Altivar AFE

Active Front End
Option for Altivar 61 & Altivar 71

Configuration guide for 120...860 kW

07/2013

8 P02 513 EN.04/04

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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.

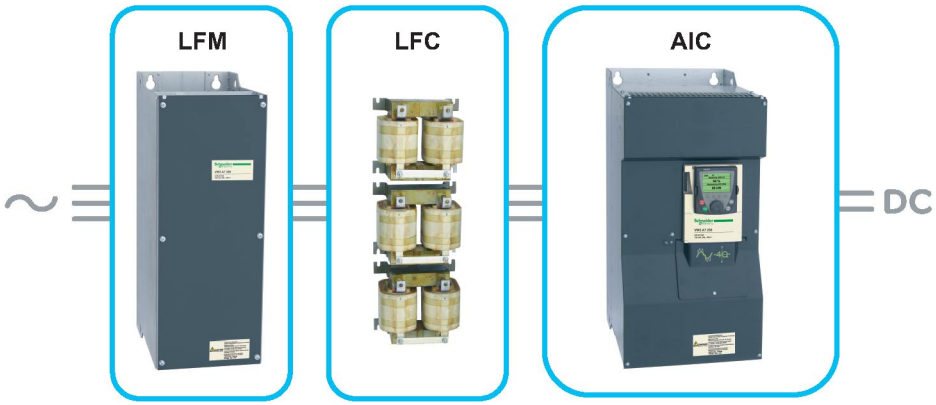
Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

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

Aktive Netzeinheit Altivar AFE

Configuration guide for 120...860 kW

Product	**Active Front End AFE**



Brief description	The Active Front End is used to reduce the mains current harmonics as well as to return excess energy to the mains. Consequently it is possible to save energy by reducing the share of reactive power and the costs can be reduced because the accumulating energy is returned to the mains.
Power range	120...860 kW
Voltage ranges	3 AC 380…480 V (120...675 kW) 3 AC 480 V (120...675 kW) 3 AC 500...690 V (145...860 kW)
Mains frequency	50 / 60 Hz ±5 %
Interfaces	Removable operating panel, control terminals can be extended, fieldbus connection via Modbus or CANopen
Protection degree	Built-in units IP00
Components	Active Infeed Converter AIC Line Filter Module LFM Line Filter Choke LFC
Further reading	This catalogue contains information about project planning and order of the Active Front End. Further information about mounting are given in the mounting instructions and information about parameterization in the Description of functions.

The Active Front End allows energy regeneration

The Active Front End is an option for the frequency inverter to return energy to the mains.
It provides 4-quadrant operation and thus it is well qualified for all applications with generator operating mode.

Special features

The Active Front End is a supply and regeneration unit that provides a constant DC voltage supply independent of the load situation. At this DC bus one or several inverters can be operated. In this way up to four Active Front End units can be connected to this DC bar in parallel in order to improve the redundancy and to increase the total power.

Mains interferences / mains conditions

- Power factor cos Phi ≈ 1 (also with partial load and at energy regeneration)
- No converter transformer required
- Mains voltage drops up to 40 % without interruption of operation
- Wide mains frequency range permitted
- Adjustable regenerating power e.g. for operation with diesel generator
- Mains short circuit power up to 100 kA permitted

Simple planning and installation

- Line contactor already integrated
- No external control voltage supply necessary
- Integrated charging circuit for max. fourfold power at the DC bus
- Operation independent of the phase sequence
- Optimised administration of spare parts due to equal components in the Active Infeed Converter and the inverter

Energy-saving operation

- Energy regeneration to the supplying mains
- Improved efficiency due to innovative control system
- No damping resistors with heavy losses required and thus it is especially robust in respect of heavily distorted mains voltages.

Typical applications

Crane applications (hoists, long-travels, …)
Downhill conveyors, winches, escalators
Complex drive systems
Test benches and high dynamic drives
Pump / turbine combinations

Applications

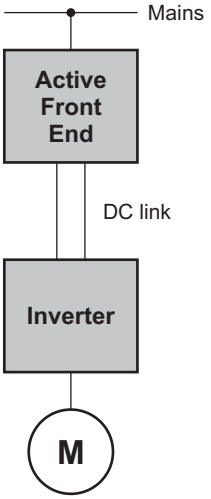
The Active Front End is equipped with numerous integrated functions and thus it meets the sophisticated demands in industry, machine building and automation.

The design allows the simple use in combination with an inverter as well as building up a common DC bus for a multitude of drives.

The Active Front End is connected upstream to the standard frequency inverter and consists of three components:

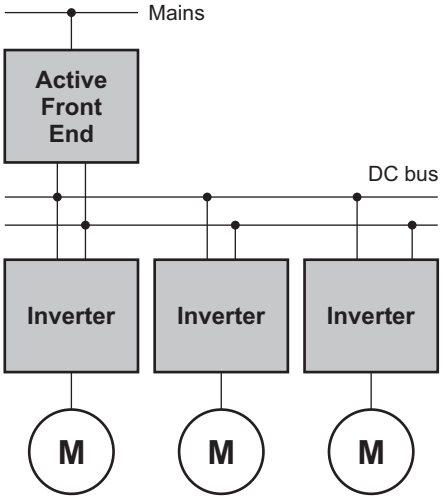
- Active Infeed Converter
- Line Filter Module (EMC filter, line contactor and charging circuit)
- Line Filter Choke (3 parts)

Single drive



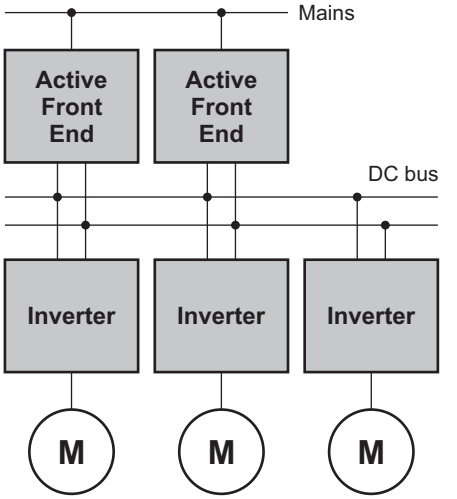
When adding an Active Front End to a standard drive the arising energy (e.g. when lowering a load) is returned to the mains.

Common DC bus



The supply via a common DC bus is often a appropriate solution for group drives (e.g. at sheet metal processing machines, roller conveyors or test benches). In this case the total power of the inverters can be fourfold higher than the nominal power of the Active Front End.

Active Font End units parallel



The parallel connection of up to four Active Front End units is used to increase the reliability due to redundancy and furthermore it enables increase of power or the use of smaller Active Front End units.

General technical data

Voltage / frequency	380...400 V / 440 V / 480 V ±10 %:	50/60 Hz ±5 % (30...70 Hz for short periods)
	500...525 V ±10 %:	50 Hz ±5 %
	575...600 V / 690 V ±10 %:	50/60 Hz ±5 % (30...70 Hz for short periods)
Overvoltage class	Category III	
Power range	120...860 kW	
Overload	+20 % for 60 seconds per 10 minutes	
Operating temperature	-10...+45 °C (+60 °C with 1% derating per °C)	
Protection degree	IP00	
Control concept	Controllable via terminals, CANopen bus or Modbus built-in	
Approvals	CE, UL, CSA, GOST, C-Tick, DNV, BV	

AFE-type 400V	**120**	**145**	**175**	**240**	**275**	**340**	**430**	**540**	**675**
AFE input current in A	177	212	255	348	395	495	628	780	980
DC power (400 V) in kW	120	143	172	238	268	336	425	530	665

AFE-type 480V (UL)	**120**	**145**	**175**	**240-13**	**275**	**340**	**430-15**	**540-15**	**675**
AFE input current in A	160	200	200	348	395	495	628	780	980
DC power (480 V) in kW	130	162	162	277	315	390	490	610	770

AFE-type 690V	**145**	**175**	**220**	**275**	**340**	**430**	**540**	**675**	**860**
AFE input current in A	120	150	185 (160)[1)]	228	285	360	450	563	715
DC power (500 V) in kW	102	127	157	193	242	305	382	478	607
DC power (600 V) in kW	123	153	162	230	290	365	460	575	730
DC power (690 V) in kW	142	172	215	268	335	424	528	663	842

1) only valid for DC power (600V)

The Active Front End allows sinusoidal mains current

The Active Front End is used when drives should contain mains harmonics particularly low.
State-of-the-art components, a new control concept as well as a top-quality filter module reduce the total current distortion factor THD(i) to a value less than 4 %.

Special features

In combination with the well-proven frequency inverters Altivar 61 & 71 the Active Front End represents a "Low Harmonic Drive" for almost all applications.

Mains interferences / mains conditions

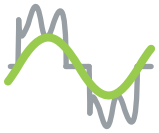
- THD(i) less than 4 %
- No converter transformer required
- Integrated radio frequency interference filter according to EN 61800-3 category C3
- Power factor cos Phi 1 independent of the load situation and the energy direction
- Mains voltage drops up to 40 % without interruption of operation
- Wide mains frequency range permitted
- Operation at a diesel generator possible
- Mains short circuit power up to 100 kA permitted

Simple planning and installation

- Line contactor already integrated
- No external control voltage supply necessary
- Operation independent of the phase sequence
- Optimised administration of spare parts due to equal components in the Active Infeed Converter and the inverter

Energy-saving operation

- Improved efficiency due to innovative control system
- No damping resistors with heavy losses required and thus it is especially robust in respect of heavily distorted mains voltages.
- Reduction of transformer losses, wiring and switching devices



Typical applications

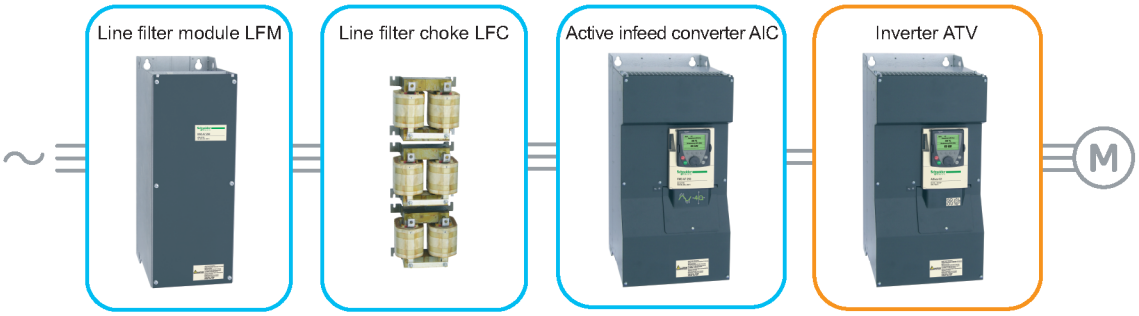
Pumps
Fans
Conveyor belts
Compressors

Applications / capabilities / design

The Active Front End with quite simple construction is quickly set up. All control connections are pre-assembled and clearly marked. Usually it is sufficient to adjust the existing mains voltage for parameterization of the whole Active Front End.

The Active Front End is connected upstream to the standard frequency inverter and consists of three components:

- Active Infeed Converter
- Line Filter Module (EMC filter, line contactor and charging circuit)
- Line Filter Choke (3 parts)



General technical data

Voltage / frequency	380...400 V / 440 V / 480 V ±10 %: 500...525 V ±10 %: 575...600 V / 690 V ±10 %:	50/60 Hz ±5 % (30...70 Hz for short periods) 50 Hz ±5 % 50/60 Hz ±5 % (30...70 Hz for short periods)
Overvoltage class	Category III	
Power range	120...860 kW	
Overload	+20 % for 60 seconds per 10 minutes	
Operating temperature	-10...+45 °C (+60 °C with 1 % derating per °C)	
Protection degree	IP00	
Control concept	Controllable via terminals, CANopen bus or Modbus built-in, other field busses via option cards	
Standards	Devices are designed, built and tested on the basis of EN 61800-5-1	
Approvals	CE, UL, CSA, GOST, C-Tick, DNV, BV	

Inverter		Active Front End			
Altivar 71	Altivar 61	Type	AIC	LFM	LFC
up to ATV71HD90N4D	up to ATV61HC11N4D	400V 120kW	VW3A7250	VW3A7260	VW3A7265
ATV71HC11N4D	ATV61HC13N4D	400V 145kW	VW3A7251	VW3A7261	VW3A7266
ATV71HC13N4D	ATV61HC16N4D	400V 175kW	VW3A7252	VW3A7261	VW3A7266
ATV71HC16N4D	ATV61HC22N4D	400V 240kW	VW3A7253	VW3A7262	VW3A7267
ATV71HC20N4D	ATV61HC25N4D	400V 275kW	VW3A7254	VW3A7262	VW3A7267
ATV71HC25N4D	ATV61HC31N4D	400V 340kW	VW3A7255	VW3A7262	VW3A7267
ATV71HC28N4D...C31N4D	ATV61HC40N4D	400V 430kW	VW3A7256	2xVW3A7262	2xVW3A7267
ATV71HC40N4D	ATV61HC50N4D	400V 540kW	VW3A7257	2xVW3A7262	2xVW3A7267
ATV71HC50N4D	ATV61HC63N4D	400V 675kW	VW3A7258	2xVW3A7262	2xVW3A7267
up to ATV71HD90N4D	up to ATV61HC11N4D	480V 120kW	VW3A7250	VW3A7260	VW3A7265
ATV71HC11N4D	ATV61HC13N4D	480V 145kW	VW3A7251	VW3A7261	VW3A7266
ATV71HC13N4D	-	480V 175kW	VW3A7252	VW3A7261	VW3A7266
ATV71HC16N4D	ATV61HC16N4D...C22N4D	480V 240kW	VW3A7283	VW3A7262	VW3A7267
ATV71HC20N4D	ATV61HC25N4D	480V 275kW	VW3A7254	VW3A7262	VW3A7267
ATV71HC25N4D	ATV61HC31N4D	480V 340kW	VW3A7255	VW3A7262	VW3A7267
ATV71HC28N4D...C31N4D	ATV61HC40N4D	480V 430kW	VW3A7286	2xVW3A7262	2xVW3A7267
ATV71HC40N4D	ATV61HC50N4D	480V 540kW	VW3A7287	2xVW3A7262	2xVW3A7267
ATV71HC50N4D	ATV61HC63N4D	480V 675kW	VW3A7258	2xVW3A7262	2xVW3A7267
ATV71HC11Y [1]	ATV61HC11Y and HC13Y [1]	690V 145kW	VW3A7270	VW3A7263	VW3A7268
ATV71HC13Y [1]	ATV61HC16Y [1]	690V 175kW	VW3A7271	VW3A7263	VW3A7268
ATV71HC16Y [1]	ATV61HC20Y [1]	690V 220kW	VW3A7272	VW3A7263	VW3A7268
ATV71HC20Y [1]	ATV61HC25Y [1]	690V 275kW	VW3A7273	VW3A7264	VW3A7269
ATV71HC25Y [1]	ATV61HC31Y [1]	690V 340kW	VW3A7274	VW3A7264	VW3A7269
ATV71HC31Y [1]	ATV61HC40Y [1]	690V 430kW	VW3A7275	VW3A7264	VW3A7269
ATV71HC40Y [2]	ATV61HC50Y [2]	690V 540kW	VW3A7276	2xVW3A7264	2xVW3A7269
ATV71HC50Y [2]	ATV61HC63Y [2]	690V 675kW	VW3A7277	2xVW3A7264	2xVW3A7269
ATV71HC63Y [2]	ATV61HC80Y [2]	690V 860kW	VW3A7278	2xVW3A7264	2xVW3A7269

1.) ... additionally 1 piece of option Fan Wiring 6V (VW3 A7 280) has to be ordered

2.) ... additionally 2 pieces of option Fan Wiring 6V (VW3 A7 280) have to be ordered

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.

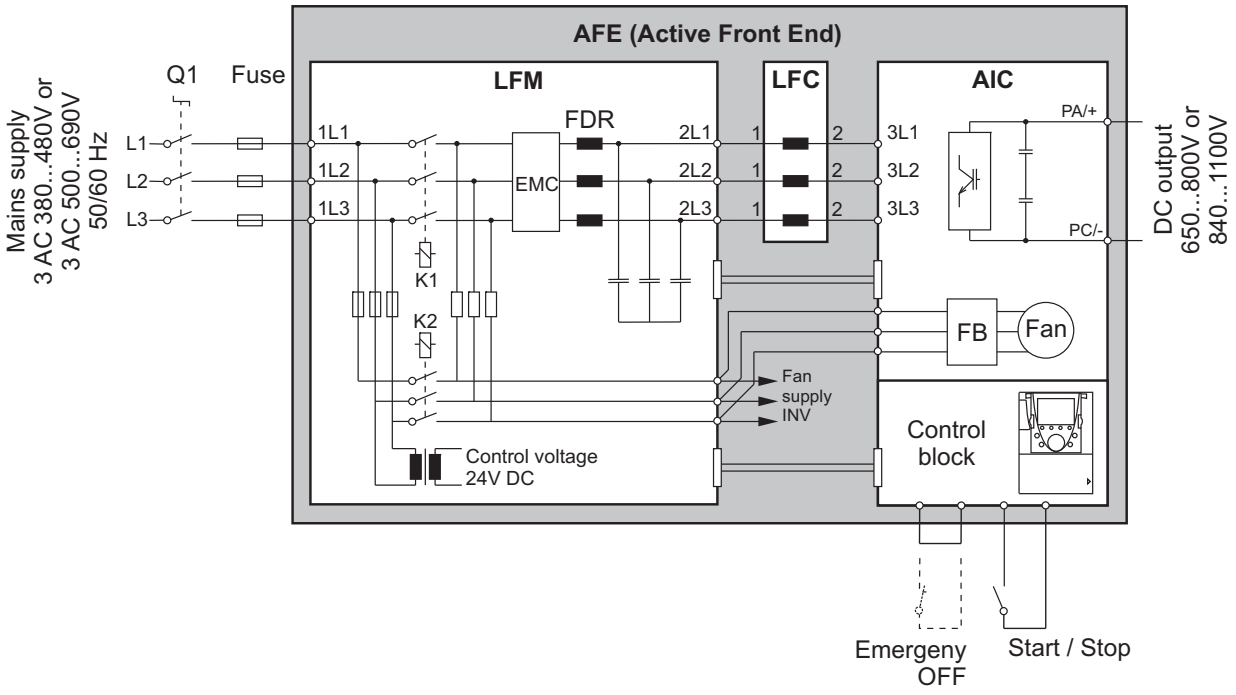
The Active Front End AFE is an option for the Altivar 61/71 drives. With this option, it is possible to return the braking energy to the mains. Therefore, it enables a 4-quadrant operation of the drive (motor and generator operation in both directions of rotation).

The Active Front End provides significant energy savings for crane hoisting, test benches, winches, and other application with frequent generator loads. Reduction in operating costs from the energy saved can result in a return on investment as short as a few months.

The Active Front End operates with high pulse frequency and carries a sinusoidal mains current. In addition to the possibility of energy regeneration, it is also an alternative for active and passive filters. By using the Active Front End, the THD(i) of the drive is reduced to a value less than 4 %.

The Active Front End AFE is connected in front of the frequency inverter and consists of several components:

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



In addition to the filter elements, the Line Filter Module LFM contains all components of the charging circuit, the main contactor (line contactor), the supply of all device fans, and the required supply units for the control voltages. For the control connections between the individual components, pre-assembled cables are included with the Active Front End.

⚠ CAUTION

INCOMPATIBLE DRIVES

Only the following devices can be used with the Active Front End AFE:

ATV61H075N4 … HC63N4
ATV61HC11Y … HC80Y
ATV61EX●●D90N4 … M14N4
ATV61EX●●D90N … M18N
ATV61EX●●C11Y … M24Y

ATV71H075N4 … HC50N4
ATV71HC11Y … HC63Y
ATV71EX●●D90N4 … M13N4
ATV71EX●●D90N … M15N
ATV71EX●●C11Y … M20Y

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

Robustness of the Active Front End

Due to a new control concept the Active Front End operates independent of the applied rotary field. At the same time this control concept enables operation without damping resistors, whereby reliability is given also in case of distorted mains voltages and also the heat losses are significantly reduced.

The line filter module is suitable for operation at mains up to a mains short-circuit current of 100 kA.
An EMC filter with EMC category C3 is integrated. For higher requirements an additional EMC filter can be connected upstream.

Our high degree of quality awareness ranges from the basic requests in the product specification over the development of the cooling system, of the mechanical design, of the electrical circuit diagram and the individual functions up to the production of the device. This quality level is also long-term improved by means of the corresponding quality assurance systems in the individual business processes and is certified every year by independent authorities according to DIN EN ISO 9001:2000 and ISO 14001:2004.

Low harmonic drive – 1:1 application

The Altivar 61/71 standard frequency inverter becomes a "Low Harmonic Drive" by connecting the Active Front End in series. By this way it reaches a THD(i) value smaller than 4 % and fulfills the requirements according to the recommendations in IEEE 519 to reduce the current harmonics in the mains.

Assembling and connecting the components to a complete drive is simply possible by pre-assembled connecting lines and a well-structured concept. Optimal presettings and a very simple control concept are the reason for blindingly easy commissioning.

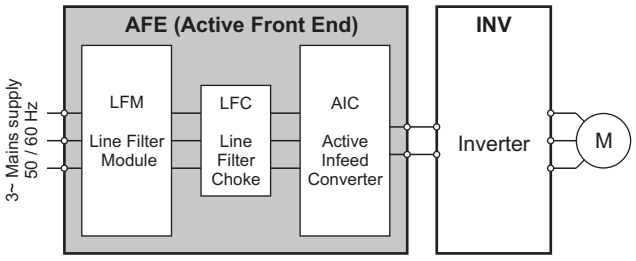
As the inverter and the Active Infeed Converter have similar hardware structure, about 90 % of the spare parts are identical.

No additional fuses are required in the DC link.

4-quadrant single drive – 1:1 application

For the 1:1 application typically **one** Active Front End AFE and **one** inverter INV (= standard frequency inverter Altivar 61/71) of same size are interconnected. Thus they form a fully-fledged 4-quadrant-drive with variable energy and speed direction. The accumulating generator energy e.g. due to lowering a load or braking of a drive is returned to the mains.

Changing from motor to generator operation occurs without interruption, with any frequency and duration. For instance, a downhill conveyor often works in a permanent interplay of the load affected by the current load of the conveyor. Also a 24-hours continuous operation in generator power range is possible for the Active Front End.



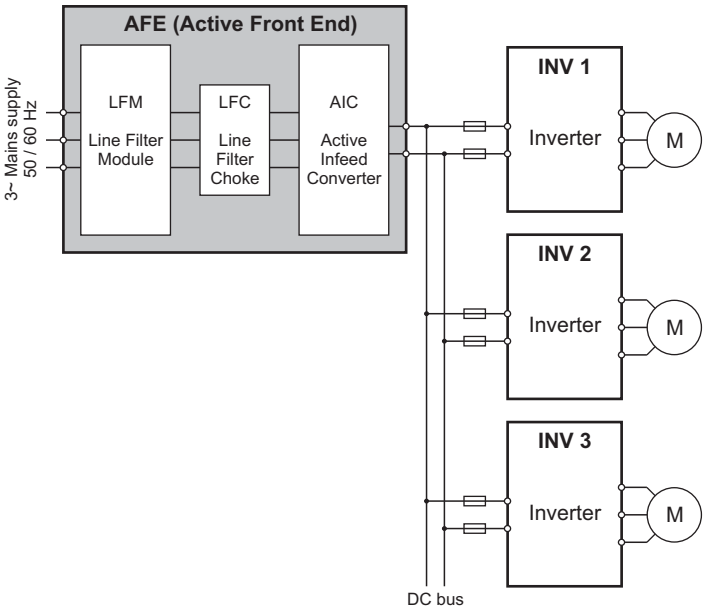
In case of the 1:1 application the Active Infeed Converter is connected with the inverter only via the DC link.

Therefor no additional fuses are required in the DC link.

As the inverter and the Active Infeed Converter have similar hardware structure, about 90 % of the spare parts are identical.

Common DC bus – 1:n application

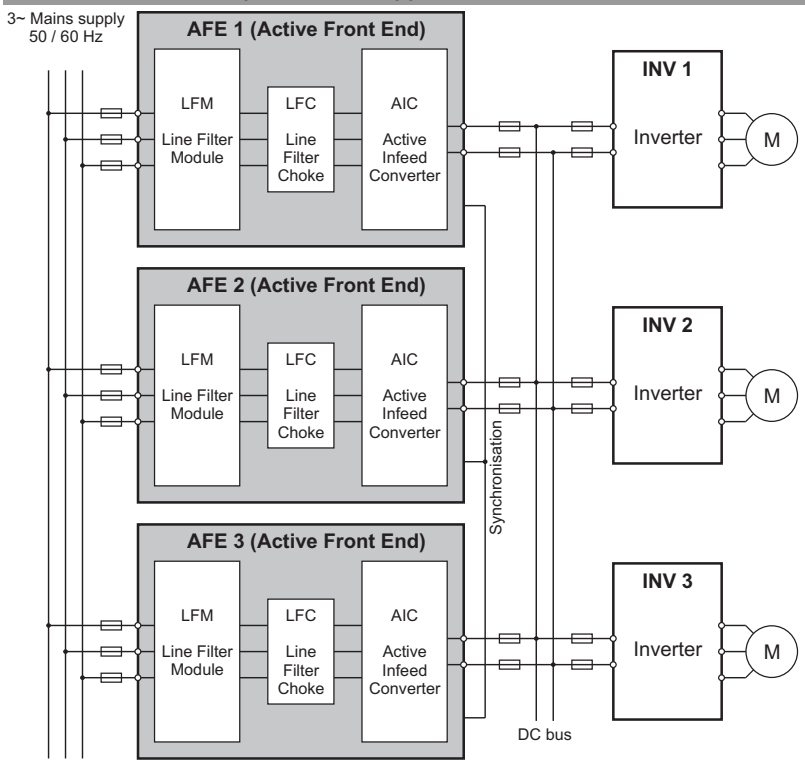
Additionally to the single drive it is possible to supply several inverters with an Active Front End via a common DC link (1:n configuration). Common applications are e.g. group drives in sheet metal processing machines, roller conveyors and motor test benches. Thereby the Active Front End supplies energy into the DC bus or feeds the accumulating braking energy back into the mains.



The total power of the installed inverters can be higher than the nominal power of the Active Front End. Next to the performance record also the maximum possible load capacity of the line filter module LFM has to be observed when dimensioning the complete configuration.

The capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. Additional filter capacitors and a separate isolating transformer can be necessary for creating an IT mains.

Active Font End units parallel – n:n application



Due to the special design it is also possible to connect several Active Front End units in parallel (n:n application).

This enables

- a higher supply / regenerating power
- the use of smaller units e.g. adapted to the size of the inverter in order to reduce the spare parts
- an increased reliability due to redundancy.

Depending on the power demand individual Active Front End units can be locked or released during operation. However, connection and disconnection has to be only executed when there is no voltage!

The capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. Additional filter capacitors and a separate isolating transformer can be necessary for creating an IT mains.

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.

NOTICE
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.

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 capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. Additional filter capacitors and a separate isolating transformer can be necessary for creating an IT mains.

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

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 restart

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

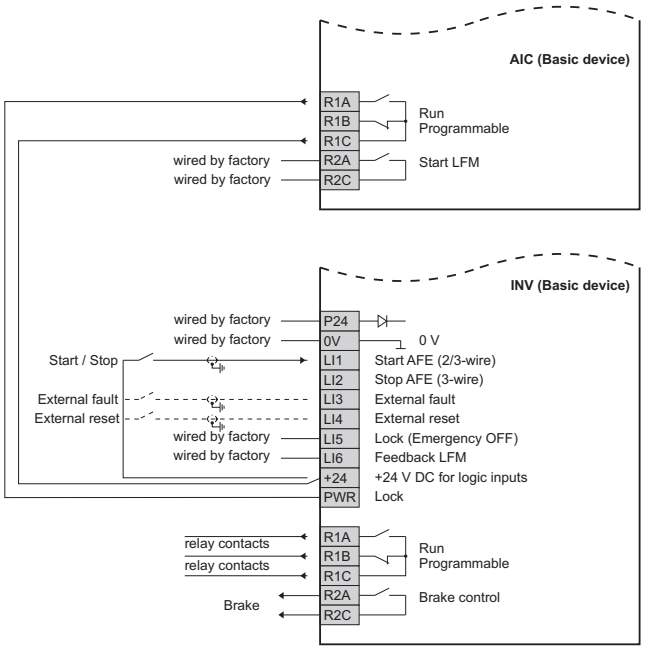
After device replacement, software update or reset to factory default, set all necessary parameters which helps to protect the equipment.

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.

Additional wiring for hoist applications

For hoist applications it is necessary to create a connection between the input "PWR" of the inverter and the relay output R1 "Run" of the Active Infeed Converter. So in case of voltage interruption also the frequency inverter (INV) changes to impulse inhibit and actuates the mechanical brake.



Mains voltage

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

- AFE 400 V:
  3 AC 380…400 V ±10 % (during operation: -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 % (during operation: -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 % (during operation: -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 % (during operation: -20% for less than 1 min), 50 Hz ±5 %
  3 AC 600 V ±10 % (during operation: -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 % (during operation: -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

Ensure that the line voltage corresponds with the supply voltage of the frequency inverter before you switch the inverter on to configure it. An incompatible line voltage may cause damage of the inverter.

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).

The capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. Additional filter capacitors and a separate isolating transformer can be necessary for creating an IT mains.

NOTICE

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.

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.

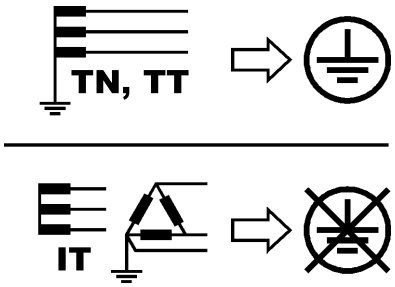
	Current harmonics in %																	
Operating mode	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	THD
motor	100	1.33	1.06	0.39	0.20	0.20	0.20	0.35	0.24	0.08	0.04	0.16	0.12	0.24	0.16	0.04	0.04	2.42
generator	100	1.30	0.55	0.39	0.39	0.71	0.63	0.24	0.43	0.20	0.24	0.16	0.20	0.16	0.08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

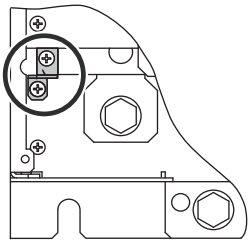
Nongrounded mains

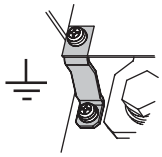
The use of the Active Front End units is basically in all mains variants permitted.

Required settings at the line filter module LFM

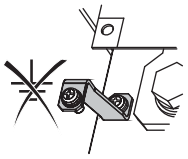
The radio frequency interference filter built-in into the line filter module LFM has to be adapted to the respective mains by means of switch-over/reconnection.







TN or TT mains
(factory default)

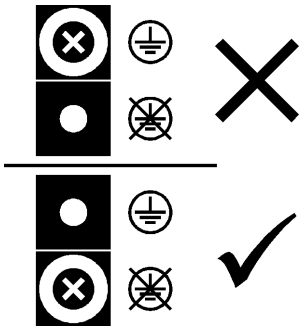


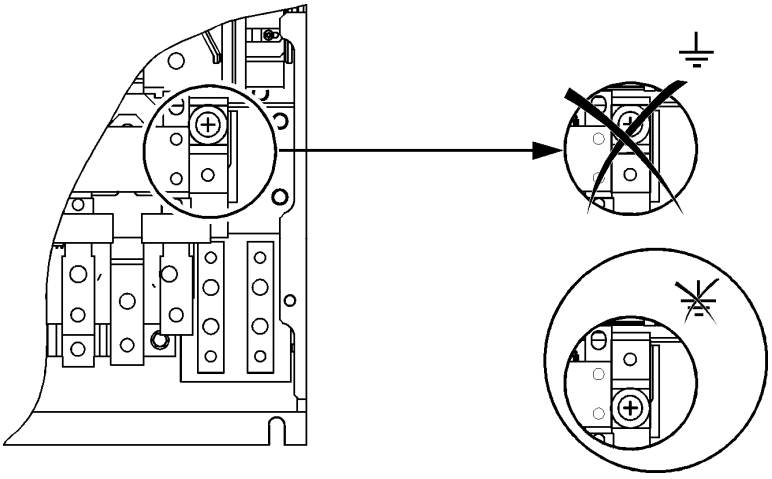
IT mains or
Corner grounded

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.

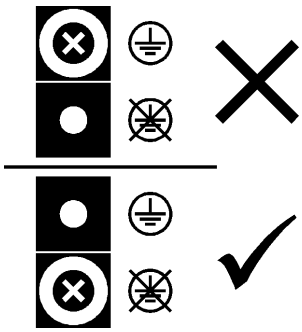
Required settings at the Active Infeed Converter AIC

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





Required settings at the inverter INV



The integrated RFI filter has to be deactivated (position IT, non-grounded mains) at all devices 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

Take care for the correct integration of 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.

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.

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 of the Active Front End

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)

Automatic restarting of the inverter

If the Active Front End breaks down the inverter INV changes to drive state "Ready" and shows USA [Undervoltage alarm] at the display. As soon as the Active Front End AFE restarts and thus the DC link voltage is increased to nominal operating voltage, the inverter INV is ready for restart.

When a start command is given the inverter INV is starting automatically after start of the Active Front End and after mains failure. When this behaviour is not permitted for safety reasons, the following functions of the inverter can be adjusted:

- Behaviour of the trip relay
- Trip state after each mains disconnection or line fault
- Selection of the start command (level rated, edge rated or 3-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.

Description

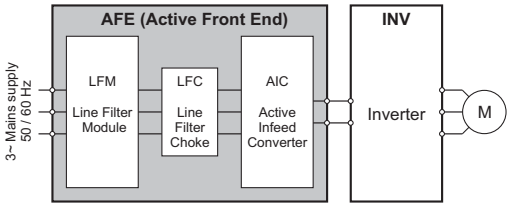
For a single drive, typically one Active Front End AFE and one inverter INV (= standard frequency inverter) of same size are interconnected. Their power connection is simply done via the DC bus.

Typical applications for the Active Front End are:

- To enable 4-quadrant operation of a drive and thus to return energy to the mains.
- To reduce the current harmonics to a THDi ≤ 4 %.

NOTICE
There are no DC fuses required when the Active Front End AFE and the inverter INV have the same power.

Components of the Active Front End



The Active Front End AFE is connected upstream to the inverter INV (= standard frequency inverter) and consists of several components:

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

The Active Front End as well as its components can be allocated to the respective inverter using the following tables.

Active Front End units of higher power are realized by parallel connection of two line filter modules LFM and two line filter chokes LFC.

Active Front End for 400 V mains

Inverter	Power	Active Front End AFE					
INV	VT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 61	[kW]	Type	Reference	Type	Reference	Type	Reference
ATV61H075N4...D90N4D	up to 90	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV61HC11N4D	110	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV61HC13N4D	132	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
ATV61HC16N4D	160	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
ATV61HC22N4D	220	4V240	VW3A7253	4V340	VW3A7262	4V340	VW3A7267
ATV61HC25N4D	250	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
ATV61HC31N4D	315	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
ATV61HC40N4D	400	4V430	VW3A7256	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV61HC50N4D	500	4V540	VW3A7257	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV61HC63N4D	630	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
Inverter	Power	Active Front End AFE					
INV	CT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 71	[kW]	Type	Reference	Type	Reference	Type	Reference
ATV71H075N4...D90N4D	up to 90	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV71HC11N4D	110	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
ATV71HC13N4D	132	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
ATV71HC16N4D	160	4V240	VW3A7253	4V340	VW3A7262	4V340	VW3A7267
ATV71HC20N4D	200	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
ATV71HC25N4D	250	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
ATV71HC28N4D	280	4V430	VW3A7256	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV71HC31N4D	315	4V430	VW3A7256	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV71HC40N4D	400	4V540	VW3A7257	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV71HC50N4D	500	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 480 V mains							
Inverter	Power	Active Front End AFE					
INV	VT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 61	[HP]	Type	Reference	Type	Reference	Type	Reference
ATV61H075N4...D90N4D	up to 125	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV61HC11N4D	150	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV61HC13N4D	200	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
-	250	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
ATV61HC16N4D...C22N4D	350	4V240-13	VW3A7283	4V340	VW3A7262	4V340	VW3A7267
ATV61HC25N4D	400	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
ATV61HC31N4D	500	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
ATV61HC40N4D	600	4V430-15	VW3A7286	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV61HC50N4D	700	4V540-15	VW3A7287	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV61HC63N4D	900	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
Inverter	Power	Active Front End AFE					
INV	CT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 71	[HP]	Type	Reference	Type	Reference	Type	Reference
ATV71H075N4...D90N4D	up to 125	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
ATV71HC11N4D	150	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
ATV71HC13N4D	200	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
ATV71HC16N4D	250	4V240-13	VW3A7283	4V340	VW3A7262	4V340	VW3A7267
ATV71HC20N4D	300	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
ATV71HC25N4D	400	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
ATV71HC28N4D...C31N4D	500	4V430-15	VW3A7286	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV71HC40N4D	600	4V540-15	VW3A7287	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
ATV71HC50N4D	700	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 500 ... 690 V mains							
Inverter	Power	Active Front End AFE					
INV	VT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 61	[kW]	Type	Reference	Type	Reference	Type	Reference
ATV61HC11Y [1)]	110	6V145	VW3A7270	6V220	VW3A7263	6V220	VW3A7268
ATV61HC13Y [1)]	132	6V145	VW3A7270	6V220	VW3A7263	6V220	VW3A7268
ATV61HC16Y [1)]	160	6V175	VW3A7271	6V220	VW3A7263	6V220	VW3A7268
ATV61HC20Y [1)]	200	6V220	VW3A7272	6V220	VW3A7263	6V220	VW3A7268
ATV61HC25Y [1)]	250	6V275	VW3A7273	6V430	VW3A7264	6V430	VW3A7269
ATV61HC31Y [1)]	315	6V340	VW3A7274	6V430	VW3A7264	6V430	VW3A7269
ATV61HC40Y [1)]	400	6V430	VW3A7275	6V430	VW3A7264	6V430	VW3A7269
ATV61HC50Y [2)]	500	6V540	VW3A7276	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
ATV61HC63Y [2)]	630	6V675	VW3A7277	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
ATV61HC80Y [2)]	800	6V860	VW3A7278	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
Inverter	Power	Active Front End AFE					
INV	CT	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
ATV 71	[kW]	Type	Reference	Type	Reference	Type	Reference
ATV71HC11Y [1)]	110	6V145	VW3A7270	6V220	VW3A7263	6V220	VW3A7268
ATV71HC13Y [1)]	132	6V175	VW3A7271	6V220	VW3A7263	6V220	VW3A7268
ATV71HC16Y [1)]	160	6V220	VW3A7272	6V220	VW3A7263	6V220	VW3A7268
ATV71HC20Y [1)]	200	6V275	VW3A7273	6V430	VW3A7264	6V430	VW3A7269
ATV71HC25Y [1)]	250	6V340	VW3A7274	6V430	VW3A7264	6V430	VW3A7269
ATV71HC31Y [1)]	315	6V430	VW3A7275	6V430	VW3A7264	6V430	VW3A7269
ATV71HC40Y [2)]	400	6V540	VW3A7276	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
ATV71HC50Y [2)]	500	6V675	VW3A7277	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
ATV71HC63Y [2)]	630	6V860	VW3A7278	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269

1.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 1x

2.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 2x

NOTICE

Further technical data can be found in chapter "Technical data", Page 67.

Order examples

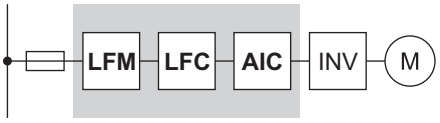
Following there are some order examples given for explanation.

Order example of an Active Front End for 400V and 145kW

One line filter module LFM, one line filter choke LFC and one Active Infeed Converter AIC have to be ordered.

The listing of the components to be ordered follows:

Simplified diagram



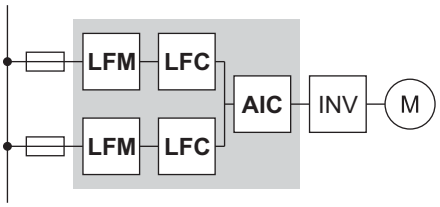
Device type		Pcs.	Order number
LFM	4V175	1	VW3A7261
LFC	4V175	1	VW3A7266
AIC	4V145	1	VW3A7251

Order example of an Active Front End for 480V and 540kW

Two line filter modules LFM, two line filter chokes LFC and one Active Infeed Converter AIC have to be ordered.

The listing of the components to be ordered follows:

Simplified diagram



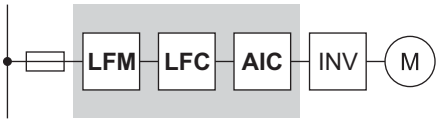
Device type		Pcs.	Order number
LFM	4V340	2	VW3A7262
LFC	4V340	2	VW3A7267
AIC	4V540-15	1	VW3A7287

Order example of an Active Front End for 690V and 220kW

One line filter module LFM, one line filter choke LFC and one Active Infeed Converter AIC have to be ordered. Furthermore the option "Fan wiring 6V" for the inverter has to be ordered once.

The listing of the components to be ordered follows:

Simplified diagram



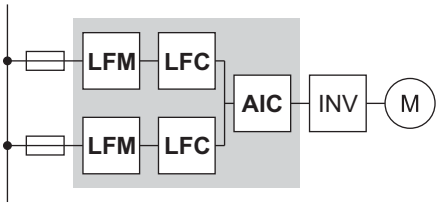
Device type		Pcs.	Order number
LFM	6V220	1	VW3A7263
LFC	6V220	1	VW3A7268
AIC	6V220	1	VW3A7272
Option "Fan wiring 6V"		1	VW3A7280

Order example of an Active Front End for 690V and 675kW

Two line filter modules LFM, two line filter chokes LFC and one Active Infeed Converter AIC have to be ordered. Furthermore the option "Fan wiring 6V" for the inverter has to be ordered twice.

The listing of the components to be ordered follows:

Simplified diagram



Device type		Pcs.	Order number
LFM	6V430	2	VW3A7264
LFC	6V430	2	VW3A7269
AIC	6V675	1	VW3A7277
Option "Fan wiring 6V"		2	VW3A7280

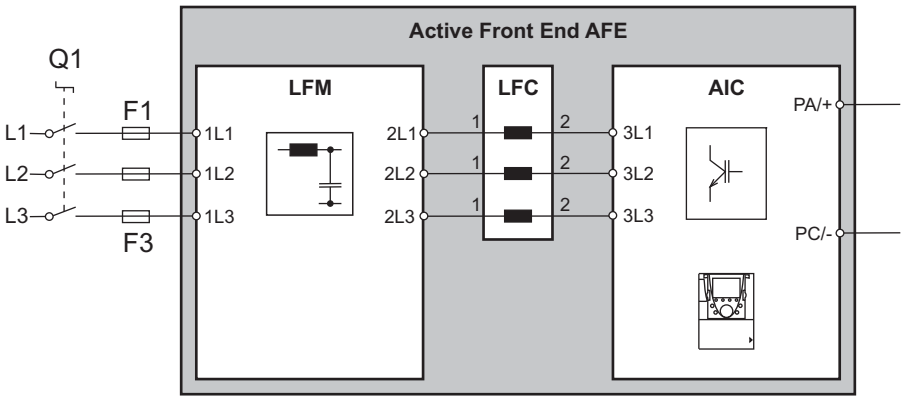
Power wiring

Devices up to 340 kW (400 V); devices up to 430 kW (500 / 690 V)

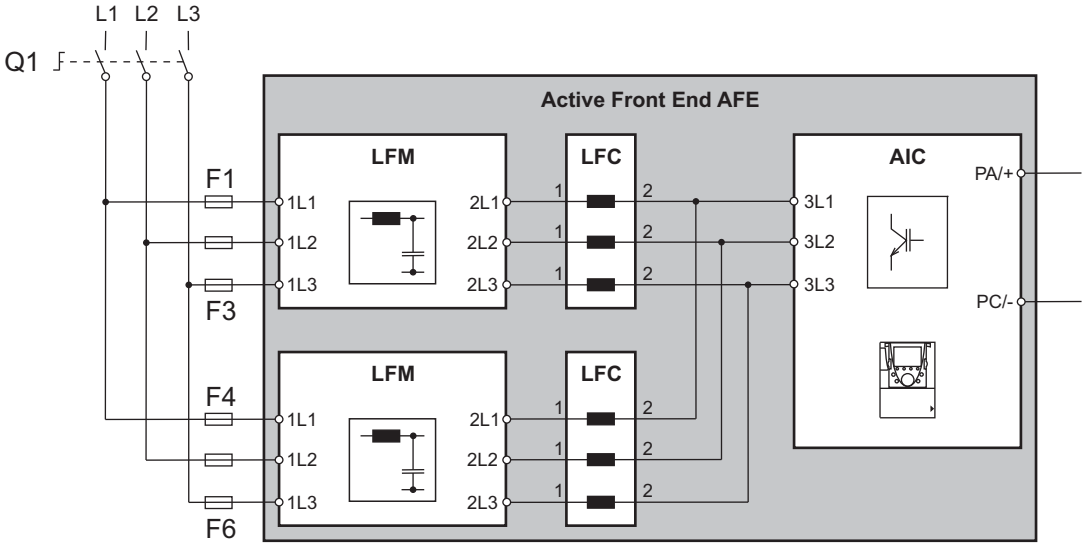
The Active Front End consists of three components in principle: the line filter module LFM, the line filter choke LFC and the Active Infeed Converter AIC.

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).



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

DC wiring

Basically the expansion of the DC bus should be kept as small as possible.

⚠ CAUTION

RISK OF RESONANCES

The length of the DC wiring between two components must not exceed 3m.

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

⚠⚠ 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.

Internal control wiring

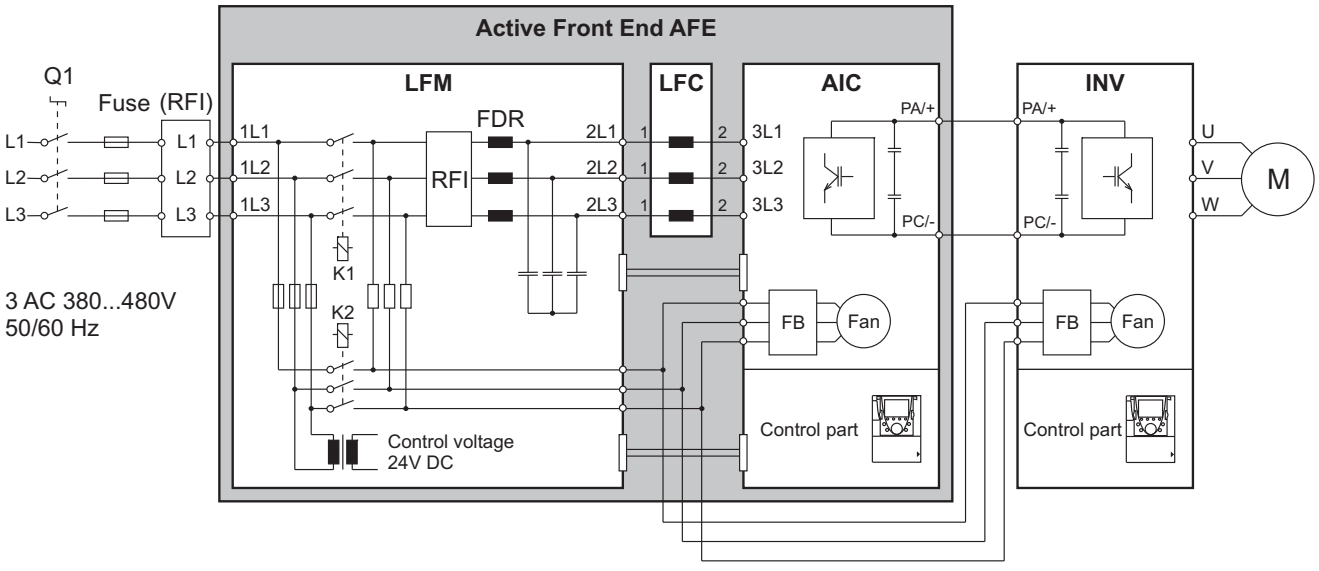
Fan supply and control voltage

The voltage for fan supply and the control voltage are generated in the line filter module LFM.

The control wiring between the line filter module LFM and the Active Infeed Converter AIC is realized by the provided connecting cables W2 and W3. 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.

For the 400 V devices (except VW3 A7 250 due to DC fans) the cable W1 has to be connected to the line filter module LFM in order to supply the fans in the Active Infeed Converter AIC. The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the auxiliary terminal block R0/S0/T0 (switching to external supply) in the INV.

With the fan supply it is possible to operate all fans of the Active Infeed Converter AIC and the fans of up to four inverters.

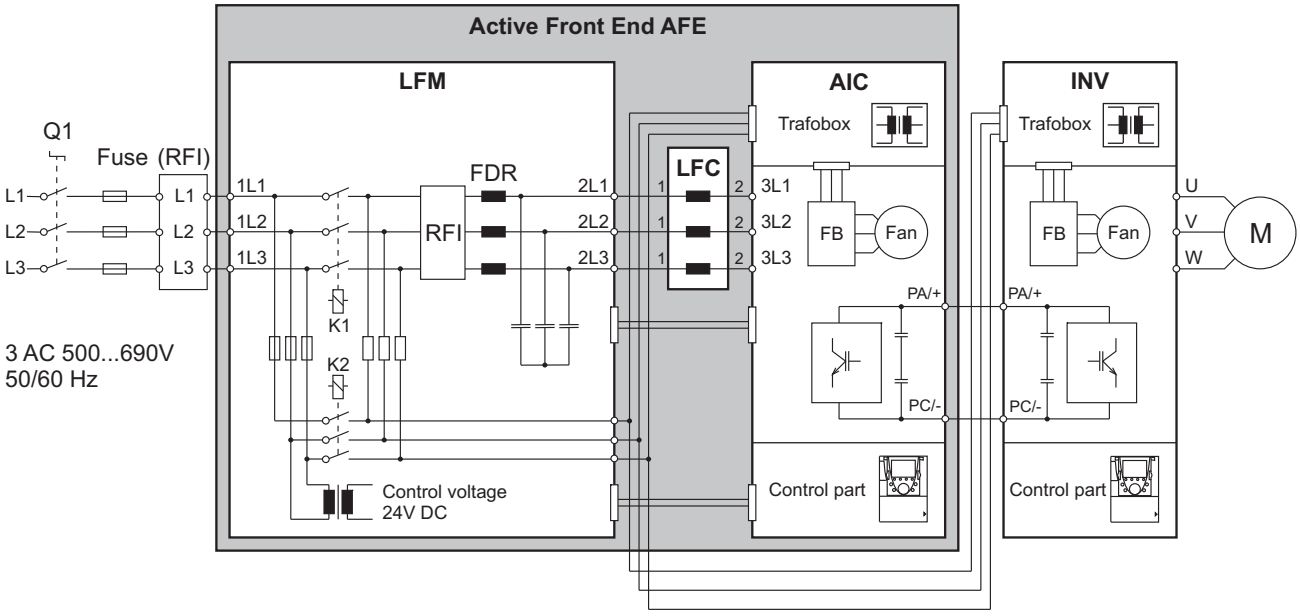


NOTICE

The fan supply output of the LFM is equipped with fuses. Therefore no additional fuses are required for the fan supply.

For the 690 V devices the fans are supplied via the transformer box at the top side of the devices. The connection to the Active Infeed Converter AIC is included in delivery and has to be connected to the line filter module LFM only.

The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the transformer box at the top side of the INV. Therefore a terminal module is necessary (deliverable as option "Fan wiring 6V" with reference number VW3A7280)



For fan supply of the inverter(s) INV it is necessary to order the option "Fan wiring 6V" with reference number VW3A7280.

1x VW3A7280 for ATV61HC11Y...C40Y; ATV71HC11Y...C31Y

2x VW3A7280 for ATV61HC50Y...C80Y; ATV71HC40Y...C63Y

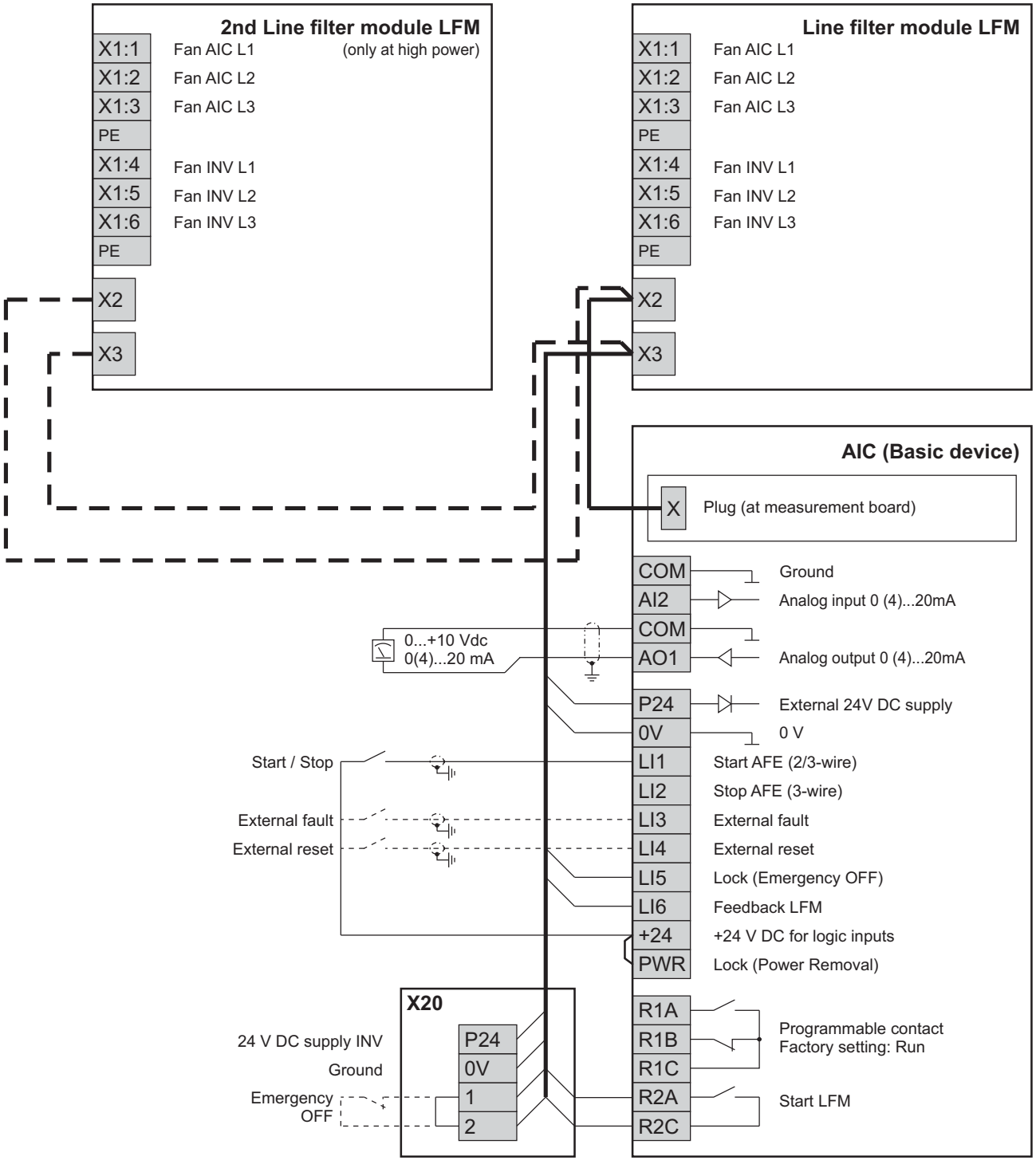
NOTICE
The fan supply output of the LFM is equipped with fuses. Therefore no additional fuses are required for the fan supply.

Terminal connections

The following presentation shows the wiring of the control terminals between the line filter module LFM and the Active Infeed Converter AIC.

The wiring is significantly simplified by means of two ready-made cables with plugs which are already connected to the AIC. The cables are designed for a maximum distance of 1 m between AIC and LFM.

At 400 V devices up to 340 kW and at 690 V devices up to 430 kW, the Active Infeed Converter AIC is connected with only one LFM. In case of higher power the AIC is connected with two LFMs.



External control wiring

The following diagrams show typical wiring variants of the Active Front End.

In case of a line fault during motor operation, the Active Front End as well as the inverter recognise the undervoltage and react according to their parameterization (impulse inhibit, alarm, trip). In generator operation the inverter may not recognize a line fault.

⚠ WARNING

ADDITIONAL WIRING FOR HOIST APPLICATIONS

Establish a connection between the input "PWR" of the inverter and the relay output R1 "Run" of the Active Infeed Converter (Page 15).

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

⚠ WARNING

HUMAN PROTECTION AND MACHINE SAFETY

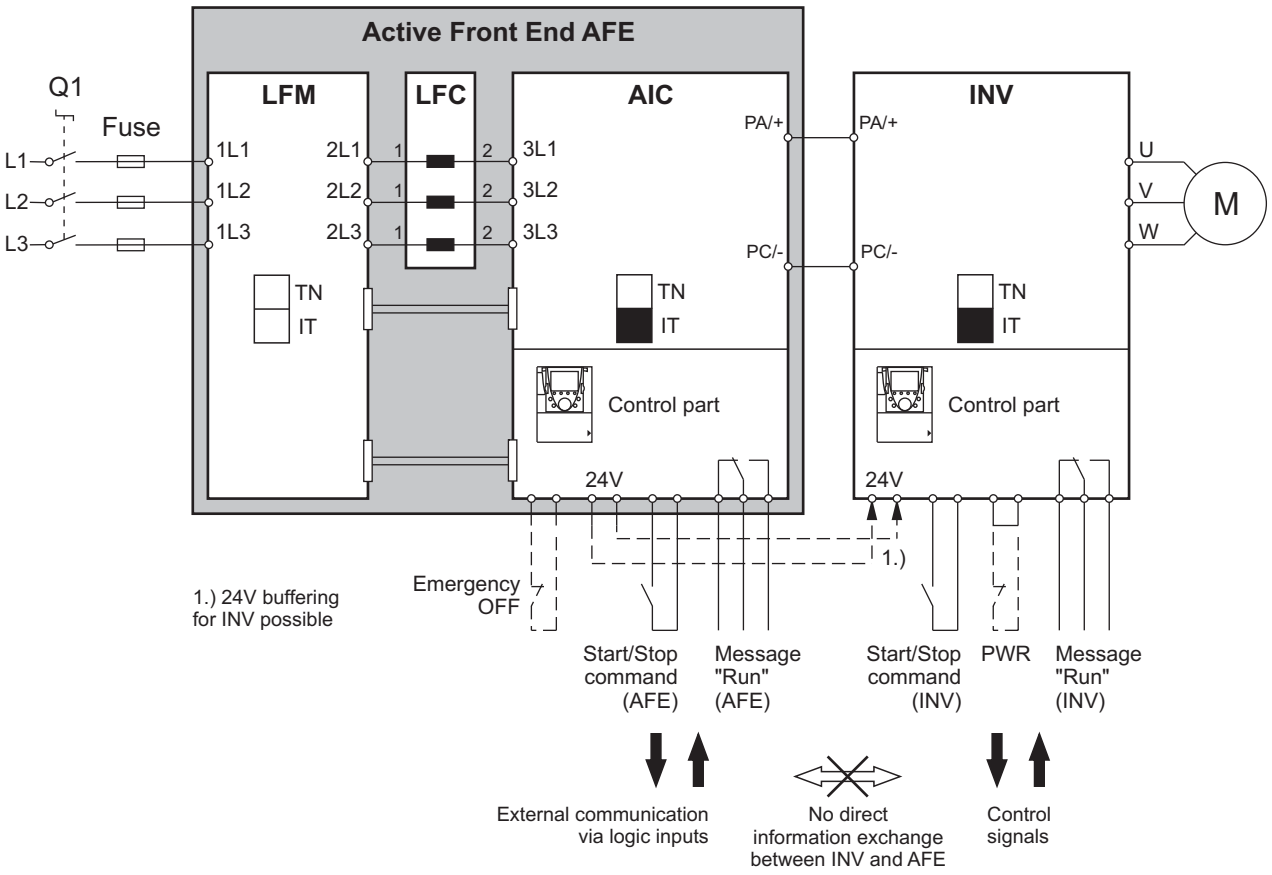
Take care for the correct integration of the Active Front End units into the protection and safety concept of the plant or machine.

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

Control via start/stop signals

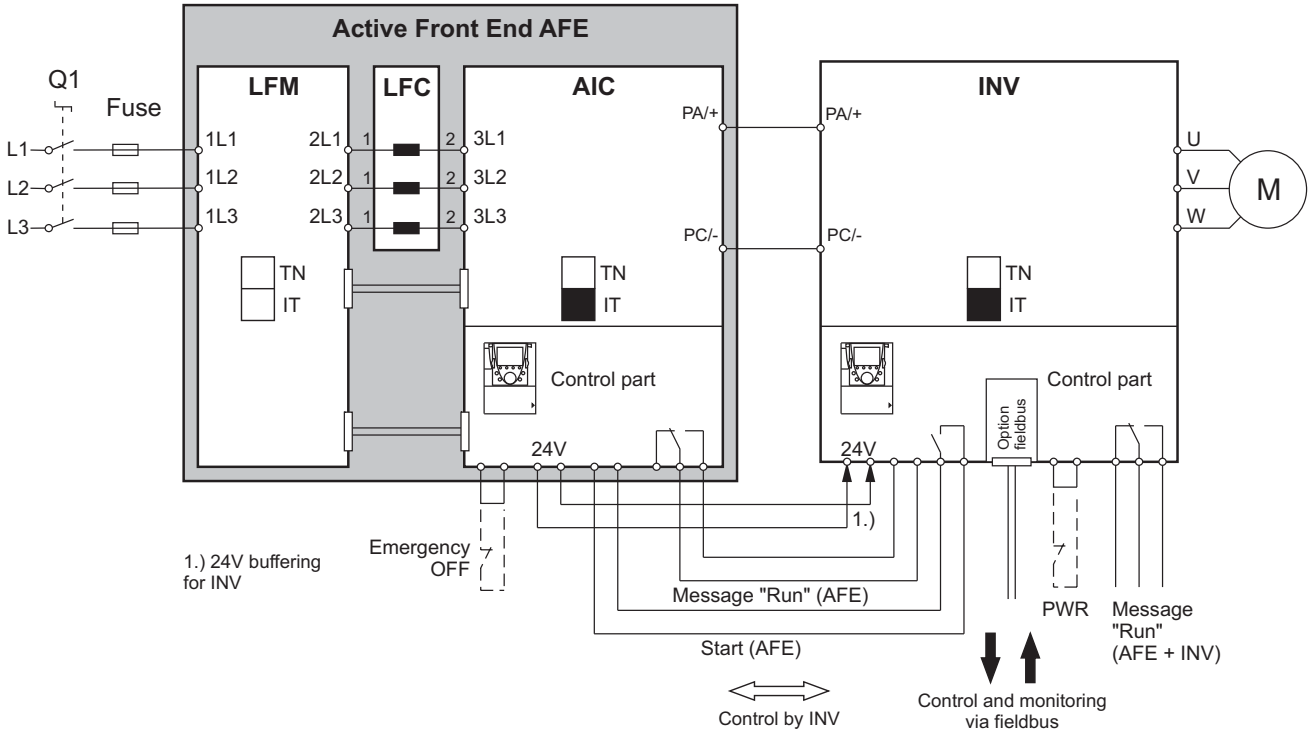
The Active Front End is controlled separately from the inverter by means of an own start command.

In this case the Active Front End AFE and the inverter INV have to be integrated to the superior control concept.



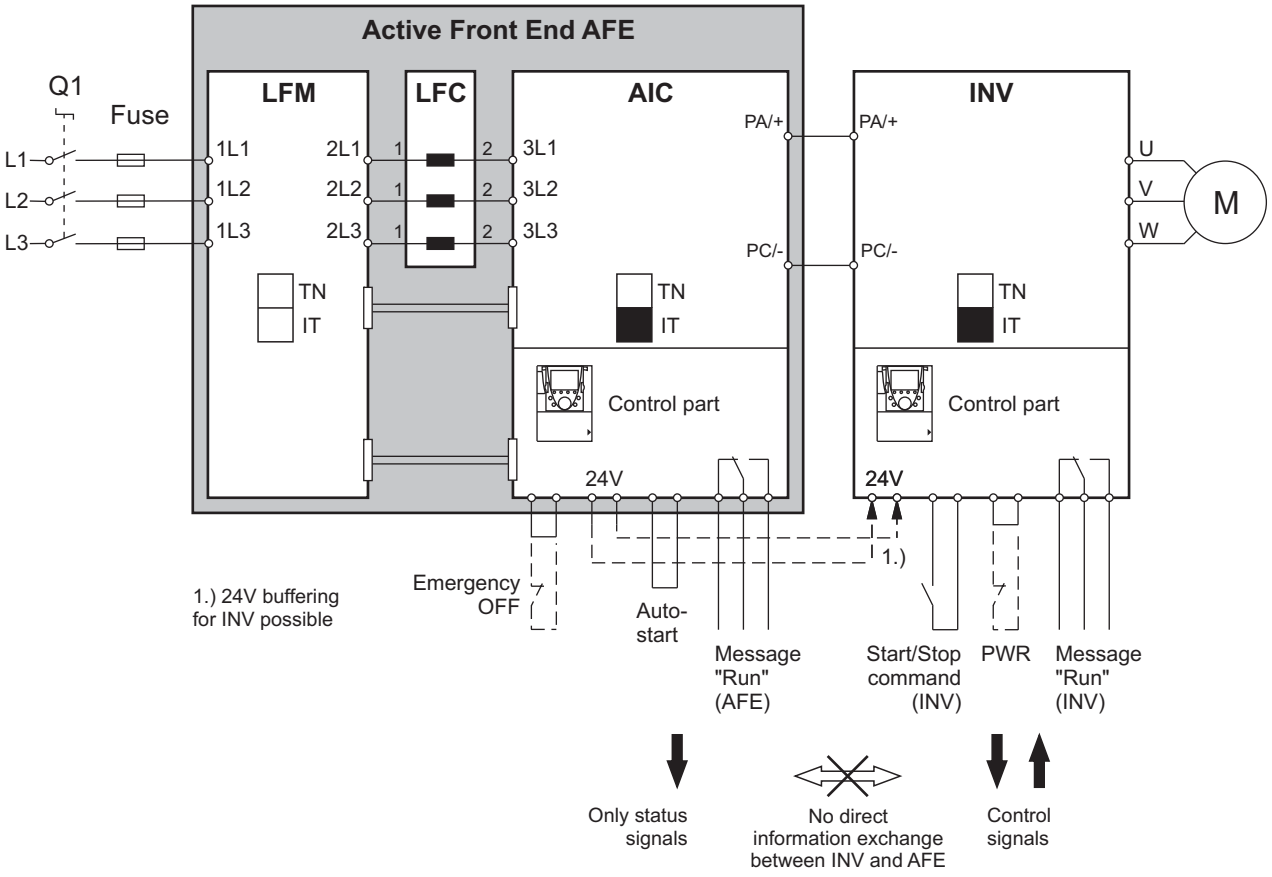
Control via start/stop signals of the inverter

The Active Front End is not controlled by an own start command but via the inverter. The 24 V buffer voltage for the INV and for the AIC are provided from the line filter module LFM.



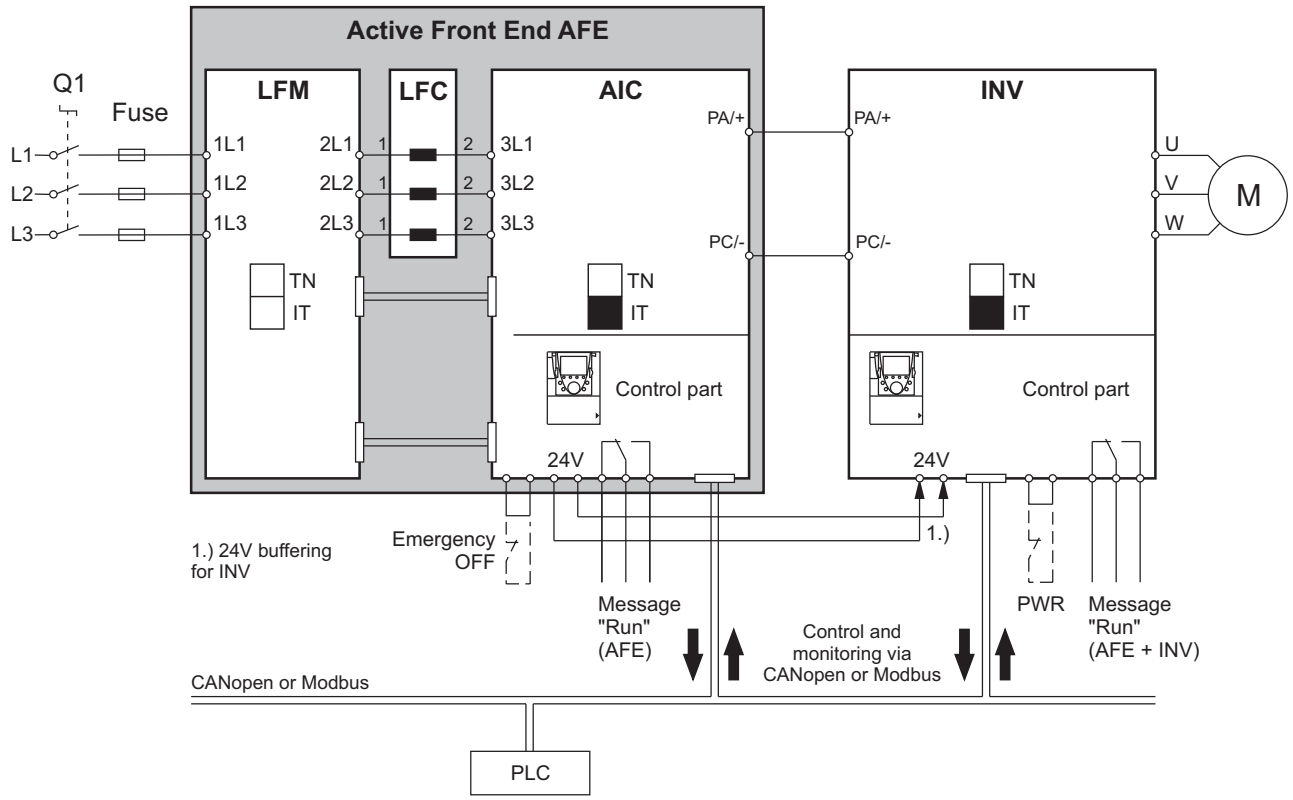
Control of the Active Front End via mains connection/disconnection

It is also possible to operate the Active Front End without additional control. In this case the Active Front End starts as soon as voltage is applied to the input terminals of the line filter module LFM.



Control of the Active Front End via direct fieldbus control

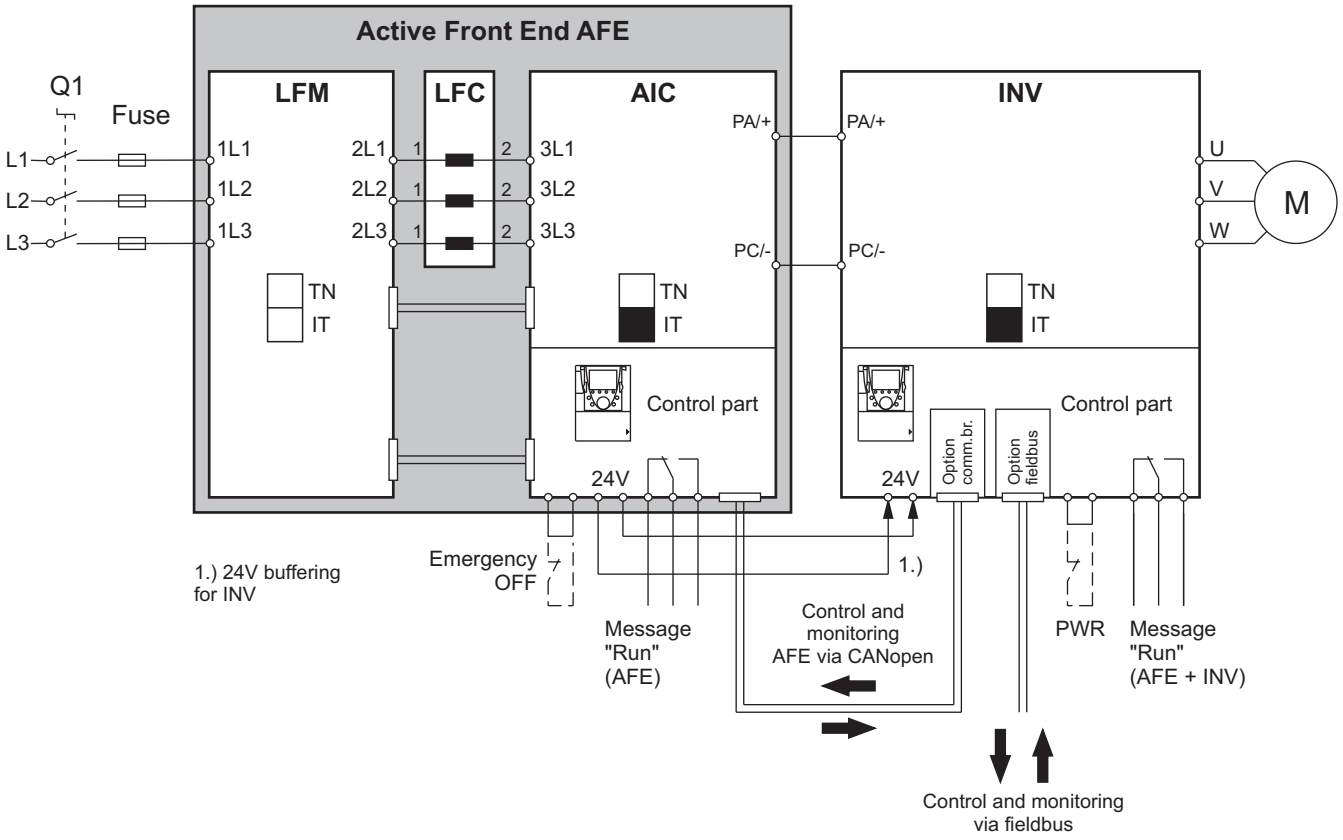
When the communication at the PLC system takes place with CANopen or Modbus, the inverter and the Active Infeed Converter can be directly connected to and controlled by the bus system.



Control of the Active Front End via indirect fieldbus control

The Active Front End is controlled and monitored by means of the option card "communication bridge" of the inverter. The connection to the Active Front End AFE is done via CANopen.

By using a fieldbus option card it is possible to control the inverter as well as the Active Infeed Converter via the inverter. Therefor each fieldbus system, which is available for the inverter, can be used.



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 **[Dec. ramp adapt.] 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 with 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).

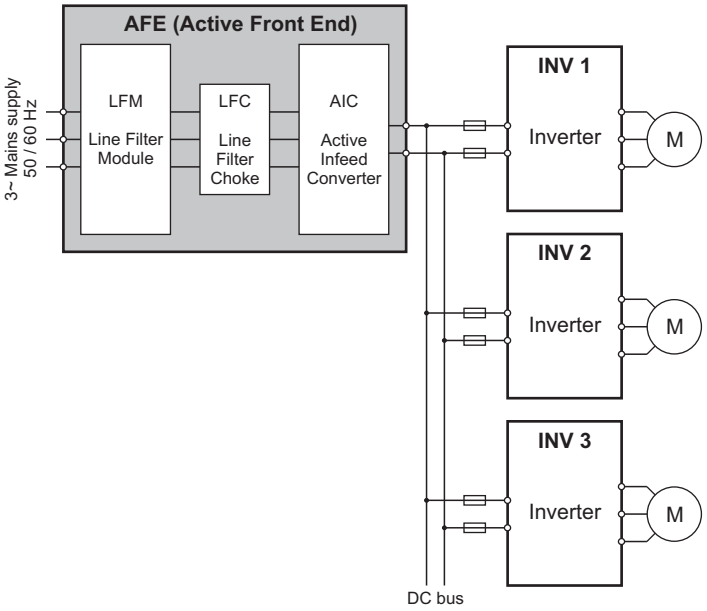
Description

The Active Front End supplies a common DC bus at which several inverters INV are connected. This enables an energy exchange between the individual motor drives.

This concept is advantageous when there is a "load conjunction" that leads to motor and generator operation of the individual inverters at the same time. Thus, dimensioning of the Active Front End can be reduced to the required acceleration and braking power of the of the whole drive unit.

Examples therefor are:

- Test benches
  (driving a shaft that is braked at the same time in order to test loads)
- Belt drives
  (winding up and off the belt with permanent traction)



Inverters of different power can be operated at the common DC bus.

⚠ CAUTION

DAMAGE OF THE COMPONENTS

- Take care of correct fuse protection of all inverters.
- Consider the performance record and the maximum possible load capacity of the Active Front End when dimensioning.
- Observe in this connection the information and notes about the inverters in chapter "Inverter", Page 95 and the device documentation provided on the CD-ROM which is attached to each inverter.

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

Dimensioning

Pay attention to following points when several inverters are operated at a common DC bus:

- Total DC power
  Check the sum of the motor power and the generator power at the DC bus separately. The higher value determines the selection of the Active Front End.
- Capacity of the DC bus
  In order to avoid overload of the charging circuit of the Active Front End, observe the sum of the capacities of all inverters connected to the DC bus.

Active Front End for 400 V mains

Continuous DC power	Load	Active Front End AFE					
[kW]	capacity	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
400 V	[mF]	Type	Reference	Type	Reference	Type	Reference
120	30	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
143	40	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
172	40	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
238	80	4V240	VW3A7253	4V340	VW3A7262	4V340	VW3A7267
268	80	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
336	80	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
425	160	4V430	VW3A7256	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
530	160	4V540	VW3A7257	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
665	160	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 480 V mains (UL)

Continuous DC power	Load	Active Front End AFE					
[kW]	capacity	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
480 V	[mF]	Type	Reference	Type	Reference	Type	Reference
130	30	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
162	40	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
162	40	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
277	80	4V240-13	VW3A7283	4V340	VW3A7262	4V340	VW3A7267
315	80	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
390	80	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
490	160	4V430-15	VW3A7286	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
610	160	4V540-15	VW3A7287	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
770	160	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 500 / 690 V mains

Continuous DC power			Load	Active Front End AFE					
[kW]			capacity	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
500 V	600 V	690 V	[mF]	Type	Reference	Type	Reference	Type	Reference
102	123	142	16	6V145	VW3A7270 [1)]	6V220	VW3A7263	6V220	VW3A7268
127	153	172	16	6V175	VW3A7271 [1)]	6V220	VW3A7263	6V220	VW3A7268
157	162	215	16	6V220	VW3A7272 [1)]	6V220	VW3A7263	6V220	VW3A7268
193	230	268	32	6V275	VW3A7273 [1)]	6V430	VW3A7264	6V430	VW3A7269
242	290	335	32	6V340	VW3A7274 [1)]	6V430	VW3A7264	6V430	VW3A7269
305	365	424	32	6V430	VW3A7275 [1)]	6V430	VW3A7264	6V430	VW3A7269
382	460	528	64	6V540	VW3A7276 [2)]	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
478	575	663	64	6V675	VW3A7277 [2)]	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
607	730	842	64	6V860	VW3A7278 [2)]	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269

1.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 1x

2.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 2x

NOTICE

Further technical data can be found in chapter "Technical data", Page Page 67.

Winch

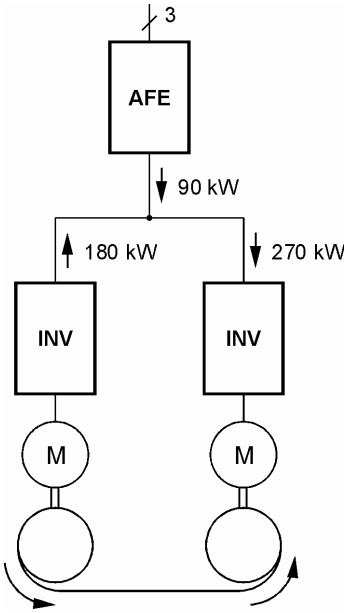
In this example the winch is operated by an inverter and it is braked by a further drive. A mains voltage is 400 V is expected.

In order to select the Active Front End, the performance record and the total charging capacity at the DC bus have to be checked.

The drive is realised with an ATV71HC25N4D frequency inverter. Thus the inverter has to be supplied with a DC power of 270 kW, as specified in the tables chapter "Inverter", Page 95.

For braking of the second shaft an ATV71HC20N4D is used. As this inverter is used to return energy to the mains, its generator power is deducted from the required DC power of the system.

As the capacities at the DC bus (independent of the energy direction) have to be charged by the Active Front End, they have to be added.



Inverter	Power	Energy direction	Capacity
ATV71HC25N4D	180 kW	generator	14 mF
ATV71HC20N4D	270 kW	motor	20 mF
Total	90 kW	motor	34 mF

In this example, due to the capacity the Active Front End with a load capacity of 40 mF is selected, consisting of following components:

AIC	4V145	VW3A7251	Load capacity: 40 mF
LFM	4V175	VW3A7261	
LFC	4V175	VW3A7266	

For drive groups with nearly balanced performance record, typically the load capacity of the Active Front End is determining the selection of the device.

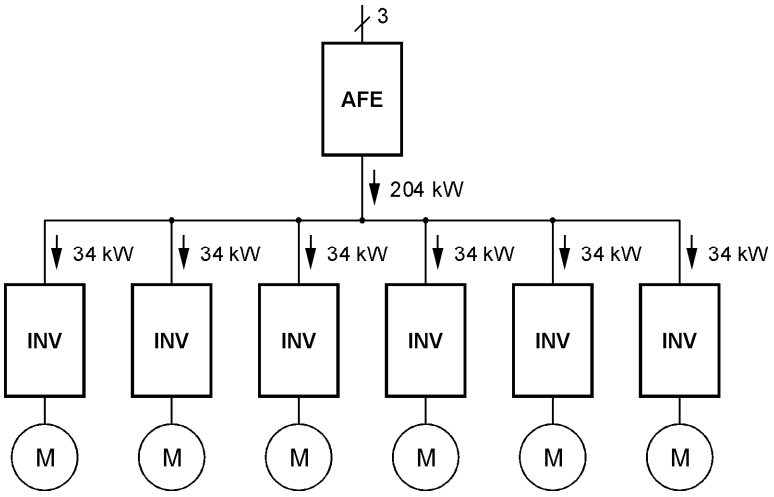
Roller conveyor

In this example the roller conveyor is operated by several inverters. A mains voltage is 400 V is expected.

In order to select the Active Front End, the performance record and the total charging capacity at the DC bus have to be checked.

The drives are realised with ATV61HD30N4 frequency inverters. Thus each inverter has to be supplied with a DC power of 34 kW, as specified in the tables in chapter "Inverter", Page 95.

As the capacities at the DC bus (independent of the energy direction) have to be charged by the Active Front End, they have to be added.



Inverter	Power demand	Capacity
6x ATV61HD30N4	6x 34 kW	6x 2 mF
Total	204 kW	12 mF

In this example, due to the performance record the Active Front End is selected, which is able to supply the DC-bus with 204 kW. It consists of the following components:

AIC	4V240	VW3A7253	DC power: 238 kW
LFM	4V340	VW3A7262	
LFC	4V340	VW3A7267	

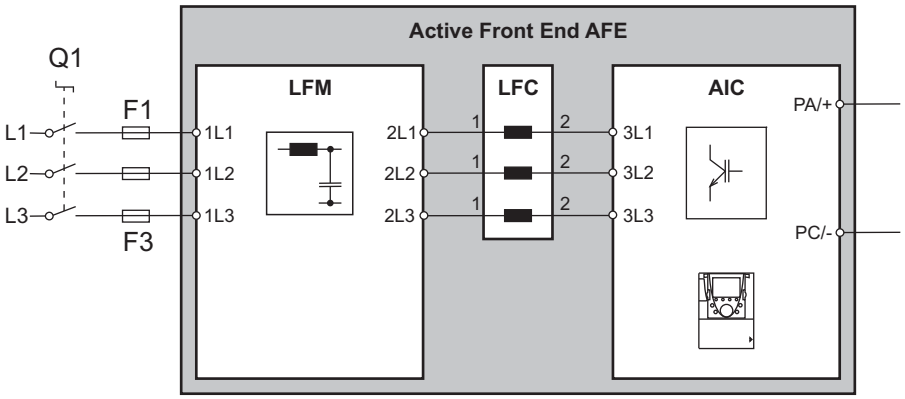
For drive groups with predominant motor power, the total power of all inverters is determining the selection of the Active Front End.

Power wiring

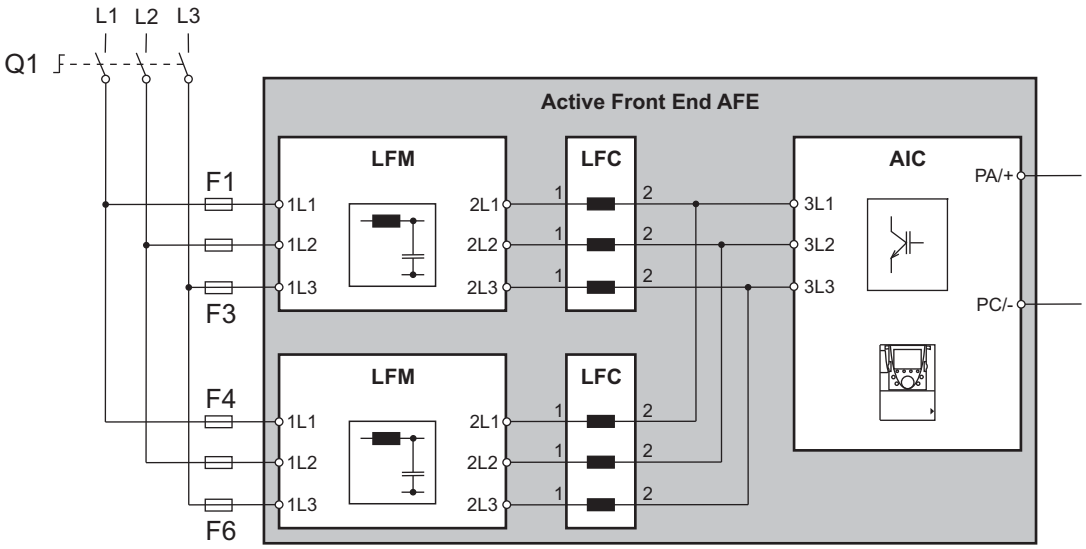
The Active Front End consists of three components in principle: the line filter module LFM, the line filter choke LFC and the Active Infeed Converter AIC.

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.



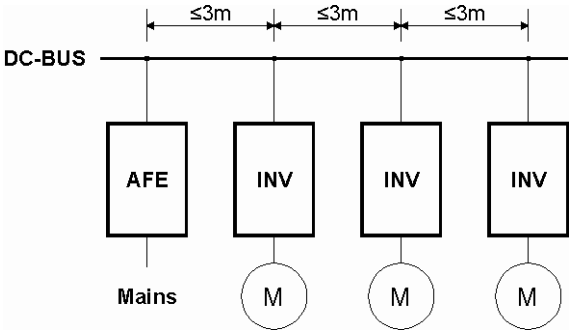
For 400 V devices 430 kW and larger and for 500 / 690 V 540 kW and lager the Active Front End consists of an AIC, **two** LFMs and **two** LFCs (each consisting of three single phase chokes).



DC wiring

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

Basically the expansion of the DC bus should be kept as small as possible.



CAUTION

RISK OF RESONANCES

The length of the DC wiring between two components must not exceed 3m.

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

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.

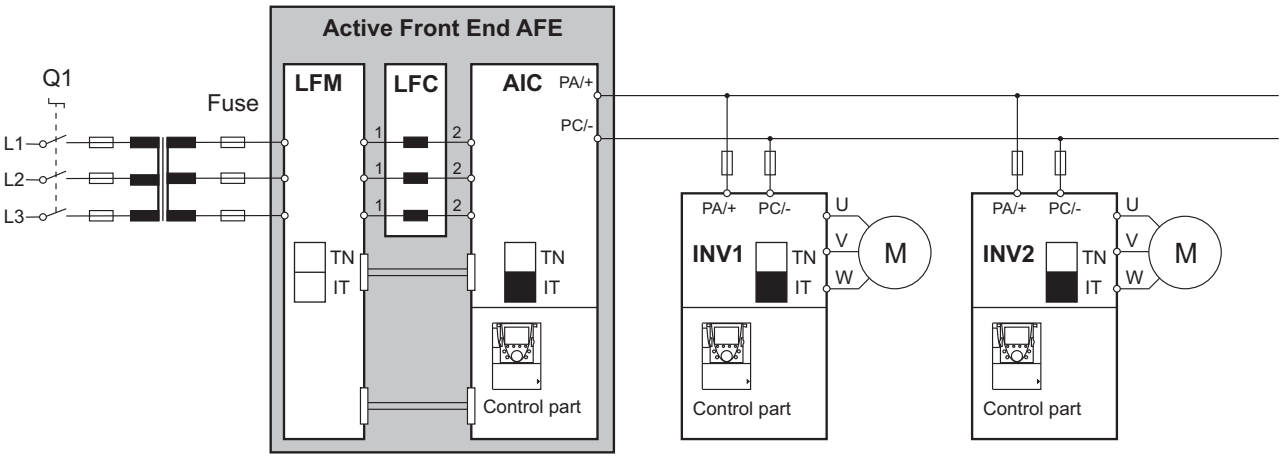
EMC in case of long motor cables

The capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. A separate isolating transformer can be necessary for creating an IT mains.

The following simplification can be used to get a guidance value for optimal planning of the plant:

(Number of motors x 50)		< 500 ..... Operation of the whole system in TN or IT mains possible
+	**=**	
Total motor cable lengths in meter		500...3000 ..... Operation only with separate isolating transformer

The transformer builds an IT mains (must not be grounded at the secondary side) and so it decouples the interference currents of the system from the mains. It has to match with the total power demand of the drive unit.



DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Ensure that human protection is guaranteed at the plant.

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

Internal control wiring

Fan supply and control voltage

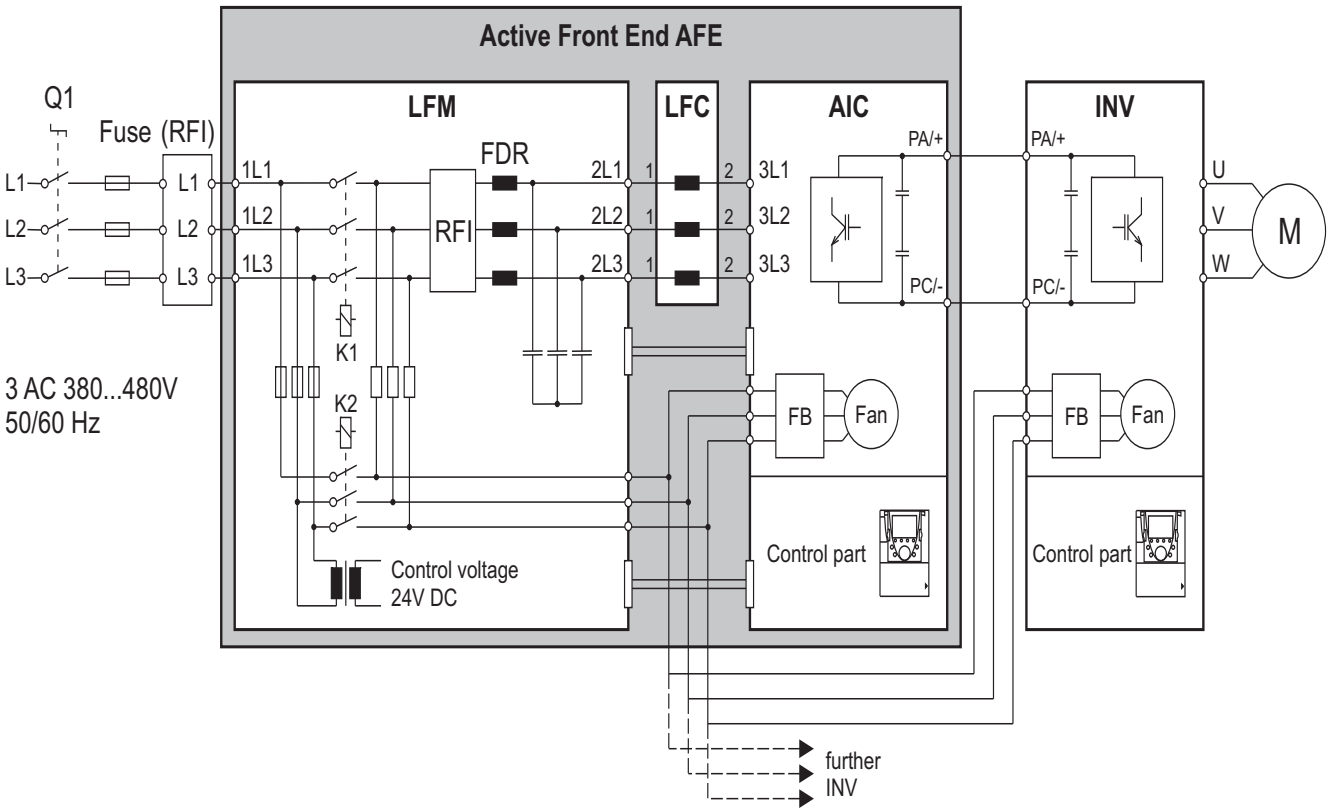
The voltage for fan supply and the control voltage are generated in the line filter module LFM.

The control wiring between the line filter module LFM and the Active Infeed Converter AIC is realized by the provided connecting cables W2 and W3. 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.

For the 400 V devices (except VW3 A7 250 due to DC fans) the cable W1 has to be connected to the line filter module LFM in order to supply the fans in the Active Infeed Converter AIC. The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the auxiliary terminal block R0/S0/T0 (switching to external supply) in the INV.

With the fan supply it is possible to operate all fans of the Active Infeed Converter AIC and the fans of up to four inverters.

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

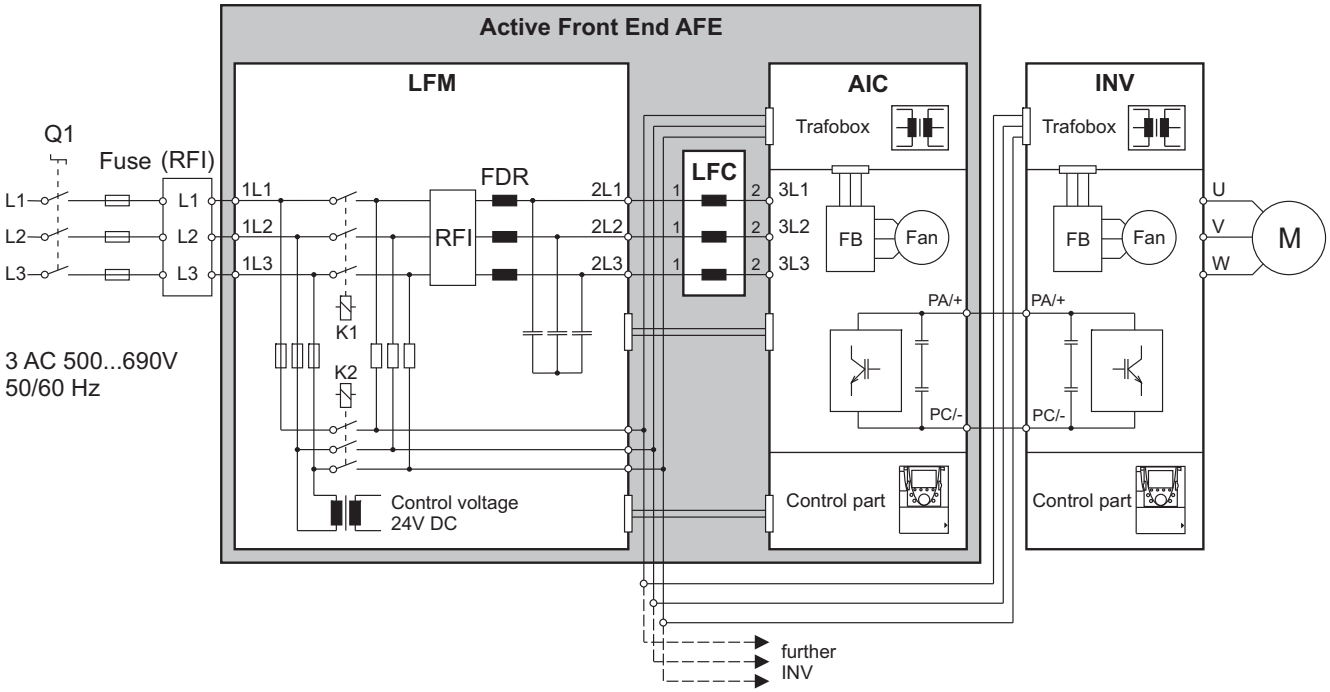


NOTICE
The inverters INV of the types ATV61H075N4 ... HC11N4 ATV71H075N4 ... HD90N4 do not require an external fan supply from the line filter module LFM, because these drives contain DC fans.

NOTICE
The fan supply output of the LFM is equipped with fuses. Therefore no additional fuses are required for the fan supply.

For the 690 V devices the fans are supplied via the transformer box at the top side of the devices. The connection to the Active Infeed Converter AIC is included in delivery and has to be connected to the line filter module LFM only.

The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the transformer box at the top side of the INV. Therefore a terminal module is necessary (deliverable as option "Fan wiring 6V" with reference number VW3A7280)



NOTICE
The fan supply output of the LFM is equipped with fuses. Therefore no additional fuses are required for the fan supply.

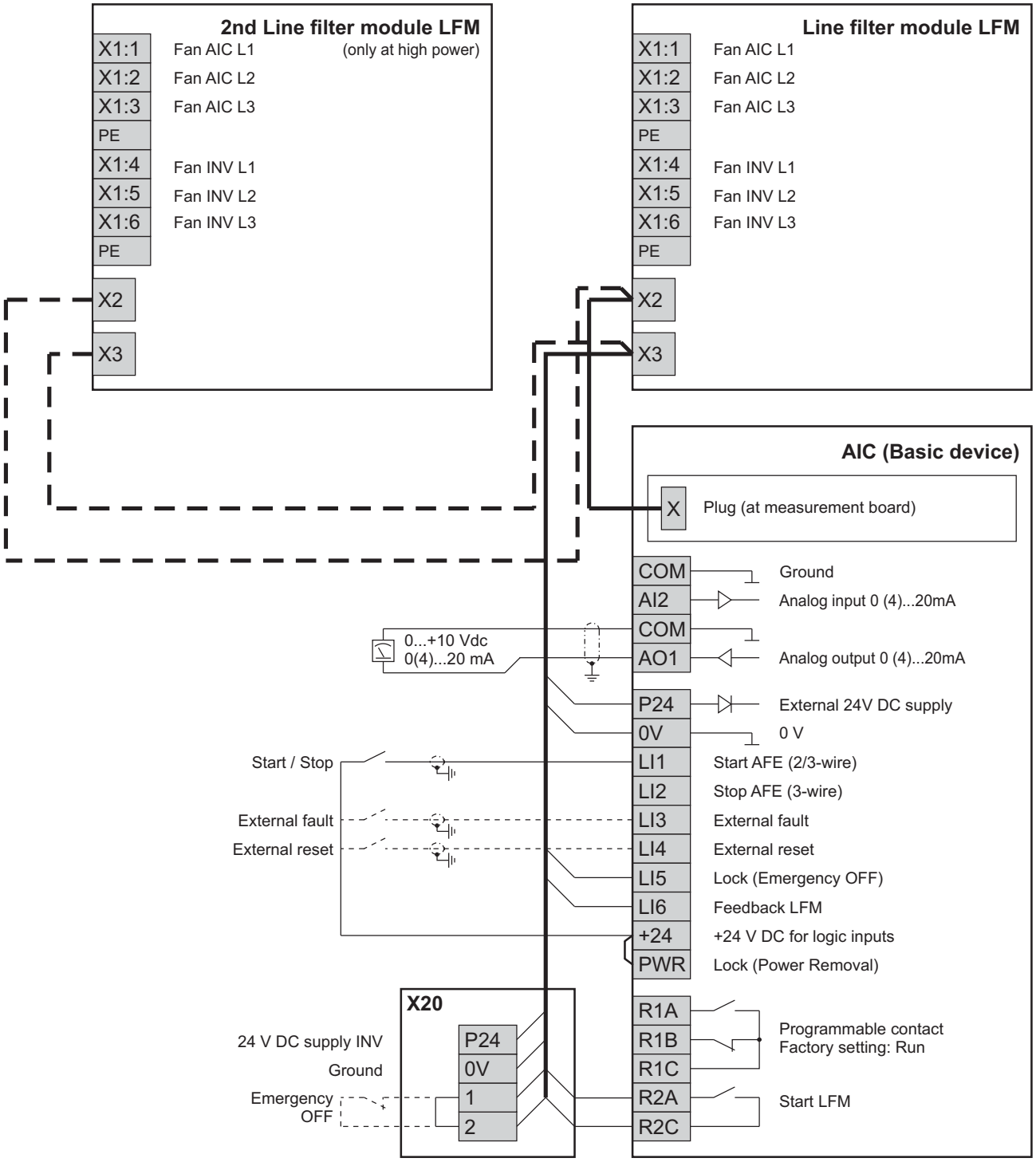
NOTICE
For fan supply of the inverter(s) INV it is necessary to order the option "Fan wiring 6V" with reference number VW3A7280. 1x VW3A7280 for ATV61HC11Y...C40Y; ATV71HC11Y...C31Y 2x VW3A7280 for ATV61HC50Y...C80Y; ATV71HC40Y...C63Y

Terminal connections

The following presentation shows the wiring of the control terminals between the line filter module LFM and the Active Infeed Converter AIC.

The wiring is significantly simplified by means of two ready-made cables with plugs which are already connected to the AIC. The cables are designed for a maximum distance of 1 m between AIC and LFM.

At 400 V devices up to 340 kW and at 690 V devices up to 430 kW, the Active Infeed Converter AIC is connected with only one LFM. In case of higher power the AIC is connected with two LFMs.



External control wiring

The following diagrams show the control wiring when several inverters are operated at a DC bus supplied by the Active Front End. Similar to the single drive, there are several possibilities for control of the Active Front End.

In case of a line fault during motor operation, the Active Front End as well as the inverter recognise the undervoltage and react according to their parameterization (impulse inhibit, alarm, trip). In generator operation the inverter may not recognize a line fault.

NOTICE

Ensure that the sum of the required DC power and sum of the capacity at the DC bus do not exceed the limits of the Active Infeed Converter AIC.

The inverters supplied via the DC bus may have different power.

⚠ WARNING

ADDITIONAL WIRING FOR HOIST APPLICATIONS

Establish a connection between the input "PWR" of the inverter and the relay output R1 "Run" of the Active Infeed Converter ().

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

⚠ WARNING

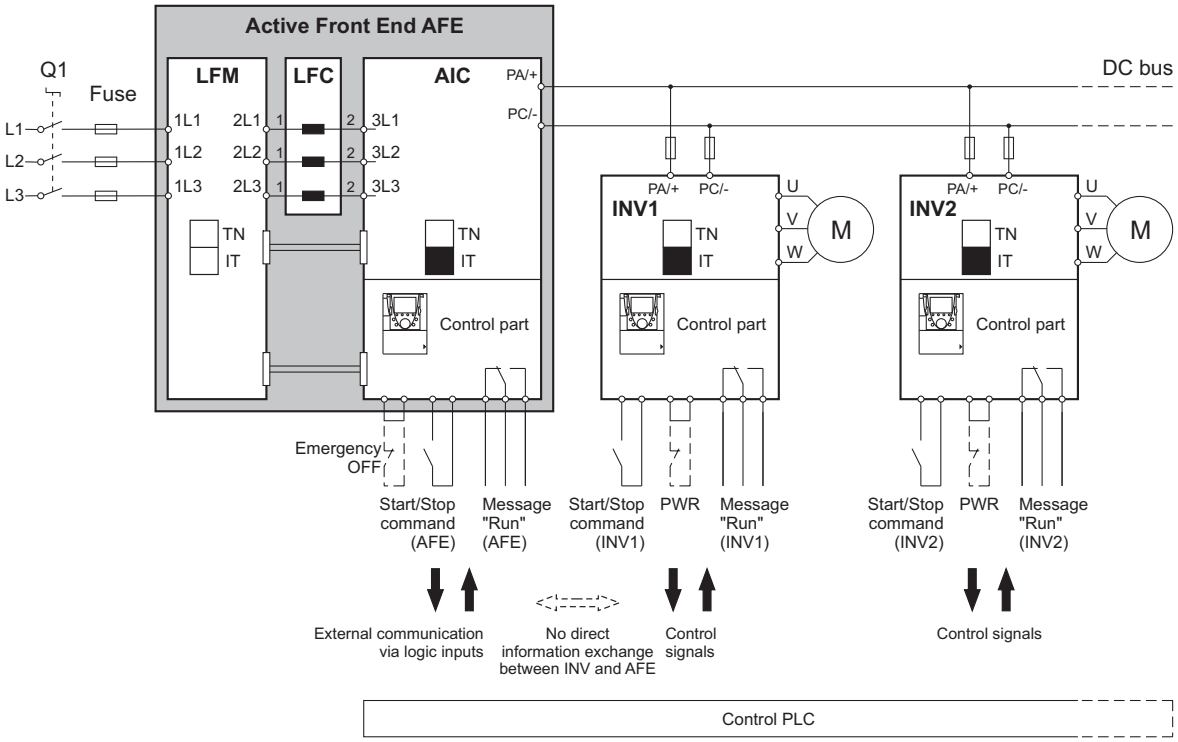
HUMAN PROTECTION AND MACHINE SAFETY

Take care for the correct integration of 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.

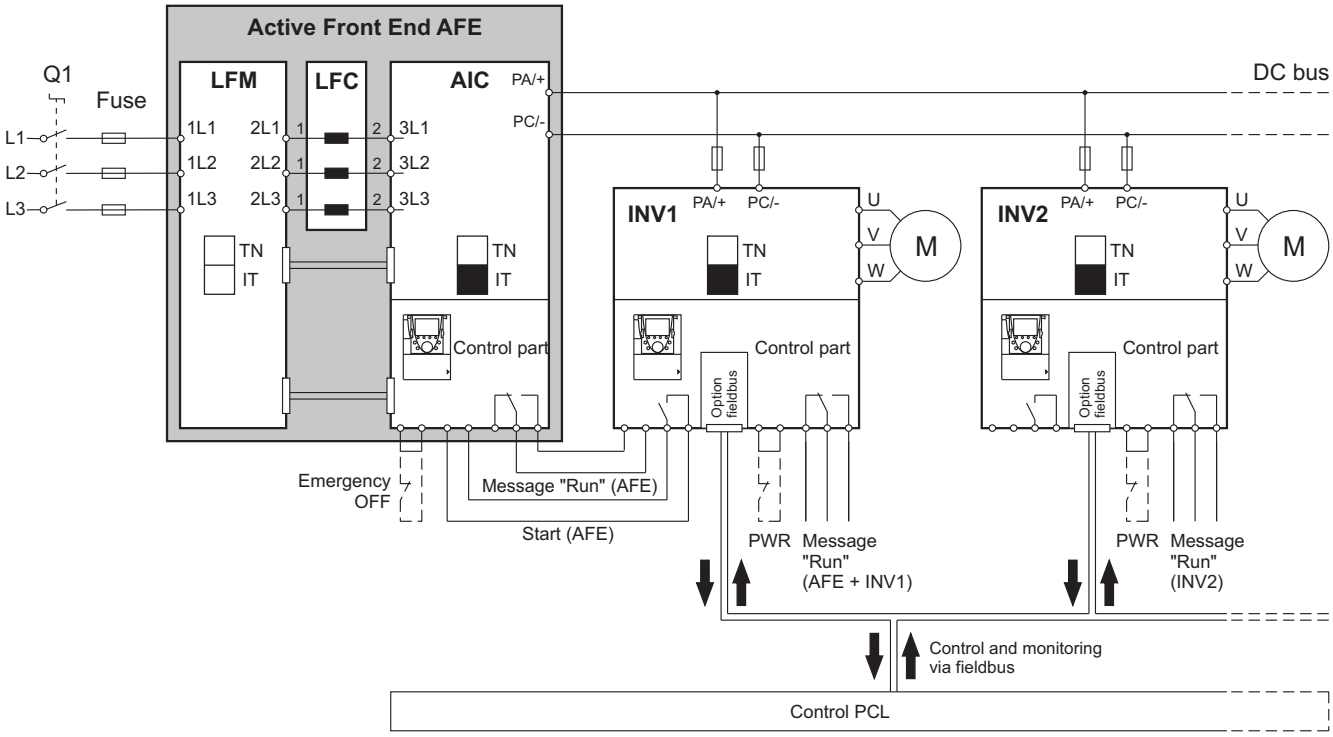
Control via start/stop signals

The Active Front End is controlled separately from the inverters by means of an own start command.
In this case the Active Front End AFE and the inverters INV have to be integrated separately to the superior control concept.



Control via start/stop signals of the inverter

The Active Front End is not controlled by an own start command but via the inverter.

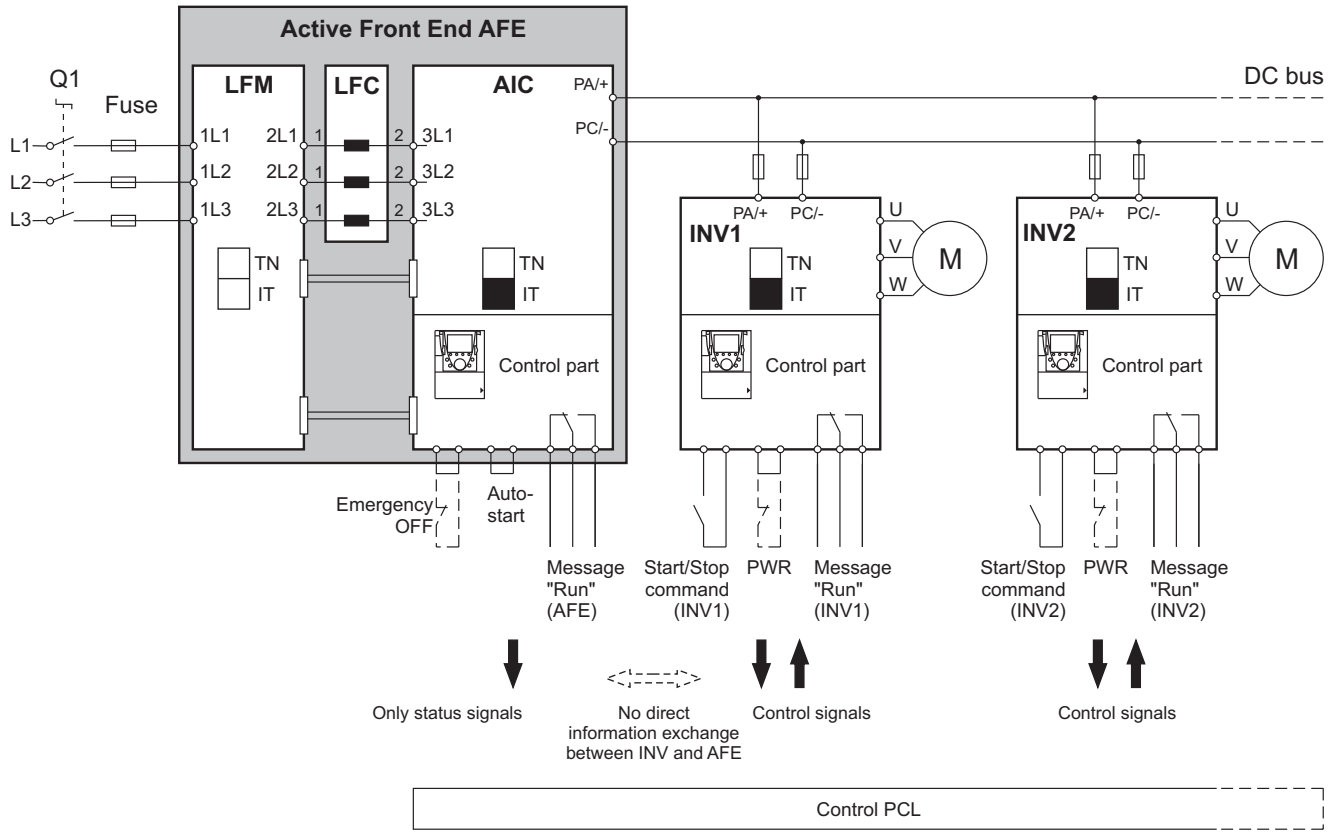


NOTICE
The 24 V DC buffer voltage of the inverter, that controls the Active Front End, can be taken from the Active Infeed Converter AIC. When further inverters should be supplied with a buffer voltage, it has to be generated external.

Control of the Active Front End via mains connection/disconnection

It is also possible with a common DC bus to operate the Active Front End without additional control. In this case the Active Front End starts as soon as voltage is recognised at the input.

In case of a line fault during motor operation, the Active Front End as well as the inverter recognise the undervoltage and react according to their parameterization (impulse inhibit, alarm, trip). In generator operation the inverter may not recognize a line fault.



⚠ WARNING

ADDITIONAL WIRING FOR HOIST APPLICATIONS

Establish a connection between the input "PWR" of the inverter and the relay output R1 "Run" of the Active Infeed Converter ().

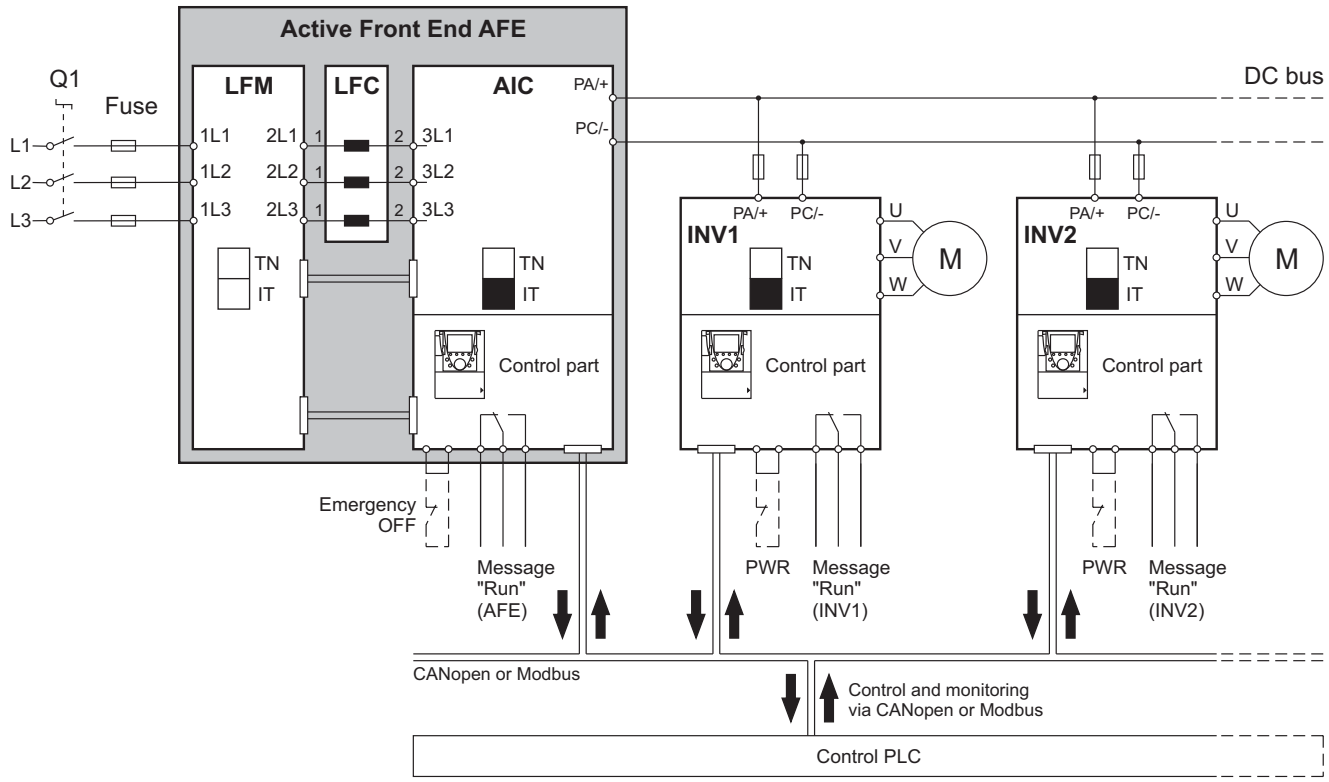
Failure to follow this instruction can result in death, serious injury or equipment damage.

NOTICE

The 24 V DC buffer voltage of an inverter INV can be taken from the Active Infeed Converter AIC. When further inverters should be supplied with a buffer voltage, it has to be generated external.

Control of the Active Front End via direct fieldbus control

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

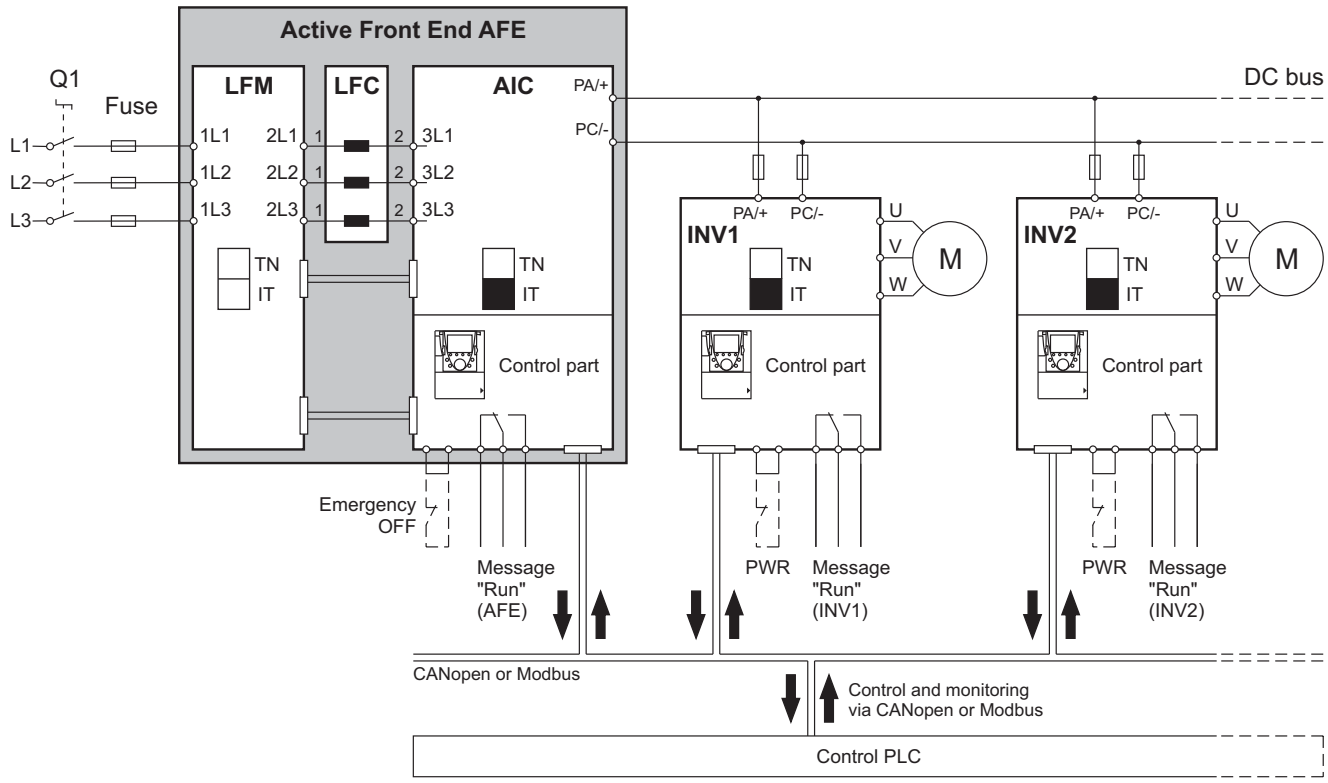


NOTICE
The 24 V DC buffer voltage of an inverter INV can be taken from the Active Infeed Converter AIC. When further inverters should be supplied with a buffer voltage, it has to be generated external.

Control of the Active Front End via indirect fieldbus control

The Active Front End is controlled and monitored by means of the option card "communication bridge" of the inverter. The connection to the Active Front End AFE is done via CANopen.

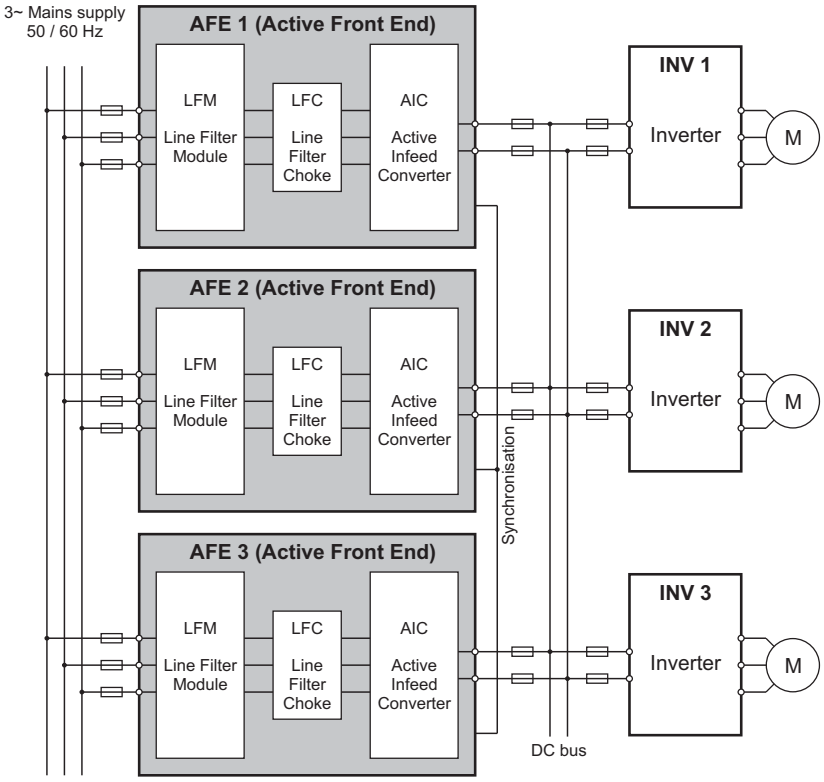
By using a fieldbus option card it is possible to control the inverter as well as the Active Infeed Converter via the inverter. Therefor each fieldbus system, which is available for the inverter, can be used.



NOTICE
The 24 V DC buffer voltage of an inverter INV can be taken from the Active Infeed Converter AIC. When further inverters should be supplied with a buffer voltage, it has to be generated external.

Description

In case of parallel connection of several Active Front End units AFE they supply a common DC bar. Thus enlarge the power at the DC bus or increase reliability due to redundancy. Up to four Active Front End units can be connected in parallel. Several inverters of different power can be operated at the DC bus. This enables also balance of energy at the DC link.



Parallel connection of the Active Front End units is possible without derating. Units of different power can be operated parallel whereas the smallest AFE unit should not be less than 50 % of the power of the biggest unit.

Depending on the power demand individual Active Front End units can be locked or released during operation.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Connection and disconnection of components must be only executed when there is no voltage

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

NOTICE

Take care of correct fuse protection of all components connected to the DC bus.

NOTICE

Observe the information and notes about the inverters in chapter "Inverter", Page 95 and the device documentation provided on the CD-ROM which is attached to each inverter.

Dimensioning

Pay attention to following points when several inverters are operated at a common DC bus that is supplied by one or several Active Front End units:

- Total DC power
  Add the required DC power of all drives that are connected to a DC bus, which is supplied by an Active Front End. Thereby you have to check the motor and generator powers.
  The DC link power of all connected inverters must not exceed the installed DC link power of the Active Front End units.
- Capacity of the DC bus
  In order to avoid overload of the charging circuit of the Active Front End, observe the sum of the capacities of all inverters connected to the DC bus. The connected capacities must not be higher than the load capacity of the Active Front End units.
- AFE type
  It is possible to connect two different types of Active Front End units parallel. However, the smallest Active Front End should not be less than 50 % of the power of the biggest unit.
  Nevertheless we recommend to connect only Active Front End units of same type parallel.

Active Front End for 400 V mains

Continuous DC power	Load	Active Front End AFE					
[kW]	capacity	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
400 V	[mF]	Type	Reference	Type	Reference	Type	Reference
120	30	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
143	40	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
172	40	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
238	80	4V240	VW3A7253	4V340	VW3A7262	4V340	VW3A7267
268	80	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
336	80	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
425	160	4V430	VW3A7256	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
530	160	4V540	VW3A7257	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
665	160	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 480 V mains (UL)

Continuous DC power	Load	Active Front End AFE					
[kW]	capacity	Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
480 V	[mF]	Type	Reference	Type	Reference	Type	Reference
130	30	4V120	VW3A7250	4V120	VW3A7260	4V120	VW3A7265
162	40	4V145	VW3A7251	4V175	VW3A7261	4V175	VW3A7266
162	40	4V175	VW3A7252	4V175	VW3A7261	4V175	VW3A7266
277	80	4V240-13	VW3A7283	4V340	VW3A7262	4V340	VW3A7267
315	80	4V275	VW3A7254	4V340	VW3A7262	4V340	VW3A7267
390	80	4V340	VW3A7255	4V340	VW3A7262	4V340	VW3A7267
490	160	4V430-15	VW3A7286	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
610	160	4V540-15	VW3A7287	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267
770	160	4V675	VW3A7258	2x4V340	2xVW3A7262	2x4V340	2xVW3A7267

Active Front End for 500 / 690 V mains									
Continuous DC power [kW]			Load capacity	Active Front End AFE					
				Active Infeed Converter AIC		Line Filter Module LFM		Line Filter Choke LFC	
500 V	600 V	690 V	[mF]	Type	Reference	Type	Reference	Type	Reference
102	123	142	16	6V145	VW3A7270 1)	6V220	VW3A7263	6V220	VW3A7268
127	153	172	16	6V175	VW3A7271 1)	6V220	VW3A7263	6V220	VW3A7268
157	162	215	16	6V220	VW3A7272 1)	6V220	VW3A7263	6V220	VW3A7268
193	230	268	32	6V275	VW3A7273 1)	6V430	VW3A7264	6V430	VW3A7269
242	290	335	32	6V340	VW3A7274 1)	6V430	VW3A7264	6V430	VW3A7269
305	365	424	32	6V430	VW3A7275 1)	6V430	VW3A7264	6V430	VW3A7269
382	460	528	64	6V540	VW3A7276 2)	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
478	575	663	64	6V675	VW3A7277 2)	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269
607	730	842	64	6V860	VW3A7278 2)	2x6V430	2xVW3A7264	2x6V430	2xVW3A7269

1.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 1x

2.) ... additionally the option Fan wiring 6V (VW3 A7 280) has to be ordered 2x

DC bus capacities for 400 V – 440 V mains					
Active Infeed Converter AIC		DC fuse	Recommended type of fuse		DC capacity
Type	Reference	[A]	Ferraz Shawmut 1)	Bussmann 2)	[mF]
4V120	VW3A7250	250	12.5 URD 70 TTF 0250	170M3395	6.5
4V145	VW3A7251	315	12.5 URD 71 TTF 0315	170M3396	9.8
4V175	VW3A7252	350	12.5 URD 71 TTF 0350	170M3397	9.8
4V240	VW3A7253	500	12.5 URD 72 TTF 0500	170M4445	13
4V275	VW3A7254	550	12.5 URD 72 TTF 0550	170M4446	14
4V340	VW3A7255	700	12.5 URD 73 TTF 0700	170M5447	20
4V430	VW3A7256	2x450	2x 12.5 URD 72 TTF 0450	2x 170M4394	21
4V540	VW3A7257	2x550	2x 12.5 URD 72 TTF 0550	2x 170M4446	30
4V675	VW3A7258	2x700	2x 12.5 URD 73 TTF 0700	2x 170M5447	39

1.) ... Ferraz Shawmut - Protistor semiconductor fuse PSC aR sizes 7x – 1250/1300Vac

2.) ... Bussmann - High speed fuse square body flush end contact – 1250/1300Vac

DC bus capacities for 480 V mains (UL)					
Active Infeed Converter AIC		DC fuse	Recommended type of fuse		DC capacity
Type	Reference	[A]	Ferraz Shawmut 1)	Bussmann 2)	[mF]
4V120	VW3A7250	250	A130 URD 70 TTI 0250	170M3395	6.5
4V145	VW3A7251	315	A130 URD 71 TTI 0315	170M3396	9.8
4V175	VW3A7252	350	A130 URD 71 TTI 0350	170M3397	9.8
4V240-13	VW3A7283	500	A130 URD 72 TTI 0500	170M4445	14
4V275	VW3A7254	550	A130 URD 72 TTI 0550	170M4446	14
4V340	VW3A7255	700	A130 URD 73 TTI 0700	170M5447	20
4V430-15	VW3A7286	2x450	2x A130 URD 72 TTI 0450	2x 170M4394	39
4V540-15	VW3A7287	2x550	2x A130 URD 72 TTI 0550	2x 170M4446	39
4V675	VW3A7258	2x700	2x A130 URD 73 TTI 0700	2x 170M5447	39

1.) ... Ferraz Shawmut - Protistor semiconductor fuse PSC aR sizes 7x – 1250/1300Vac

2.) ... Bussmann - High speed fuse square body flush end contact – 1250/1300Vac

DC bus capacities for 500 / 690 V mains					
Active Infeed Converter AIC		DC fuse	Recommended type of fuse		DC capacity
Type	Reference	[A]	Ferraz Shawmut 1)	Bussmann 2)	[mF]
6V145	VW3A7270	160	CC 7.5 gRC 120 TTF 0160	170E3581	3.9
6V175	VW3A7271	200	CC 7.5 gRC 121 TTF 0200	170E5417	3.9
6V220	VW3A7272	250	CC 7.5 gRC 121 TTF 0250	170E5418	3.9
6V275	VW3A7273	315	CC 7.5 gRC 122 TTF 0315	170E8336	7.8
6V340	VW3A7274	400	CC 7.5 gRC 122 TTF 0400	170E8337	7.8
6V430	VW3A7275	500	CC 7.5 gRC 123 TTF 0500	170E9681	7.8
6V540	VW3A7276	2x315 or 1x630	2x CC 7.5 gRC 122 TTF 0315 or 1x CC 7.5 gRC 2122 TTF 0630	2x 170E8336	16
6V675	VW3A7277	2x400 or 1x800	2x CC 7.5 gRC 122 TTF 0400 or 1x CC 7.5 gRC 2122 TTF 0800	2x 170E8337	16
6V860	VW3A7278	2x500 or 1x1000	2x CC 7.5 gRC 123 TTF 500 or 1x CC 7.5 gRC 2123 TTF 1000	2x 170E9681	16

1.) ... Ferraz Shawmut - Protistor semiconductor fuse PSC aR sizes 7x – 1250/1300Vac

2.) ... Bussmann - High speed fuse square body flush end contact – 1250/1300Vac

DC bus capacities for 600 V mains (UL/CSA)				
Active Infeed Converter AIC		DC fuse	Recommended type of fuse	DC capacity
Type	Reference	[A]	Bussmann 1)	[mF]
6V145	VW3A7270	160	170M1826	3.9
6V175	VW3A7271	200	170M1827	3.9
6V220	VW3A7272	250	170M1828	3.9
6V275	VW3A7273	315	170M1829	7.8
6V340	VW3A7274	400	170M1831	7.8
6V430	VW3A7275	500	170M1833	7.8
6V540	VW3A7276	2x315	2x 170M1829	16
6V675	VW3A7277	2x400	2x 170M1831	16
6V860	VW3A7278	2x500	2x 170M1833	16

1.) ... Bussmann - High speed fuse square body flush end contact – 1250/1300Vac

NOTICE

Further technical data can be found in chapter "Technical data", Page 67.

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.

Parallel connection

In this example two Active Front End units supply a common DC bus at which several inverters are operated. A mains voltage is 400 V is expected.

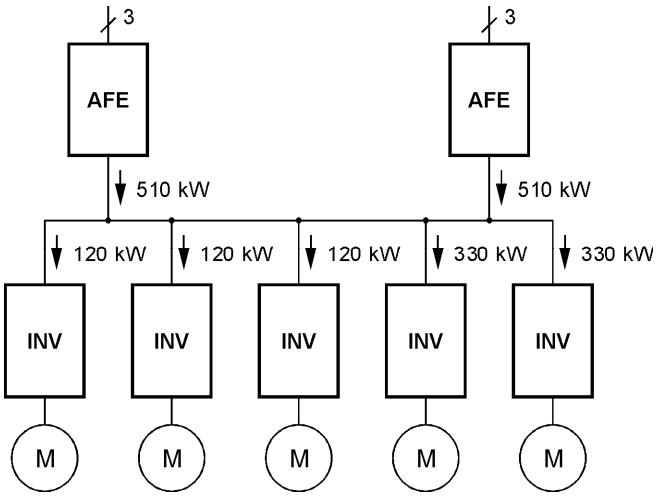
The two Active Front End units are used to reach a higher power at the DC bus. The control has to take care that both Active Front End units are controlled simultaneously. It is not necessary to take the capacity of the Active Front End units into account because the Active Front End itself supplies its capacities.

In case of parallel connection due to increase redundancy, the capacity of the Active Front End has to be observed because the supply of the whole DC bus has to be provided if the Active Front End breaks down.

In order to select the Active Front End units, the performance record and the total charging capacity at the DC bus have to be checked.

3 pieces ATV61HC11N4D and 2 pieces ATV61HC31N4D are used as inverters. Thus each inverter needs a DC power of 120 kW or 330 kW, as specified in the previous tables.

As the capacities at the DC bus (independent of the energy direction) have to be charged by the Active Front End, they have to be added.



Inverter	Power demand	Capacity
ATV61HC11N4D	120 kW	6.5 mF
ATV61HC11N4D	120 kW	6.5 mF
ATV61HC11N4D	120 kW	6.5 mF
ATV61HC31N4D	330 kW	20 mF
ATV61HC31N4D	330 kW	20 mF
Total	1020 kW	59.5 mF

Due to the parallel connection, two Active Front End units of same type are selected. Based on the performance record the following two Active Front End units are selected, consisting of following components:

2x 1x AIC	4V540	VW3A7257	Total power (of both AFEs): 1060 kW
2x **2x** LFM	4V340	VW3A7262	Load capacity (per AFE): 160 mF
2x **2x** LFC	4V340	VW3A7267	

Due to the tolerances of components, the load sharing between the two AFEs may differ up to 40 % in partial-load range.

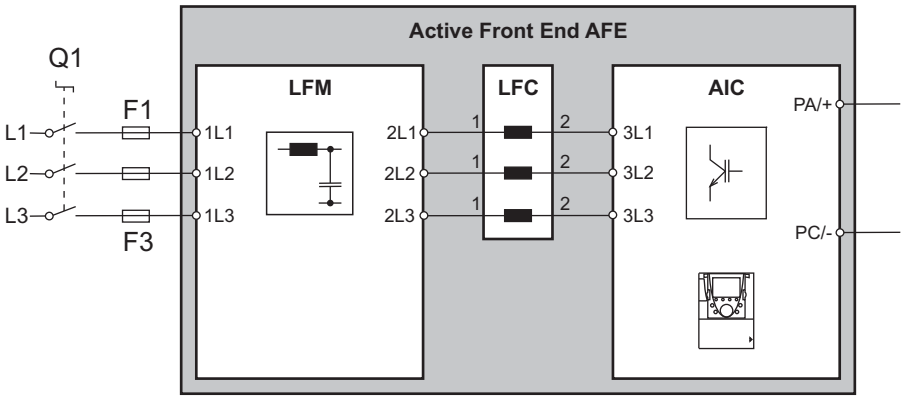
NOTICE
In case of two or more AFEs parallel to increase the total power, take care that the external superior control of the installed AFEs are ready to run and that they are started simultaneously (within 100ms). Derating by parallel connection is not required.

Power wiring

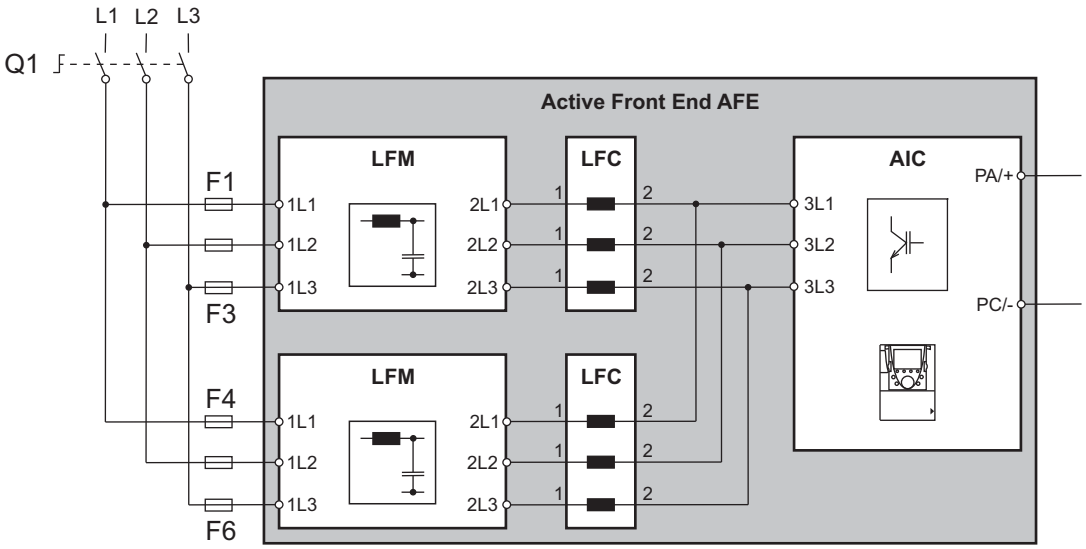
The Active Front End consists of three components in principle: the line filter module LFM, the line filter choke LFC and the Active Infeed Converter AIC.

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.

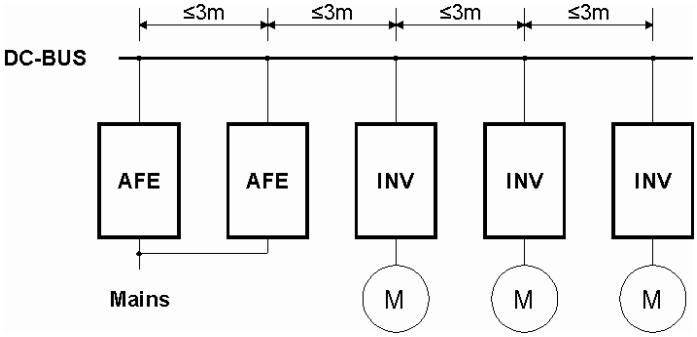


For 400 V devices 430 kW and larger and for 500 / 690 V 540 kW and lager the Active Front End consists of an AIC, **two** LFMs and **two** LFCs (each consisting of three single phase chokes).



DC wiring

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



CAUTION

RISK OF RESONANCES

The length of the DC wiring between two components must not exceed 3m.

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

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.

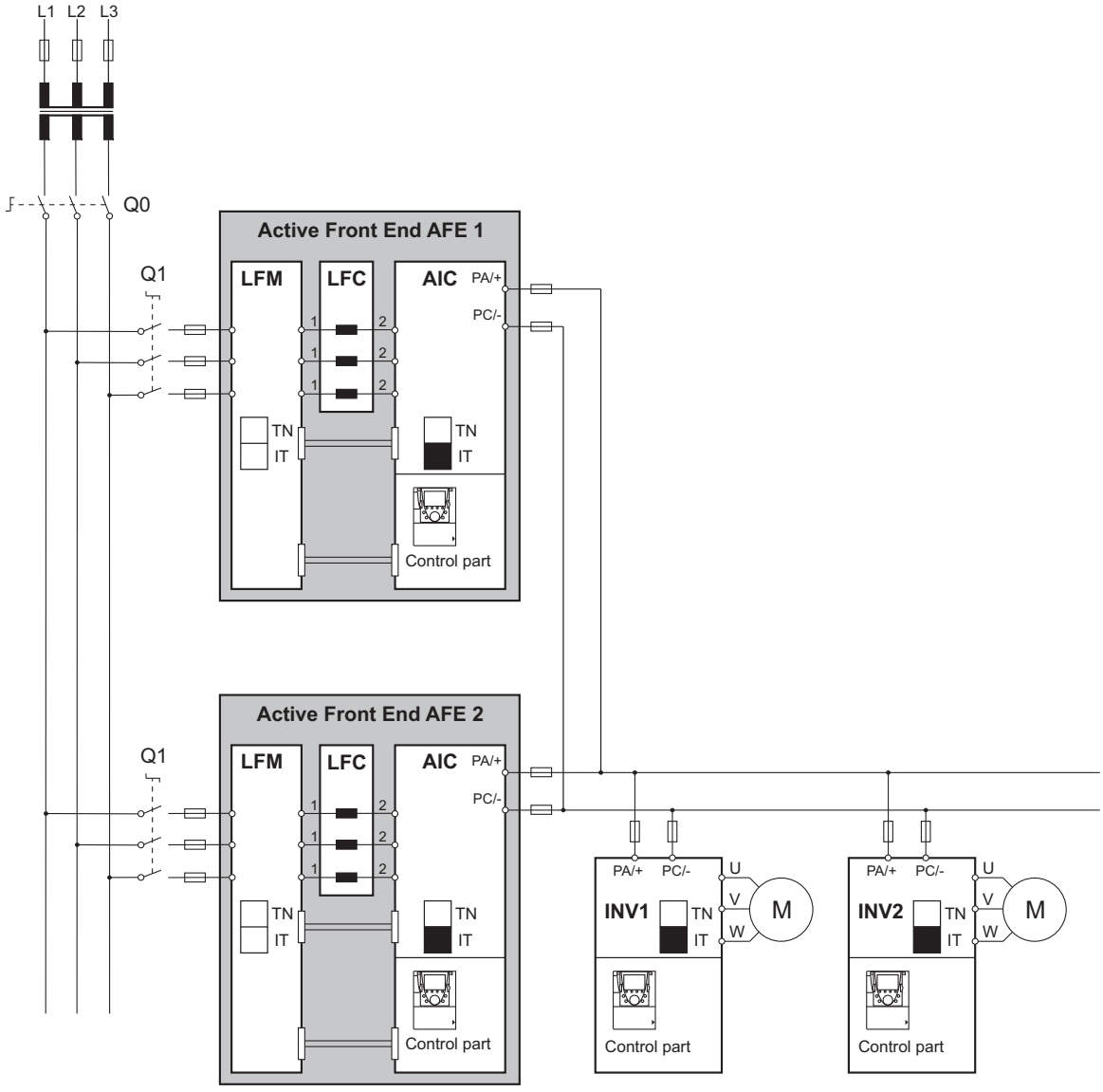
EMC in case of long motor cables

The capacitive leakage currents increase with the number of parallel inverters and the total length of the installed motor cables. A separate isolating transformer can be necessary for creating an IT mains.

The following simplification can be used to get a guidance value for optimal planning of the plant:

(Number of motors x 50)		< 500 ..... Operation of the whole system in TN or IT mains possible
+	**=**	
Total motor cable lengths in meter		500...3000 ..... Operation only with separate isolating transformer

The transformer builds an IT mains (must not be grounded at the secondary side) and so it decouples the interference currents of the system from the mains. It has to match with the total power demand of the drive unit.



DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Ensure that human protection is guaranteed at the plant.

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

Internal control wiring

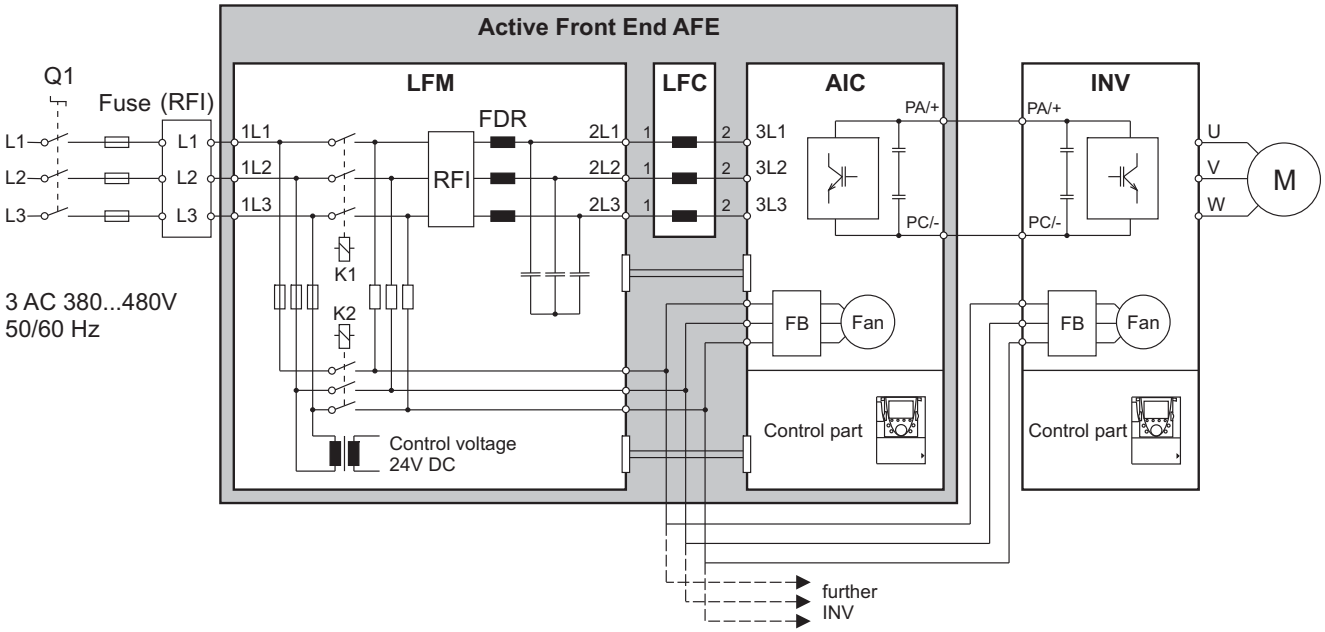
The voltage for fan supply and the control voltage are generated in the line filter module LFM.

The control wiring between the line filter module LFM and the Active Infeed Converter AIC is realized by the provided connecting cables W2 and W3. 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.

For the 400 V devices (except VW3 A7 250 due to DC fans) the cable W1 has to be connected to the line filter module LFM in order to supply the fans in the Active Infeed Converter AIC. The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the auxiliary terminal block R0/S0/T0 (switching to external supply) in the INV.

With the fan supply it is possible to operate all fans of the Active Infeed Converter AIC and the fans of up to four inverters.

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

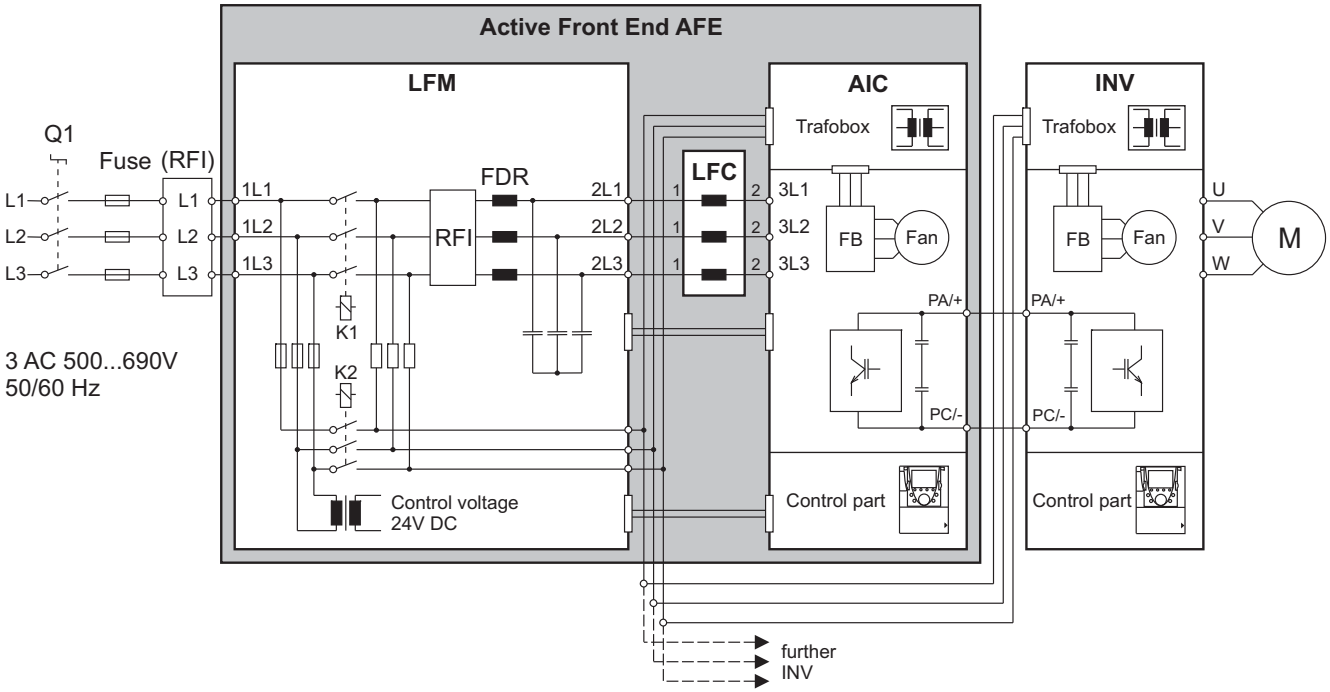


NOTICE
The inverters INV of the types ATV61H075N4 ... HC11N4 ATV71H075N4 ... HD90N4 do not require an external fan supply from the line filter module LFM, because these drives contain DC fans.

NOTICE
The fan supply output of the LFM is equipped with fuses. Therefore no additional fuses are required for the fan supply.

For the 690 V devices the fans are supplied via the transformer box at the top side of the devices. The connection to the Active Infeed Converter AIC is included in delivery and has to be connected to the line filter module LFM only.

The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the transformer box at the top side of the INV. Therefore a terminal module is necessary (deliverable as option "Fan wiring 6V" with reference number VW3A7280)



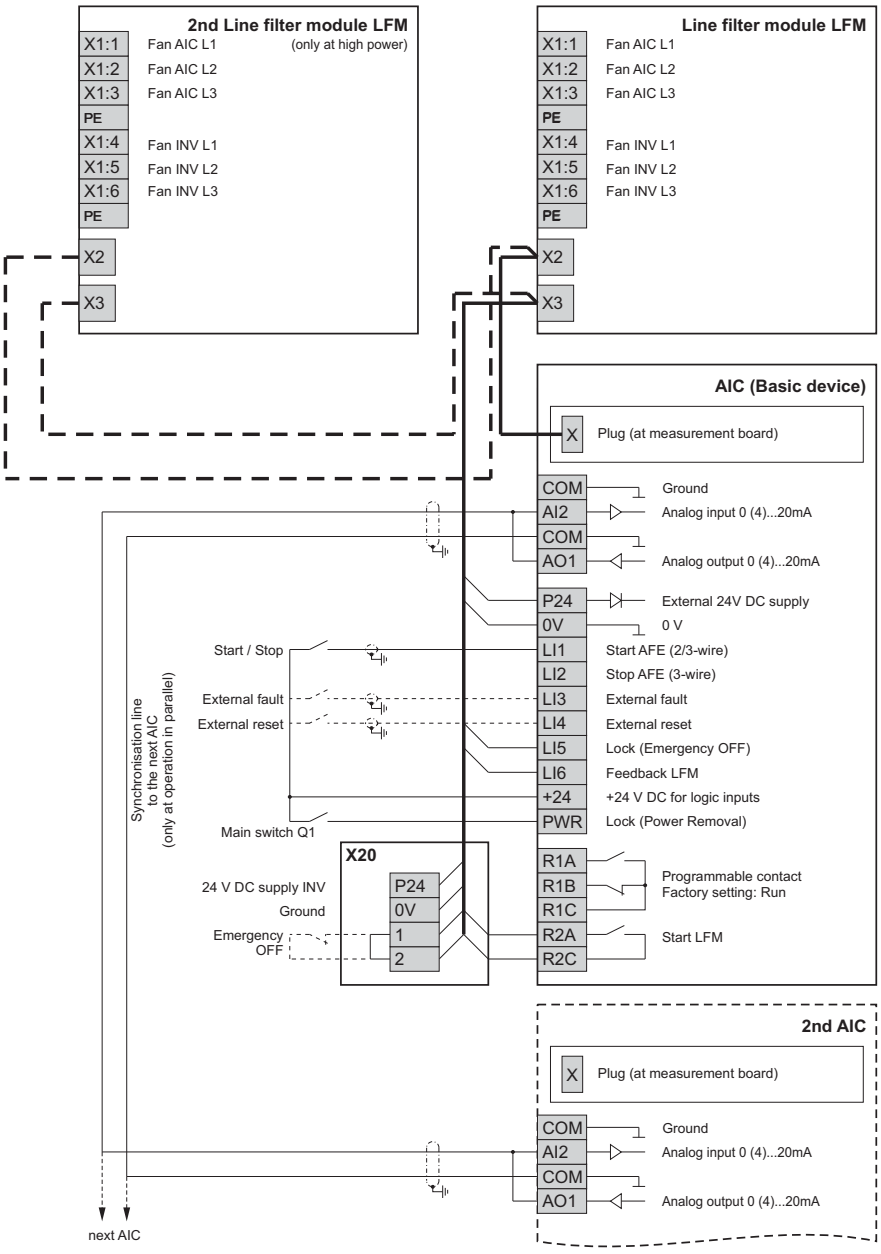
NOTICE
For fan supply of the inverter(s) INV it is necessary to order the option "Fan wiring 6V" with reference number VW3A7280. 1x VW3A7280 for ATV61HC11Y...C40Y; ATV71HC11Y...C31Y 2x VW3A7280 for ATV61HC50Y...C80Y; ATV71HC40Y...C63Y

Terminal connections

The following presentation shows the wiring of the control terminals between the line filter module LFM and the Active Infeed Converter AIC.

The wiring is significantly simplified by means of two ready-made cables with plugs which are already connected to the AIC. The cables are designed for a maximum distance of 1 m between AIC and LFM.

At 400 V devices up to 340 kW and at 690 V devices up to 430 kW, the Active Infeed Converter AIC is connected with only one LFM. In case of higher power the AIC is connected with two LFMs.



NOTICE

At parallel operation of 4 Active Front End units AFE an interruption of the synchronisation line may not be detected definitely.

NOTICE

As soon as parameter 2.1.02 "Parallel operation" is set to "active", the analog outputs and inputs are not available any longer because they are used for synchronisation.

External control wiring

The following diagrams show the control wiring when several inverters are operated at a DC bus supplied by several Active Front End units. There are several possibilities for control of the Active Front End units.

In case of a mains failure during motor operation, the Active Front End as well as the inverter recognise the undervoltage and react according to their parameterization (impulse inhibit, alarm, trip). In generator operation the inverter may not recognize a mains failure always.

The inverters supplied via the DC bus may have different power.

The built-in line contactor opens at stop or lock of an AFE and so it prevents current flow between the active and the locked AFE's.

⚠ WARNING

HUMAN PROTECTION AND MACHINE SAFETY

Take care for the correct integration of 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.

⚠ WARNING

ADDITIONAL WIRING FOR HOIST APPLICATIONS

Establish a connection between the input "PWR" of the inverter and the relay output R1 "Run" of the Active Infeed Converter ().

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

⚠ CAUTION

RISK OF OVERLOAD OF INTERNAL FILTER COMPONENTS

Ensure that the main switch Q1 is equipped with an auxiliary contact. Integrate it via a monitoring line into the locking of the Active Front End (e.g. input PWR).

When the AFE is not connected to mains voltage, but it is supplied by the parallel connected AFE via the DC link, the operation of the AFE is locked.

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

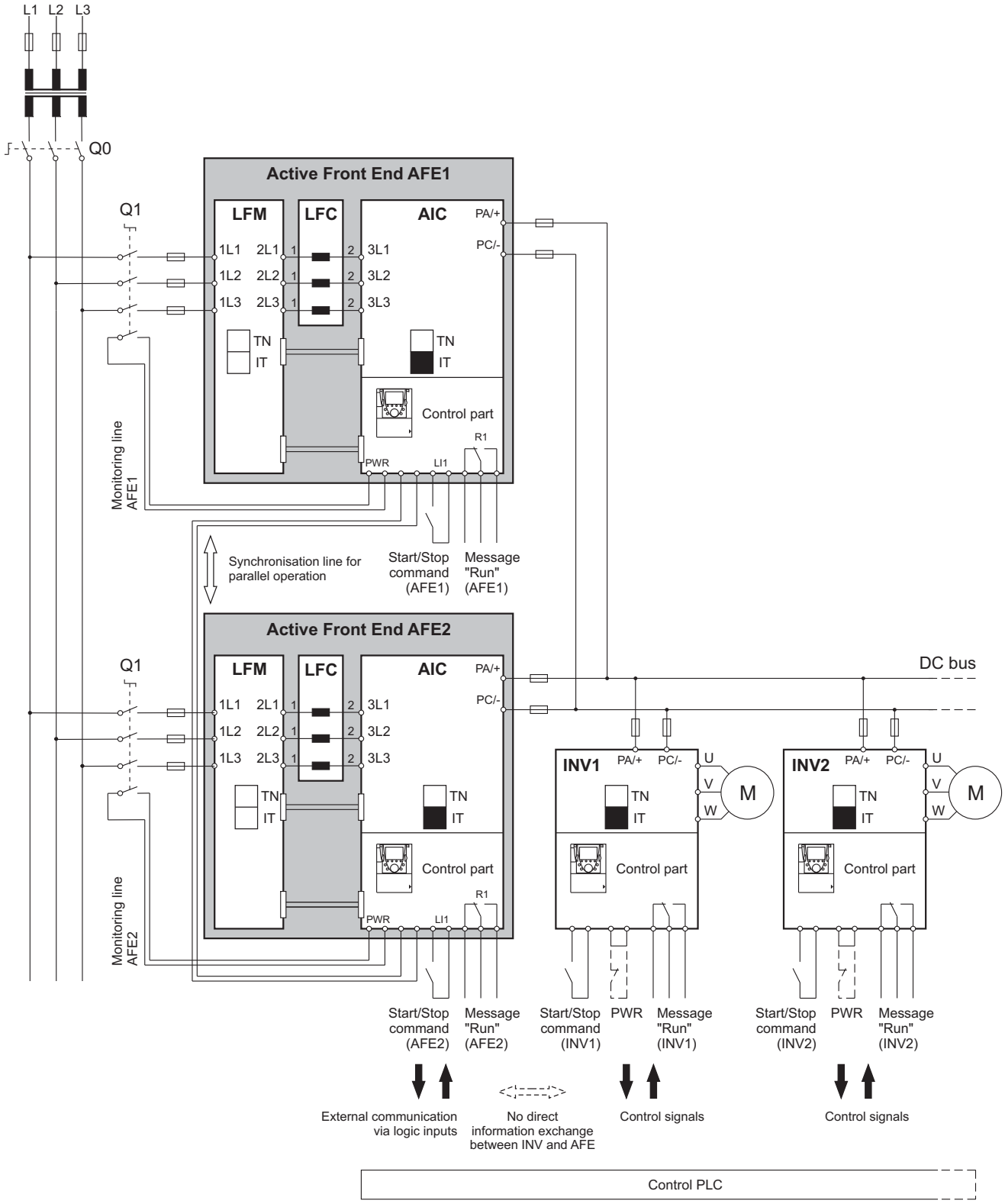
NOTICE

Ensure that the sum of the required DC power and sum of the capacity at the DC bus do not exceed the limits of the Active Infeed Converter AIC.

The inverters supplied via the DC bus may have different power.

Control via start/stop signals

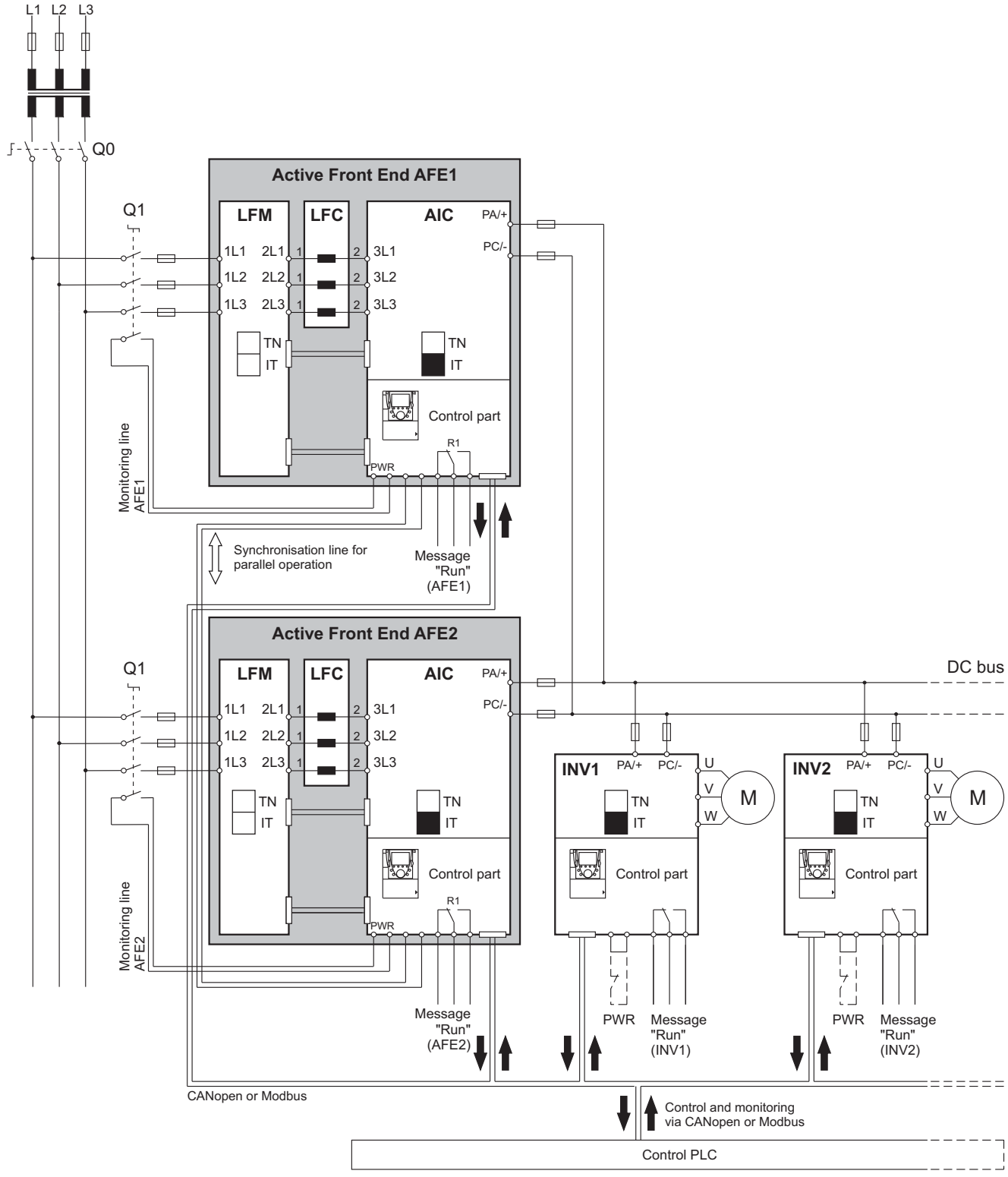
The Active Front End units are controlled separately from the inverters by means of an own start command.
In this case the Active Front End units and the inverters have to be integrated separately to the superior control concept.
For parallel operation of AFEs a connection between the Active Front End units is required.



Control of the Active Front End via direct fieldbus control

The inverters INV as well as the Active Front End units can be tested and monitored via CANopen or Modbus using the built-in interface.

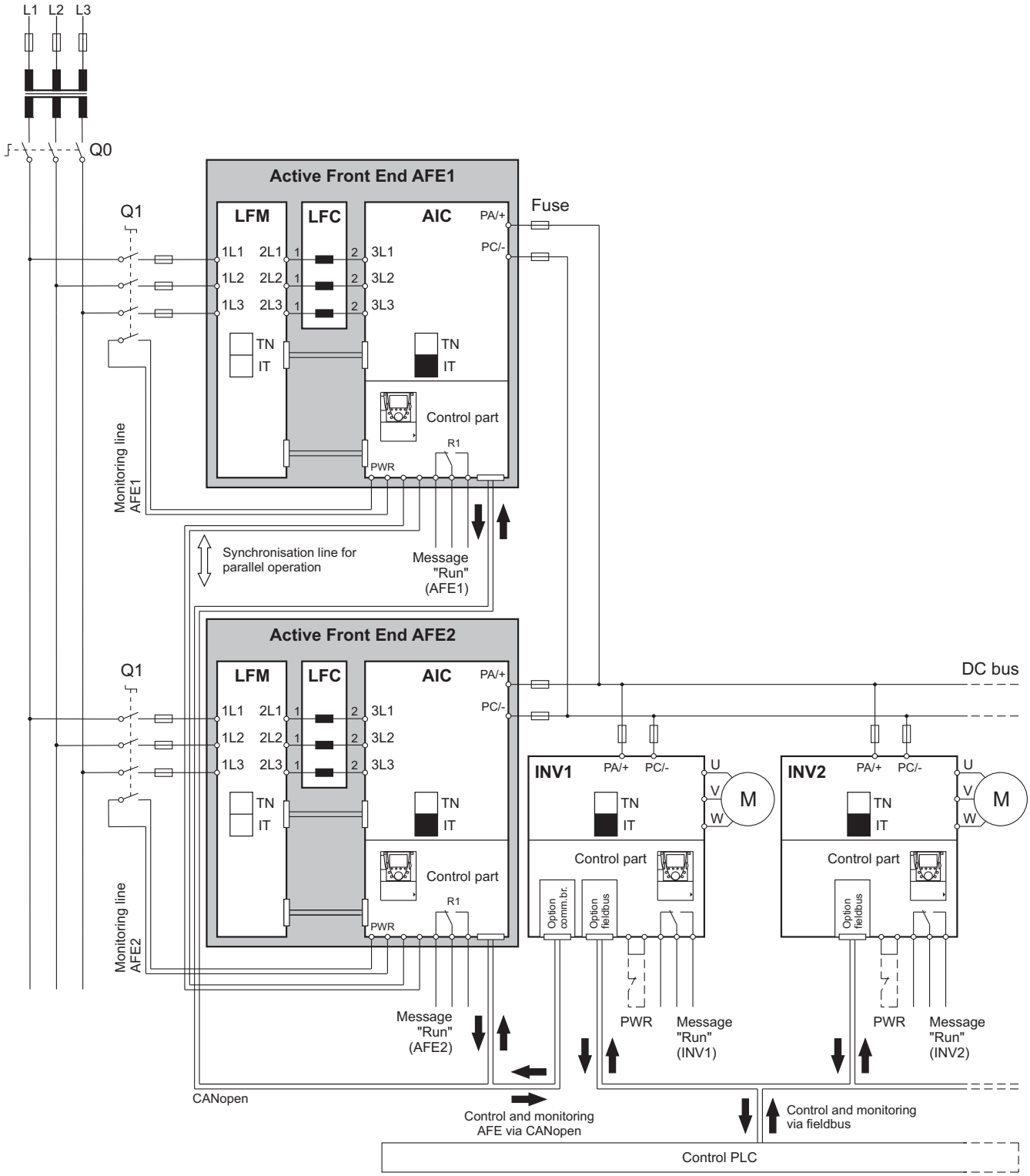
For parallel operation of AFEs a connection between the Active Front End units is required.



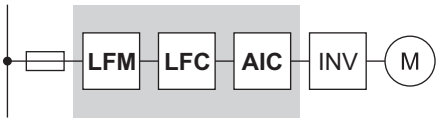
Control of the Active Front End via indirect fieldbus control

When communication at the control system is not realized with CANopen or Modbus but with another fieldbus system, the option card "communication bridge" is required. Combined with a "fieldbus option card" it allows indirect communication with the fieldbus system.

Please observe that the "communication bridge" card is built into the inverter. By using the fieldbus option card it is possible to control the inverter as well as the Active Infeed Converter.



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:

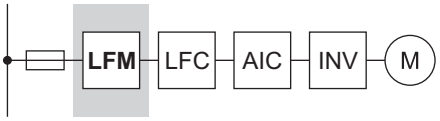
- Line Filter Module LFM
- Line Filter Choke LFC
- Active Infeed Converter AIC

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		

NOTICE

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.

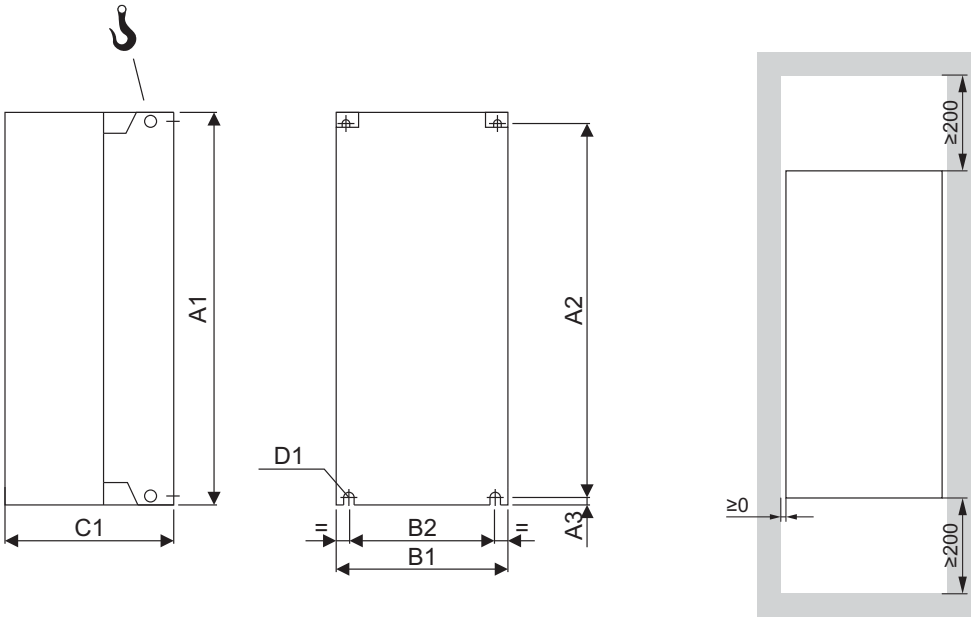
Line filter module LFM



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	
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, C-Tick, DNV, BV	

	400 V			690 V	
	LFM 4V120	LFM 4V175	LFM 4V340	LFM 6V220	LFM 6V430
Order number	VW3 A7 260	VW3 A7 261	VW3 A7 262	VW3 A7 263	VW3 A7 264
Nominal current @50°C [A]	180	255	495	185	360
Losses [W]	290	360	560	360	560
Weight [kg]	60	80	125	80	125
Dimension A1 [mm]	680	730	1100	730	1100
Dimension A2 [mm]	650	695	1065	695	1065
Dimension A3 [mm]	15	15	15	15	15
Dimension B1 [mm]	240	290	290	290	290
Dimension B2 [mm]	170	220	220	220	220
Dimension C1 [mm]	379	379	379	370	390
Fixing D1 [mm]	4 x ∅11.5	4 x ∅11.5	4 x ∅11.5	4 x ∅11.5	4 x ∅11.5



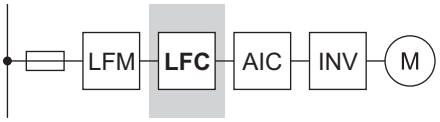
Losses regarding the Active Infeed Converter AIC

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

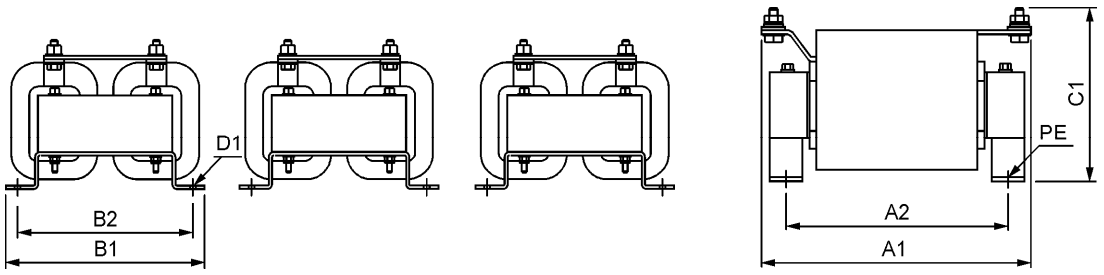
Line filter choke LFC



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.

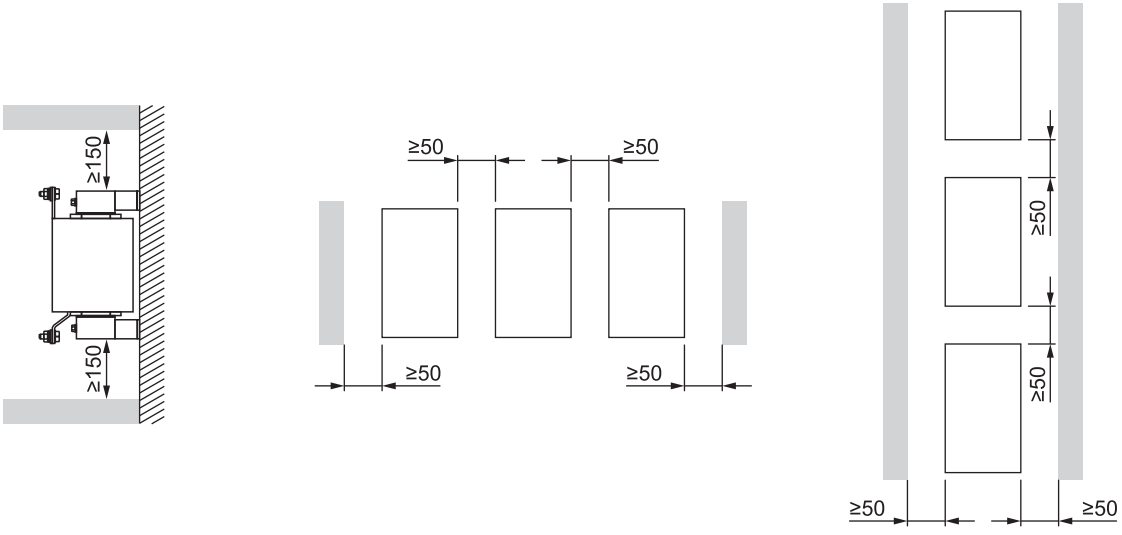
Line Filter Choke LFC	400 V / 480 V	500 V / 600 V / 690 V
General		
Nominal voltage	380 V -30 % … 480 V +10 %	500 V -20 % … 690 V +10 %
Design	Open constructions for installation into the cubicle	
Cooling	Natural convection / no forced ventilation	
Mechanical strength		
Winding protection	Drenched in 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 1% derating per °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
Standards		
Insulation class	H	
Approvals	CE, GOST, UL, C-Tick, DNV, BV	

	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]	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.

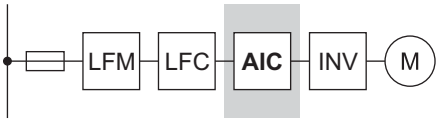
Losses regarding the Active Infeed Converter AIC

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

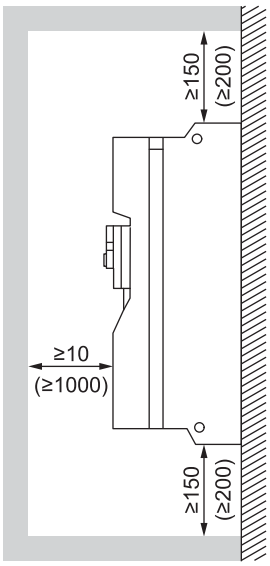
Active Infeed Converter AIC



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, C-Tick, DNV, BV	

AIC	4V120	4V145	4V175
Order number	VW3 A7 250	VW3 A7 251	VW3 A7 252
Nominal data			
Input voltage			
V_N [V]	380 V -30% ... 480 V +10%	380 V -30% ... 480 V +10%	380 V -30% ... 480 V +10%
Input current			
I_N [A] V_N = 400 V	177	212	255
I_{Harm} [A] V_N = 400 V	6.8	8.2	9.8
Input power			
$P_{N\,400}$ [kW] V_N = 400 V	123	146	175
$P_{N\,480}$ [kW] V_N = 480 V	133	166	166
Characteristics			
Losses [W] at I_N	2250	2660	2970
Losses control part [W]	270	300	360
Losses power part [W]	1980	2360	2610
Weight approx. [kg]	60	74	80
Ambient conditions			
Air flow IP23 [m^3/h]	400	600	600
Air flow IP54 [m^3/h][1)]	115	145	165
Min. air inlet and air outlet (IP23) [dm^2]	5	7	7
Dimensions			
Dimension A1 [mm]	680	782	950
Dimension A2 [mm]	650	758	920
Dimension A3 [mm]	15	12	15
Dimension B1 [mm]	310	350	330
Dimension B2 [mm]	250	298	285
Dimension C1 [mm]	377	377	377
Fixing D1 [mm]	4x ∅11.5	4x ∅11.5	4x ∅11.5



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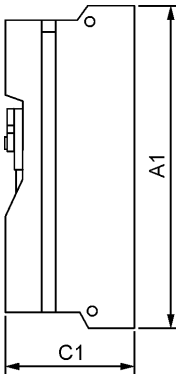
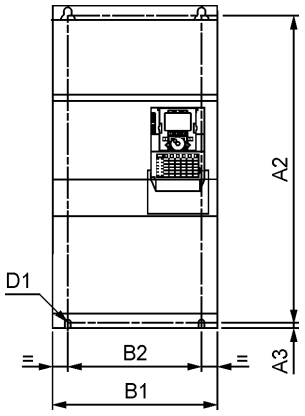
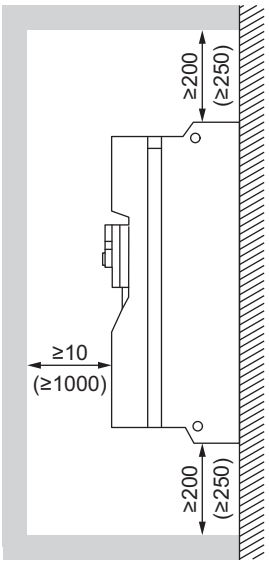
1) ..... The given air flow is only valid for the control part losses because the losses of the power part are exhausted via the air channel of the separated air flow.

Basic device without or with 1 option card





AIC	4V240	4V240-13	4V275	4V340
Order number	VW3 A7 253	VW3 A7 283	VW3 A7 254	VW3 A7 255
Nominal data				
Input voltage				
V_N [V]	380 V -30% ... 440 V +10%	480 V - 40/+10%	380 V -30% ... 480 V +10%	380 V -30% ... 480 V +10%
Input current				
I_N [A]	348	348	395	495
I_{Harm} [A]	13.4	13.4	15.2	19
Input power				
$P_{N\,400}$ [kW] V_N = 400 V	242	-	273	342
$P_{N\,480}$ [kW] V_N = 480 V	-	281	320	396
Characteristics				
Losses [W] at I_N	3560	3560	4710	5800
Losses control part [W]	430	430	610	770
Losses power part [W]	3130	3130	4100	5030
Weight approx. [kg]	110	140	140	140
Ambient conditions				
Air flow IP23 [m^3/h]	800	1200	1200	1200
Air flow IP54 [m^3/h][1)]	200	270	270	330
Min. air inlet and air outlet (IP23) [dm^2]	8	10	10	10
Dimensions				
Dimension A1 [mm]	950	950	950	950
Dimension A2 [mm]	920	920	920	920
Dimension A3 [mm]	15	15	15	15
Dimension B1 [mm]	430	585	585	585
Dimension B2 [mm]	350	540	540	540
Dimension C1 [mm]	377	377	377	377
Fixing D1 [mm]	4x ∅11.5	4x ∅11.5	4x ∅11.5	4x ∅11.5



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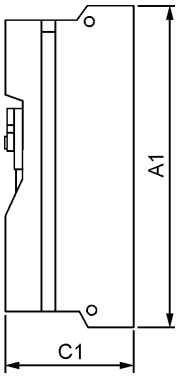
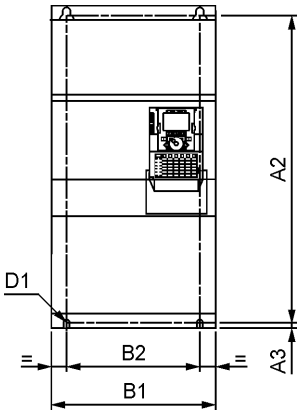
Basic device without or with 1 option card





AIC	4V430	4V430-15	4V540	4V540-15	4V675
Order number	VW3 A7 256	VW3 A7 286	VW3 A7 257	VW3 A7 287	VW3 A7 258
Nominal data					
Input voltage V_N [V]	380 V -30% ... 440 V +10%	480 V -40/+10%	380 V -30% ... 440 V +10%	480 V -40/+10%	380 V -30% ... 480 V +10%
Input current					
I_N [A]	628	628	780	780	980
I_{Harm} [A]	24.2	24.2	30	30	37.7
Input power					
$P_{N\ 400}$ [kW] V_N = 400 V	431	-	539	-	676
$P_{N\ 480}$ [kW] V_N = 480 V	-	496	-	619	781
Characteristics					
Losses [W] at I_N	6130	6130	8920	8920	11060
Losses control part [W]	860	860	1190	1190	1500
Losses power part [W]	5270	5270	7730	7730	9560
Weight approx. [kg]	215	300	225	300	300
Ambient conditions					
Air flow IP23 [m^3/h]	1800	2400	1800	2400	2400
Air flow IP54 [m^3/h][1)]	450	660	500	660	660
Min. air inlet and air outlet (IP23) [dm^2]	15	20	15	20	20
Dimensions					
Dimension A1 [mm]	1150	1150	1150	1150	1150
Dimension A2 [mm]	1120	1120	1120	1120	1120
Dimension A3 [mm]	15	15	15	15	15
Dimension B1 [mm]	880	1110	880	1110	1110
Dimension B2 [mm]	417.5	533	417.5	533	533
Dimension C1 [mm]	377	377	377	377	377
Fixing D1 [mm]	5x ∅11.5	6x ∅11.5	5x ∅11.5	6x ∅11.5	6x ∅11.5

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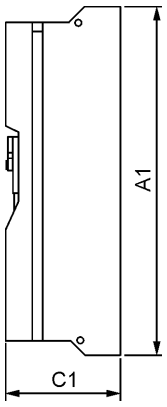
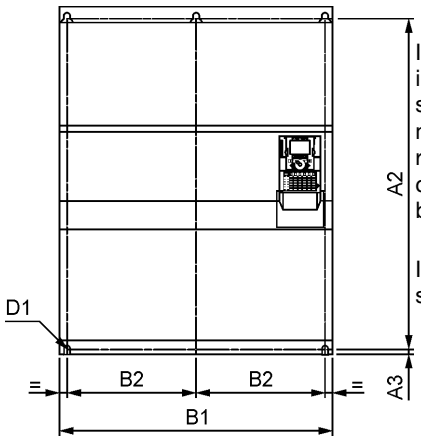
Basic device without or with 1 option card





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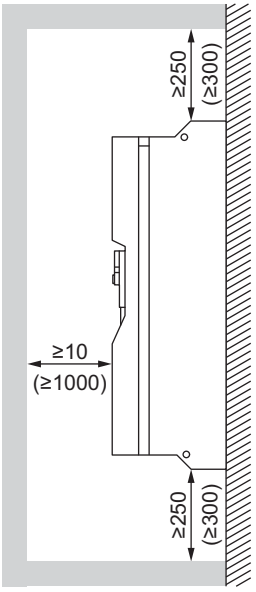
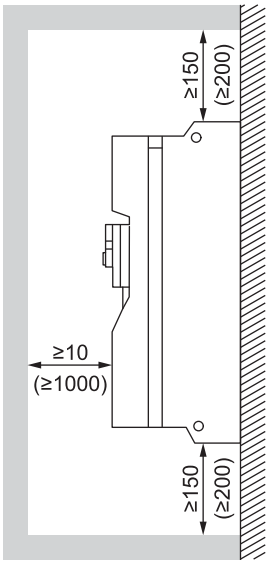


AIC	6V145	6V175	6V220
Order number	VW3 A7 270	VW3 A7 271	VW3 A7 272
Nominal data			
Input voltage			
V_N [V]	500V -20% ... 690V +10%	500V -20% ... 690V +10%	500V -20% ... 690V +10%
Input current			
I_N [A]	120	150	185(160)[1]
I_{Harm} [A]	4.6	5.8	7.1 (6.2)[1]
Input power			
$P_{N\,500}$ [kW] V_N = 500 V	104	130	160
$P_{N\,600}$ [kW] V_N = 600 V	125	156	166
$P_{N\,690}$ [kW] V_N = 690 V	144	175	218
Characteristics			
Losses [W] at I_N	2200	2630	3220
Losses control part [W]	190	220	250
Losses power part [W]	2010	2410	2970
Weight approx. [kg]	110	110	110
Ambient conditions			
Air flow IP23 [m^3/h]	600	600	600
Air flow IP54 [m^3/h][2]	190	220	250
Min. air inlet and air outlet (IP23) [dm^2]	7	7	7
Dimensions			
Dimension A1 [mm]	950	950	950
Dimension A2 [mm]	920	920	920
Dimension A3 [mm]	15	15	15
Dimension A4 [mm]	1190	1190	1190
Dimension B1 [mm]	330	330	330
Dimension B2 [mm]	285	285	285
Dimension B3 [mm]	340	340	340
Dimension C1 [mm]	377	377	377
Fixing D1 [mm]	4x ∅11.5	4x ∅11.5	4x ∅11.5

1) ..... only valid at 600 V
2) ..... The given air flow is only valid for the control part losses because the losses of the power part are exhausted via the air channel of the separated air flow.



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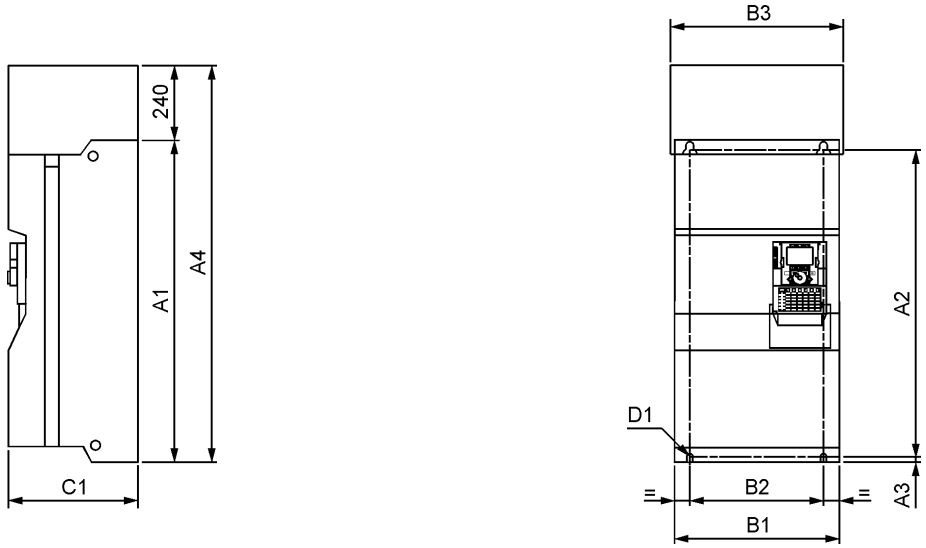
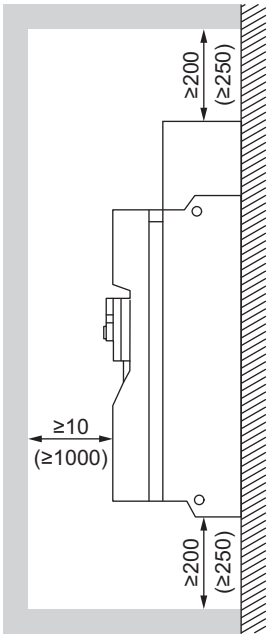
Basic device without or with 1 option card



AIC	6V275	6V340	6V430
Order number	VW3 A7 273	VW3 A7 274	VW3 A7 275
Nominal data			
Input voltage			
V_N [V]	500V -20% ... 690V +10%	500V -20% ... 690V +10%	500V -20% ... 690V +10%
Input current			
I_N [A]	228	285	360
I_{Harm} [A]	8.8	11	13.8
Input power			
$P_{N\,500}$ [kW] V_N = 500 V	198	247	312
$P_{N\,600}$ [kW] V_N = 600 V	235	295	371
$P_{N\,690}$ [kW] V_N = 690 V	272	340	430
Characteristics			
Losses [W] at I_N	4130	5050	6040
Losses control part [W]	330	380	440
Losses power part [W]	3800	4670	5600
Weight approx. [kg]	190	190	190
Ambient conditions			
Air flow IP23 [m^3/h]	1200	1200	1200
Air flow IP54 [m^3/h][1)]	160	180	200
Min. air inlet and air outlet (IP23) [dm^2]	10	10	10
Dimensions			
Dimension A1 [mm]	950	950	950
Dimension A2 [mm]	920	920	920
Dimension A3 [mm]	15	15	15
Dimension A4 [mm]	1190	1190	1190
Dimension B1 [mm]	585	585	585
Dimension B2 [mm]	540	540	540
Dimension B3 [mm]	595	595	595
Dimension C1 [mm]	377	377	377
Fixing D1 [mm]	4x ∅11.5	4x ∅11.5	4x ∅11.5



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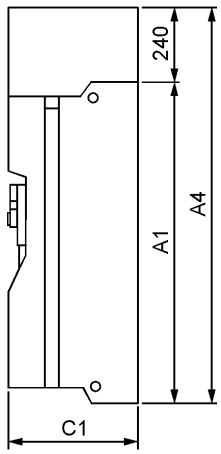
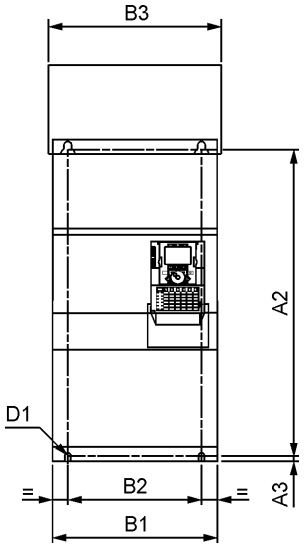
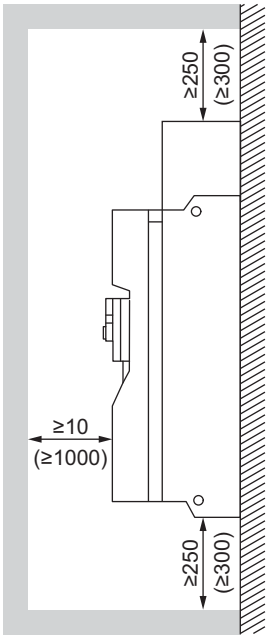
Basic device without or with 1 option card





AIC	6V540	6V675	6V860
Order number	VW3 A7 276	VW3 A7 277	VW3 A7 278
Nominal data			
Input voltage			
V_N [V]	500V -20% ... 690V +10%	500V -20% ... 690V +10%	500V -20% ... 690V +10%
Input current			
I_N [A]	450	563	715
I_{Harm} [A]	17.3	21.7	27.5
Input power			
$P_{N\,500}$ [kW] V_N = 500 V	390	488	619
$P_{N\,600}$ [kW] V_N = 600 V	468	585	742
$P_{N\,690}$ [kW] V_N = 690 V	536	673	854
Characteristics			
Losses [W] at I_N	7730	9560	11980
Losses control part [W]	580	690	860
Losses power part [W]	7150	8870	11120
Weight approx. [kg]	400	400	400
Ambient conditions			
Air flow IP23 [m^3/h]	2400	2400	2400
Air flow IP54 [m^3/h]1)	260	300	400
Min. air inlet and air outlet (IP23) [dm^2]	20	20	20
Dimensions			
Dimension A1 [mm]	1150	1150	1150
Dimension A2 [mm]	1120	1120	1120
Dimension A3 [mm]	15	15	15
Dimension A4 [mm]	1390	1390	1390
Dimension B1 [mm]	1110	1110	1110
Dimension B2 [mm]	532.5	532.5	532.5
Dimension B3 [mm]	1120	1120	1120
Dimension C1 [mm]	377	377	377
Fixing D1 [mm]	6x ∅11.5	6x ∅11.5	6x ∅11.5



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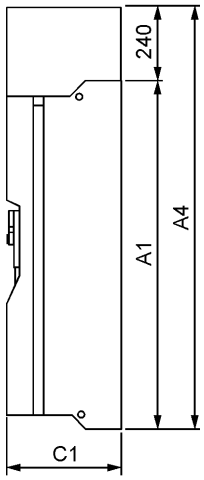
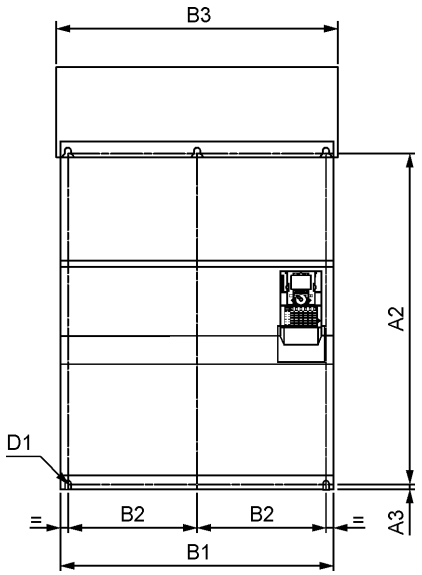
Basic device without or with 1 option card





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						AIC	DC output		
Pre- or conduit fuses	Cu cable [mm²]	Mains fuse "AFE protection"	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	**4V120**	180 A	1 x M12	95
315 A	3x185	315 A sf	120	212 A	1 x M10	**4V145**	220 A	1 x M12	120
400 A	2x (3x120)	350 A sf	150	255 A	1 x M10	**4V175**	265 A	1 x M12	150
500 A	2x (3x150)	500 A sf	2x95	348 A	1 x M10	**4V240**	366 A	1 x M12	2x95
630 A	2x (3x185)	550 A sf	2x95	395 A	1 x M10	**4V275**	412 A	2 x M12	2x95
800 A	3x (3x185)	700 A sf	2x150	495 A	1 x M10	**4V340**	517 A	2 x M12	2x150
1000 A	4x (3x185)	450 A sf *)	2x95	314 A	1 x M10	**4V430**	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	**4V540**	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	**4V675**	1023 A	4 x M12	4x185
		700 A sf *)	2x150	490 A	1 x M10				

Mains supply 3AC 480 V						AIC	DC output		
Circuit breaker Rated current	Cu cable	Mains fuse "AFE protection"	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 A	1x (3x250 MCM)	250 A sf	AWG 1/0	160 A	1 x M10	**4V120**	163 A	1 x M12	AWG 1/0
250 A	1x (3x 350 MCM)	315 A sf	AWG 3/0	200 A	1 x M10	**4V145**	203 A	1 x M12	AWG 3/0
400 A	2x (3x AWG 4/0)	350 A sf	AWG 4/0	200 A	1 x M10	**4V175**	203 A	1 x M12	AWG 4/0
400 A	2x (3x350 MCM)	500 A sf	300 MCM	348 A	1 x M10	**4V240-13**	366 A	1 x M12	350 MCM
600 A	2x (3x 400 MCM)	550 A sf	350 MCM	395 A	1 x M10	**4V275**	412 A	2 x M12	400 MCM or 2x AWG 4/0
600 A	2x (3x 400 MCM)	700 A sf	2x 250 MCM	495 A	1 x M10	**4V340**	517 A	2 x M12	2x 300 MCM
800 A	5x (3x 400 MCM)	500 A sf *)	300 MCM	314 A	1 x M10	**4V430-15**	654 A	4 x M12	2x 400 MCM
		500 A sf *)	300 MCM	314 A	1 x M10				
1000 A	6x (3x 500 MCM)	550 A sf *)	350 MCM	390 A	1 x M10	**4V540-15**	815 A	4 x M12	2x 600 MCM or 3x 350 MCM
		550 A sf *)	350 MCM	390 A	1 x M10				
1200 A	6x (3x 700 MCM)	700 A sf *)	2x 250 MCM	490 A	1 x M10	**4V675**	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						AIC	DC output		
Pre- or conduit fuse	Cu cable [mm²]	Mains fuse "AFE protection"	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	6V145	130 A	1 x M12	50
250 A	3x120	200 A sf	70	150 A	1 x M10	6V175	156 A	1 x M12	70
315 A	3x185	250 A sf	95	185 A	1 x M10	6V240	195 A	1 x M12	95
400 A	2x (3x120)	315 A sf	120	228 A	1 x M10	6V275	244 A	2 x M12	120
400 A	2x (3x120)	400 A sf	150	285 A	1 x M10	6V340	305 A	2 x M12	150
500 A	2x (3x150)	500 A sf	2x 95	360 A	1 x M10	6V430	386 A	2 x M12	2x 95
800 A	3x (3x185)	315 A sf *)	120	225 A	1 x M10	6V540	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	6V675	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	6V860	765 A	4 x M12	3x 150
		500 A sf *)	2x 95	358 A	1 x M10				

Mains supply 3AC 600 V						AIC	DC output		
Circuit breaker Rated current	Cu cable	Mains fuse "AFE protection"	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 A	1x (3x AWG 2/0)	160 A sf	AWG 2	120 A	1 x M10	6V145	130 A	1 x M12	AWG 2
250 A	1x (3x AWG 4/0)	200 A sf	AWG 1/0	150 A	1 x M10	6V175	156 A	1 x M12	AWG 1/0
250 A	1x (3x 300 MCM)	250 A sf	AWG 2/0	160 A	1 x M10	6V240	170 A	1 x M12	AWG 2/0
400 A	1x (3x 400 MCM)	315 A sf	AWG 3/0	228 A	1 x M10	6V275	244 A	2 x M12	AWG 3/0
400 A	2x (3x 250 MCM)	400 A sf	AWG 4/0	285 A	1 x M10	6V340	305 A	2 x M12	250 MCM
600 A	2x (3x 350 MCM)	500 A sf	350 MCM	360 A	1 x M10	6V430	386 A	2 x M12	350 MCM
600 A	3x (3x 350 MCM)	315 A sf *)	AWG 3/0	225 A	1 x M10	6V540	481 A	4 x M12	500 MCM or 2x250 MCM
		315 A sf *)	AWG 3/0	225 A	1 x M10				
800 A	3x (3x 500 MCM)	400 A sf *)	AWG 4/0	282 A	1 x M10	6V675	604 A	4 x M12	2x350 MCM
		400 A sf *)	AWG 4/0	282 A	1 x M10				
1000 A	6x (3x 400 MCM)	500 A sf *)	350 MCM	358 A	1 x M10	6V860	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

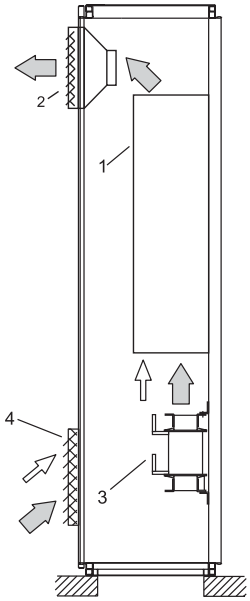
Types of mains fuses for 600 V mains (UL/CSA)			
AFE Type 500V / 690V	Mains fuse	Recommended type of fuse	
		Ferraz Shawmut, Protistor semiconductor fuse, PSC aR sizes 3x – 690/700Vac	Bussmann High speed fuse square body flush end contact – 690/700Vac
145	160 A	A070 URD 30 TTI 0160	170M3414
175	200 A	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.

Cubicle installation IP23

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)

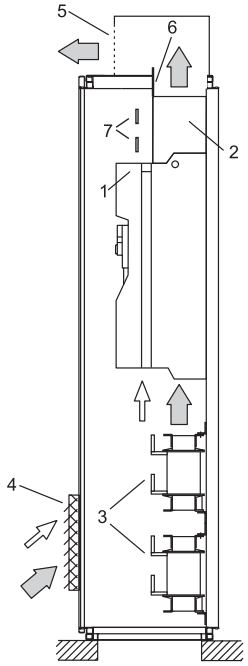
CAUTION

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.

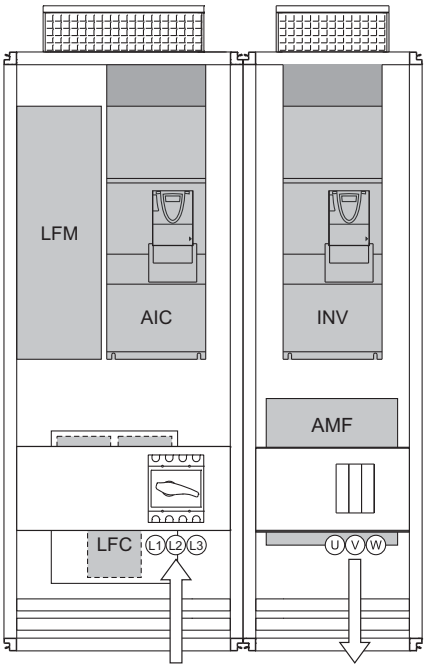
Failure to follow this instruction can result in injury or equipment damage.

Exhaust concept for cubicle installation

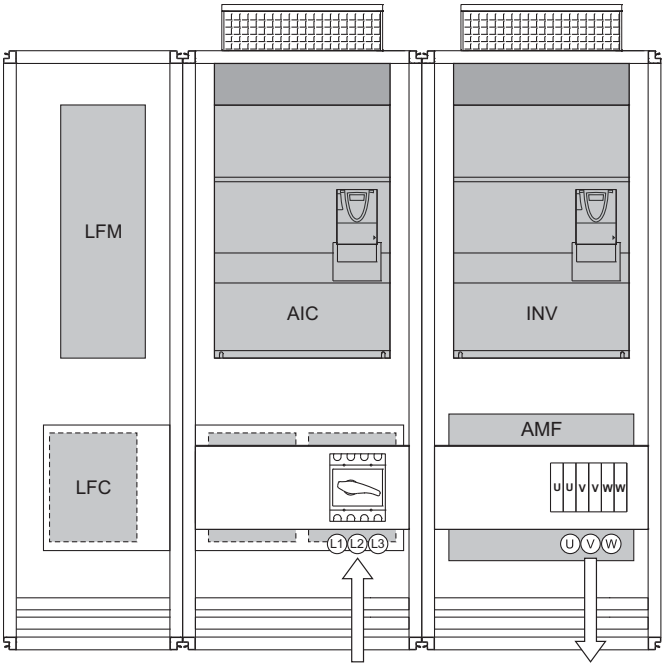
The components of the Active Front End AFE are designed in protection class IP00 and thus they are intended for cubicle installation.

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.

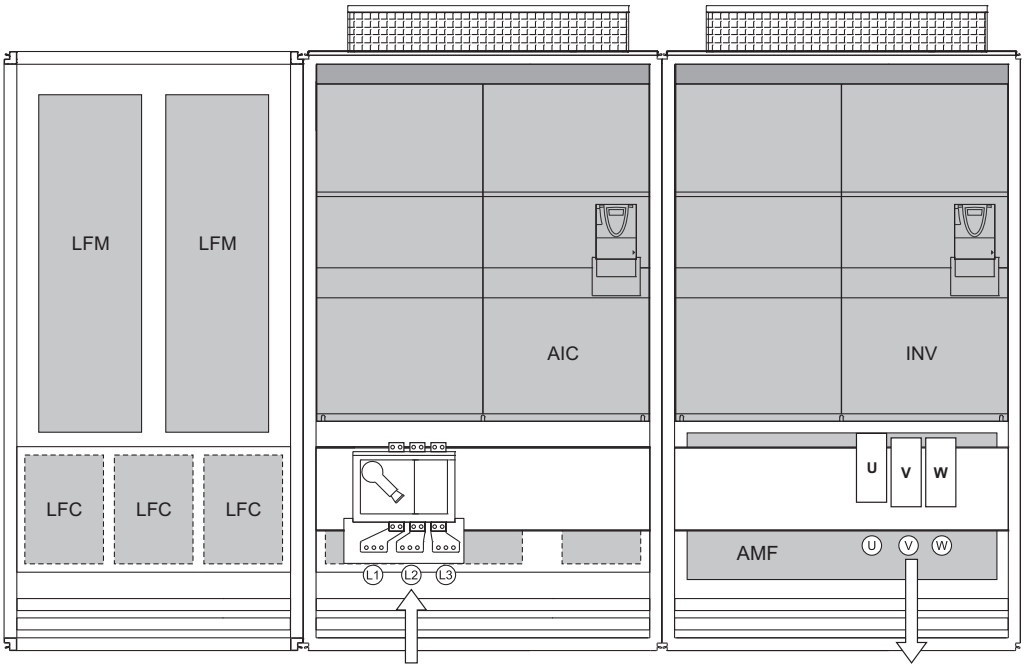
AFE 400V to 175kW
AFE 480V to 175kW
AFE 690V to 220kW



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



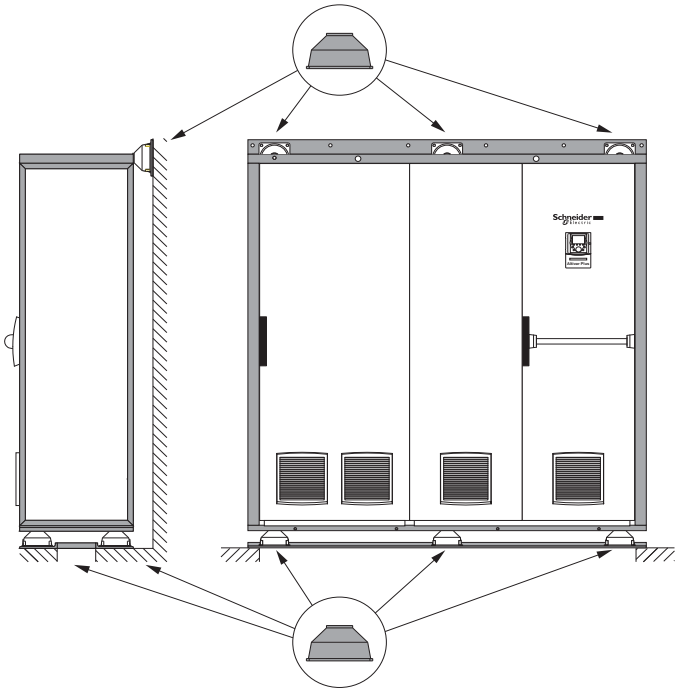
AFE 400V to 675kW
AFE 480V to 675kW
AFE 690V to 860kW



Cubicle installation for Marine applications

The Active Front End unit AFE is also qualified for Marine applications. In order to comply with the requirements, the cubicle has to be mounted with damping elements.

The following drawing illustrates the recommended installation:



Damping elements:
Sopemea BFC-15, BFC-16
or similar damping elements

The number of the required damping elements is given in the following table.

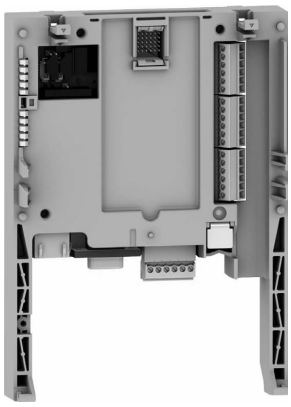
Active Front End				Inverter		No. of damping elements	
Type	AIC	LFM	LFC	Altivar 61	Altivar 71	Top	Bottom
400V 120kW	VW3A7250	VW3A7260	VW3A7265	up to ATV61HC11N4D	up to ATV71HD90N4D	3 (BFC-15)	6 (BFC-15)
400V 145kW	VW3A7251	VW3A7261	VW3A7266	ATV61HC13N4D	ATV71HC11N4D	3 (BFC-15)	6 (BFC-15)
400V 175kW	VW3A7252	VW3A7261	VW3A7266	ATV61HC16N4D	ATV71HC13N4D	3 (BFC-15)	6 (BFC-15)
400V 240kW	VW3A7253	VW3A7262	VW3A7267	ATV61HC22N4D	ATV71HC16N4D	3 (BFC-15)	6 (BFC-15)
400V 275kW	VW3A7254	VW3A7262	VW3A7267	ATV61HC25N4D	ATV71HC20N4D	4 (BFC-15)	8 (BFC-15)
400V 340kW	VW3A7255	VW3A7262	VW3A7267	ATV61HC31N4D	ATV71HC25N4D	4 (BFC-15)	8 (BFC-15)
400V 430kW	VW3A7256	2xVW3A7262	2xVW3A7267	ATV61HC40N4D	ATV71HC28N4D...C31N4D	4 (BFC-16)	8 (BFC-16)
400V 540kW	VW3A7257	2xVW3A7262	2xVW3A7267	ATV61HC50N4D	ATV71HC40N4D	4 (BFC-16)	8 (BFC-16)
400V 675kW	VW3A7258	2xVW3A7262	2xVW3A7267	ATV61HC63N4D	ATV71HC50N4D	4 (BFC-16)	8 (BFC-16)
480V 120kW	VW3A7250	VW3A7260	VW3A7265	up to ATV61HC11N4D	up to ATV71HD90N4D	3 (BFC-15)	6 (BFC-15)
480V 145kW	VW3A7251	VW3A7261	VW3A7266	ATV61HC13N4D	ATV71HC11N4D	3 (BFC-15)	6 (BFC-15)
480V 175kW	VW3A7252	VW3A7261	VW3A7266	-	ATV71HC13N4D	3 (BFC-15)	6 (BFC-15)
480V 240kW	VW3A7283	VW3A7262	VW3A7267	ATV61HC16N4D...C22N4D	ATV71HC16N4D	3 (BFC-15)	6 (BFC-15)
480V 275kW	VW3A7254	VW3A7262	VW3A7267	ATV61HC25N4D	ATV71HC20N4D	4 (BFC-15)	8 (BFC-15)
480V 340kW	VW3A7255	VW3A7262	VW3A7267	ATV61HC31N4D	ATV71HC25N4D	4 (BFC-15)	8 (BFC-15)
480V 430kW	VW3A7286	2xVW3A7262	2xVW3A7267	ATV61HC40N4D	ATV71HC28N4D...C31N4D	4 (BFC-16)	8 (BFC-16)
480V 540kW	VW3A7287	2xVW3A7262	2xVW3A7267	ATV61HC50N4D	ATV71HC40N4D	4 (BFC-16)	8 (BFC-16)
480V 675kW	VW3A7258	2xVW3A7262	2xVW3A7267	ATV61HC63N4D	ATV71HC50N4D	4 (BFC-16)	8 (BFC-16)
690V 145kW	VW3A7270	VW3A7263	VW3A7268	ATV61HC11Y and HC13Y	ATV71HC11Y	3 (BFC-15)	6 (BFC-15)
690V 175kW	VW3A7271	VW3A7263	VW3A7268	ATV61HC16Y	ATV71HC13Y	3 (BFC-15)	6 (BFC-15)
690V 220kW	VW3A7272	VW3A7263	VW3A7268	ATV61HC20Y	ATV71HC16Y	3 (BFC-15)	6 (BFC-15)
690V 275kW	VW3A7273	VW3A7264	VW3A7269	ATV61HC25Y	ATV71HC20Y	4 (BFC-15)	8 (BFC-15)
690V 340kW	VW3A7274	VW3A7264	VW3A7269	ATV61HC31Y	ATV71HC25Y	4 (BFC-15)	8 (BFC-15)
690V 430kW	VW3A7275	VW3A7264	VW3A7269	ATV61HC40Y	ATV71HC31Y	4 (BFC-15)	8 (BFC-15)
690V 540kW	VW3A7276	2xVW3A7264	2xVW3A7269	ATV61HC50Y	ATV71HC40Y	4 (BFC-16)	8 (BFC-16)
690V 675kW	VW3A7277	2xVW3A7264	2xVW3A7269	ATV61HC63Y	ATV71HC50Y	4 (BFC-16)	8 (BFC-16)
690V 860kW	VW3A7278	2xVW3A7264	2xVW3A7269	ATV61HC80Y	ATV71HC63Y	4 (BFC-16)	8 (BFC-16)

Operating and control options				
Option	**Brief description**	**Order number**	**Weight [kg]**	**Reference**
Operating options				
Remote mounting kit	Enables the installation of the graphic display terminal in the cubicle door (protection degree IP54).	VW3 A1 102	0.150	See product catalogue
IP65 transparent cover	Transparent IP65 cover for the door mounting kit of the operating panel	VW3 A1 103	0.040	See product catalogue
Connecting cable for decentralised installation of the graphic display terminal	Pre-assembled RJ45 connecting cable 1 m	VW3 A1 104 R10	0.050	See product catalogue
	Pre-assembled RJ45 connecting cable 3 m	VW3 A1 104 R30	0.150	See product catalogue
	Pre-assembled RJ45 connecting cable 5 m	VW3 A1 104 R50	0.250	See product catalogue
	Pre-assembled RJ45 connecting cable 10 m	VW3 A1 104 R100	0.500	See product catalogue
RJ45 adapter socket	RJ45 F/F adapter is required for the connection of the operating panel to the connecting cable	VW3 A1 105	0.010	See product catalogue
Control options				
Basic I/O options card	Terminal extension for additional logic inputs and outputs	VW3 A3 201	0.320	See product catalogue
Option card "Communication bridge"	Option card for communication with other fieldbus systems (only useful for the inverter INV)	VW3 A7 281	0.320	
Wiring options				
Fan wiring 6V	Option for connecting the fans at 690V devices. This option is only necessary for the inverters. 1x for ATV61HC11Y...C40Y; ATV71HC11Y...C31Y 2x for ATV61HC50Y...C80Y; ATV71HC40Y...C63Y	VW3 A7 280	0.320	Page 92

Fieldbus options				
Option	**Brief description**	**Order number**	**Weight [kg]**	**Reference**
Modbus				
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	See product catalogue
Modbus T-adapter	Modbus T-adapter with 0.3 m connecting cable	VW3 A8 306 TF03	0.190	See product catalogue
	Modbus T-adapter with 1 m connecting cable	VW3 A8 306 TF10	0.210	See product catalogue
Connecting cable	Pre-assembled RJ45 connecting cable 0.3 m	VW3 A8 306 R03	0.025	See product catalogue
	Pre-assembled RJ45 connecting cable 1 m	VW3 A8 306 R10	0.060	See product catalogue
	Pre-assembled RJ45 connecting cable 3 m	VW3 A8 306 R30	0.130	See product catalogue
Bus termination	Bus termination RC	VW3 A8 306 RC	0.010	See product catalogue
CANopen				
CANopen adapter	RJ45/Sub-D adapter for connecting the Active Front End to a CANopen fieldbus system.	VW3 CAN A71	–	See product catalogue
Plug connector	Connecting plug for CANopen fieldbus system	VW3 CAN KCDF 180T	–	See product catalogue
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	See product catalogue
	Pre-assembled standard connecting cable 100 m minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CA 100	8.800	See product catalogue
	Pre-assembled standard connecting cable 300 m minimal smoke emission, non-halogen self-extinguishing (IEC 60332-1)	TSX CAN CA 300	24.560	See product catalogue
UL connecting cable	Pre-assembled UL connecting cable 50 m self-extinguishing (IEC 60332-2)	TSX CAN CB 50	3.580	See product catalogue
	Pre-assembled UL connecting cable 100 m self-extinguishing (IEC 60332-2)	TSX CAN CB 100	7.840	See product catalogue
	Pre-assembled UL connecting cable 300 m self-extinguishing (IEC 60332-2)	TSX CAN CB 300	21.870	See product catalogue
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	See product catalogue
	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	See product catalogue
	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	See product catalogue

Option card "Communication bridge" VW3 A7 281

Description

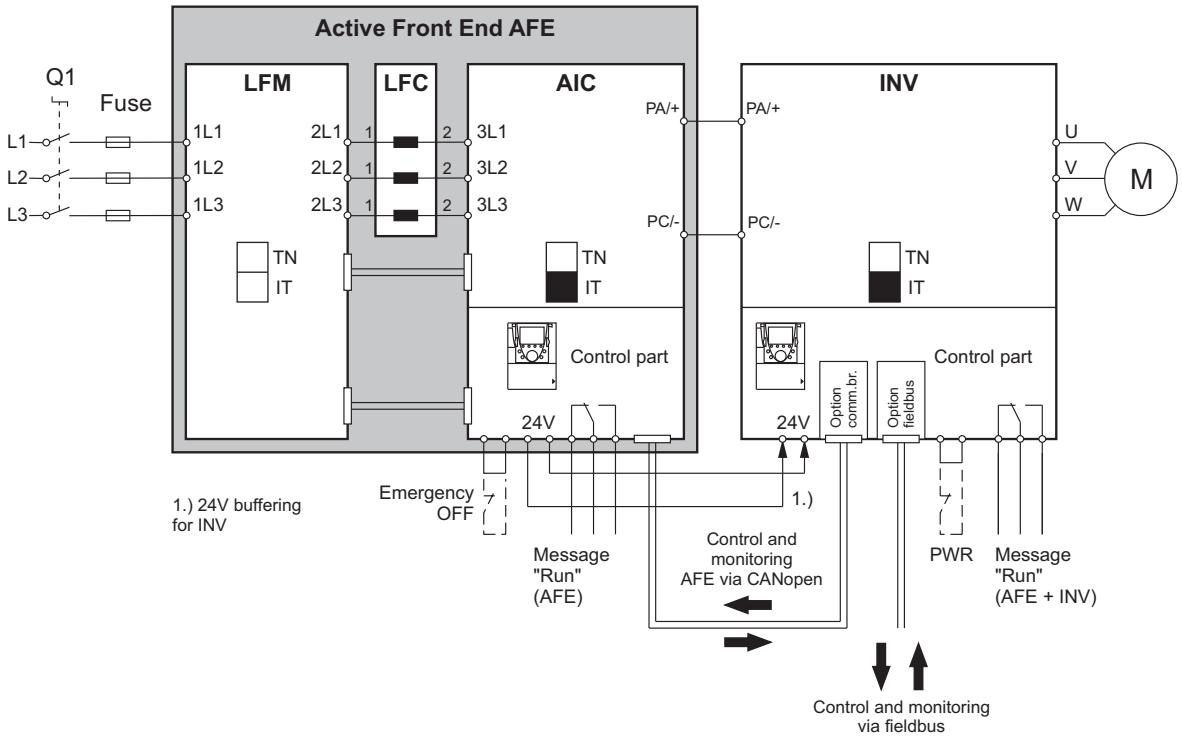


The option card "Communication bridge" enables indirect connection of the Active Front End AFE to further fieldbus systems.

This option card serves as compiler between two fieldbus systems. It is installed together with a fieldbus card in an inverter INV. By means of this combination it is possible to address the inverter as well as up to 4 Active Front End units AFE.

The communication between the option card "AFE COMM-Bridge" and the Active Front End unit(s) takes place via CANopen.

Application

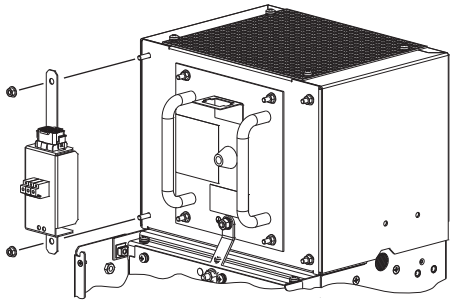


The control and status word of the inverter is used for control and monitoring of the Active Front End unit(s).
The management of the control and status words has to be realised in the control system (PLC, ...).

NOTICE
As the option card "AFE COMM-Bridge" can be only used together with an option card "Fieldbus", there are no further card slots available at the inverter.

Option "AFE Fan wiring 6V" VW3 A7 280

Description

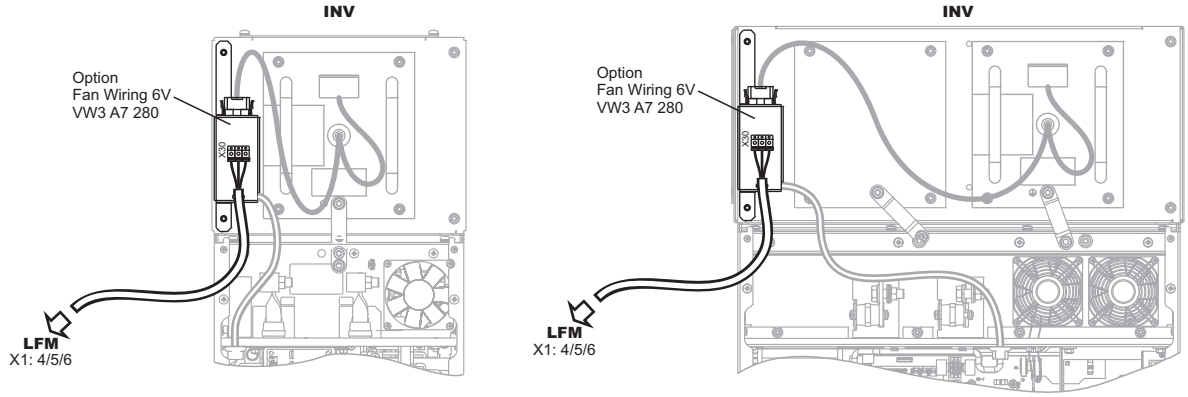


The option "AFE Fan wiring 6V" enables simple wiring of the fans in the inverter INV (at 690 V devices).

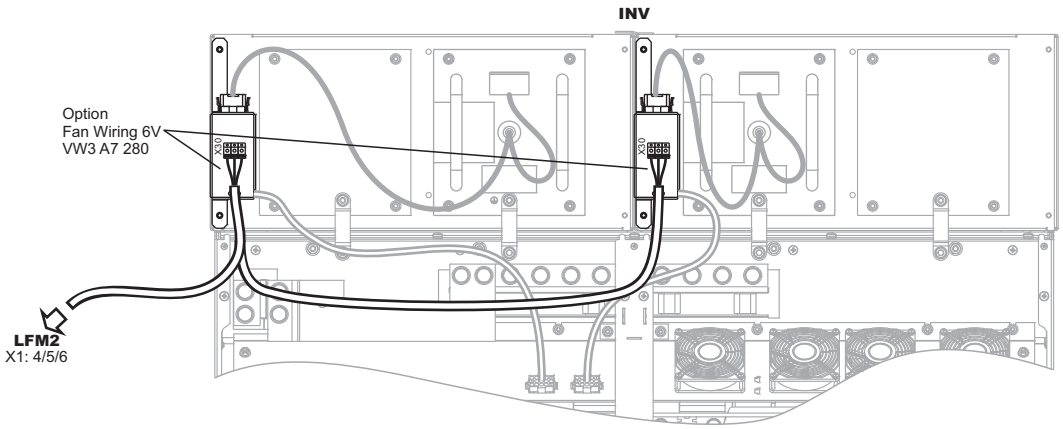
For the 690 V devices the fans are supplied via the transformer box at the top side of the devices. The fans in the inverter INV are supplied from the drive side between the terminals 4/5/6 in the line filter module LFM and the transformer box at the top side of the inverter INV.

Application

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



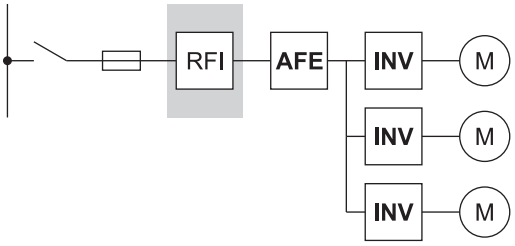
To wire the fan supply at the inverters ATV71HC40Y to HC63Y and ATV61HC50Y to HC80Y respectively the option "Fan wiring 6V" (VW3 A7 280) has to be ordered twice.



NOTICE
For fan supply of the inverter(s) INV it is necessary to order the option "Fan wiring 6V" with reference number VW3A7280. 1x VW3A7280 for ATV61HC11Y...C40Y; ATV71HC11Y...C31Y 2x VW3A7280 for ATV61HC50Y...C80Y; ATV71HC40Y...C63Y

NOTICE
As the option card "AFE COMM-Bridge" can be only used together with an option card "Fieldbus", there are no further card slots available at the inverter.

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.

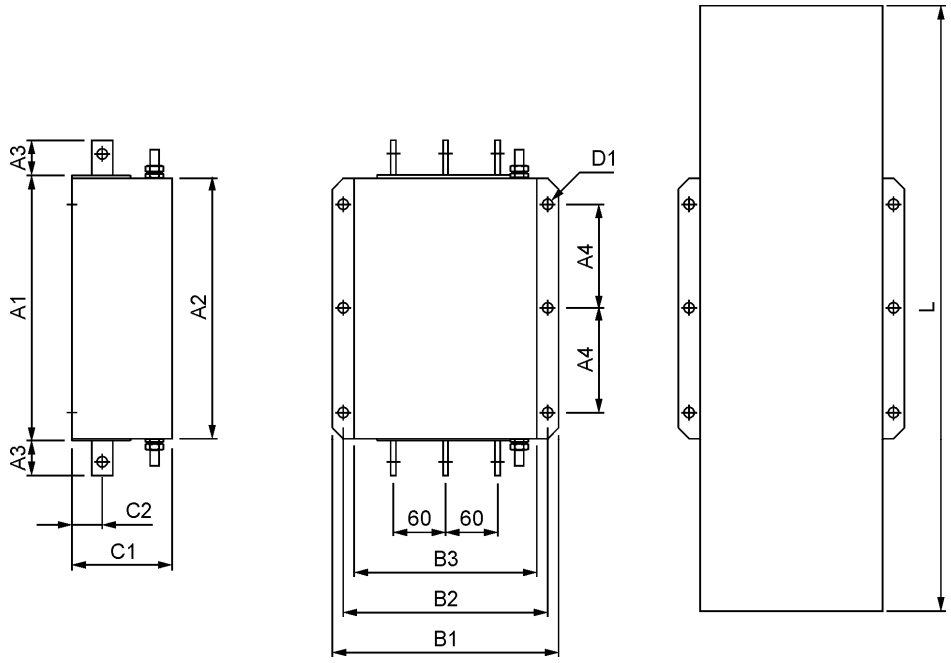
Failure to follow this instruction can result in injury or equipment damage.

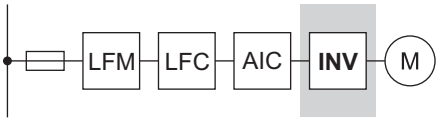
	General technical data
Operating voltage RFI 480	3AC 380 V -15 % ... 480 V +10 %
Nominal frequency	50/60 Hz ±5 %
Overload capability	150 % for 60 s per 10 min, 200 % for 2 s
Ambient temperature	-10...+50°C, up to 60°C with derating
Storage temperature	-40...+70°C
Altitude	0...1000 m, up to 3000 m with 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 (lbs)]
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





Additionally to the single drive it is possible to supply several inverters with an Active Front End via a common DC link (1:n configuration). Also parallel connection of several Active Front End units AFE is possible (n:n configuration).

As the total power of the installed inverters may be higher than the nominal power of the Active Front End, next to the performance record also the maximum possible load capacity (see tables on Page 36 or Page 52) of the line filter module LFM has to be observed when dimensioning the complete configuration.

In the following tables the DC bus power and capacities of the inverters INV are given:

DC bus power demand / capacities

Inverter INV Type		Power				DC fuse [1]	
		Motor (VT) [kW]	[HP]	DC (at 400 V) [kW]	DC (at 480 V) [kW]	[A]	DC capacity [mF]
ATV61H	075N4	0.8	1	1.1	1.2	16	0.2
	U15N4	1.5	2	2.0	2.3	16	0.2
	U22N4	2.2	3	2.8	3.2	16	0.3
	U30N4	3.0	-	3.7	4.3	16	0.4
	U40N4	4.0	5	4.9	5.6	20	0.6
	U55N4	5.5	7.5	6.6	7.6	25	0.8
	U75N4	7.5	10	8.8	10	32	1.1
	D11N4	11	15	13	15	40	1.4
	D15N4	15	20	17	20	63	1.9
	D18N4	18	25	21	24	63	1.9
	D22N4	22	30	25	29	80	1.4
	D30N4	30	40	34	39	100	2.0
	D37N4	37	50	41	47	125	2.4
	D45N4	45	60	50	58	160	2.7
	D55N4	55	75	60	69	160	3.9
	D75N4	75	100	82	94	200	4.8
	D90N4D	90	125	98	115	250	6.5
	C11N4D	110	150	120	140	250	6.5
	C13N4D	130	200	140	160	315	9.8
	C16N4D	160	250	170	195	350	9.8
	C22N4D	220	350	240	275	500	13
	C25N4D	250	400	270	310	550	14
	C31N4D	310	500	330	380	700	20
	C40N4D	400	600	420	480	2x450 [2]	21
	C50N4D	500	700	530	610	2x550 [2]	30
	C63N4D	630	900	660	760	2x700 [2]	39
ATV61EXA●	C63N4	630	900	660	706	–	60
	C71N4	710	1000	750	783	–	60
	C90N4	900	1250	940	977	–	120
	M11N4	1100	1550	1200	1170	–	120

1.) For the DC fuse the type "Ferraz Protistor DC fuse gR" is recommended. Otherwise a similar type for 800VDC at 10ms L/R has to be used for the DC fuse. (Also see AFE DC fuses)

2.) Parallel connection of 2 LFM and 2 LFC

DC bus power demand / capacities							
Inverter INV Type		Power				DC fuse [1]	
		Motor (CT) [kW]	[HP]	DC (at 400 V) [kW]	DC (at 480 V) [kW]	[A]	DC capacity [mF]
ATV71H	075N4	0.8	1	1.1	1.2	16	0.2
	U15N4	1.5	2	2.0	2.3	16	0.2
	U22N4	2.2	3	2.8	3.2	16	0.3
	U30N4	3.0	-	3.7	4.3	20	0.4
	U40N4	4.0	5	4.9	5.6	25	0.6
	U55N4	5.5	7.5	6.6	7.6	32	0.8
	U75N4	7.5	10	8.8	10	40	1.1
	D11N4	11	15	13	15	63	1.4
	D15N4	15	20	17	20	63	1.9
	D18N4	18	25	21	24	80	1.9
	D22N4	22	30	25	29	100	1.4
	D30N4	30	40	34	39	125	2.0
	D37N4	37	50	41	47	160	2.4
	D45N4	45	60	50	58	160	2.7
	D55N4	55	75	60	69	200	3.9
	D75N4	75	100	82	94	250	4.8
	D90N4	90	125	98	115	250	6.5
	C11N4D	110	150	120	140	315	9.8
	C13N4D	130	200	140	160	350	9.8
	C16N4D	160	250	170	195	500	13
	C20N4D	200	300	210	240	550	14
	C25N4D	250	400	270	310	700	20
	C28N4D	280	450	300	345	800	20
	C31N4D	310	500	330	380	2x450 [2]	21
	C40N4D	400	600	420	485	2x550 [2]	30
	C50N4D	500	700	530	610	2x700 [2]	39
ATV71EXA●	C50N4	500	700	530	550	–	60
	C63N4	630	900	660	706	–	60
	C71N4	710	1000	750	784	–	120
	C90N4	900	1250	940	977	–	120
	M11N4	1100	1550	1150	1170	–	120

1.) For the DC fuse the type "Ferraz Protistor DC fuse gR" is recommended. Otherwise a similar type for 800VDC at 10ms L/R has to be used for the DC fuse. (Also see AFE DC fuses)

2.) Parallel connection of 2 LFM and 2 LFC

DC bus power demand / capacities									
Inverter INV Type		Power at 500 V		Power at 600 V		Power at 690 V		DC fuse [1] [A]	DC capacity [mF]
		Motor (VT) [kW]	DC [kW]	Motor (VT) [HP]	DC [kW]	Motor (VT) [kW]	DC [kW]		
ATV61H	C11Y	90	100	125	105	110	120	160	3.9
	C13Y	110	120	150	120	132	142	160	3.9
	C16Y	132	142	180	143	160	172	200	3.9
	C20Y	160	172	200	159	200	215	250	3.9
	C25Y	200	215	250	199	250	268	315	7.8
	C31Y	250	268	350	279	315	335	400	7.8
	C40Y	315	335	450	355	400	424	500	7.8
	C50Y	400	424	550	431	500	528	630	16
	C63Y	500	528	700	547	630	663	800	16
	C80Y	630	663	800	624	800	842	1000	16
ATV61EXA●	C80Y	630	665	800	630	800	838	–	31
	M10Y	800	842	1000	787	1000	1050	–	31
	M12Y	900	948	1250	981	1200	1250	–	31

1.) For the DC fuse the type "Ferraz Protistor DC fuse gR" is recommended. Otherwise a similar type for 800VDC at 10ms L/R has to be used for the DC fuse. (Also see AFE DC fuses)

DC bus power demand / capacities									
Inverter INV Type		Power at 500 V		Power at 600 V		Power at 690 V		DC fuse [1] [A]	DC capacity [mF]
		Motor (CT) [kW]	DC [kW]	Motor (CT) [HP]	DC [kW]	Motor (CT) [kW]	DC [kW]		
ATV71H	C11Y	90	100	125	103	110	120	160	3.9
	C13Y	110	120	150	120	132	142	200	3.9
	C16Y	132	142	180	143	160	172	250	3.9
	C20Y	160	172	200	159	200	215	315	7.8
	C25Y	200	215	250	199	250	268	400	7.8
	C31Y	250	268	350	279	315	335	500	7.8
	C40Y	315	335	450	355	400	424	630	16
	C50Y	400	424	550	431	500	528	800	16
	C63Y	500	528	700	547	630	663	1000	16
ATV71EXA●	C63Y	500	529	700	552	630	662	–	31
	C80Y	630	665	800	631	800	838	–	31
	M10Y	800	842	1000	787	1000	1050	–	31

1.) For the DC fuse the type "Ferraz Protistor DC fuse gR" is recommended. Otherwise a similar type for 800VDC at 10ms L/R has to be used for the DC fuse. (Also see AFE DC fuses)

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 **[Dec. ramp adapt.] 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 with 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).

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