430 W
690V 340kW	LFM 6V430	VW3A7264	510 W
690V 430kW	LFM 6V430	VW3A7264	600 W
690V 540kW	2x LFM 6V430	2x VW3A7264	2x 430 W
690V 675kW	2x LFM 6V430	2x VW3A7264	2x 510 W
690V 860kW	2x LFM 6V430	2x VW3A7264	2x 600 W

LFM 4V120 (VW3 A7 260)

Dimensions



Terminals

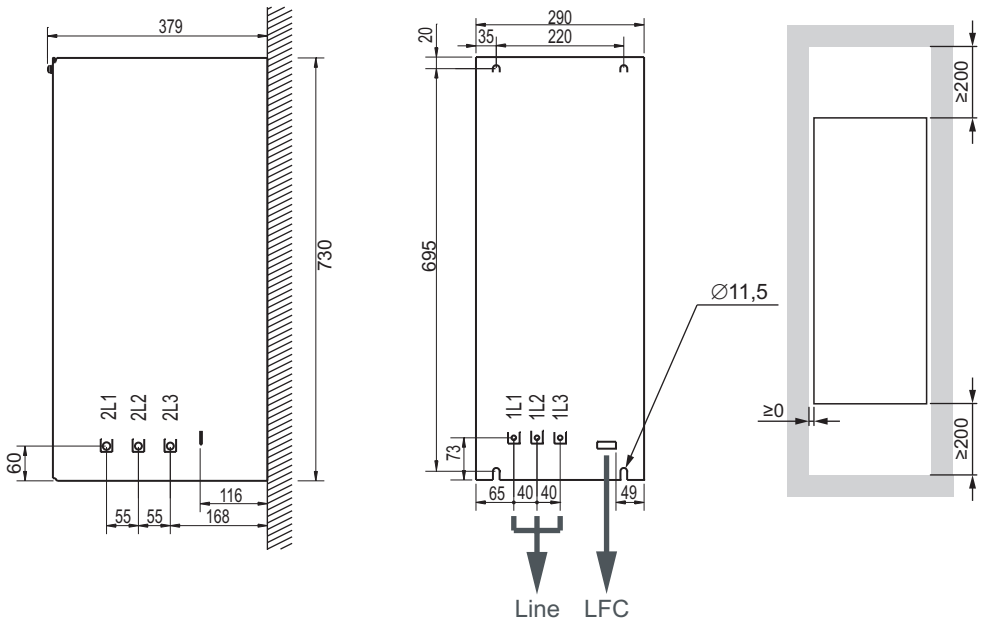
Designation	Connection	Tightening torque	Max. connection cross-section
X1:1 – X1:6	UK5N	0.6...0.8 Nm (5.3...7.1 lb.in)	2.5 mm² (AWG 14)
1L1, 1L2, 1L3	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)
2L1, 2L2, 2L3	UK95 (Allen screw)	15...20 Nm (133...177 lb.in)	95 mm² (AWG 3/0)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Technical data

Nominal data	
Nominal current @50°C	185 A
Max. losses	290 W
Weight	60 kg

LFM 4V175 (VW3 A7 261)

Dimensions



Terminals

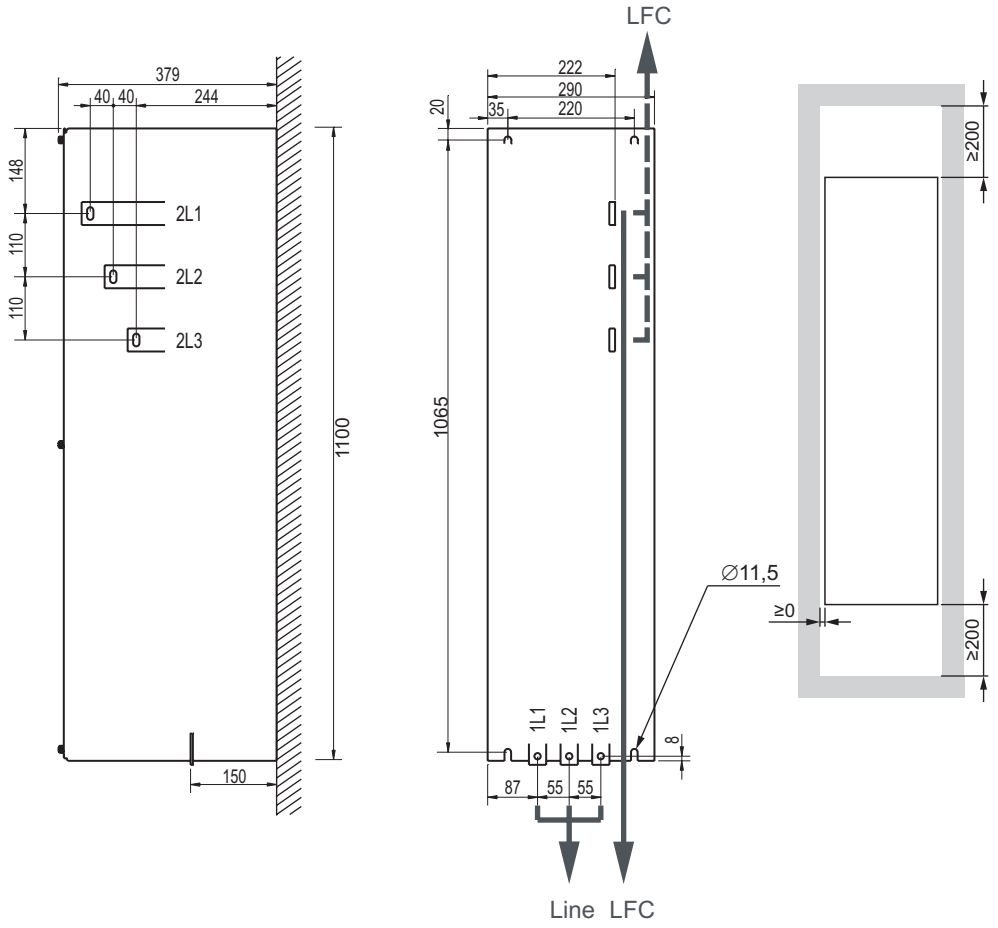
Designation	Connection	Tightening torque	Max. connection cross-section
X1:1 – X1:6	UK5N	0.6...0.8 Nm (5.3...7.1 lb.in)	2.5 mm² (AWG 14)
1L1, 1L2, 1L3	M10	24 Nm (212 lb.in)	150 mm² or 2x95 mm² (300 MCM or 2x AWG 3/0)
2L1, 2L2, 2L3	WFF185 with M12	14...31 Nm (124...274 lb.in)	185 mm² or 2x95 mm² (350 MCM or 2x AWG 3/0)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Technical data

Nominal data	
Nominal current @50°C	255 A
Max. losses	360 W
Weight	80 kg

LFM 4V340 (VW3 A7 262)

Dimensions



Terminals

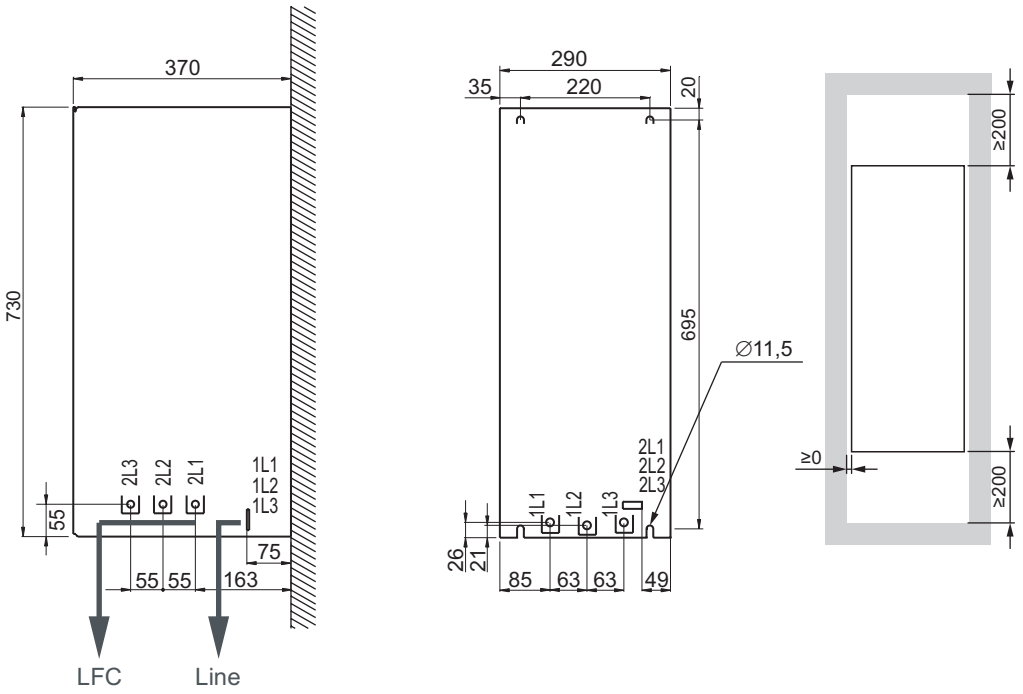
Designation	Connection	Tightening torque	Max. connection cross-section
X1:1 – X1:6	UK5N	0.6...0.8 Nm (5.3...7.1 lb.in)	2.5 mm² (AWG 14)
1L1, 1L2, 1L3	M10	24 Nm (212 lb.in)	2x 185 mm² (2x 350 MCM)
2L1, 2L2, 2L3	Slotted hole at choke M10	24 Nm (212 lb.in)	2x 185 mm² (2x 350 MCM)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Technical data

Nominal data	
Nominal current @50°C	495 A
Max. losses	560 W
Weight	125 kg

LFM 6V220 (VW3 A7 263)

Dimensions



Terminals

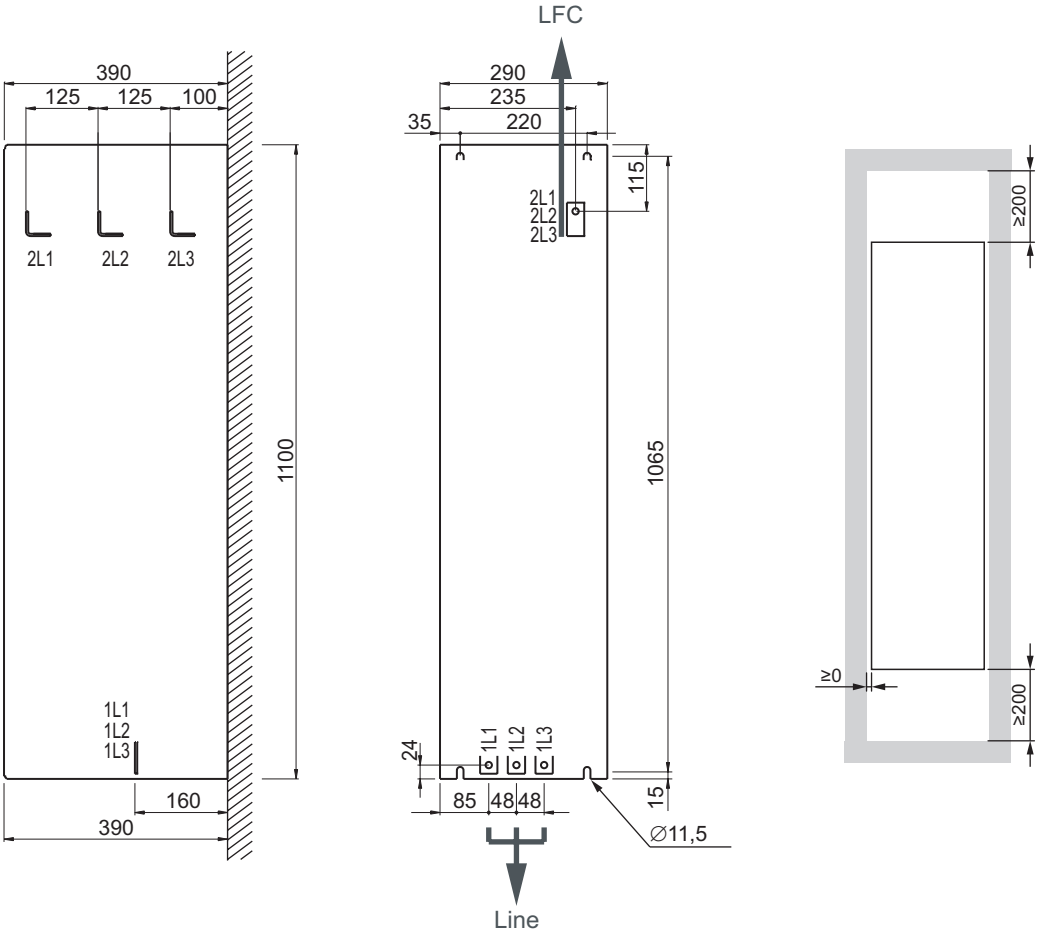
Designation	Connection	Tightening torque	Max. connection cross-section
X1:1 – X1:6	UK5N	0.6...0.8 Nm (5.3...7.1 lb.in)	2.5 mm² (AWG 14)
1L1, 1L2, 1L3	M10	24 Nm (212 lb.in)	185 mm² (350 MCM)
2L1, 2L2, 2L3	M10	24 Nm (212 lb.in)	185 mm² (350 MCM)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Technical data

Nominal data	
Nominal current @50°C	185 A
Max. losses	360 W
Weight	80 kg

LFM 6V430 (VW3 A7 264)

Dimensions



Terminals

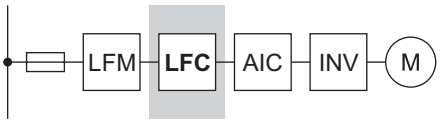
Designation	Connection	Tightening torque	Max. connection cross-section
X1:1 – X1:6	UK5N	0.6...0.8 Nm (5.3...7.1 lb.in)	2.5 mm² (AWG 14)
1L1, 1L2, 1L3	M10	24 Nm (212 lb.in)	2x 150 mm² (2x 300 MCM)
2L1, 2L2, 2L3	M10	24 Nm (212 lb.in)	2x 150 mm² (2x 300 MCM)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Technical data

Nominal data	
Nominal current @50°C	360 A
Max. losses	560 W
Weight	125 kg

Line Filter Choke LFC

Technical data



The line filter choke LFC is a mandatory component of the Active Front End AFE. It is connected in the power path between the line filter module LFM and the Active Infeed Converter AIC and consists of three single-phase chokes.

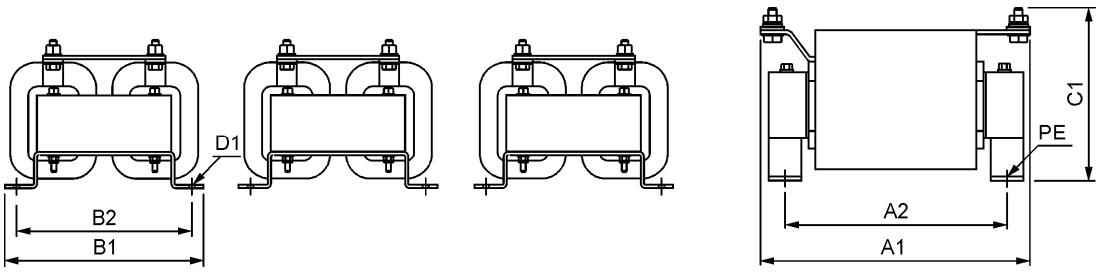
Line Filter Choke LFC	400 V / 480 V	500 V / 600 V / 690 V
General		
Nominal voltage	380 V -30 % … 480 V +10 %	500 V -20 % … 690 V +10 %
Design	Open constructions for installation into the cubicle	
Cooling	Natural convection / no forced ventilation	
Mechanical strength		
Winding protection	Drenched in synthetic resin	
Mechanical vibration	According to IEC/EN 60068-2-6 1.5 mm in the range of 3...10 Hz, 0.6 g of 10...200 Hz (3M3 according to IEC/EN 60721-3-3)	
Shock	According to IEC/EN 60068-2-27 7 g for 11 ms (3M3 according to IEC/EN 60721-3-3)	
Ambient conditions		
Operating temperature	-10°…45°C, up to +60°C with derating	
Storage / Transport temperature	-25...+70°C	
Protection degree	IP00	
Environmental class / Humidity	Class 3K3 in accordance with IEC/EN 60721-3-3 / no condensation, max. 95 % relative humidity	
Altitude	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 3000 m	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 2400 m
Standards		
Insulation class	H	
Approvals	CE, UR, GOST	

Losses regarding the Active Infeed Converter AIC

As the line filter choke LFC (as the line filter module LFM) is used in different Active Front End units AFE, its losses are varying. In the following table the losses of the line filter choke LFC are given related to the respective Active Infeed Converter AIC.

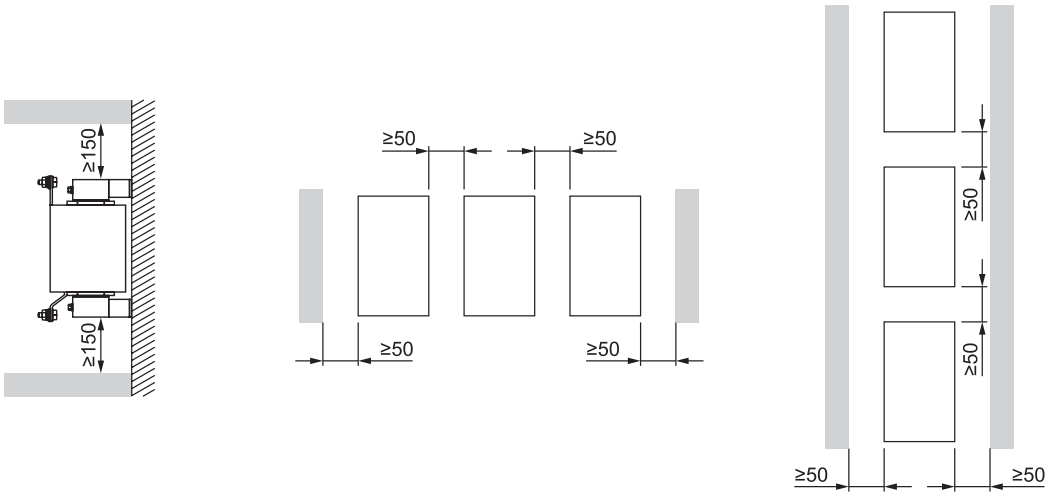
Losses			
Active Front End	Line Filter Choke LFC		
	Type	Order number	Losses
400V 120kW	LFC 4V120	VW3A7265	3x 320 W
400V 145kW	LFC 4V175	VW3A7266	3x 370 W
400V 175kW	LFC 4V175	VW3A7266	3x 425 W
400V 240kW	LFC 4V340	VW3A7267	3x 530 W
400V 275kW	LFC 4V340	VW3A7267	3x 620 W
400V 340kW	LFC 4V340	VW3A7267	3x 790 W
400V 430kW	2x LFC 4V340	2x VW3A7267	2x (3x 530) W
400V 540kW	2x LFC 4V340	2x VW3A7267	2x (3x 620) W
400V 675kW	2x LFC 4V340	2x VW3A7267	2x (3x 790) W
480V 120kW	LFC 4V120	VW3A7265	3x 320 W
480V 145kW	LFC 4V175	VW3A7266	3x 370 W
480V 175kW	LFC 4V175	VW3A7266	3x 425 W
480V 240kW	LFC 4V340	VW3A7267	3x 530 W
480V 275kW	LFC 4V340	VW3A7267	3x 620 W
480V 340kW	LFC 4V340	VW3A7267	3x 790 W
480V 430kW	2x LFC 4V340	2x VW3A7267	2x (3x 530) W
480V 540kW	2x LFC 4V340	2x VW3A7267	2x (3x 620) W
480V 675kW	2x LFC 4V340	2x VW3A7267	2x (3x 790) W
690V 145kW	LFC 6V220	VW3A7268	3x 360 W
690V 175kW	LFC 6V220	VW3A7268	3x 380 W
690V 220kW	LFC 6V220	VW3A7268	3x 410 W
690V 275kW	LFC 6V430	VW3A7269	3x 440 W
690V 340kW	LFC 6V430	VW3A7269	3x 540 W
690V 430kW	LFC 6V430	VW3A7269	3x 650 W
690V 540kW	2x LFC 6V430	2x VW3A7269	2x (3x 440) W
690V 675kW	2x LFC 6V430	2x VW3A7269	2x (3x 540) W
690V 860kW	2x LFC 6V430	2x VW3A7269	2x (3x 650) W

	400 V and 480 V			690 V	
	LFC 4V120	LFC 4V175	LFC 4V340	LFC 6V220	LFC 6V430
Order number	VW3 A7 265	VW3 A7 266	VW3 A7 267	VW3 A7 268	VW3 A7 269
Nominal current @50°C [A]	180	255	495	185	360
Max. losses [W]	3x 320	3x 425	3x 790	3x 410	3x 650
Weight [kg (lb)]	3x 18	3x 23	3x 44	3x 33	3x 70
Dimension A1 [mm]	210	295	360	295	540
Dimension A2 [mm]	190	250	313	250	452
Dimension B1 [mm]	245	245	290	245	295
Dimension B2 [mm]	215	215	250	215	255
Dimension C1 [mm]	185	195	255	210	250
Fixing D1 [mm]	9x15	9x15	11x18	9x22.5	11x18



The line filter chokes LFC consist of 3 single-phase chokes.

During installation observe the free space above and below as well as the required minimum distance between the three components.



CAUTION

DAMAGE BY OVERHEATING

It is recommended to install the chokes of the LFC one upon the other only at forced cooling because in case of insufficient ventilation the upper choke may overheat.

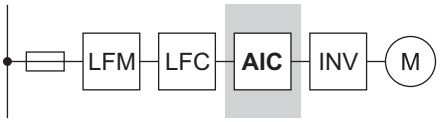
Failure to follow this instruction can result in injury or equipment damage.

Terminals

Designation	Connection	Tightening torque	Max. connection cross-section
1	M10	24 Nm (212 lb.in)	2x 150 mm² (2x 300 MCM)
2	M10	24 Nm (212 lb.in)	2x 150 mm² (2x 300 MCM)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)

Active Infeed Converter AIC

Technical data

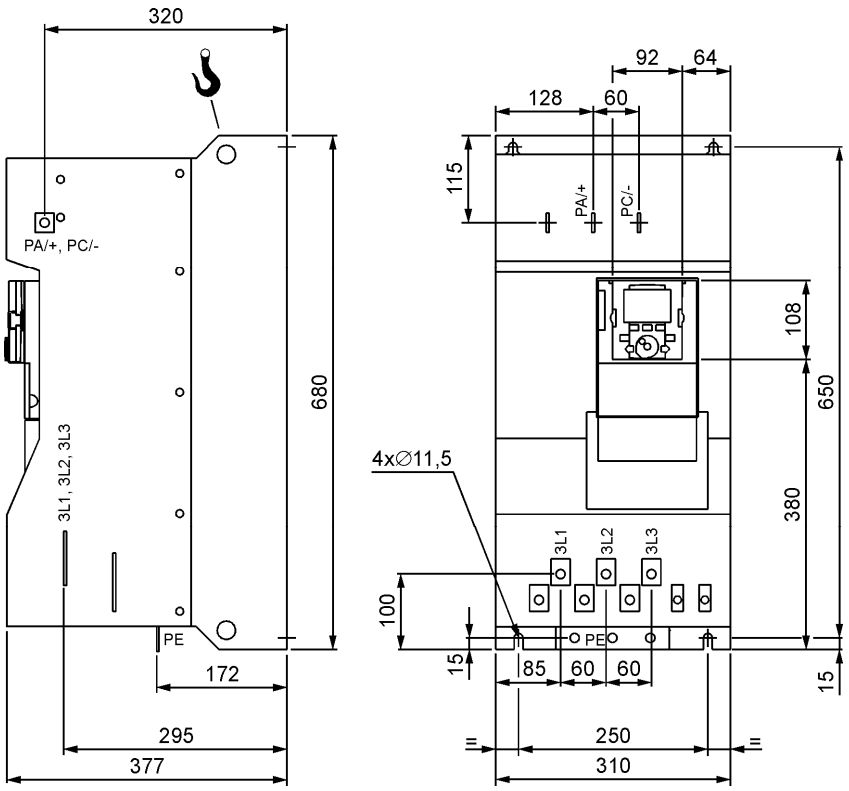


The Active Infeed Converter AIC is connected to the inverter INV via the DC bus. During operation the energy is supplied to the DC bus or the accumulating braking energy is feed back into the mains.

Active Infeed Converter AIC	400 V / 480 V	500 V / 600 V / 690 V
General		
Design	Built-in unit for vertical mounting	
Cooling	Forced	
Mechanical strength		
Mechanical vibration	According to IEC/EN 60068-2-6 1.5 mm in the range of 3...10 Hz, 0.6 g of 10...200 Hz (3M3 according to IEC/EN 60721-3-3)	
Shock	According to IEC/EN 60068-2-27 AIC 4V120...AIC 4V175: 7 g for 11 ms (3M3 according to IEC/EN 60721-3-3) AIC 4V240...AIC 4V675: 4 g for 11 ms (3M2 according to IEC/EN 60721-3-3)	 AIC 6V145...AIC 6V220: 7 g for 11 ms (3M3 according to IEC/EN 60721-3-3) AIC 6V275...AIC 6V860: 4 g for 11 ms (3M2 according to IEC/EN 60721-3-3)
Ambient conditions		
Operating temperature	-10...+45°C (3K3 according to IEC/EN 60721-3-3) Beyond power decrease of 2 % per 1°C up to +60°C	
Storage / Transport temperature	-25...+70°C	
Protection degree	IP00	
Environmental class / Humidity	Class 3K3 in accordance with IEC/EN 60721-3-3 / no condensation, max. 95 % relative humidity	
Altitude	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 3000 m	Up to 1000 m, beyond power decrease of 1 % per 100 m up to 2400 m
Allowed pollution	Pollution degree 2 according to EN 61800-5-1 3C2 and 3S2 according to EN 60721-3-3	
Protection class	Class 1 according to EN 61800-5-1	
Standards		
Basic standard	The devices are designed, built and tested on the basis of EN 61800-5-1.	
EMC immunity	According to EN 61800-3, 1st and 2nd environment (IEC 1000-4-2; IEC 1000-4-3; IEC 1000-4-4; IEC 1000-4-5; IEC 1000-4-6)	
EMC emission	In accordance with product standard EN 61800-3, 2nd environment, category C3	
Insulation	Galvanic insulation from the control electronics in accordance with EN 61800-5-1 PELV (Protective Extra Low Voltage)	
Approvals	CE, UL, GOST, CSA	

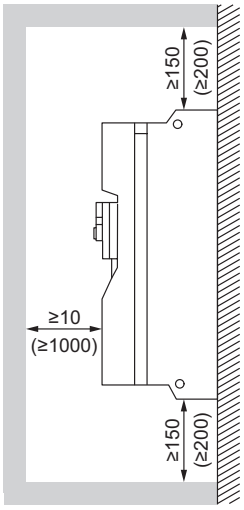
AIC 4V120 (VW3 A7 250)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	2x 95 mm² (2x AWG 3/0)
3L1, 3L2, 3L3	M10	24 Nm (212 lb.in)	2x 95 mm² (2x AWG 3/0)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

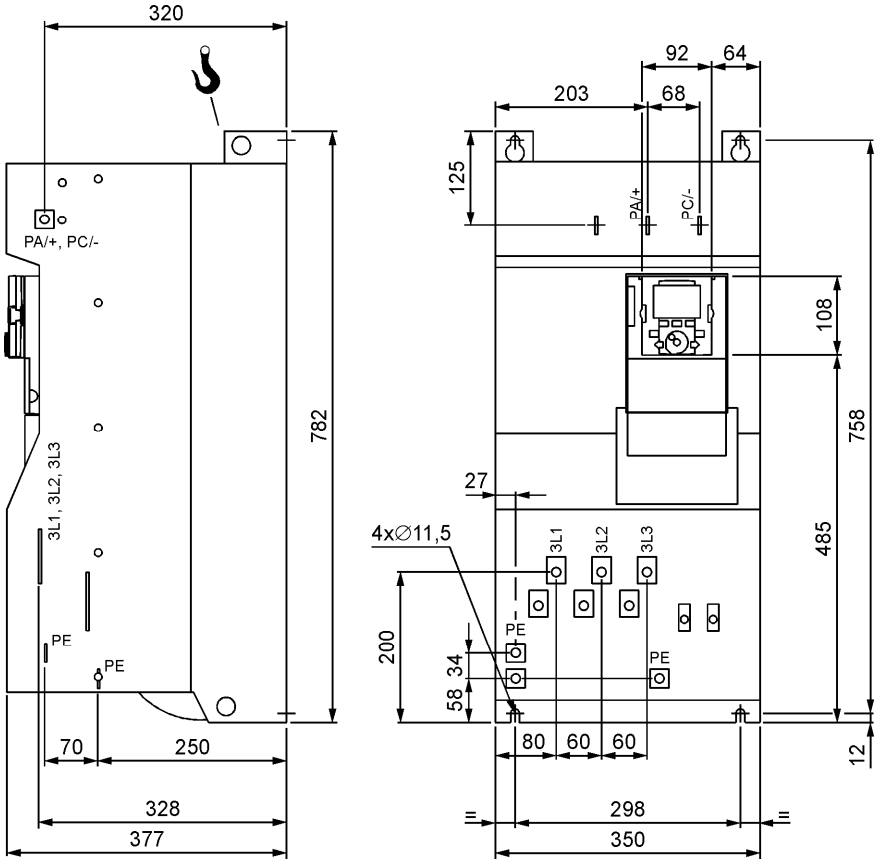
Technical data		AIC 4V120
Order number		VW3 A7 250
Characteristics		
Losses	at I_N	2250 W
Losses control part		270 W
Losses power part		1980 W
Weight approx.		60 kg
Ambient conditions		
Air flow		400 m³/h
Min. air inlet and air outlet		5 dm²



(when mounting without any distance sideways)

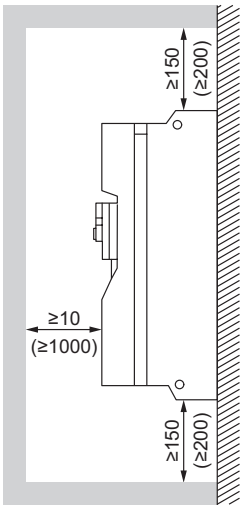
AIC 4V145 (VW3 A7 251)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	2x 150 mm² (2x 300 MCM)
3L1, 3L2, 3L3	M10	24 Nm (212 lb.in)	2x 95 mm² (2x AWG 3/0)
PE	M10	24 Nm (212 lb.in)	95 mm² (AWG 3/0)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

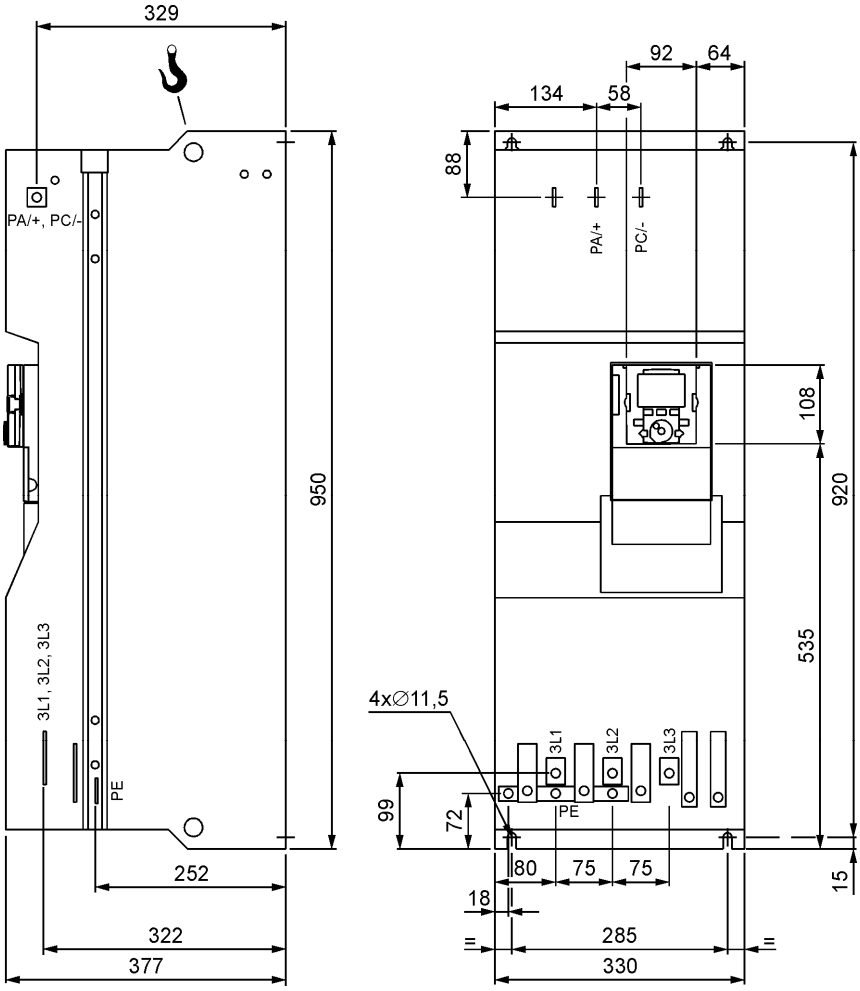
Technical data		AIC 4V145
Order number		VW3 A7 251
Characteristics		
Losses	at I_N	2660 W
Losses control part		300 W
Losses power part		2360 W
Weight approx.		74 kg
Ambient conditions		
Air flow		600 m³/h
Min. air inlet and air outlet		7 dm²



(when mounting without any distance sideways)

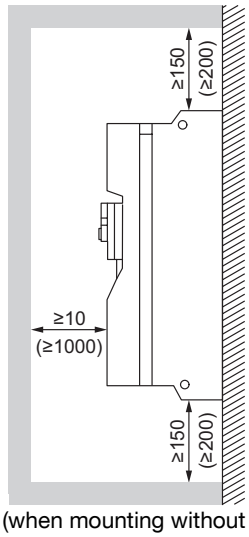
AIC 4V175 (VW3 A7 252)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	2x 120 mm² (2x 250 MCM)
3L1, 3L2, 3L3	M10	24 Nm (212 lb.in)	2x 120 mm² (2x 250 MCM)
PE	M10	24 Nm (212 lb.in)	120 mm² (250 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

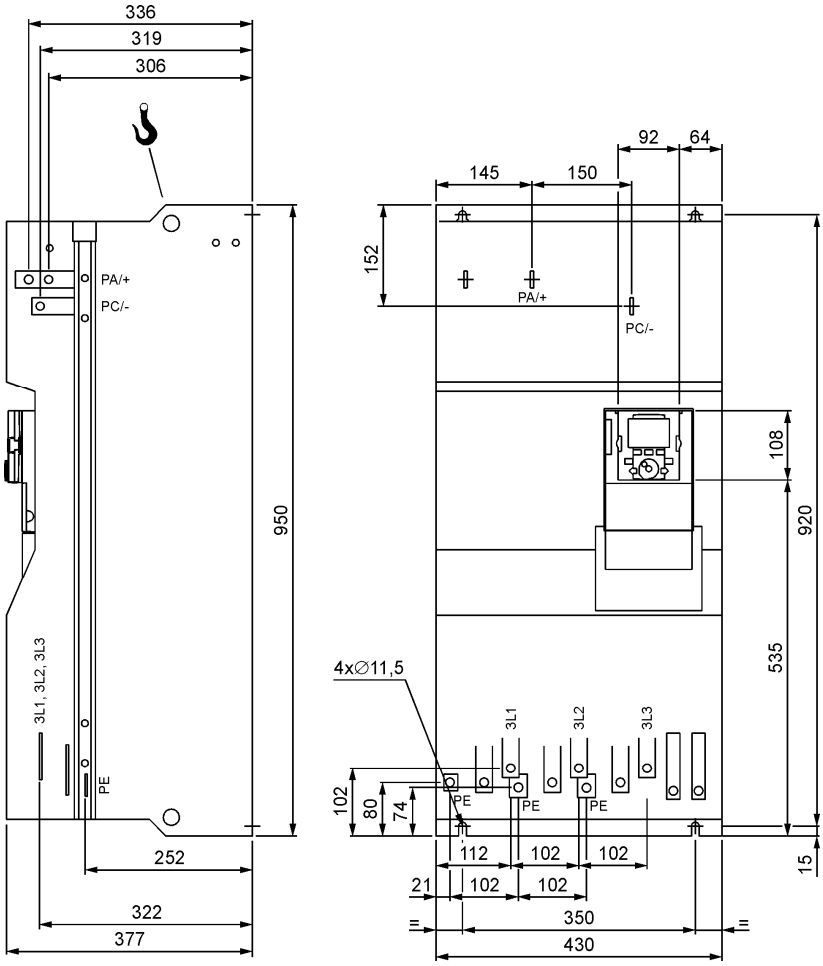
Technical data		AIC 4V175
Order number		VW3 A7 252
Characteristics		
Losses	at I_N	2970 W
Losses control part		360 W
Losses power part		2610 W
Weight approx.		80 kg
Ambient conditions		
Air flow		600 m³/h
Min. air inlet and air outlet		7 dm²



(when mounting without any distance sideways)

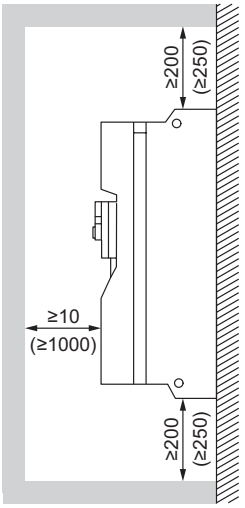
AIC 4V240 (VW3 A7 253)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	2x 150 mm² (2x 300 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	2x 150 mm² (2x 300 MCM)
PE	M12	41 Nm (363 lb.in)	150 mm² (300 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

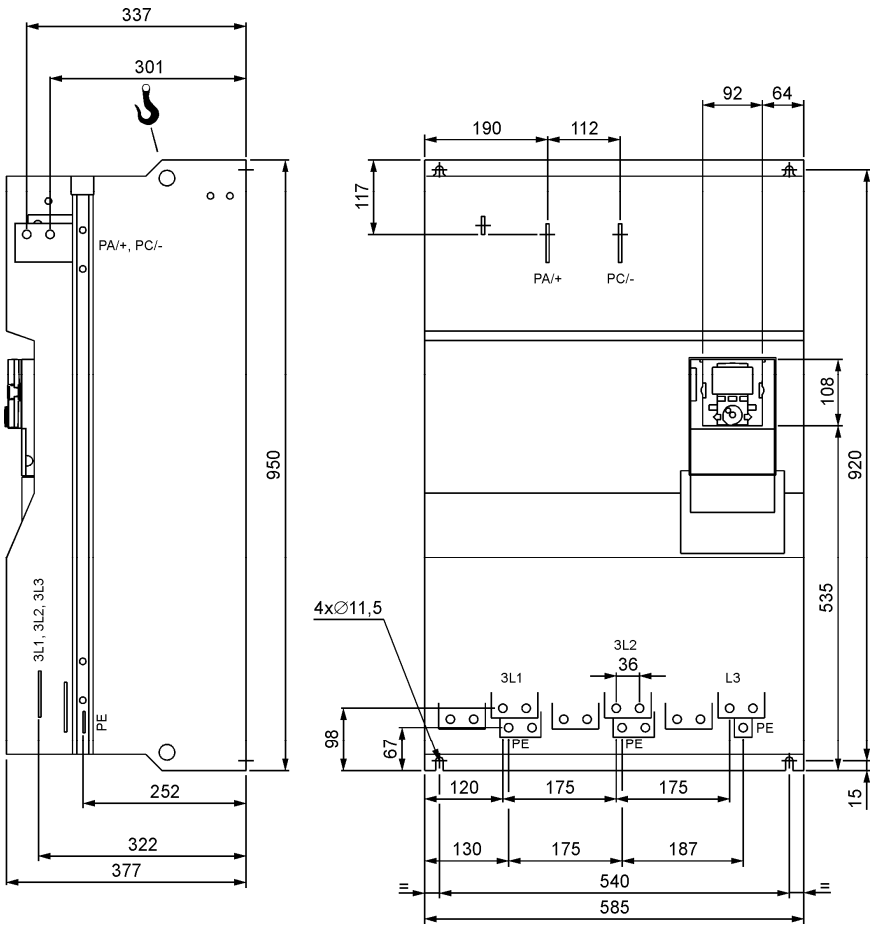
Technical data	AIC 4V240
Order number	VW3 A7 253
Characteristics	
Losses at I_N	3960 W
Losses control part	430 W
Losses power part	3530 W
Weight approx.	110 kg
Ambient conditions	
Air flow	800 m^3/h
Min. air inlet and air outlet	8 dm^2



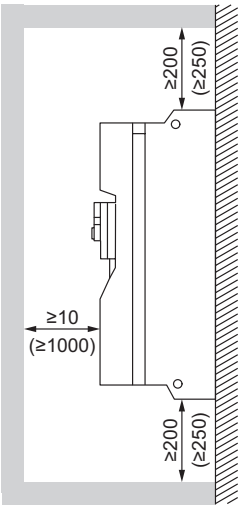
(when mounting without any distance sideways)

AIC 4V275 (VW3 A7 254) / AIC 4V340 (VW3 A7 255) / AIC 4V240-13 (VW3 A7 283)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
PE	M12	41 Nm (363 lb.in)	2x 185 mm² (2x 400 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

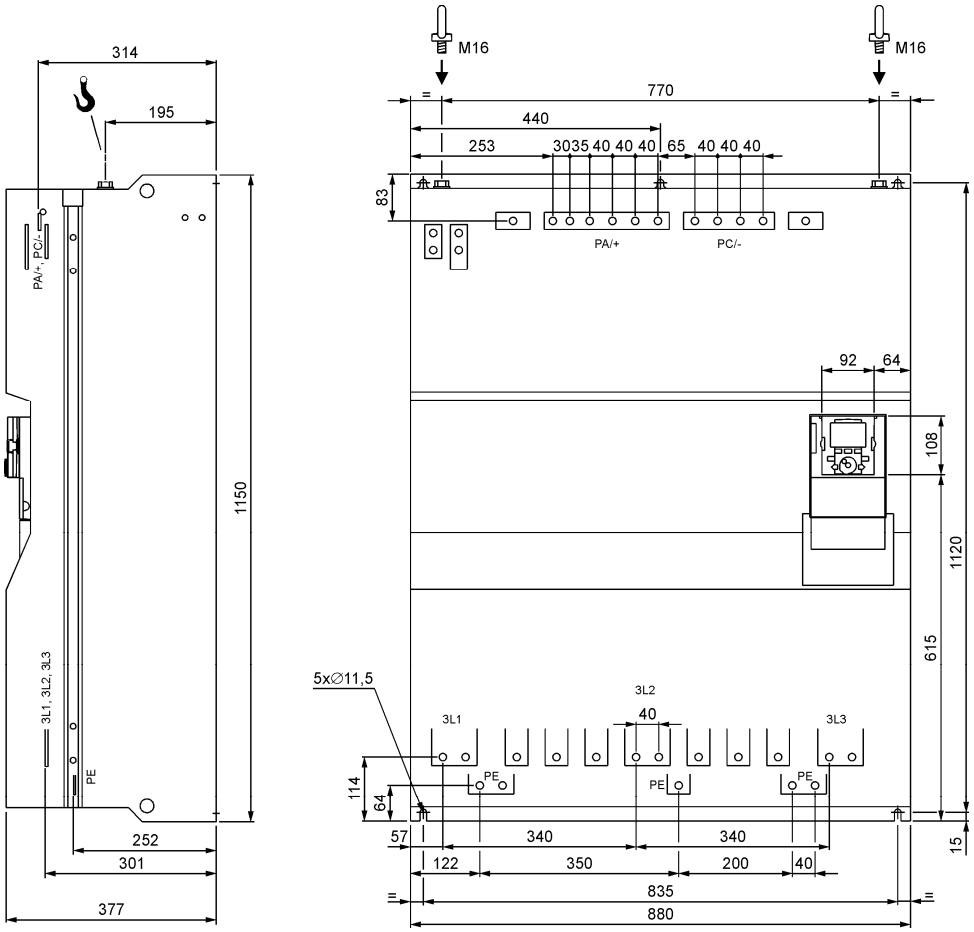


(when mounting without any distance sideways)

Technical data		AIC 4V240-13	AIC 4V275	AIC 4V340
Order number		VW3 A7 283	VW3 A7 254	VW3 A7 255
Characteristics				
Losses	at I_N	3960 W	4710 W	5800 W
Losses control part		430 W	610 W	770 W
Losses power part		3530 W	4100 W	5030 W
Weight approx.		140 kg	140 kg	140 kg
Ambient conditions				
Air flow		1200 m^3/h	1200 m^3/h	1200 m^3/h
Min. air inlet and air outlet		10 dm^2	10 dm^2	10 dm^2

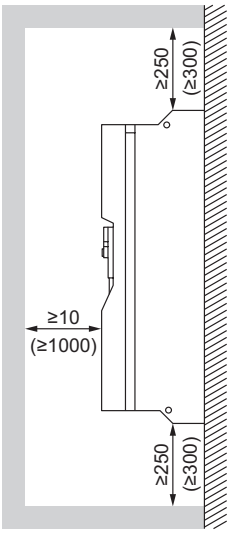
AIC 4V430 (VW3 A7 256) / AIC 4V540 (VW3 A7 257)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	8x 185 mm² (8x 400 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	2x (2x185) mm² (2x (2x 400) MCM)
PE	M12	41 Nm (363 lb.in)	2x 185 mm² (2x 400 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

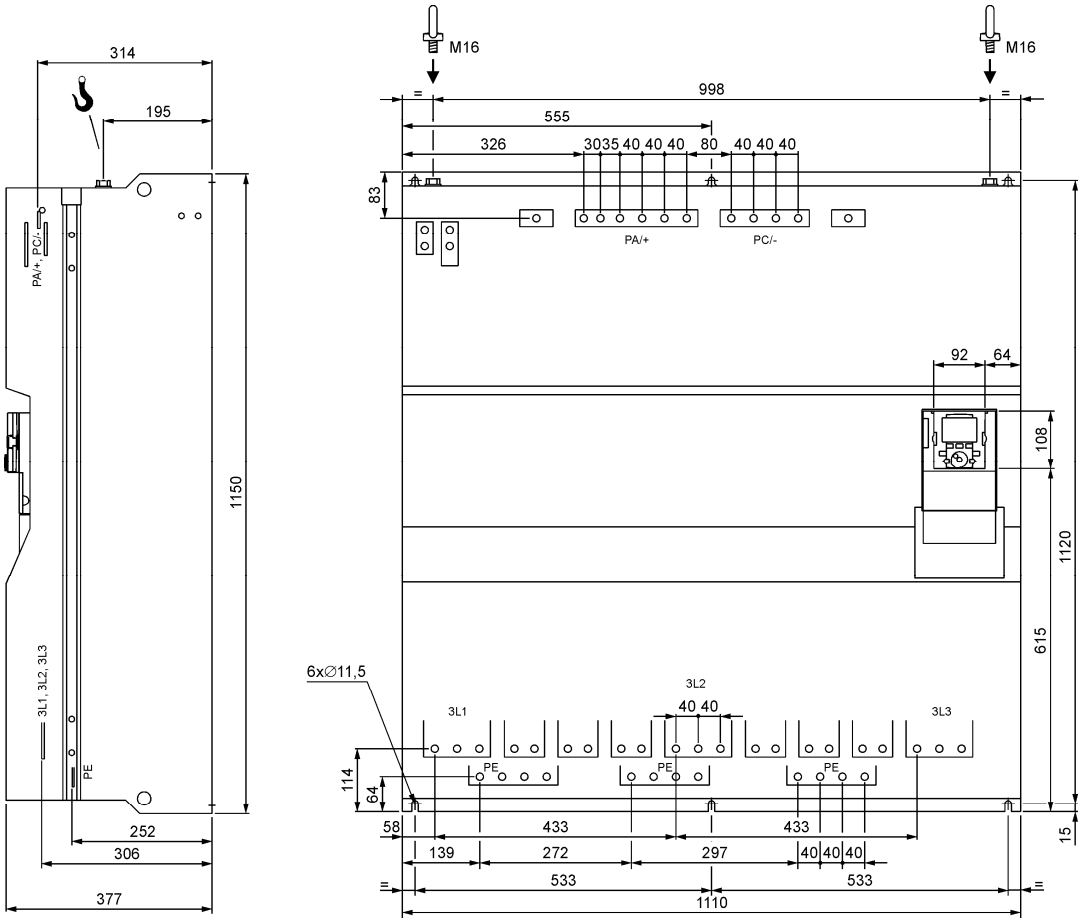
Technical data		AIC 4V430	AIC 4V540
Order number		VW3 A7 256	VW3 A7 257
Characteristics			
Losses	at I_N	7130 W	8920 W
Losses control part		960 W	1190 W
Losses power part		6170 W	7730 W
Weight approx.		215 kg	225 kg
Ambient conditions			
Air flow		1800 m³/h	1800 m³/h
Min. air inlet and air outlet		15 dm²	15 dm²



(when mounting without any distance sideways)

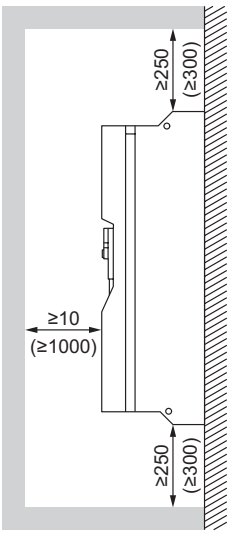
AIC 4V675 (VW3 A7 258) / AIC 4V430-15 (VW3 A7 286) / AIC 4V540-15 (VW3 A7 287)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	8x 185 mm² (8x 400 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	2x (4x 185) mm² (2x (4x 400) MCM)
PE	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

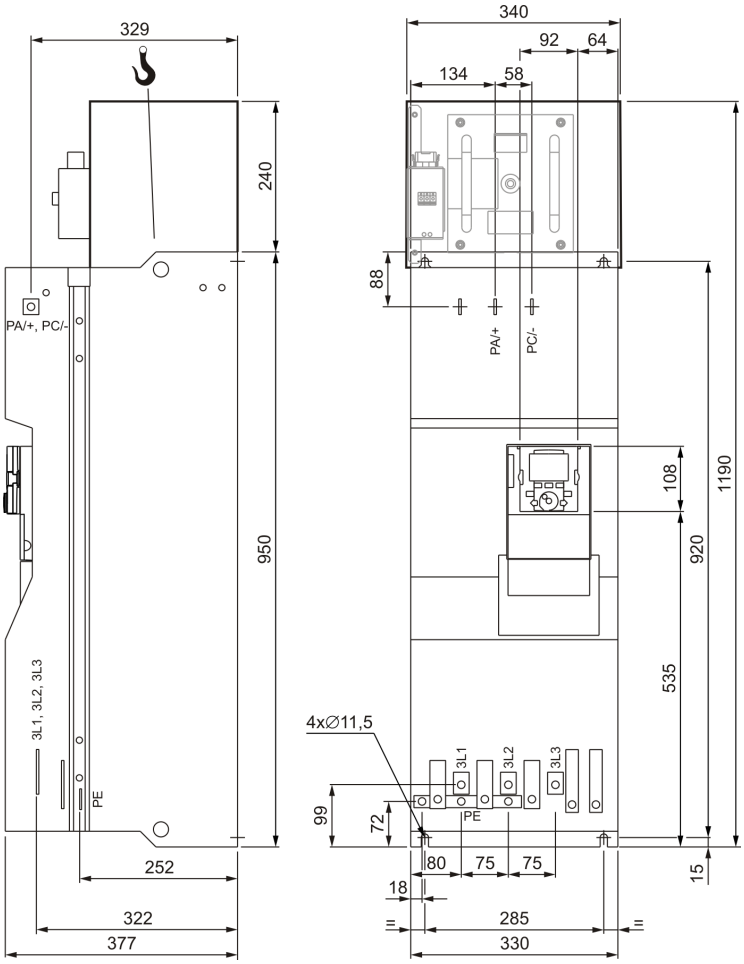
Technical data	AIC 4V430-15	AIC 4V540-15	AIC 4V675
Order number	VW3 A7 286	VW3 A7 287	VW3 A7 258
Characteristics			
Losses at I_N	6130 W	8920 W	11060 W
Losses control part	860 W	1190 W	1500 W
Losses power part	5270 W	7730 W	9560 W
Weight approx.	300 kg	300 kg	300 kg
Ambient conditions			
Air flow	2400 m³/h	2400 m³/h	2400 m³/h
Min. air inlet and air outlet	20 dm²	20 dm²	20 dm²



(when mounting without any distance sideways)

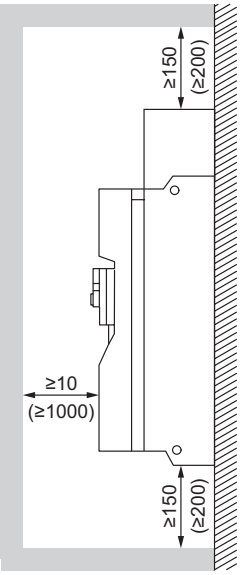
AIC 6V145 (VW3 A7 270) / AIC 6V175 (VW3 A7 271) / AIC 6V220 (VW3 A7 272)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	2x 120 mm² (2x 250 MCM)
3L1, 3L2, 3L3	M10	24 Nm (212 lb.in)	120 mm² (250 MCM)
PE	M10	24 Nm (212 lb.in)	120 mm² (250 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

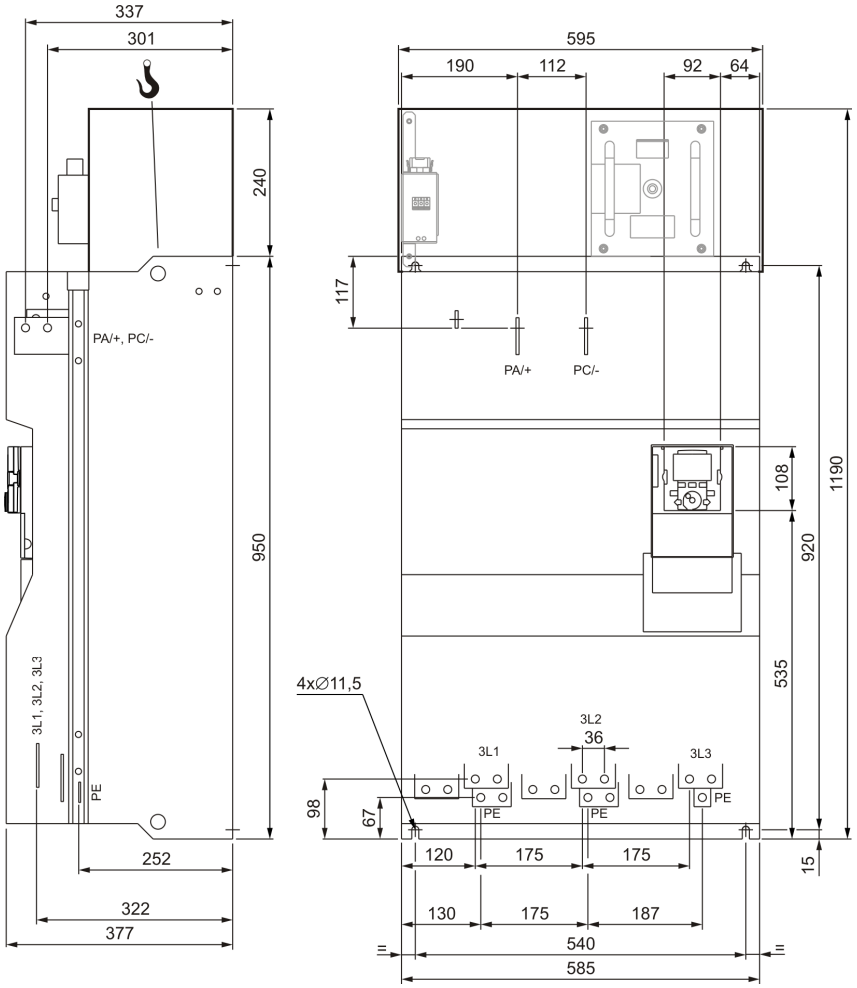
Technical data	AIC 6V145	AIC 6V175	AIC 6V220
Order number	VW3 A7 270	VW3 A7 271	VW3 A7 272
Characteristics			
Losses at I_N	2200 W	2630 W	3220 W
Losses control part	190 W	220 W	250 W
Losses power part	2010 W	2410 W	2970 W
Weight approx.	110 kg	110 kg	110 kg
Ambient conditions			
Air flow	600 m³/h	600 m³/h	600 m³/h
Min. air inlet and air outlet	7 dm²	7 dm²	7 dm²



(when mounting without any distance sideways)

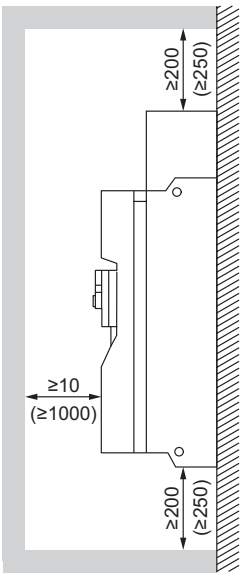
AIC 6V275 (VW3 A7 273) / AIC 6V340 (VW3 A7 274) / AIC 6V430 (VW3 A7 275)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
PE	M12	41 Nm (363 lb.in)	2x 185 mm² (2x 400 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

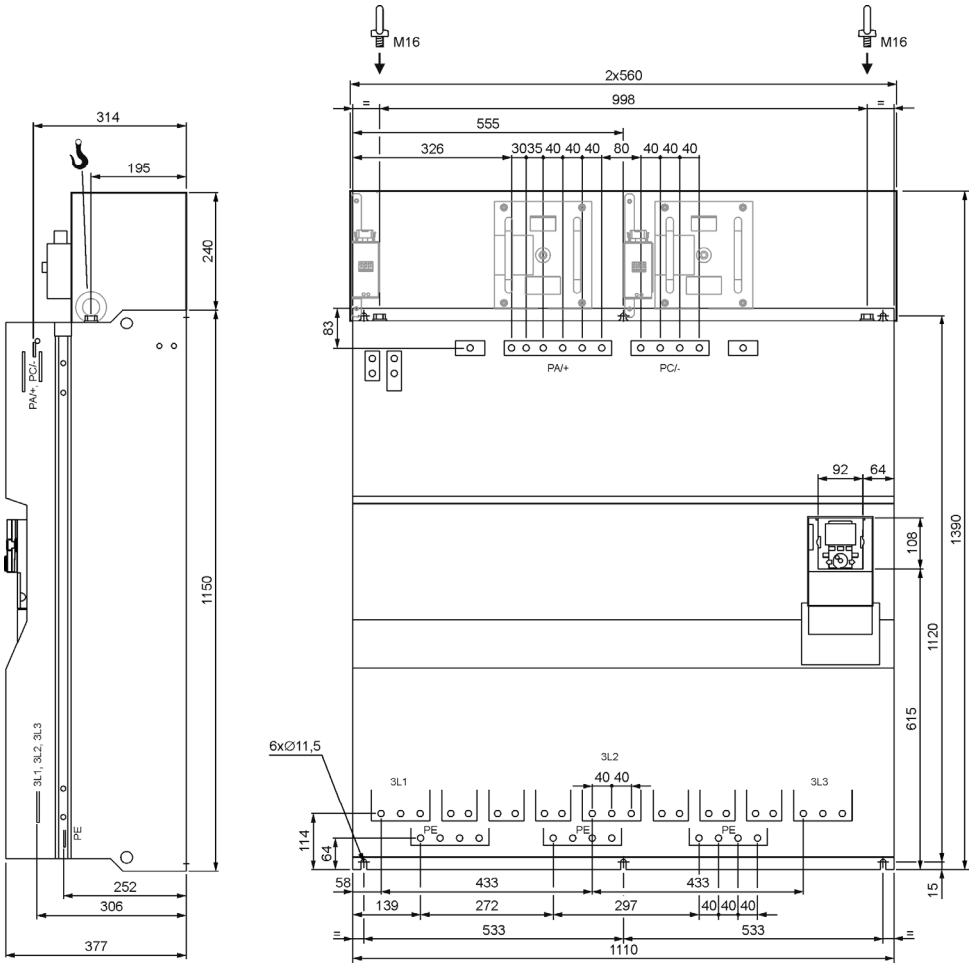
Technical data	AIC 6V275	AIC 6V340	AIC 6V430
Order number	VW3 A7 273	VW3 A7 274	VW3 A7 275
Characteristics			
Losses at I_N	4130 W	5050 W	6040 W
Losses control part	330 W	380 W	440 W
Losses power part	3800 W	4670 W	5600 W
Weight approx.	190 kg	190 kg	190 kg
Ambient conditions			
Air flow	1200 m³/h	1200 m³/h	1200 m³/h
Min. air inlet and air outlet	10 dm²	10 dm²	10 dm²



(when mounting without any distance sideways)

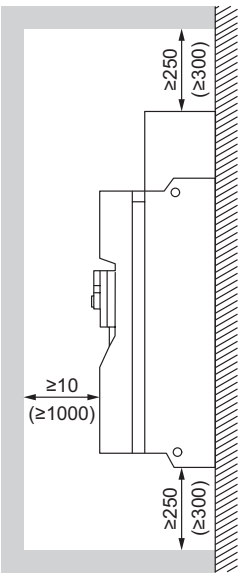
AIC 6V540 (VW3 A7 276) / AIC 6V675 (VW3 A7 277) / AIC 6V860 (VW3 A7 278)

Dimensions



Power terminals			
Designation	**Connection**	**Tightening torque**	**Max. connection cross-section**
PA/+ and PC/-	M12	41 Nm (363 lb.in)	8x 185 mm² (8x 400 MCM)
3L1, 3L2, 3L3	M12	41 Nm (363 lb.in)	2x (2x 185) mm² (2x (2x 400) MCM)
PE	M12	41 Nm (363 lb.in)	4x 185 mm² (4x 400 MCM)
Control terminals			
X20	M2.6	0.5...0.6 Nm (4.3...5.3 lb.in)	2.5 mm² (AWG 14)
I/O terminals	M2	0.25 Nm (2.2 lb.in)	1.5 mm² (AWG 16)
Relay terminals	M2.6	0.6 Nm (5.3 lb.in)	2.5 mm² (AWG 14)

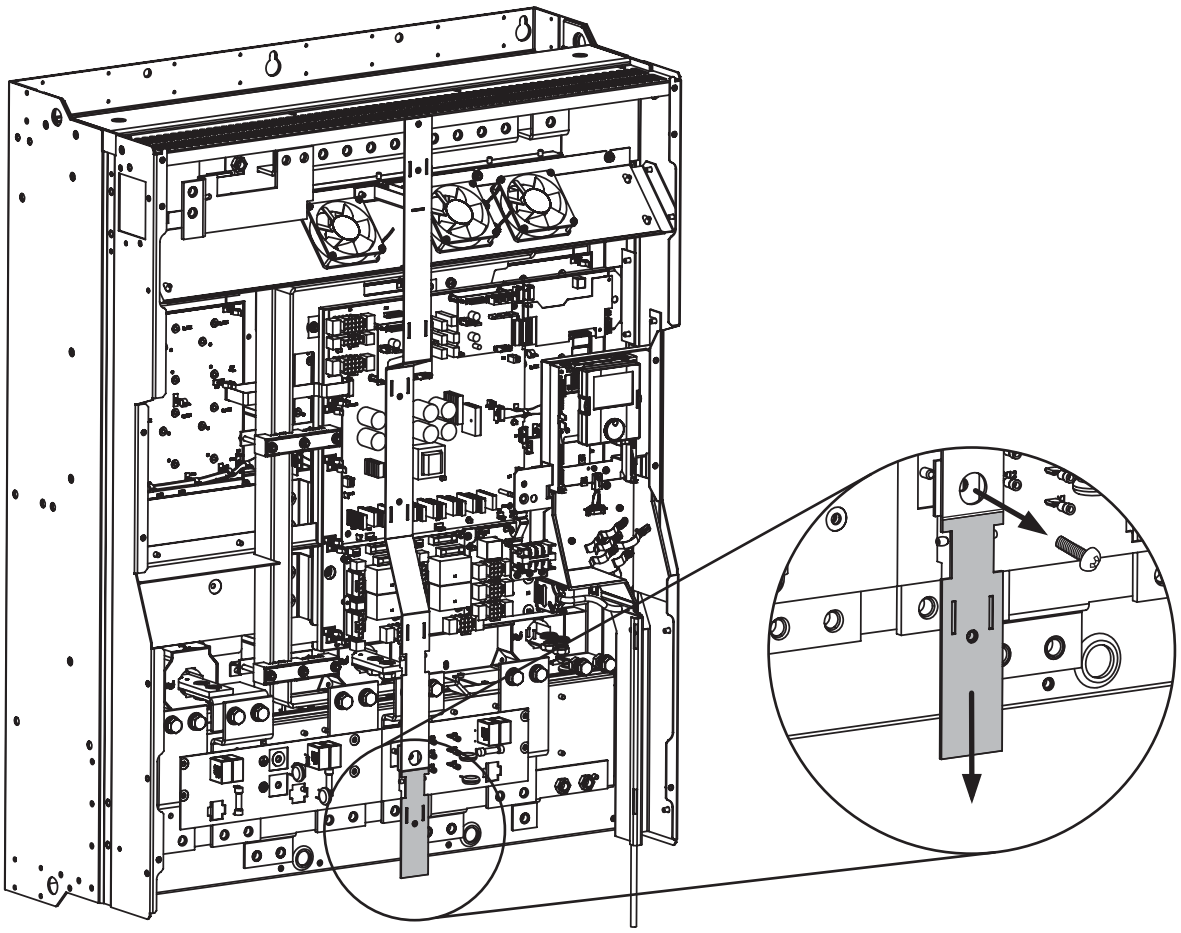
Technical data		AIC 6V540	AIC 6V675	AIC 6V860
Order number		VW3 A7 276	VW3 A7 277	VW3 A7 278
Characteristics				
Losses	at I_N	7730 W	9560 W	11980 W
Losses control part		580 W	690 W	860 W
Losses power part		7150 W	8870 W	11120 W
Weight approx.		400 kg	400 kg	400 kg
Ambient conditions				
Air flow		2400 m^3/h	2400 m^3/h	2400 m^3/h
Min. air inlet and air outlet		20 dm^2	20 dm^2	20 dm^2



(when mounting without any distance sideways)

Access to phase 3L2

Therefor unscrew the lower part of the middle front cover support.
Required tool: Torx TX30



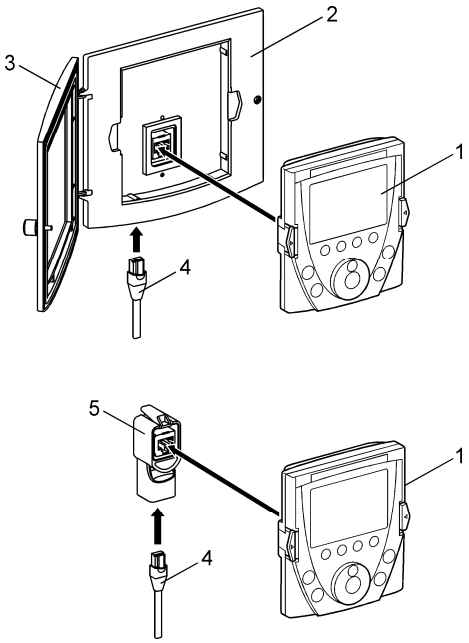
Options

Operating options

Door mounting kit

The door mounting kit enables the installation of the operating panel in the cubicle door (protection degree IP54). It allows an operation of the Active Infeed Converter with closed cubicle door and separates the position of the Active Infeed Converter AIC in the cubicle from the optimal height for handling.

An additional "IP65 transparent cover" helps to protect the made device settings against unintentional modifications whereas the operating state can be still read off.



1 Operating panel

2 Door mounting kit
Order number: VW3 A1 102

3 IP65 transparent cover
Order number: VW3 A1 103

4 Connecting cable operating panel – Active Infeed Converter AIC

Length 1 m:
Order number: VW3 A1 104 R10

Length 3 m:
Order number: VW3 A1 104 R30

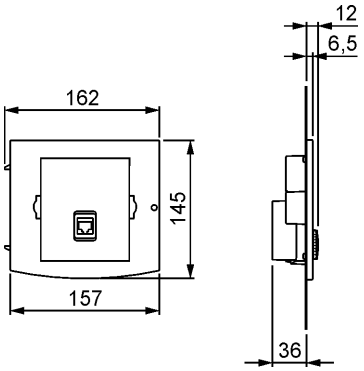
Length 5 m:
Order number: VW3 A1 104 R50

Length 10 m:
Order number: VW3 A1 104 R100

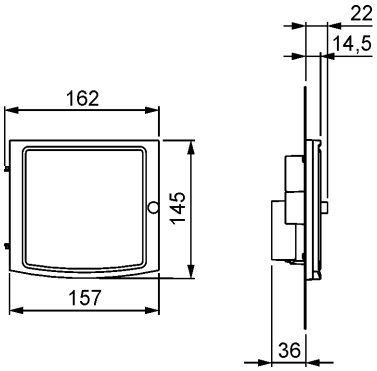
5 RJ45 adapter socket (socket / socket)
for connection between connecting cable and operating panel
Order number: VW3 A1 101

Dimensions in mm (in)

Remote mounting kit

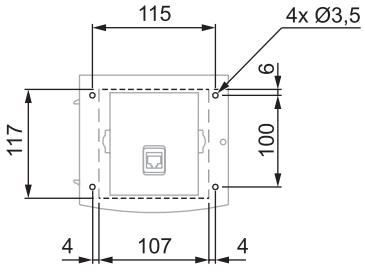


IP65 transparent cover



Drilling plan

Cut-out 117 x 107 mm

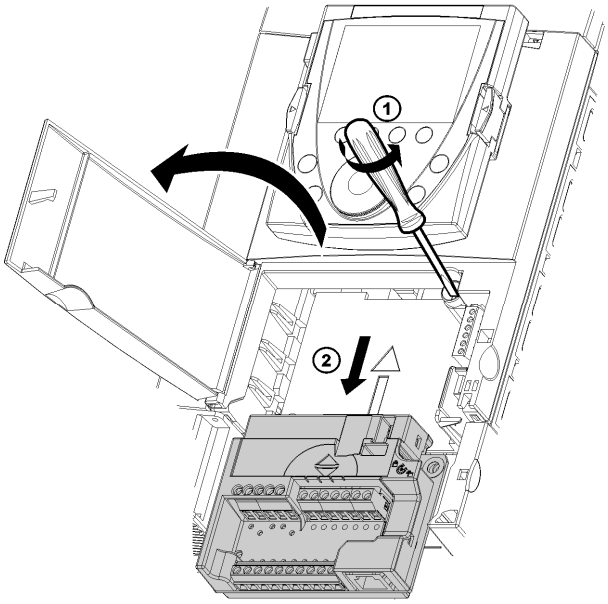


Thickness of sheet metal:
1.5...3 mm

NOTICE
The connecting cable for the door mounting kit can be connected to the front of the Active Infeed Converter AIC or to RJ45 plug at the control terminal board, alternatively. When it is connected to the plug at the control terminal board, the parameters for adjusting the Modbus must be set to the factory setting.

Control terminals

Access to the control terminals



Open the control trap (①) to get access to the control terminals.

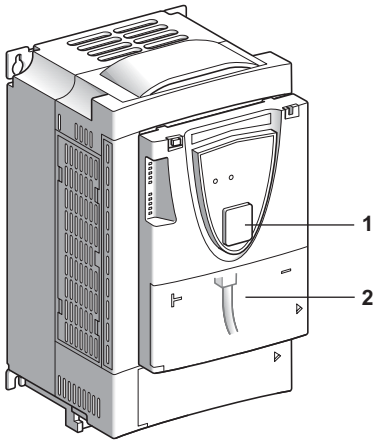
In order to simplify the wiring of the control part of the inverter it is possible to pull out the control terminal board.

Unscrew the screw until the spring is expanded (②). Pull out the option card (③) by pushing it downwards.

⚠ CAUTION
WRONG OR INADEQUATE MOUNTING After reassembling the control terminal board tighten the captive screw. **Failure to follow this instruction can result in injury or equipment damage.**

Control options

Fieldbus Modbus



The Active Infeed Converters AIC are equipped with a Modbus interface to control and monitor the drive as standard.

1. A RJ45 plug for the Modbus connection is at the front side of the AIC. It is used for the removable operating panel.
2. A RJ45 plug for the Modbus connection is at the control terminals of the Active Infeed Converter AIC. It is provided for control via a PLC or another control system. It is also possible to connect a terminal or diagnosis tool.

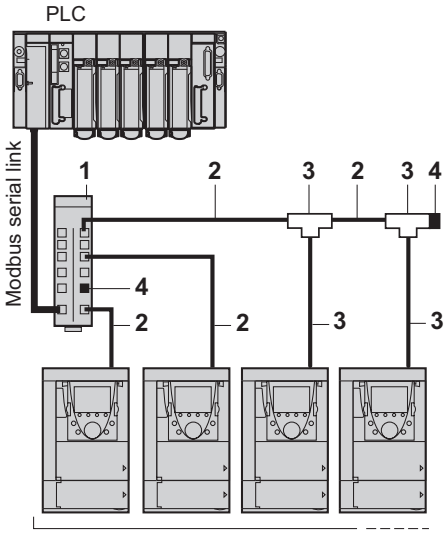
Technical data:

- Max. 247 subscribers in all segments
- Max. 32 subscribers including repeater per segment
- Max. 1000 m line length at 19.2 kBaud
- Bus cable: screened (shielded), 2 x twisted, two-wire line (typ. Cat5)
- Bus termination: serial connection of R = 120 Ω and C = 1 nF for each bus segment
- RJ45 port: screened (shielded), pin assignment 4, 5, 8
- No galvanic isolation

NOTICE
The Modbus interface cannot be used at the same time as the ADAP-CAN option!

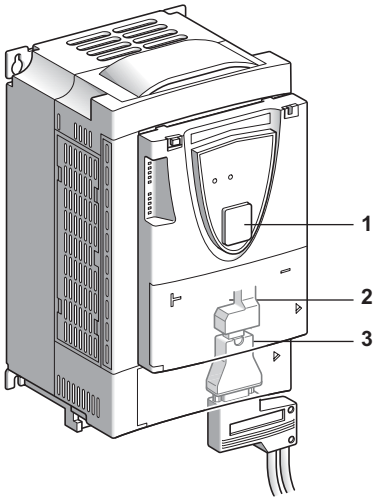
More information on the Modbus network and a precise description of the Modbus parameters can be found in the Modbus operating instructions.

Example for a Modbus network:



Accessories for Modbus connection				
No.	Designation	Brief description	Order number	Weight [kg (lb)]
1	Modbus splitter	Divides the Modbus signal into eight additional channels using a star configuration. Several Modbus splitters can be connected parallel.	LU9 GC3	0.500 (0.110)
2	Connecting cable	Pre-assembled RJ45 connecting cable 0.3 m (1 ft)	VW3 A8 306 R03	0.025 (0.055)
		Pre-assembled RJ45 connecting cable 1 m (3.3 ft)	VW3 A8 306 R10	0.060 (0.132)
		Pre-assembled RJ45 connecting cable 3 m (9.8 ft)	VW3 A8 306 R30	0.130 (0.287)
3	Modbus T-adapter	Modbus T-adapter with 0.3 m (1 ft) connecting cable	VW3 A8 306 TF03	0.190 (0.419)
		Modbus T-adapter with 1 m (3.3 ft) connecting cable	VW3 A8 306 TF10	0.210 (0.463)
4	Bus termination	Bus termination RC	VW3 A8 306 RC	0.010 (0.022)

Fieldbus adapter for CANopen



Active Infeed Converters AIC support the fieldbus system CANopen as standard. For the integration of the CANopen-typical Sub-D fieldbus connection, an optional CANopen adapter must be installed at the RJ45 interface next to the terminals of the Active Infeed Converter.

In the CANopen network the Active Infeed Converter AIC is operated as a slave.

1. A RJ45 plug for the Modbus connection is at the front side of the AIC. It is used for the removable operating panel.
2. A RJ45 plug for the Modbus connection is at the control terminals of the Active Infeed Converter AIC. It is provided for control via a PLC or another control system. It is also possible to connect a terminal or diagnosis tool.
3. The Sub-D fieldbus connection can be connected to the modbus interface using the CANopen adapter.

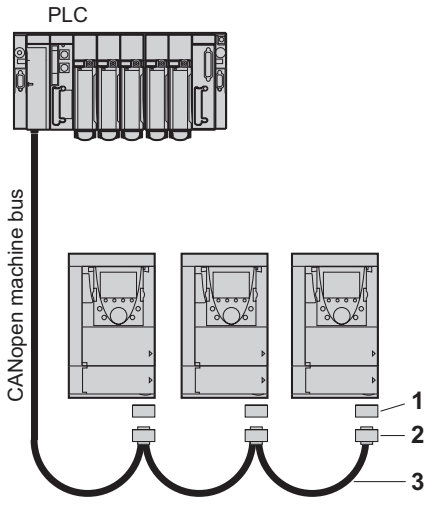
Technical data:

- Max. 32...126 subscribers (according to the CAN controller used)
- Bus cable: screened (shielded), twisted two-wire line
- Bus terminating resistor: R = 120 Ω (108…132 Ω)
- SUB-D port according to ISO 11898
- CAN interface according to CiA DS 102
- No galvanic isolation

NOTICE
The ADAP-CAN option cannot be used at the same time as the Modbus interface!

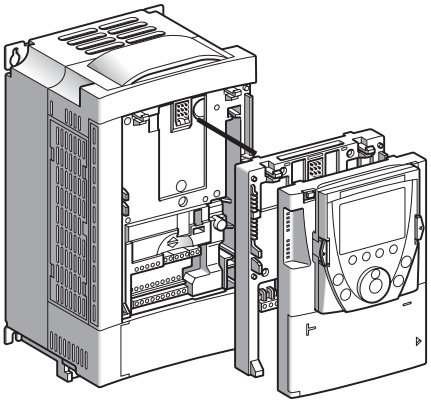
More information on the CANopen network and a precise description of the CANopen parameters can be found in the CANopen operating instructions.

Example for a CANopen network:



Accessories for CANopen connection				
No.	Designation	Brief description	Order number	Weight [kg]
1	CANopen adapter	RJ45/Sub-D adapter for connecting the Active Front End to a CANopen fieldbus system.	VW3 CAN A71	–
2	Plug connector	Connecting plug for CANopen fieldbus system	VW3 CAN KCDF 180T	–
3	Standard connecting cable	Pre-assembled standard connecting cable 50 m minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CA 50	4.930
		Pre-assembled standard connecting cable 100 m minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CA 100	8.800
		Pre-assembled standard connecting cable 300 m minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CA 300	24.560
3	UL connecting cable	Pre-assembled UL connecting cable 50 m self-extinguishing (IEC 60332-2)	TSX CAN CB 50	3.580
		Pre-assembled UL connecting cable 100 m self-extinguishing (IEC 60332-2)	TSX CAN CB 100	7.840
		Pre-assembled UL connecting cable 300 m self-extinguishing (IEC 60332-2)	TSX CAN CB 300	21.870
3	Connecting cable for difficult environment	Pre-assembled connecting cable 50 m for difficult ambient conditions or mobile installation. Minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CD 50	3.510
		Pre-assembled connecting cable 100 m for difficult ambient conditions or mobile installation. Minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CD 100	7.770
		Pre-assembled connecting cable 300 m for difficult ambient conditions or mobile installation. Minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CD 300	21.700

Logic extension card



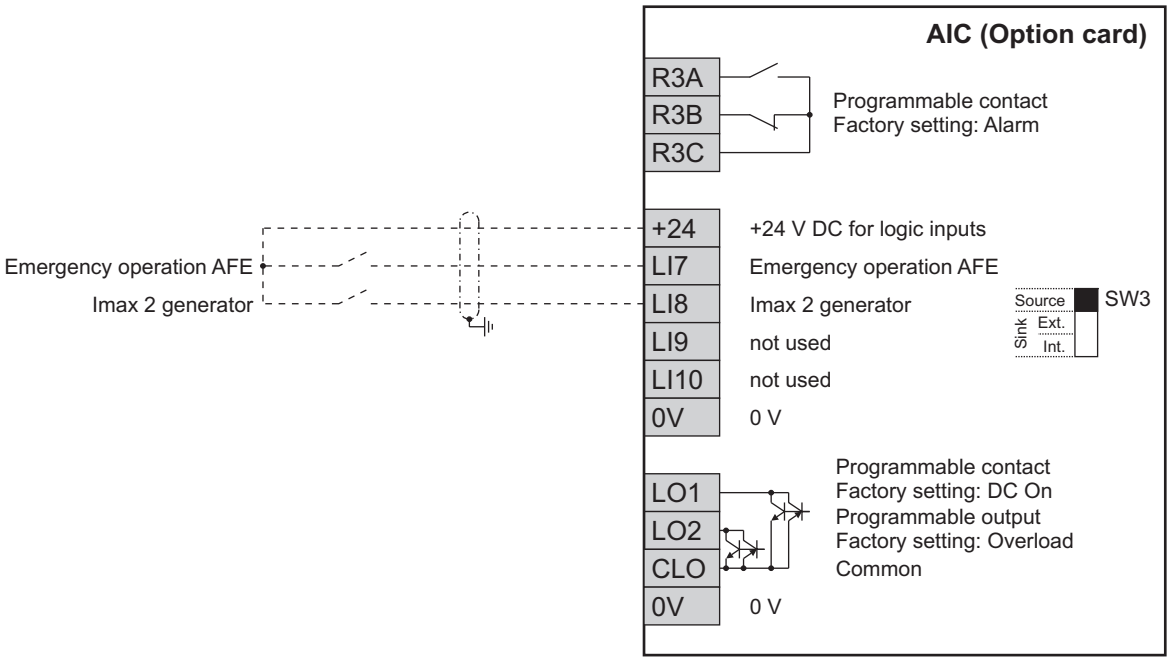
The Active Infeed Converters AIC are equipped with extensive control terminals as standard. As the Active Front End AFE is an option of an inverter, some inputs and outputs are already fixed in their function and usage.

For further functions the logic I/O extension card can be used.

Designation: Logic I/O extension card
Order number: VW3 A3 201

NOTICE
Only one I/O extension card can be installed in the Active Infeed Converter AIC.

With the I/O extension card (order number: VW3 A3 201) there are additional logic inputs and outputs as well as a relay output available.



Unlike the logic inputs of the basic device the inputs of the extension card can be switched between positive and negative logic using sliding switch SW3.
Parameters that belong to the outputs of the option cards are only available at the Active Infeed Converter when the card is plugged.

Specification of the control terminals at I/O extension card VW3 A3 201

Terminal	Designation	Specification
R3A R3B R3C	Relay output 3 (R3A N.O. contact, R3B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 7 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Voltage has to correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.
-10	Not used	–
+24	Sampling voltage for logic inputs (Sink/Source-switching with selector switch SW3)	– *Selector switch SW3 in position Source or Sink Int.:* +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 50 mA (incl. all options) – *Selector switch SW3 in position Sink Ext.:* Input for external voltage supply +24 V DC of the logic inputs
LI7	Emergency operation AFE	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 2 ms ±0.5 ms Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 SW3 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW3 at Sink Int. or Sink Ext.: High < 10 V DC, Low > 16 V DC
LI8	I max 2 generator	
LI9	Not used	
LI10	Not used	
0 V	Weight	0 V reference potential for logic inputs
LO1	Logic output LO1 (can be parameterized)	+24 V DC Open-Collector-Outputs, floating ground Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 Switching capacity max. 200 mA at 12...30 VDC Reaction time: 2 ms ±0.5 ms
LO2	Logic output LO2 (can be parameterized)	
CLO	Common	Reference potential of the logic outputs
0 V	Ground	0 V general use

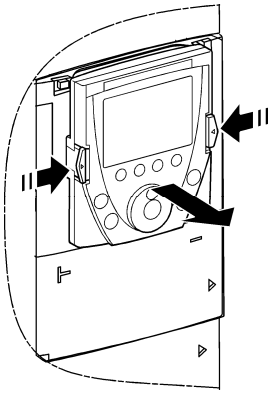
Maximum connection cross-section: 1.5 mm^2 (AWG16), 0.25 Nm (2.5 mm^2 (AWG14), 0.6 Nm for relay terminals)

Use screened (shielded) cables for all control wires and separate it from power cables.

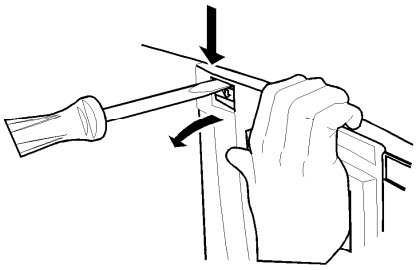
Installing of an option card

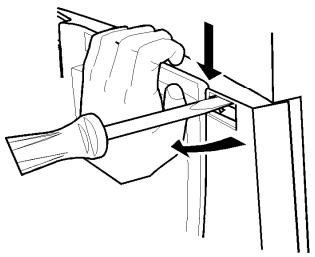
Installing of the option card is finished after a few steps.

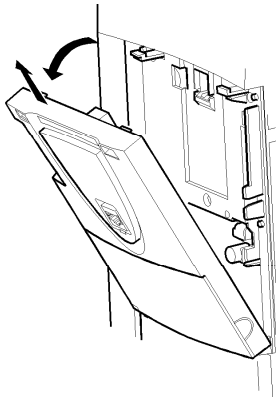
1. Remove the operating panel from the front side of the device.



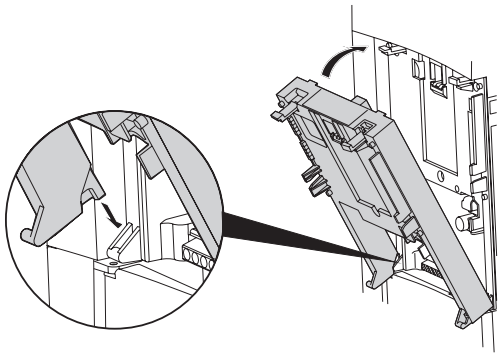
2. Remove the front cover of the device by releasing both mechanical interlocks.

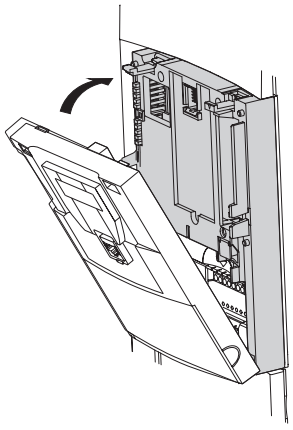


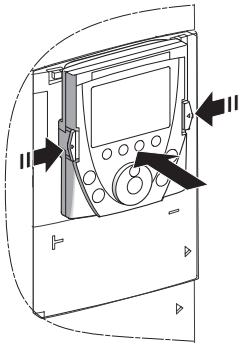




3. Mount the option card.







⚠ CAUTION

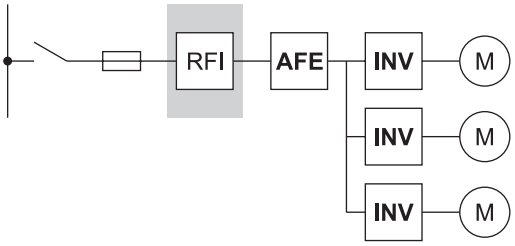
DAMAGE OF THE COMPONENT

Only install the option card when there is no voltage.

Failure to follow this instruction can result in injury or equipment damage.

External options

Radio frequency interference filter RFI



The Active Front End units include a radio frequency interference filter for use in industrial environments according to EN 61800-3 category C3 as standard.

For applications in "1st environment - residential environments" of category C2, when several inverters INV are operated at the DC bus and in case of long motor cables, the use of the additional RFI filters is required. These filters are connected at the mains side of the Active Front End.

NOTICE

The determining factor for the radio frequency interference filters to be effective is a HF connection as good as possible between motor, motor cable screen, inverter components, line filter module and filter!

⚠ CAUTION

RISK OF DAMAGE OF THE RFI-FILTER

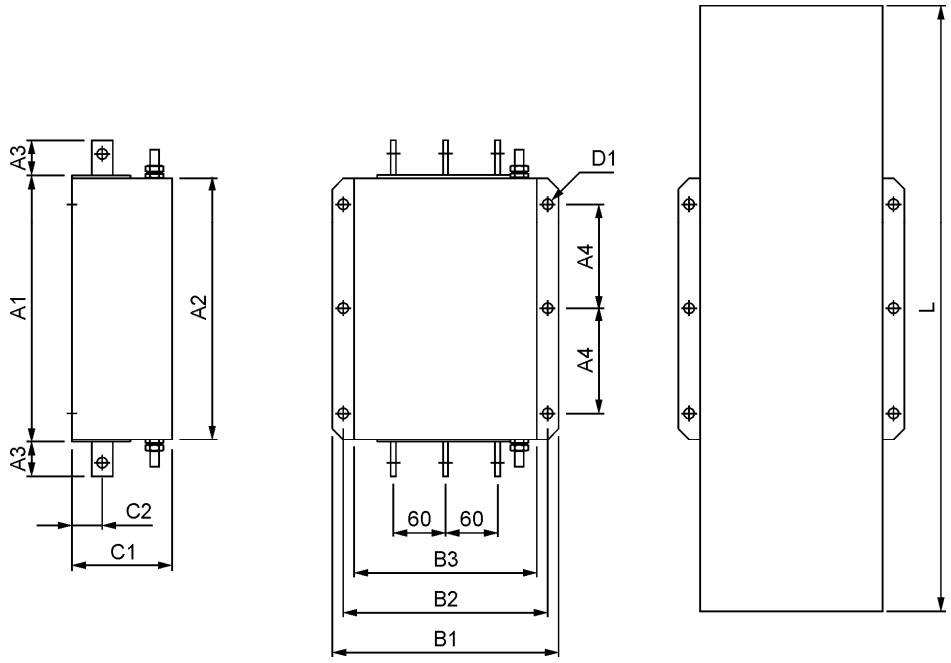
The RFI filters are not qualified for nongrounded (IT) mains and not qualified for "Corner Grounded Networks".
Do not use these filters for nongrounded mains.

Failure to follow this instruction can result in injury or equipment damage.

	General technical data
Operating voltage RFI 480	3AC 380 V -15 % ... 480 V +10 %
Nominal frequency	50/60 Hz ±5 %
Overload capability	150 % for 60 s per 10 min, 200 % for 2 s
Ambient temperature	-10...+50°C, up to 60°C with derating
Storage temperature	-40...+70°C
Altitude	0...1000 m, up to 3000 m with derating
Vibration resistance	1.5 mm at 3...13 Hz, 1 g at 13...200 Hz according to IEC/EN 60068-2-6
Shock resistance	15 g for 11 ms according to IEC/EN 60068-2-27
Approvals	CE, UR, GOST

Allocation table			
Description	AFE	Order number	Weight [kg]
RFI filter 400V	4V120 ... 4V175	VW3 A4 410	13.000
	4V240 ... 4V340	VW3 A4 411	15.000
	4V430 ... 4V675	2x VW3 A4 411	30.000

	Radio frequency interference filter	
	RFI 480/300-TN	RFI 480/600-TN
Order number	VW3 A4 410	VW3 A4 411
Nominal current	300 A	580 A
Max. leakage current	350 mA	350 mA
Cont. leakage current	3 mA	3 mA
Protection degree	IP00, with protection against contact	
Losses	60 W	125 W
Weight	13 kg	15 kg
Dimension A1	306 mm	306 mm
Dimension A2	300 mm	300 mm
Dimension A3	40 mm	95 mm
Dimension A4	120 mm	120 mm
Dimension B1	260 mm	260 mm
Dimension B2	235 mm	235 mm
Dimension B3	210 mm	210 mm
Dimension C1	135 mm	135 mm
Dimension C2	65 mm	65 mm
Protective cover L	800 mm	800 mm
Fixing D1	6x ∅ 12 mm	6x ∅ 12 mm
Connection bar	25x 6 mm 1x M10	32x 8 mm 2x M10
PE connection	M12	M12



Commissioning

Commissioning procedure

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read the safety notes in chapter "Safety informations", page 3 completely and carefully before commissioning.

Failure to follow these instructions will result in death or serious injury.

Check power wiring

- The mains supply must be connected to the terminals 1L1 / 1L2 / 1L3 at the Line Filter Module LFM.
- The Line Filter Choke LFC is connected between the Line Filter Module (at the terminals 2L1 / 2L2 / 2L3) and the Active Infeed Converter AIC (at the terminals 3L1 / 3L2 / 3L3).
  For 400 V devices 430 kW (577 HP) and for 500/690 V devices from 540 kW (724 HP) and larger, there are two Line Filter Modules and two Line Filter Chokes connected in parallel.
- The values of the main fuses correspond to the table in chapter "Fuses and cable cross sections" in the Mounting Instructions found on the CD-Rom.
- The drive must be connected before commissioning.
- Check whether there is no reverse polarity, no short circuit and no ground (earth) fault in the dc connection between the Active Infeed Converter and the drive.

Check control and power wiring

- The fan supply of the Active Infeed Converter AIC is properly connected to the Line Filter Module LFM (terminal strip X1 / terminal 1 / 2 / 3).
- The fan supply between the drive and the Line Filter Module LFM is established (terminal strip X1 / terminal 4 / 5 / 6).
- The plugs on the "Fan-Supply-Board" of the drive are connected in the right position (see mounting instructions chapter "Fan supply").
- The control wires (W2 and W3) of the Active Infeed Converter AIC are connected to the Line Filter Module LFM (X2 / X3).
- For parallel operation of Active Front End units, the synchronization line has to be established.

Check the RFI-filter

- Verify the setting of the integrated RFI-filter in the Line Filter Module LFM corresponds to the mains (TT, TN or IT, Corner Grounded).
- Check, if the integrated RFI-filter in the Active Infeed Converter AIC and inverters INV are in the position "nongrounded".

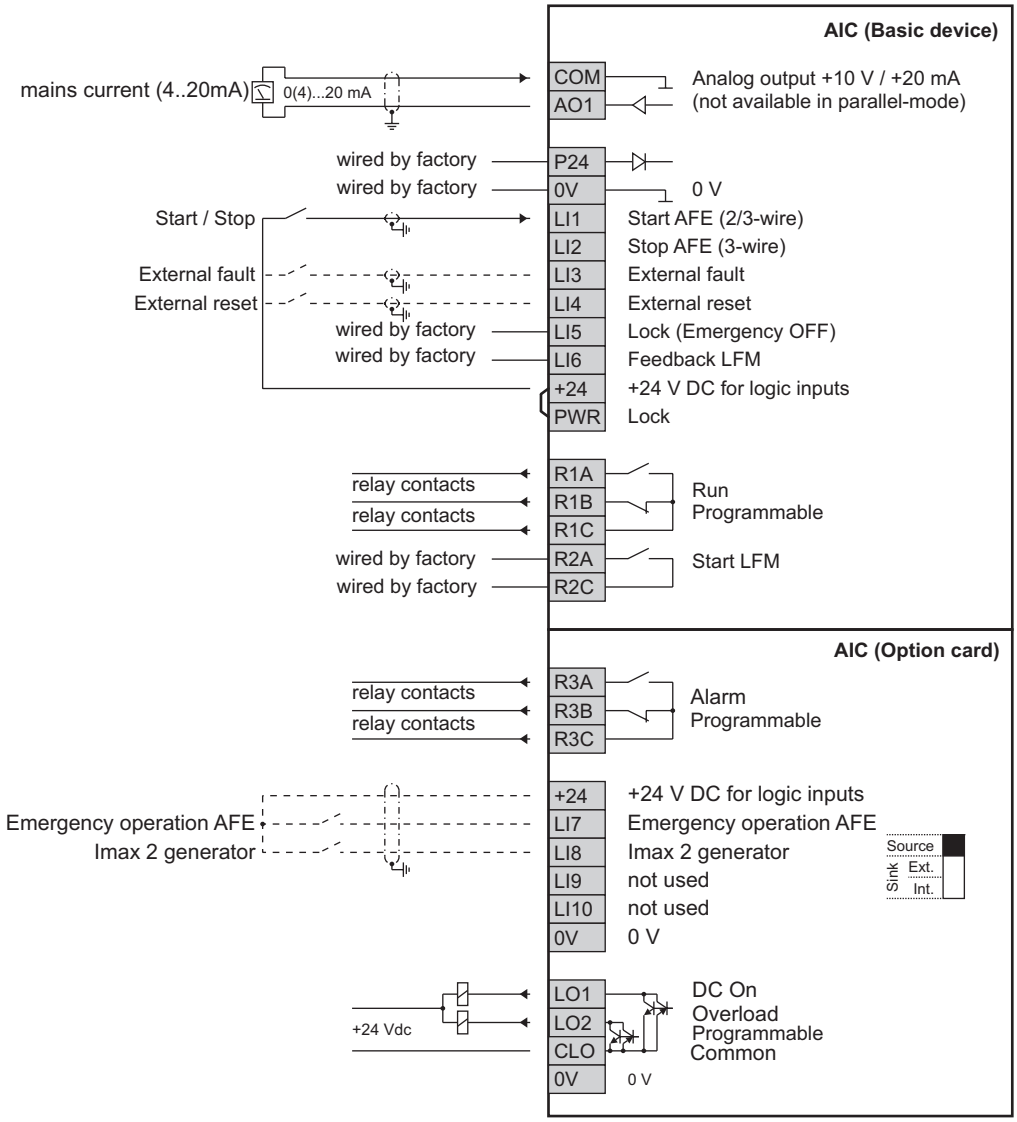
Switch on mains voltage and make parameter settings

- Switch on mains.
- Adjust the parameter 2.1.01 [Mains voltage] on the Active Infeed Converter according to the mains voltage used.
- Adjust the parameter UrES [Mains voltage] on the drive(s) according to the mains voltage used.
- Activate the parameter AFE [Regen. connection] on the drive(s).
- Further settings at the inverter, see chapter "Parameter settings", page 81.

Factory setting

The Active Front End is factory-set for the most common operating conditions:

- Supply voltage: 480V / 690V
- Control source: 2-wire (level rated)



- Display
  - Selection upper field: mains current AFE [%]
  - Selection lower field: effective power [kW]
- External fault
  - Ext. fault monitoring: N.O. always active
  - Ext. fault reaction: adjustable time delay
- Fault management
  - Autoreset: active (only for line fault or input phase loss)
- Parallel operation: no parallel operation

NOTICE
Further functions as well as a detailed description of the setting possibilities are given in the Description of functions Altivar AFE.

Settings at the inverter

Software

The ATV61/71 frequency inverters with the following software versions are able to operate with an Active Front End. The necessary parameters can only be read on the graphic display terminal

Altivar 61

Menu [1.11 IDENTIFICATION]

- **[APPL. SOFTWARE]** = B2.1IE20 or higher
- **[MC-SOFTWARE]** = A2.3IE34, P1.5IE20 or higher
- **[PRODUCT]** = V2.1IE23 or higher

Altivar 71

Menu [1.11 IDENTIFICATION]

- **[APPL. SOFTWARE]** = A3.3IE40 or higher
- **[MC-SOFTWARE]** = A2.3IE34, P1.5IE20 or higher
- **[PRODUCT]** = V3.3IE43 or higher

Altivar 71...383

Menu [1.11 IDENTIFICATION]

- **[APPL. SOFTWARE]** = D3.4IE41 or higher
- **[MC-SOFTWARE]** = C2.4IE35, P1.5IE20 or higher
- **[PRODUCT]** = V3.4IE44 or higher

Parameter settings

Required settings at the inverter

It is absolutely necessary to make the following settings for all drives connected to an Active Front End:

- AFE **[Regen. connection] in menu [1.7 APPLICATION FUNCT.] (FUn-)**
  in submenu [REGEN. CONNECTION] (OIr-)
  Setting: [Yes] (YES)
  Thereby the undervoltage level of the frequency inverter is adapted to the operation with the Active Front End.
  Please contact your local drive support if this parameter is not available in the parameter list of your device.

- brA **[Braking balance] in menu [1.7 APPLICATION FUNCT.] (FUn-)**
  in submenu [RAMP TYPE] (rPt-)
  Setting: [No] (nO)

- dEC **[Deceleration] in menu [1.7 APPLICATION FUNCT.] (FUn-) in submenu [RAMP TYPE] (rPt-)**
  For dynamic processes a very short deceleration ramp can cause an overload on the DC-bus with an overvoltage fault shut-down.
  This can be prevented by an extension or rounding of the deceleration ramp (parameters tA3 [Begin Dec round]; tA4 [End Dec round]).

- UrES **[Mains voltage] in menu [1.8 FAULT MANAGEMENT] (FLt-) in submenu [UNDERVOLTAGE MGT.] (USb-)**
  Same setting as the Active Front End.
  This allows the internal voltage of the drive to be compatible with the Active Front End.

- IPL **[Input phase loss] in menu [1.8 FAULT MANAGEMENT] (FLt-) in submenu [INPUT PHASE LOSS] (OPL-)**
  Setting: [Ignore] (nO)

- bUb **[Brake res. fault Mgt] in menu [1.8 FAULT MANAGEMENT] (FLt-) in submenu [BU PROTECTION] (bUF-)**
  Setting: [Ignore] (nO)

- tCt **[2 wire type] in menu [1.5 INPUTS/OUTPUTS CFG] (I-O-)**
  Setting: [Level] (LEL)
  In order to ensure an automatic restart by the AFE after an undervoltage recognition. An automatic restart is only possible with 2-wire control.

- **RFI filter**
  The integrated RFI filter has to be deactivated (position IT, ungrounded, and Corner Grounded mains) at all devices because there is no direct mains connection of the drive when used with an Active Front End.

⚠ CAUTION

INCORRECT SETTINGS AT THE INVERTER

Be sure that all drives which are connected to the Active Front End comply to the parameter settings listed above.

Failure to follow this instruction can result in injury or equipment damage.

NOTICE

The 24 V control voltage of the Active Front End AFE can also be used to buffer the control electronics of the frequency inverter.

NOTICE

When the frequency inverter is supplied via the DC link an external supply for the device fans is required.

Using the LFM (line filter module) it is possible to supply the fans for 4 additional drives (with the same power as the AIC).

Appendix

Conversion to US units

Length	
[mm] to [in]	$\frac{1\ mm}{25.4} \Rightarrow 0.039\ in$
[m] to [ft]	$\frac{1\ m}{0.3048} \Rightarrow 3.2808\ ft$
Area	
[dm²] to [sq.in]	$\frac{1\ dm^2}{0.3048} \Rightarrow 15.5\ sq.in$
Weight	
[kg] to [lb]	$\frac{1\ kg}{0.45359237} \Rightarrow 2.2046\ lb$
Temperature	
[°C] to [°F]	$1°C \times 1.8 + 32 \Rightarrow 33.8\ °F$
Flow rate	
[m³/h] to [cfm]	$1\ m^3/h \times 0.58867 \Rightarrow 0{,}58867\ \ cfm$
Torque	
[Nm] to [lb.in]	$1\ Nm \times 8.8505 \Rightarrow 8.8508\ \ lb.in$

Schneider Electric Power Drives GmbH

Ruthnergasse 1
A-1210 Vienna
Phone: +43 (0) 1 29191 0
Fax: +43 (0) 1 29191 15

Design: Schneider Electric Power Drives
Photos: Schneider Electric Power Drives