Altivar 71Q

90 ... 630 kW

Mounting instructions

English

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Important Informations

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

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

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

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

Mounting of the water-cooled frequency inverters
Altivar 71Q

90 to 500 kW, 3 AC 380 to 480 V 90 to 630 kW, 3 AC 500 to 690 kW

Parameters and their settings refer to software version APSdrd_B09_01 and higher

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ATV71Q Products

With the ATV71Q you decide in favour for an utmost multifunctional frequency inverter which covers a very wide range of applications by means of its option possibilities and numerous functions.

The frequency inverters are designed for liquid cooling of the power electronics. Due to the continuously use of corrosion-resistant steel (stainless steel) in the cooling circuit it is possible to use industrial water, clean water with or without corrosion protection or a water-glycol-mixture for cooling. As the design of the cooling element is especially robust, the inverter can be operated in closed cooling systems as well as in open cooling systems.

The exceedingly user-friendly LCD operating panel or the PC software PowerSuite can be selected for operation.

In addition to the standard terminals, terminal extension cards, fieldbus options and the possibility of the speed feedback are available to control.

Optimized device features suitable for your application range:

Application	Device features
Liquid cooling for reduction of the lost heat in the electrical room	When several inverters with high power are installed in an electrical room, the heat dissipation is often problematic. At the devices of type ATV71Q the losses of the power electronics are dissipated by the cooling liquid. Only the remaining losses of the inverter are exhausted by the device-internal fans. Thus prevents an increase of temperature inside the enclosure and the installation of an external air conditioning unit can be avoided.
Liquid cooling to increase the protection degree of the enclosure	Due to the ambient conditions there are often enclosures with higher protection degree required. That can be realized for air-cooled inverters of high power only with extraordinary expenses. At the devices of type ATV71Q the losses of the power electronics are directly dissipated by the cooling liquid. The remaining losses are exhausted from the enclosure via an air-water-heat exchanger. Usually the air-water-heat exchanger is dimensioned in such a way that it also covers the losses of the other components (line reactor, motor choke, ...) of the enclosure.
Coupled drive systems	– Master/Slave control for balanced load distribution with group drives – Simple possibility of coupling the DC link provides an optimum balance of energy – Safety function "Safe Standstill" also with coupled drives

ATV71Q•••N4

General technical data	
Mains voltage	3-phase 380…440 V -15 +10 %; 50 Hz ±5 % 3-phase 380…480 V -15 +10 %; 60 Hz ±5 %
Maximum current	150 % for 60 s per 10 minutes, 165 % for 2 seconds
Design	Built in unit with protection degree IP20 / IP00 with liquid cooling of the power electronics
Interfaces	Removable LCD operating panel, extensible terminals, speed feedback, Profibus DP, Profibus DP V1, CANopen, DeviceNet, Modbus TCP, Fipio, Modbus/Uni-Telway, Modbus Plus, Ethernet/IP, Interbus-S, CC-Link
Special functions	RFI filter built-in for 2nd "industrial environment" braking unit built-in up to ATV71QC13N4, above as option function "Safe Standstill" according to EN 954-1 / ISO 13849-1 category 3
Standards	CE (UL, CSA, GOST, ATEX in preparation)

Order code	Motor rating	Output current	Dimensions W x H x D
ATV71QD90N4	90 kW	179 A	330 x 950 x 377 mm
ATV71QC11N4	110 kW	215 A	330 x 950 x 377 mm
ATV71QC13N4	132 kW	259 A	330 x 950 x 377 mm
ATV71QC16N4 1.)	160 kW	314 A	585 x 950 x 377 mm
ATV71QC20N4 1.)	200 kW	387 A	585 x 950 x 377 mm
ATV71QC25N4 1.)	250 kW	481 A	585 x 950 x 377 mm
ATV71QC31N4 1.)	315 kW	616 A	1110 x 1150 x 377 mm
ATV71QC40N4 1.)	400 kW	759 A	1110 x 1150 x 377 mm
ATV71QC50N4 1.)	500 kW	941 A	1110 x 1150 x 377 mm

1.) The braking option is an optional component.

ATV71Q●●●Y

General technical data	
Mains voltage	3-phase 500V -15% … 690V+10%; 50/60Hz+/-5%
Auxiliary voltage for fan	3 AC 400...440 V ±10%, 50 Hz ±5% 3 AC 400...480 V ±10%, 60 Hz ±5%
Maximum current	150 % for 60 s per 10 minutes, 165 % for 2 seconds
Design	Built in unit with protection degree IP20 / IP00 with liquid cooling of the power electronics
Interfaces	Removable LCD operating panel, extensible terminals, speed feedback, Profibus DP, Profibus DP V1, CANopen, DeviceNet, Modbus TCP, Fipio, Modbus/Uni-Telway, Modbus Plus, Ethernet/IP, Interbus-S, CC-Link
Special functions	RFI filter built-in for 2nd "industrial environment" category C3 braking unit built-in up to ATV71QC16Y, above as option function "Safe Standstill" according to EN 954-1 / ISO 13849-1 category 3
Standards	CE (UL, CSA, GOST, ATEX in preparation)

Order code	Motor rating (500 V) 690 V	Output current (500 V) 690 V	Dimensions W x H x D [mm]
ATV71QC11Y	(90) 110 kW	(136) 125 A	330 x 950 x 377
ATV71QC13Y	(110) 132 kW	(165) 150 A	330 x 950 x 377
ATV71QC16Y	(132) 160 kW	(200) 180 A	330 x 950 x 377
ATV71QC20Y 1.)	(160) 200 kW	(240) 220 A	585 x 950 x 377
ATV71QC25Y 1.)	(200) 250 kW	(312) 290 A	585 x 950 x 377
ATV71QC31Y 1.)	(250) 315 kW	(390) 355 A	585 x 950 x 377
ATV71QC40Y 1.)	(315) 400 kW	(462) 420 A	1110 x 1150 x 377
ATV71QC50Y 1.)	(400) 500 kW	(590) 543 A	1110 x 1150 x 377
ATV71QC63Y 1.)	(500) 630 kW	(740) 675 A	1110 x 1150 x 377

1.) The braking option is an optional component.

CAUTION

RISK OF OVERHEATING OF THE FREQUENCY INVERTER

For sufficient cooling of the frequency inverter the external fan supply of 3AC 400…480 V must be connected at all ATV71Q●●●Y.

Failure to follow this instruction can result in equipment damage.

Safety informations

Important information

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

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

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

DANGER

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

WARNING

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

CAUTION

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

CAUTION

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

NOTICE

REMARK explains a proceeding without any potentially hazardous situation.

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

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

DANGER

HAZARDOUS VOLTAGE

- Read and understand these instructions carefully before installing or operating the frequency inverter. Installation, adjustment and repair must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards concerning protective grounding of the whole equipment.
- Many parts of the frequency inverter, including the printed circuit boards, are supplied with line voltage. Do not touch these parts.

  Only use electrically insulated tools.
- Do not touch unshielded components or terminal screws when the device is energised.
- Do not short-circuit terminals PA/+ and PC/- or the capacitors of the DC bus.
- Install and close all the covers before applying power on the drive.
- Execute the following precautions before maintenance or repair of the frequency inverter:
  - Disconnect the power supply.
  - Place a label with the notation "DO NOT TURN ON" on the circuit breaker or disconnecting switch of the frequency inverter.
  - Lock the circuit breaker or disconnecting switch in the opened position.
- Before any work, disconnect the frequency inverter from the mains as well as from the external supply of the control part, if existing. Wait until the charging LED is completely lapsed. Measure the voltage of the DC bus in order to check whether the DC voltage is below 45 V. The LED of the frequency inverter which indicates the present DC bus voltage is not sufficient.

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

DANGER

UNEXPECTED OPERATION OF THE DEVICE

- Read and understand the programming manual before operating the drive.
- Any changes made to the parameter settings must be performed by qualified personnel.
- To avoid an unintentional restart please ensure that the input PWR (POWER REMOVAL) is deactivated (state 0) before you switch the frequency inverter on to configure it.
- Before switching on the device or when exiting the configuration menu, please ensure that the inputs which are used as run commands are deactivated (state 0) because they promptly could cause a start of the motor.

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

WARNING

DAMAGE OF THE DEVICE

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

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

WARNING

RISK OF TOPPLING

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

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

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

⚠ WARNING

ELECTROMAGNETIC FIELDS "ELECTRO SMOG"

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

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

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

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

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

⚠ CAUTION

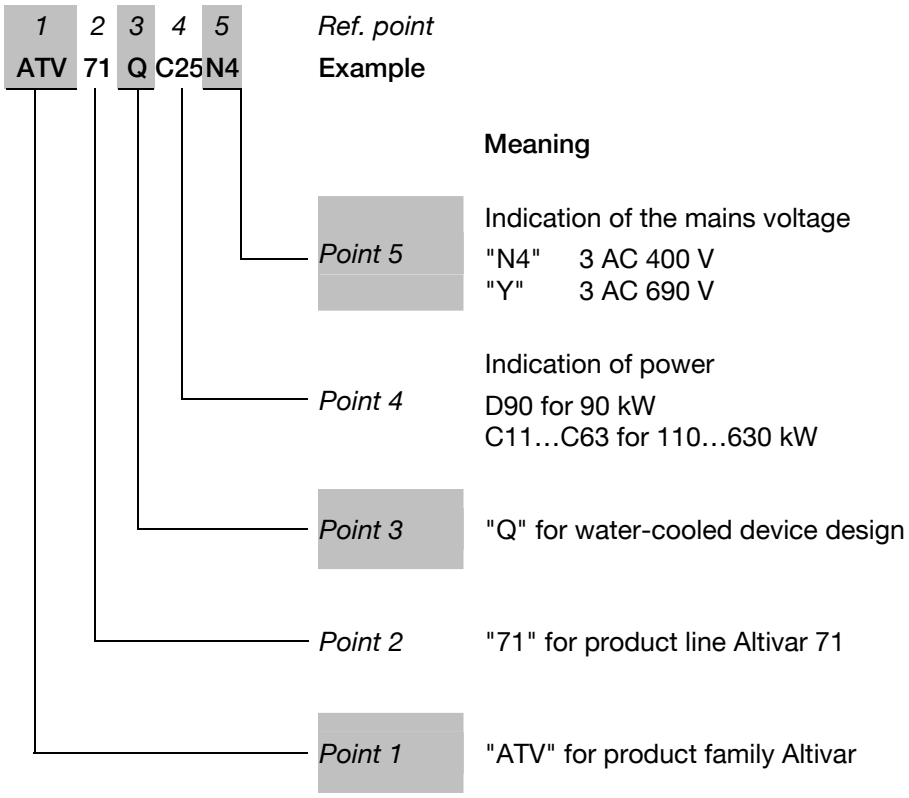
INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

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

Purchase order

The product designation of the Altivar frequency inverters consists of several points of reference (characters and figures). The meaning of each point is illustrated in the following example.



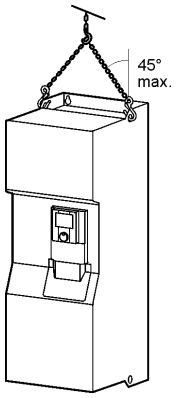
NOTICE
Options for the inverter device must be ordered additionally. The respective order numbers are given in the product catalogue and in chapter "Options", as from page 83.

Receiving the device

Handling

Before installation the inverter should be packaged during movement and storage to protect the device. Ensure that the ambient conditions are permitted.

Open the packaging and check whether the frequency inverter was not damaged during transport.



The inverters ATV71Q can be unpacked without any tools.

In case of bigger inverter types a hoist is necessary to install the device. Therefore they are equipped with handling lugs.

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

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

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

Checking the scope of delivery

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

Storage

Storage temperature -25°C to 70°C

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

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

⚠ CAUTION

EXCEEDING THE MAXIMUM STORAGE TIME

When the maximum storage temperature has been exceeded, the inverter has to be applied with mains voltage for about one hour (forming the electrolyte capacitors) before pulse enable takes place. We recommend to execute this process already after a shutdown period of 6 months.
In case of line contactor control the line contactor has to be controlled manually without applying a start command to the frequency inverter.

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

General specification

Quality

CE Marking

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

The frequency inverters 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 radio frequency interference filters which are built into the frequency inverters they are in conformity with **EN 61800-3** and **EN 61800-5-1**.

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

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

The frequency inverters 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 ATV71Q frequency inverters include a radio frequency interference filter for industrial environments which is built-in as standard. In case of long motor cables and for the use in residential environment the implementation of an additional external filter is necessary to reduce the current harmonics on the mains caused by the DC link.
- Installation on a well-grounded metallic mounting plate with good HF connection between motor cable screen and filter
- Use of screened motor cables, proper connection of the motor cables on both ends or proper laying in a metallic, closed and interconnected cable conduit
- Use of a motor choke in case of high motor cable lengths
- Use and proper connection of screened control cables
- Grounding of the frequency inverter for human protection with at least 10 mm^2
- Consider the protective separation when preparing control lines and coupling relays
- Laying of the motor cables separated from other cables, especially from the control wiring

Mains conditions

Mains voltage

The frequency inverters are designed for the following mains voltages:

- ATV71Q●●●N4:

  3 AC 380 V -15 % to 440 V +10 %, 50 Hz ± 5 %
  3 AC 380 V -15 % to 480 V +10 %, 60 Hz ± 5 %

- ATV71Q●●●Y:

  3 AC 500 V -15 % to 690 V +10 %, 50/60 Hz ± 5 %

The existing nominal mains voltage must be set at the inverter by means of a parameter. Thereby an optimal adjustment of the undervoltage protective function takes place.

The existing nominal mains voltage must be set at the inverter by means of a parameter. Thereby an optimal adjustment of the undervoltage protective function takes place.

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

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

Fan supply

The inverters ATV71Q●●●Y need an auxiliary voltage supply in addition to the mains voltage:

3 AC 400 V -10 % to 440 V +10 %, 50 Hz ± 5 %
3 AC 400 V -10 % to 480 V +10 %, 60 Hz ± 5 %

Fuses

The Altivar frequency inverters do not contain any input fuses. These must be provided externally (see chapter "Fuses") to protect the power cables from overload and to protect the input rectifier in the event of an internal short circuit.

It is recommended to use super fast (semiconductor) fuses. Standard fast fuses or circuit breakers can also be used but the rectifier could be damaged in case of an internal fault.

Braking unit / Braking resistor

The frequency inverters ATV71Q have parameters to monitor the braking power.

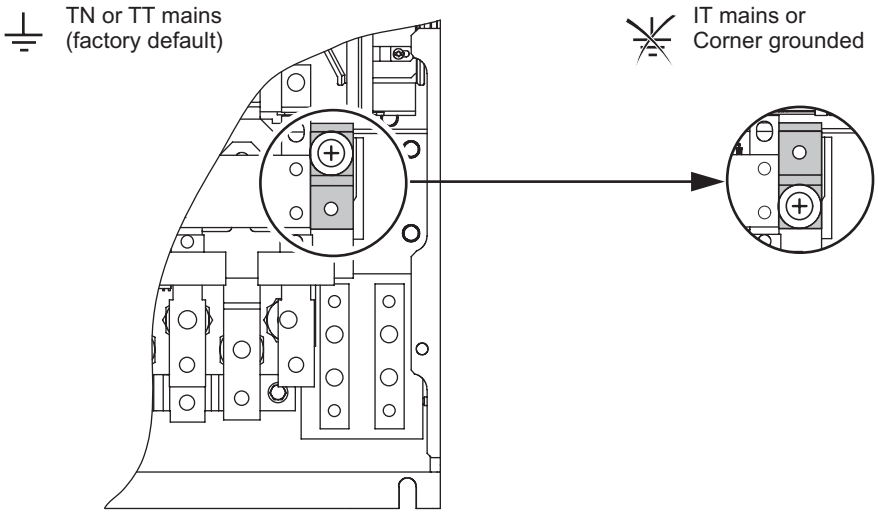
The correct setting of the braking parameters is essential for the protection of the braking resistor in normal operation. In case of malfunction of the internal braking transistor or of the external braking unit, the braking resistor can be only protected by mains disconnection. Therefrom, a line contactor is necessary when using the braking function. Furthermore, the use of the function "Line contactor control (LLC)" is recommended.

CAUTION
OVERLOAD OF THE BRAKING RESISTOR Ensure for protection of the braking resistor that the correct data of the resistor are set at the inverter. If the braking resistor does not match the overload characteristic to be used or the local regulations require an additional protective device, a thermal relay should be integrated into the mains disconnection mechanism. **Failure to follow this instruction can result in equipment damage.**

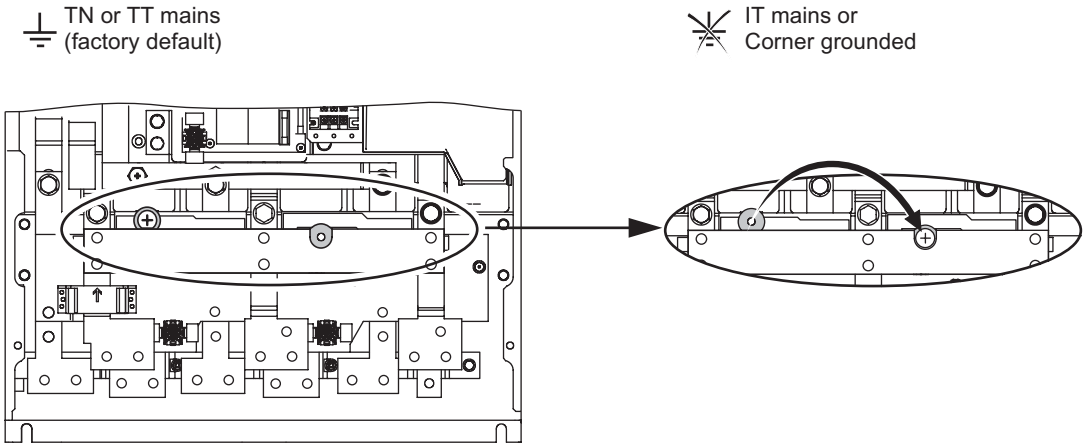
Nongrounded mains

The use of the frequency inverters is basically in all network variants permitted.
But ATV71Q●●●Y devices must not be operated in "Corner Grounded Networks".

ATV71QD90N4…C13N4
ATV71QC11Y…C16Y



ATV71QC16N4…C50N4 (2 screws at ATV71QC31N4…C50N4)
ATV71QC20Y…C63Y (2 screws at ATV71QC40Y…C63Y)



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

⚠ 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". The option EMC filter is not qualified for the use in IT networks ! **Failure to follow this instruction can result in injury or equipment damage.**

Radio interferences

The Altivar frequency inverters include a built-in radio frequency interference filter as standard. These filters fulfil the requirements for category "C3 – industrial environments" according to EN/IEC 61800-3 (in the past: EN 55011 class A group 2).

For using inverters of higher power in residential environment and in case of longer motor cables, additional EMC filters (available as option) must be used.

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

Mains current harmonics / Mains voltage distortion

Because of using a diode rectifier on the input of the inverter harmonics occur in the mains current which lead to a voltage distortion of the supplying mains.

There are several possibilities to reduce this current harmonics and to decrease the total mains current:

- Use of a three-phase choke in the mains lines
- 12-pulse-connection

  The supply results from a separate transformer with two out-of-phase secondary windings.
  The following devices are prepared for 12-pulse-supply as standard:

  ATV71QC31N4...C50N4
  ATV71QC40Y…C63Y
- Active Front End unit option AFE connected upstream

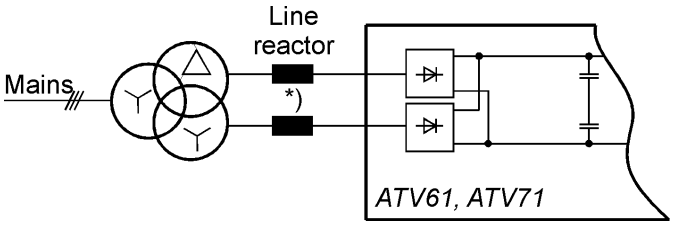
12-pulse supply

Some frequency inverters are standard equipped with two parallel input rectifiers and therefore are suitable for a 12-pulse rectification.

The supply results from a separate transformer with two out-of-phase secondary windings (e.g. superimposing transformer Yy6 Yd5). On the main side of the transformer the 5th and 7th current harmonics are practically non-existent as they have been cancelled by the shifted transformer windings.

NOTICE

If the mains is already distorted by other loads (e.g. frequency inverter with normal 6-pulse-circuit), a superimposing transformer in zig-zag-connection (±15° phase shift at each secondary windings e.g. Yy1130 Yy0030) will be highly recommended.



*) Line reactors are only necessary if a transformer is used for several inverters or if the transformer power is notedly larger than the inverter power.

CAUTION

RISK OF DAMAGE OF THE INTERNAL RFI-FILTER

In case of 12-pulse supply the built-in radio frequency interference filters inside the frequency inverter must be reconnected onto setting "IT mains".

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

The following specifications must be kept at a minimum in order to ensure trouble-free operation and even current sharing:

Transformer:

- Converter transformer for 12-pulse supply with two non-controlled rectifier bridges in a common voltage DC link.
- Recommended design: superimposing
- Nominal voltage at the primary side: according to application
- Voltage adaptation at the primary side: +5% / +2.5% / 0 / -2.5% / -5%
- Nominal output current: see the following table
- Current harmonics at the secondary side: see the following table
- Nominal output voltage (= no-load voltage): see the following table
- Tolerance of the secondary voltages to each other: < 0.3% (< 0.1%) of V_{NOM}
- Short circuit voltage: see the following table
- Tolerance of the relative short circuit voltage: ±10% of v_{SC_NOM}
- Tolerance of the relative short circuit voltage between both secondary windings: < 5% (< 2%) of v_{SC_NOM}
- Further specifications: according to the application
- Tolerance for unbalance of phaseshift (±0.5°)

Mains:

- allowed mains distortion: THD(u) < 5%
- max. single harmonic (5th): < 3%

( ) ..... Values in brackets for transformer in zig-zag-connection (±15° phase shift at both secondary windings e.g. Yy1130 Yy0030)

Recommended values for dimensioning a "12-pulse transformer"

Inverter power [kW]	Transformer Output current 400V	Output current 500V	Output current 690V	Inverter power [HP]	Transformer Output current 480V	Output current 600V	Harmonics Secondary (THDi LV)	Short-circuit voltage	Harmonics Primary (THDi HV)
90	2x 90 A	2x 70 A	2x 60 A	**125**	2x 80 A	2x 65 A	42 %	4 %	12 %
110	2x 110 A	2x 80 A	2x 65 A	**150**	2x 95 A	2x 75 A	42 %	4 %	12 %
132	2x 130 A	2x 95 A	2x 75 A	**200**	2x 125 A	2x 115 A	42 %	4 %	12 %
160	2x 155 A	2x 120 A	2x 90 A	**250**	2x 155 A	2x 140 A	42 %	4 %	12 %
200	2x 190 A (2x 175 A)	2x 145 A (2x 140 A)	2x 120 A (2x 100 A)	**300**	2x 185 A (2x 170 A)	2x 160 A (2x 140 A)	42 %	4 %	12 %
220	2x 210 A (2x 195 A)	2x 160 A (2x 150 A)	2x 130 A (2x 110 A)	**350**	2x 215 A (2x 185 A)	2x 175 A (2x 160 A)	42 %	4 %	12 %
250	2x 240 A (2x 215 A)	2x 180 A (2x 175 A)	2x 145 A (2x 130 A)	**400**	2x 245 A (2x 220 A)	2x 200 A (2x 180 A)	42 %	4 %	12 %
280	2x 265 A (2x 240 A)	2x 205 A (2x 195 A)	2x 160 A (2x 145 A)	**450**	2x 275 A (2x 245 A)	2x 225 A (2x 200 A)	42 %	4 %	12 %
315	2x 300 A (2x 275 A)	2x 230 A (2x 215 A)	2x 180 A (2x 160 A)	**500**	2x 305 A (2x 275 A)	2x 250 A (2x 225 A)	42 %	4 %	12 %
355	2x 340 A (2x 310 A)	2x 250 A (2x 245 A)	2x 210 A (2x 180 A)	**550**	2x 330 A (2x 310 A)	2x 275 A (2x 255 A)	42 %	4 %	12 %
400	2x 380 A (2x 355 A)	2x 285 A (2x 275 A)	2x 230 A (2x 200 A)	**600**	2x 365 A (2x 330 A)	2x 290 A (2x 270 A)	42 %	4 %	12 %
500	2x 490 A (2x 455 A)	2x 385 A (2x 360 A)	2x 285 A (2x 255 A)	**700**	2x 420 A (2x 390 A)	2x 340 A (2x 315 A)	35 %	6 %	10 %
560	2x 550 A (2x 510 A)	2x 440 A (2x 410 A)	2x 320 A (2x 275 A)	**800**	2x 480 A (2x 440 A)	2x 395 A (2x 370 A)	35 %	6 %	10 %
630	2x 610 A (2x 565 A)	2x 490 A (2x 460 A)	2x 365 A (2x 335 A)	**900**	2x 540 A (2x 500 A)	2x 430 A (2x 400 A)	35 %	6 %	10 %
710	2x 680 A (2x 630 A)	2x 540 A (2x 505 A)	2x 420 A (2x 385 A)	**1000**	2x 600 A	2x 480 A (2x 445 A)	35 %	6 %	10 %
800	2x 770 A (2x 710 A)	2x 610 A (2x 570 A)	2x 465 A (2x 430 A)	**1150**	–	2x 540 A (2x 505 A)	35 %	6 %	10 %
900	2x 860 A (2x 800 A)	2x 685 A (2x 635 A)	2x 525 A (2x 485 A)	**1250**	–	2x 590 A (2x 550 A)	35 %	6 %	10 %
1000	2x 940 A (2x 870 A)	2x 770 A (2x 710 A)	2x 570 A (2x 525 A)	**1400**	–	2x 660 A (2x 615 A)	35 %	6 %	10 %
1100	2x 1040 A (2x 960 A)	2x 840 A (2x 780 A)	2x 620 A (2x 575 A)	**1600**	–	2x 755 A (2x 705 A)	35 %	6 %	10 %
1200	2x 1110 A (2x 1030 A)	2x 900 A (2x 840 A)	2x 665 A (2x 620 A)	**1700**	–	2x 790 A (2x 740 A)	35 %	6 %	10 %
1300	2x 1200 A (2x 1120 A)	2x 980 A (2x 910 A)	2x 725 A (2x 670 A)	**1900**	–	2x 885 A (2x 825 A)	35 %	6 %	10 %
1400	2x 1300 A (2x 1200 A)	2x 1050 A (2x 980 A)	2x 780 A (2x 720 A)	**2000**	–	2x 930 A (2x 865 A)	35 %	6 %	10 %
1500	–	2x 1120 A (2x 1040 A)	2x 840 A (2x 770 A)	**2100**	–	2x 980 A (2x 905 A)	35 %	6 %	10 %
1800	–	2x 1330 A (2x 1230 A)	2x 1000 A (2x 920 A)	**2200**	–	2x 1020 A (2x 950 A)	35 %	6 %	10 %
2000	–	–	2x 1100 A (2x 1000 A)	**2500**	–	2x 1150 A (2x 1070 A)	35 %	6 %	10 %
2100	–	–	2x 1150 A (2x 1050 A)	–	–	–	35 %	6 %	10 %
2400	–	–	2x 1300 A (2x 1200 A)	–	–	–	35 %	6 %	10 %

( ) ..... Values in brackets for transformer in zig-zag-connection (±15° phase shift at both secondary windings e.g. Yy1130 Yy0030)

Recommended output voltage for the transformer

The nominal output voltage of a transformer is specified at no load operation. Therefore this value should be 3...5 % higher than the rated voltage of the drive.

Inverter	Transformer output voltage phase / phase (no load)						
	Nominal voltage **380V**	Nominal voltage **400V**	Nominal voltage **440V**	Nominal voltage **480V**	Nominal voltage **500V**	Nominal voltage **600V**	Nominal voltage **690V**
400 V range	400V	425V	460V	500V	–	–	–
690 V range	–	–	–	–	525V	630V	715V

Harmonics level

In a 12-pulse supply system many harmonics are compensated nearly to zero in the mains side of the 3-windings transformer due to a phase shifting of the secondary windings. Therefore 12-pulse supply is a simple solution for harmonic mitigation.

The following lines show the harmonic values based on a mains voltage without any disturbances:

	Current harmonics in %																	
Power range	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	THD
up to 500kW	**100**	2.51	1.33	5.13	2.78	0.53	0.48	1.14	0.95	0.31	0.27	0.38	0.36	0.20	0.21	0.22	0.15	**6.74**
above 500kW	**100**	1.98	1.09	4.99	2.91	0.41	0.36	0.84	0.79	0.24	0.23	0.39	0.31	0.18	0.15	0.18	0.20	**6.40**

In a typical medium voltage network the THD(u) value can be assumed with 3 %. Due to this voltage harmonics there is no total compensation of harmonics.
The following lines show the harmonic values based on a mains voltage with a THD(u) of 3 %:

	Current harmonics in %																	
Power range	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	H31	H35	H37	H41	H43	H47	H49	THD
up to 500kW	**100**	7.10	4.75	6.48	3.82	1.29	1.00	1.46	0.95	0.45	0.50	0.37	0.39	0.34	0.30	0.12	0.11	**11.67**
above 500kW	**100**	6.59	4.61	5.15	3.05	1.33	0.89	0.71	0.46	0.44	0.48	0.08	0.10	0.36	0.31	0.03	0.06	**10.23**
(above 500kW)	**100**	5.67	3.59	5.31	3.25	0.99	0.60	0.92	0.66	0.29	0.35	0.23	0.21	0.31	0.29	0.14	0.09	**9.33**

( ) ..... Values in brackets for transformer in zig-zag-connection (±15° phase shift at both secondary windings e.g. Yy1130 Yy0030)

Voltage harmonics in the mains supply lead to a different current value for both rectifier bridges. In bad conditions the current can be different by 20 % (10 %) at most.

NOTICE
Passive filters cannot be used together with 12-pulse solution.

Mains impedance / Short-circuit current

The Altivar frequency inverters are designed considering a maximal permitted mains short-circuit current of the supply (values see technical data of the respective frequency inverter).

NOTICE
By means of using line reactors (available as option) considerably higher mains short-circuit powers are possible without any effect to the operating safety of the inverter.

Power factor correction systems

Frequency inverters cause current harmonics in the supplying mains. When a power factor correction system is used, their capacitors are additionally stressed by means of the harmonics.

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

Switching rate

The inverters can be directly switched on and off by means of the line contactor which can be easy controlled via a relay output of the inverters.

In case of frequent start/stop commands it is recommended to realize them by means of the logic control inputs (or via a serial bus) directly to the electronics of the inverter.

NOTICE
By means of the certificated control input "PWR" a "Safe Standstill" of the drive is guaranteed considering the safety category according to EN 954-1 / ISO 13849-1 (and IEC/EN 61800-5-2). Thus a line or motor contactor can be saved.

Inverter control	Switching rate
The inverter is controlled by means of connecting and disconnecting the line supply voltage.	max. 60 switching operations per hour (safety category 1, stop category 0)
Disconnection of the motor by means of a motor contactor	depending on the motor contactor (safety category 1, stop category 0)
Electronic start/stop commands by means of the logic inputs of the inverter	arbitrary
Electronic lock of the inverter by means of the control input PWR "Safe Standstill"	arbitrary (safety category 3, stop category 0 or 1)

NOTICE
The control of the device fans takes automatically place dependent from the start command and a temperature-dependent lag function.

Protection of the plant

Responsibility

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

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

⚠ WARNING

HUMAN PROTECTION AND MACHINE SAFETY

The users are responsible to integrate the frequency inverter 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.

Frequencies > 60 Hz

⚠ CAUTION

OPERATION AT FREQUENCIES > 60 Hz

Check whether the used components are qualified for operation at frequencies higher than 60 Hz. Ask the manufacturer of the motor and the machine if necessary.

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

Overvoltage protective circuit

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

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

CAUTION

PROTECTION FROM OVERVOLTAGES

All inductances like relays, contactors, magnetic brakes, etc. have to be equipped with an overvoltage protective circuit. It prevents 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.

Automatic restart

The internal function "automatic restart (AUr)" switches the inverter automatically on after each mains switch-on or mains recurrence without the power failure having to be confirmed. This is an important and valuable function for the increase in availability, especially for drives that are not integrated into the plant control via a fieldbus system.

The automatic restart takes place in case of:

- Switch-on of the line supply voltage (only in case of 2-wire control and dependent on the selected undervoltage behaviour)
- after a mains failure (only in case of 2-wire control and dependent on the selected undervoltage behaviour)
- after each trip confirmation (only in case of 2-wire control – level rated)
- after a fast stop or emergency stop (only in case of 2-wire control – level rated)

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Make sure that neither persons nor equipment is in danger in case of an automatic restart.

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

Earth leakage circuit breaker

Frequency inverters, especially those with additional EMC filters and screened motor cables, lead an increased leakage current against earth.

The leakage current depends on:

- the length of the motor cable
- the type of laying and whether the motor cable is screened or not
- the set pulse frequency
- the use of an additional radio frequency interference filter
- the grounding of the motor at its installation place (grounded or nongrounded))

CAUTION

INCORRECT TRIGGERING OF THE EARTH LEAKAGE CIRCUIT BREAKER

Particularly because of the capacitors of the radio frequency interference filter, an unintentional triggering of an earth leakage circuit breaker may occur at the moment of switching on. As well, the 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 earth leakage circuit breakers with considerably higher tripping current.
- Protect the other loads by means of a separate earth leakage circuit breaker.
- Earth leakage circuit breakers in front of an inverter 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 earth leakage currents) and therefore they do not violate the protective multiple earthing.

Failure to follow this instruction can result in equipment damage.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Depending on the conditions, the leakage current of plants with high cable lengths can be absolutely higher than 100 mA !!
- The built-in earth leakage detection has no current-limiting effect. It only protects the drive and is no human protection.

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

Locking of the frequency inverter

The ATV71Q devices include the standard protective function "Safe Standstill" (Power Removal, certificate no. 72148-2 /2006), which prevents any unintended start-up of the motor. This function fulfills, when correctly wired, the machine standard EN 954-1 / ISO 13849-1 safety category 3, the IEC/EN 61508 SIL2 standard for functional safety and the power drive system standard IEC/EN 61800-5-2.

Connecting and disconnecting the motor

Alternatively to the use of the control terminal PWR "Safe Standstill" a safety switch or a motor contactor can be installed to connect and disconnect the motor. Because the inverter recognizes the respective switching state, there is no risk of demolition or fault switch-off.

After connection the motor restarts by means of the function "Catch on the fly".

Operation of ATEX motors in explosive atmospheres

The ATV71Q frequency inverters integrate the "Power Removal" safety function which prohibits unintended equipment operation. The motor no longer produces torque. The use of the "Power Removal" safety function allows the ATV71Q frequency inverter to be installed as a part of the safety-related electrical, electronic and programmable electronic control systems, dedicated to the safety of a machine or an industrial process. This safety function complies with the standard for safety of machinery EN 954-1 / ISO 13849-1, category 3. It complies also with the standard for functional safety IEC/EN 61508 and with the power drive systems product standard IEC/EN 61800-5-2, SIL2 capability.

The use of the "Power Removal" safety function also allows the use of the ATV71Q frequency inverters to control and command motors installed in explosive atmospheres (ATEX).

Specification of the inverter

Technical data

Input	
Voltage	ATV71Q●●●N4: 380 V -15% to 480 V +10% for TT, TN or IT networks *) ATV71Q●●●Y: 500 V -15% to 690 V +10% for TT, TN or IT networks *) (not for "Corner Grounded Networks")
Frequency	50 / 60 Hz ±5 % *)
Auxiliary voltage (only ATV71Q●●●Y)	3 AC 400...440 V ±10%, 50 Hz ±5% 3 AC 400...480 V ±10%, 60 Hz ±5%
Overvoltage class	Class III according to EN 61800-5-1
Power factor	Fundamental (displacement factor): > 0.98 Total (λ) at full load: 0.93...0.95 (with AC choke) Total (λ) at no load: approx. 0.7 (with AC choke)
Leakage current	Setting TN: < 350 mA max.; < 30 mA continuously Setting IT: < 350 mA max.; < 6 mA continuously
Output	
Control method	Sensorless Vector Control, Vector Control with speed feedback, Synchronous motor without speed feedback, AVC (Auto Vector Control)
Voltage	3 AC 0...100% line supply voltage, dynamic voltage stabilization
Overload	150 % for 60 seconds 165 % for 2 seconds
Pulse frequency	ATV71Q●●●N4: 2.5 kHz, adjustable from 2...8 kHz ATV71Q●●●Y: 2.5 kHz, adjustable from 2...4.9 kHz
Frequency / Base frequency	0.1...500 Hz / 25...500 Hz, adjustable
Short circuit protection	All-pole protected against short circuit and earth fault by means of overcurrent switch-off
Design	Built-in unit for vertical mounting
Cooling	Power electronics: Liquid cooling Residual device: Forced air cooling
Coolant	Industrial water, clean water with or without corrosion protection, water-glycol-mixture
Frequency resolution, digital	0.01 Hz / 50 Hz, frequency stability: ±0.01 % / 50 Hz
Speed accuracy	VC without feedback: 0.3 x slip frequency VC with feedback: 0.01 % of maximum frequency (parameter tFr)
Torque response time	Depending on the setting of the speed controller up to approx. 2 ms
Mechanical strength	
Mechanical vibration	According to IEC/EN 60068-2-6 1.5 mm in the range of 3...10 Hz, 0.6 g at 10...200 Hz (3M3 according to IEC/EN 60721-3-3)
Shock	According to IEC/EN 60068-2-27 4 g for 11 ms (3M2 according to IEC/EN 60721-3-3)

*) Technical data and remarks for mains voltages are given in chapter "Mains conditions", page 14.

Ambient conditions	
Operating / Ambient temperature	without derating: -10...+50°C with derating: -10...+60°C (3K3 according to IEC/EN 60721-3-3)
Operating temperature water	+5...+55°C (condensation must be prevented)
Storage / Transport temperature	-25...+70°C (without or with suitable cooling liquid)
Protection degree	sideways, front IP31 top IP20 bottom 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
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
Safety functions and ATEX – applications	
Safety of the drive	The safety function "safe standstill" (Power Removal) allows a controlled shut-down as well as switch-off of the power supply when standstill. It also prevents any unintended start of the motor according to EN 954-1 / ISO 13849-1, category 3 and IEC/EN 61800-5-2.
Protection of the machine	The safety function "safe standstill" (Power Removal) allows a controlled shut-down as well as switch-off of the power supply when standstill. It also prevents any unintended start of the motor according to IEC/EN 61508, SIL2 capability and IEC/EN 61800-5-2.
Safety of the ATEX motor	The thermal sensor of the ATEX motor is integrated to the safety function "safe standstill" (PWR input) of the inverter by a safety switching device.
Response time	≤ 100 ms in STO (Safe Torque Off)
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, CSA, GOST, ATEX in preparation)

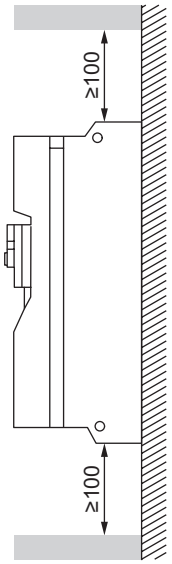
CAUTION

PROTECTION AGAINST HIGH-FREQUENCY INTERFERENCES

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

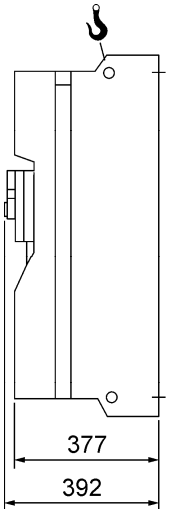
Failure to follow this instruction can result in equipment damage.

ATV71Q		D90N4	C11N4	C13N4
Nominal data				
Motor rating				
P_N [kW]		90	110	132
P_N [hp]		125	150	200
Continuous output power				
$S_{N\ 400}$ [kVA]	V_N = 400 V	124	149	179
$S_{N\ 460}$ [kVA]	V_N = 460 V	143	171	206
Continuous output current				
$I_{N\ 400}$ [A]	V_N = 400 V	179	215	259
$I_{N\ 460}$ [A]	V_N = 460 V	179	215	259
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]		269	323	389
Input current				
$I_{IN\ 400}$ [A]	V_N = 400 V	159	194	229
$I_{IN\ 460}$ [A]	V_N = 460 V	143	173	225
Braking unit				
P_{CONT} [kW]		70	85	100
P_{MAX} for 10 s [kW]		135	165	200
R_{MIN} / R_{MAX} [Ω]		2.5/5.0	2.1/4.0	1.75/3.5
Characteristics				
Efficiency [%]		> 97.5	> 97.5	> 97.6
Losses [W]	at I_N	2500	2800	3200
Weight approx. [kg]		80	80	80
Ambient conditions				
Sound pressure level [dB(A)]		71	71	71
Mains short circ. curr. [kA]		>100 [1.)]	100 [1.)]	100 [1.)]

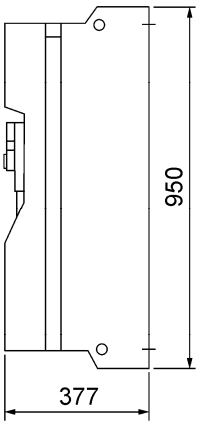


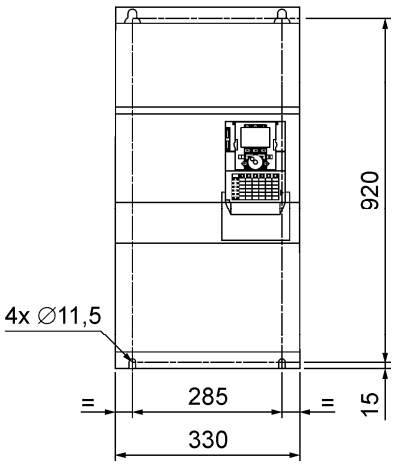
1.) In combination with option line reactor possible

with 2 option cards

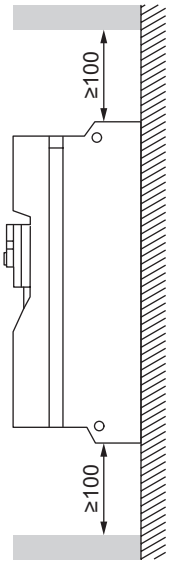


Basic device without or with 1 option card





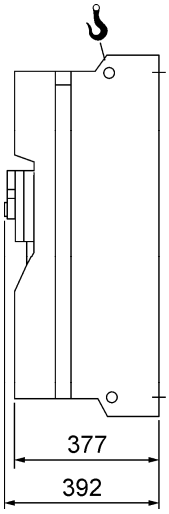
ATV71Q		C16N4	C20N4	C25N4
Nominal data				
Motor rating				
P_N [kW]		160	200	250
P_N [hp]		250	300	400
Continuous output power				
$S_{N\,400}$ [kVA]	V_N = 400 V	218	268	333
$S_{N\,460}$ [kVA]	V_N = 460 V	250	308	383
Continuous output current				
$I_{N\,400}$ [A]	V_N = 400 V	314	387	481
$I_{N\,460}$ [A]	V_N = 460 V	314	387	481
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]		471	581	722
Input current				
$I_{IN\,400}$ [A]	V_N = 400 V	277	340	424
$I_{IN\,460}$ [A]	V_N = 460 V	281	333	442
Braking unit				
P_{CONT} [kW]		120 [2.)]	200 [2.)]	200 [2.)]
P_{MAX} for 10 s [kW]		240	300	375
R_{MIN} / R_{MAX} [Ω]		1.75/2.75	1.05/2.2	1.05/1.75
Characteristics				
Efficiency [%]		> 97.7	> 97.7	> 97.7
Losses [W]	at I_N	4000	5000	6500
Weight approx. [kg]		140	140	140
Ambient conditions				
Sound pressure level [dB(A)]		73	73	73
Mains short circ. curr. [kA]		100 [1.)]	100 [1.)]	100 [1.)]



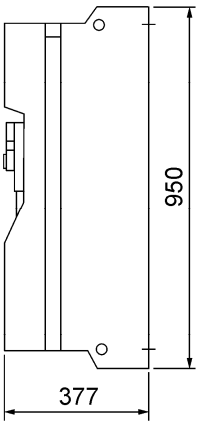
1.) In combination with option line reactor possible

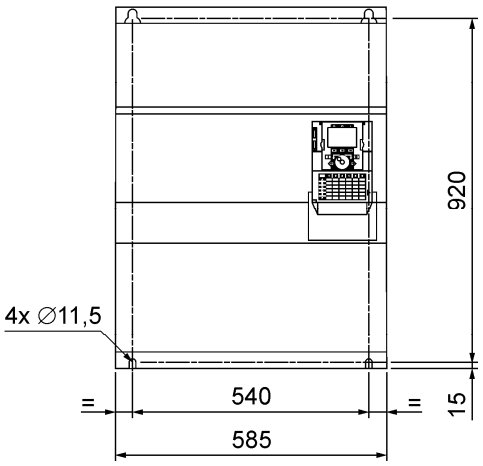
2.) External braking unit

with 2 option cards

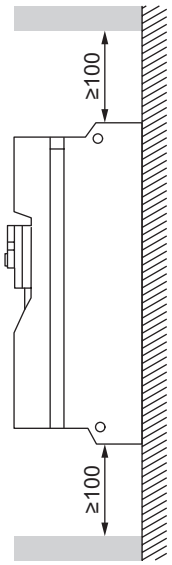


Basic device without or with 1 option card





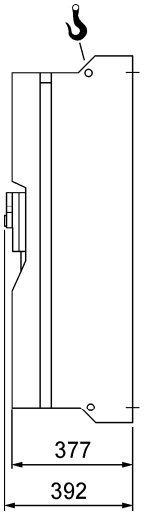
ATV71Q		C31N4	C40N4	C50N4
Nominal data				
Motor rating				
P_N [kW]		315	400	500
P_N [hp]		500	600	700
Continuous output power				
$S_{N\ 400}$ [kVA]	V_N = 400 V	427	526	652
$S_{N\ 460}$ [kVA]	V_N = 460 V	491	605	750
Continuous output current				
$I_{N\ 400}$ [A]	V_N = 400 V	616	759	941
$I_{N\ 460}$ [A]	V_N = 460 V	616	759	941
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]		924	1139	1412
Input current				
$I_{IN\ 400}$ [A]	V_N = 400 V	529	675	834
$I_{IN\ 460}$ [A]	V_N = 460 V	547	660	761
Braking unit				
P_{CONT} [kW]		400 [2.]	400 [2.]	400 [2.]
P_{MAX} for 10 s [kW]		475	600	750
R_{MIN} / R_{MAX} [Ω]		0.7/1.4	0.7/1.1	0.7/0.85
Characteristics				
Efficiency [%]		> 97.8	> 97.8	> 97.8
Losses [W]	at I_N	7100	8900	11600
Weight approx. [kg]		300	300	300
Ambient conditions				
Sound pressure level [dB(A)]		75	75	75
Mains short circ. curr. [kA]		100 [1.]	100 [1.]	100 [1.]



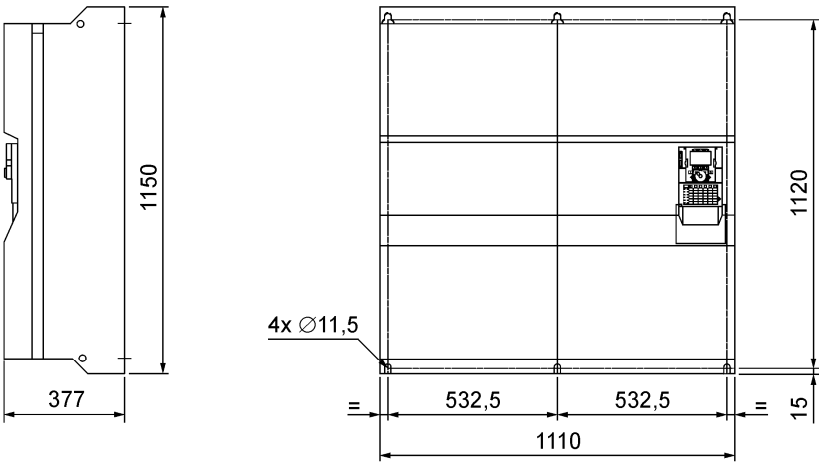
1.) In combination with option line reactor possible

2.) External braking unit

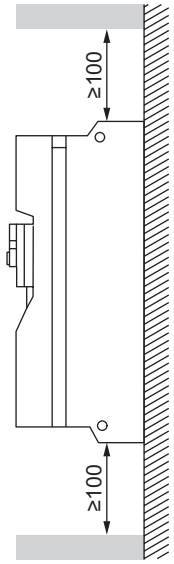
with 2 option cards



Basic device without or with 1 option card

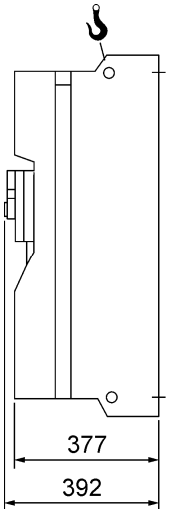


ATV71Q		C11Y	C13Y	C16Y
Nominal data				
Motor rating				
P_N [kW]	V_N = 500 V	90	110	132
P_N [hp]	V_N = 600 V	125	150	(180)
P_N [kW]	V_N = 690 V	110	132	160
Continuous output power				
$S_{N\,500}$ [kVA]	V_N = 500 V	118	143	173
$S_{N\,600}$ [kVA]	V_N = 600 V	130	156	187
$S_{N\,690}$ [kVA]	V_N = 690 V	149	179	215
Continuous output current				
$I_{N\,500}$ [A]	V_N = 500 V	136	165	200
$I_{N\,600}$ [A]	V_N = 600 V	125	150	180
$I_{N\,690}$ [A]	V_N = 690 V	125	150	180
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]	V_N = 500 V	204	248	300
I_{MAX} [A]	V_N = 600 V	188	225	270
I_{MAX} [A]	V_N = 690 V	188	225	270
Input current				
$I_{IN\,500}$ [A]	V_N = 500 V	128	153	182
$I_{IN\,600}$ [A]	V_N = 600 V	113	133	159
$I_{IN\,690}$ [A]	V_N = 690 V	117	137	163
Braking unit				
P_{CONT} [kW]		110	132	160
P_{MAX} for 60 s [kW]		165	198	240
R_{MIN} / R_{MAX} [Ω]		4/7.3	4/6.1	4/5
Characteristics				
Efficiency [%]		> 97.9	> 97.9	> 97.9
Losses [W]	at I_N	2300	2800	3400
Weight approx. [kg]		80	80	80
Ambient conditions				
Sound pressure level [dB(A)]		71	71	71
Mains short circ. curr. [kA]		100 [1.)]	100 [1.)]	100 [1.)]
Fan supply				
Voltage [V]		400…480	400…480	400…480
Power demand [VA]		550	550	550

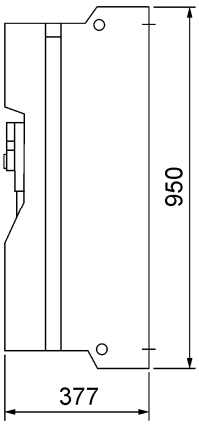


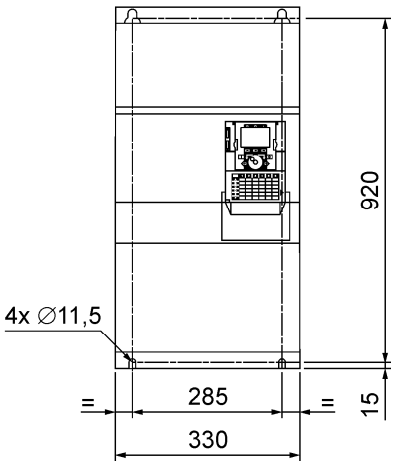
[1.)] In combination with option line reactor possible

with 2 option cards

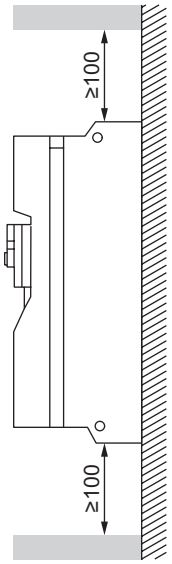


Basic device without or with 1 option card





ATV71Q		C20Y	C25Y	C31Y
Nominal data				
Motor rating				
P_N [kW]	V_N = 500 V	160	200	250
P_N [hp]	V_N = 600 V	200	250	350
P_N [kW]	V_N = 690 V	200	250	315
Continuous output power				
$S_{N\ 500}$ [kVA]	V_N = 500 V	208	270	338
$S_{N\ 600}$ [kVA]	V_N = 600 V	228	301	368
$S_{N\ 690}$ [kVA]	V_N = 690 V	263	347	424
Continuous output current				
$I_{N\ 500}$ [A]	V_N = 500 V	240	312	390
$I_{N\ 600}$ [A]	V_N = 600 V	220	290	355
$I_{N\ 690}$ [A]	V_N = 690 V	220	290	355
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]	V_N = 500 V	360	468	585
I_{MAX} [A]	V_N = 600 V	330	435	533
I_{MAX} [A]	V_N = 690 V	330	435	533
Input current				
$I_{IN\ 500}$ [A]	V_N = 500 V	227	277	342
$I_{IN\ 600}$ [A]	V_N = 600 V	204	249	311
$I_{IN\ 690}$ [A]	V_N = 690 V	212	256	317
Braking unit				
P_{CONT} [kW]		200 2.)	250 2.)	315 2.)
P_{MAX} for 60 s [kW]		300	375	473
R_{MIN} / R_{MAX} [Ω]		2/4	2/3.2	2/2.6
Characteristics				
Efficiency [%]		> 98	> 98	> 98
Losses [W]	at I_N	4000	5200	6300
Weight approx. [kg]		140	140	140
Ambient conditions				
Sound pressure level [dB(A)]		73	73	73
Mains short circ. curr. [kA]		100 1.)	100 1.)	100 1.)
Fan supply				
Voltage [V]		400…480	400…480	400…480
Power demand [VA]		1100 +550*)	1100 +550*)	1100 +550*)

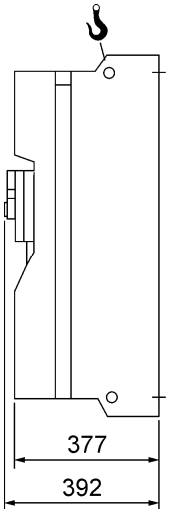


1.) In combination with option line reactor possible

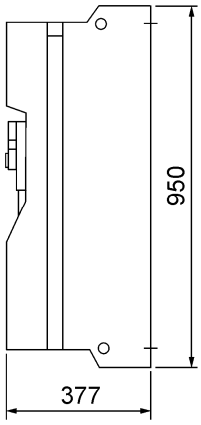
2.) External braking unit

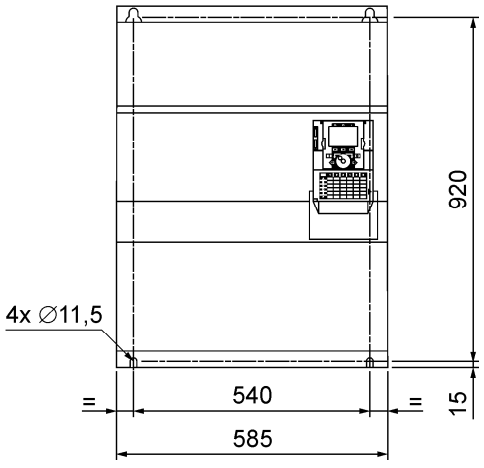
*) 550 VA for braking unit

with 2 option cards

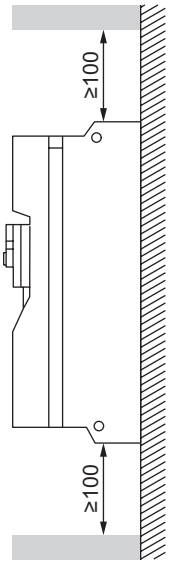


Basic device without or with 1 option card





ATV71Q		C40Y	C50Y	C63Y
Nominal data				
Motor rating				
P_N [kW]	V_N = 500 V	315	400	500
P_N [hp]	V_N = 600 V	450	550	700
P_N [kW]	V_N = 690 V	400	500	630
Continuous output power				
$S_{N\ 500}$ [kVA]	V_N = 500 V	400	511	641
$S_{N\ 600}$ [kVA]	V_N = 600 V	436	564	701
$S_{N\ 690}$ [kVA]	V_N = 690 V	502	649	807
Continuous output current				
$I_{N\ 500}$ [A]	V_N = 500 V	462	590	740
$I_{N\ 600}$ [A]	V_N = 600 V	420	543	675
$I_{N\ 690}$ [A]	V_N = 690 V	420	543	675
Maximum current for 60 s per 10 minutes				
I_{MAX} [A]	V_N = 500 V	693	885	1110
I_{MAX} [A]	V_N = 600 V	630	815	1013
I_{MAX} [A]	V_N = 690 V	630	815	1013
Input current				
$I_{IN\ 500}$ [A]	V_N = 500 V	439	544	673
$I_{IN\ 600}$ [A]	V_N = 600 V	401	491	613
$I_{IN\ 690}$ [A]	V_N = 690 V	409	498	616
Braking unit				
P_{CONT} [kW]		400 2.)	500 2.)	630 2.)
P_{MAX} for 60 s [kW]		600	750	945
R_{MIN} / R_{MAX} [Ω]		1/2.02	1/1.61	1/1.28
Characteristics				
Efficiency [%]		> 98	> 98	> 98
Losses [W]	at I_N	7600	9700	12000
Weight approx. [kg]		300	300	300
Ambient conditions				
Sound pressure level [dB(A)]		75	75	75
Mains short circ. curr. [kA]		100 1.)	100 1.)	100 1.)
Fan supply				
Voltage [V]		400…480	400…480	400…480
Power demand [VA]		2200 +550*)	2200 +550*)	2200 +550*)

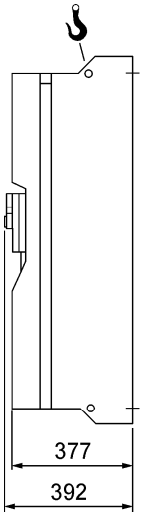


1.) In combination with option line reactor possible

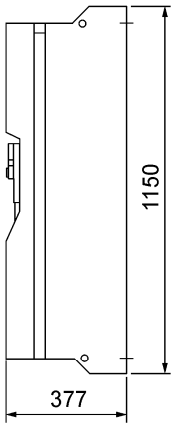
2.) External braking unit

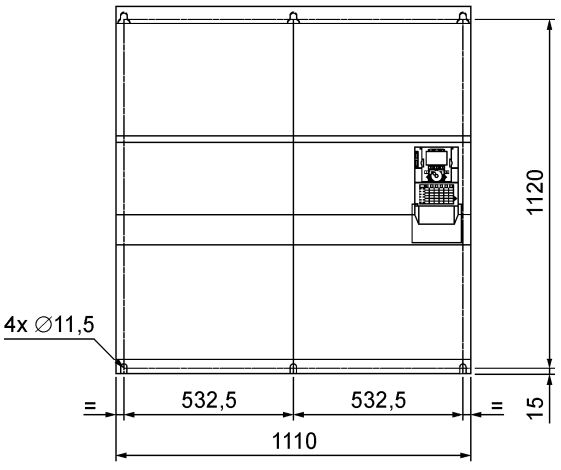
*) 550 VA for braking unit

with 2 option cards



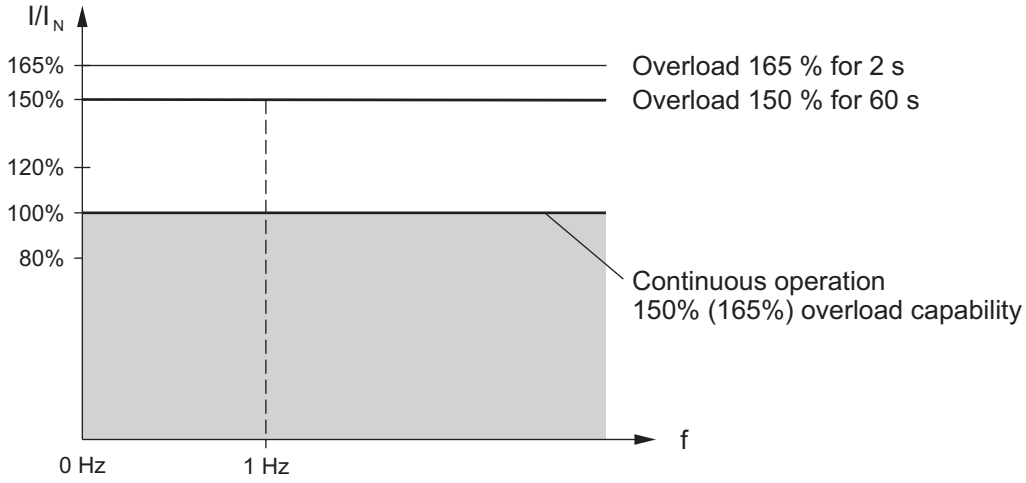
Basic device without or with 1 option card





Continuous current at output frequencies < 1 Hz

Due to the especially efficient liquid cooling of the ATV71Q inverters the full overload capability is also available in the speed range of 0 Hz.



Power decrease

Frequency inverter	Derating	
	4 kHz pulse frequency	+5°K air temperature
ATV71Q•••N4		
D90N4	8 %	10 %
C11N4	8 %	10 %
C13N4	8 %	10 %
C16N4	8 %	10 %
C20N4	8 %	10 %
C25N4	8 %	10 %
C31N4	8 %	10 %
C40N4	8 %	10 %
C50N4	8 %	10 %
ATV71Q•••Y		
C11Y	18 %	5 %
C13Y	18 %	5 %
C16Y	18 %	5 %
C20Y	18 %	5 %
C25Y	18 %	5 %
C31Y	18 %	5 %
C40Y	18 %	5 %
C50Y	18 %	5 %
C63Y	18 %	5 %

Wiring and connection

Wiring diagram

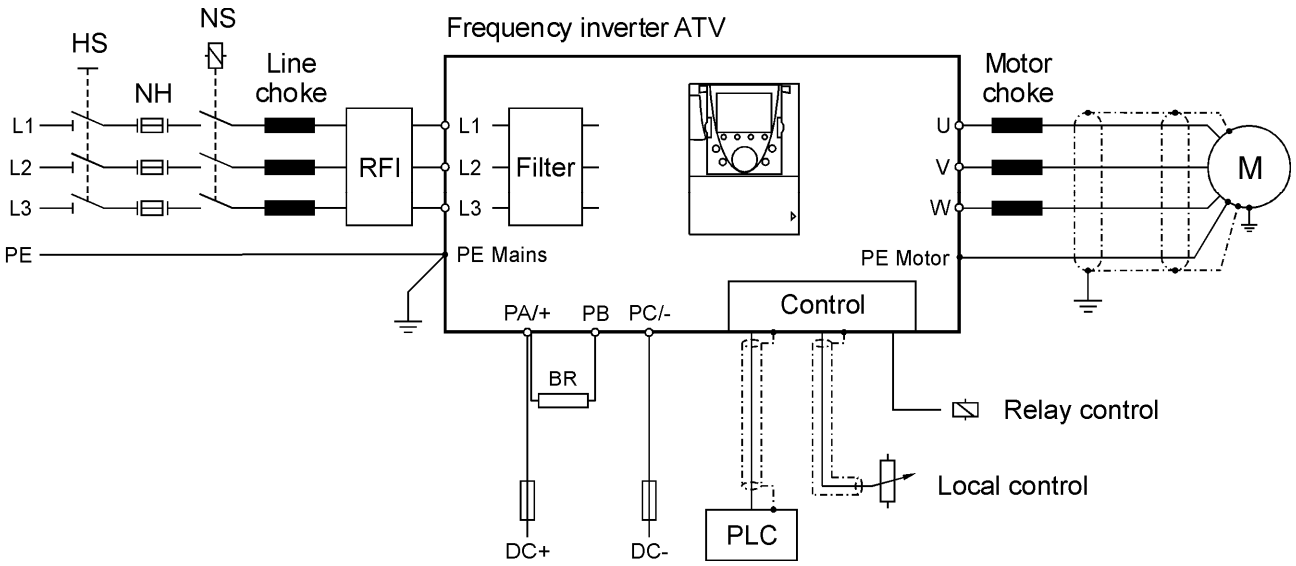
The following diagrams show the typical wiring of the frequency inverters including the options which may be required for protection of the plant or the device, depending on the application.

Description of the used abbreviations:

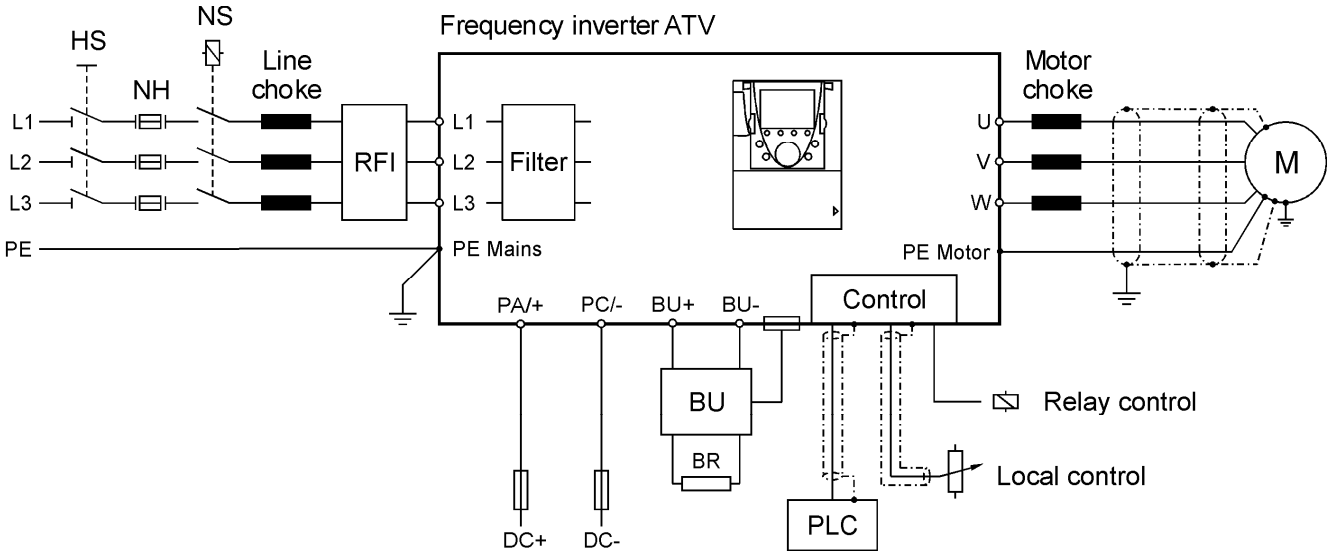
ATV ..... Frequency inverter
HS ..... Main switch (to be used if required according to the local regulations)
NH ..... Mains fuses considering table "Fuses" (absolutely necessary)
NS ..... Mains contactor (to be used if required according to the local regulations)
TS ..... Disconnecting switch (to be used according to the local regulations)
TR ..... Transformer with two out-of-phase secondary windings (e.g. Yy6 d5)
Line reactor ..... Line reactor to reduce the current harmonics on the mains caused by the DC link
RFI ..... Option radio frequency interference filter to use the inverter considering category C2 according to EN 61800-3 "Use in 1st environment - residential environment"
internal filter ..... Radio frequency interference filter built-in as standard considering category C3 according to EN 61800-3 "Use in industrial environments"
Motor choke ..... Motor choke to reduce the voltage peaks at the motor in case of long motor cables
BU ..... Braking unit
BR ..... Braking resistor for short deceleration time or short-time dynamic loads
DC+ / DC- ..... Power supply from a DC-bar; alternatively to 3AC mains supply.

1. The inverter supply must be split up in front of the line reactors, if they are used.
2. The monitoring of the fuses protects the inverter against unbalanced load. It must act on line contactor or pulse inhibit (e.g. digital input "External trip"). It is not absolutely necessary as the inverter monitors the mains voltage. Therefor parameter *IPL* "Input phase loss" must be set to "YES" (factory default).
3. In case of supply by means of a three-winding-transformer the neutral point can be grounded or alternatively an insulation monitoring relay can be used.
4. Please observe chapter "12-pulse supply", page 18 for specification of the transformer.

ATV71QD90N4...C13N4
ATV71QC11Y...C16Y



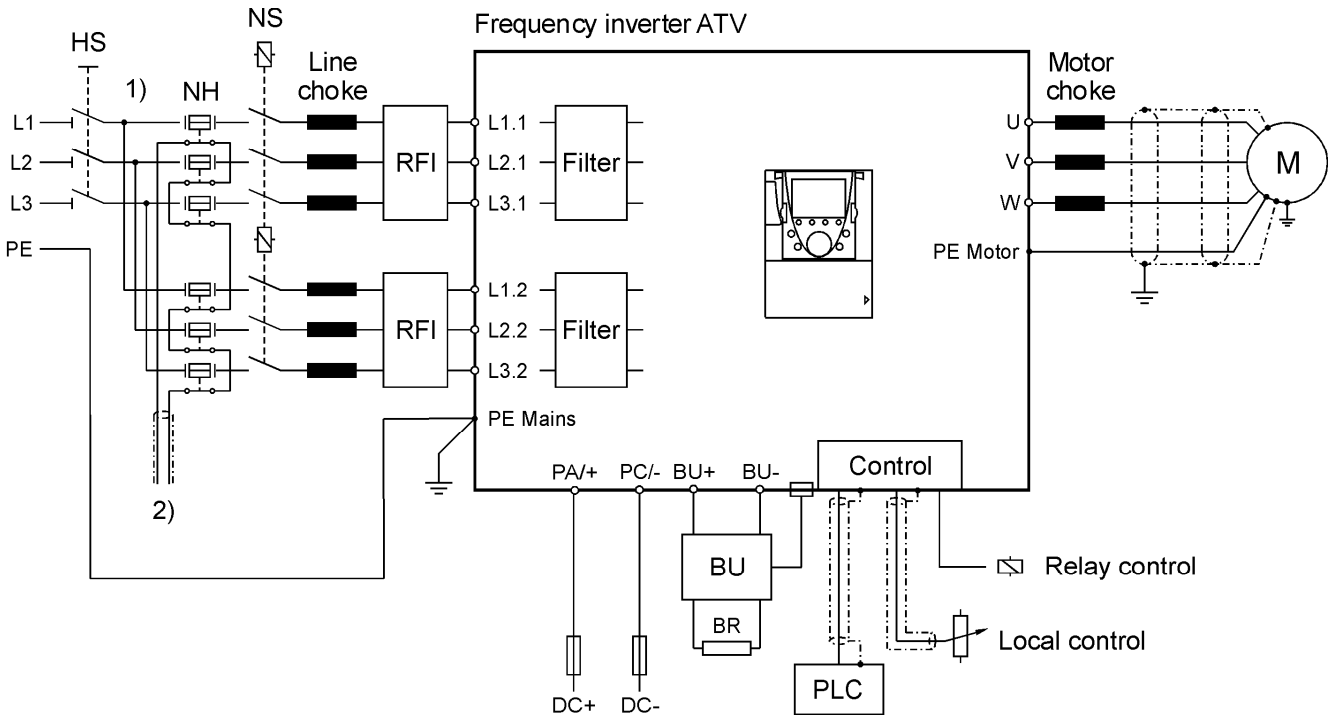
ATV71QC16N4...C25N4
ATV71QC20Y...C31Y



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

ATV71QC31N4...C50N4

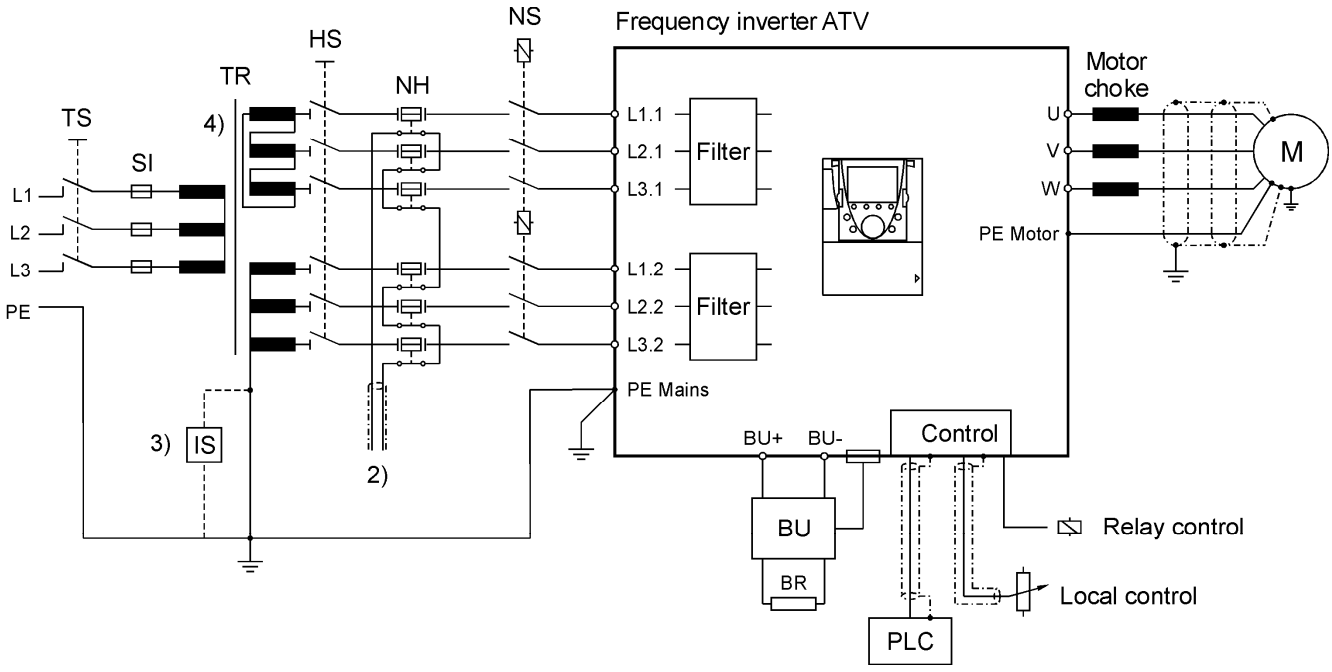
ATV71QC40Y...C63Y



ATV71QC31N4...C50N4

ATV71QC40Y...C63Y

12-pulse rectification



CAUTION

PROTECTION AGAINST HIGH-FREQUENCY INTERFERENCES

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Failure to follow this instruction can result in equipment damage.

Fuses

CE

The ATV71Q frequency inverters do not contain any input fuses. They have to be provided externally for the case that the electronic protective mechanism of the inverters fails. So they are a secondary protection of the inverter to protect the power cables against overload and to protect the input rectifier against an internal short-circuit.

Fuses for CE at 400…480 V

		Mains supply						Motor output
		No. of phases	Circuit breaker $I_{Therm\ 400V}$	Mains short circuit current	Max. connection [mm²] (per phase)	Mains fuse "Inverter protection" "sf" (per phase)		Max. motor cable [mm²] (per phase)
ATV71Q	D90N4	3	240 A	10 (100)	2x 120 (M10)	250 A sf	C	2x 120 (M10)
	C11N4	3	300 A	10 (100)	2x 120 (M10)	315 A sf	C	2x 120 (M10)
	C13N4	3	340 A	18 (100)	2x 120 (M10)	350 A sf	D	2x 120 (M10)
	C16N4	3	420 A	18 (100)	4x 185 (M12)	400 A sf	D	4x 185 (M12)
	C20N4	3	510 A	18 (100)	4x 185 (M12)	500 A sf	E	4x 185 (M12)
	C25N4	3	640 A	30 (100)	4x 185 (M12)	630 A sf	F	4x 185 (M12)
	C31N4	6	790 A	30 (100)	4x 185 (M12)	2 x 400 A sf 2.)	F	6x 185 (M12)
	C40N4	6	1010 A	30 (100)	4x 185 (M12)	2 x 500 A sf 2.)	E	6x 185 (M12)
	C50N4	6	1250 A	30 (100)	4x 185 (M12)	2 x 630 A sf 2.)	F	6x 185 (M12)

() In combination with the optional line reactor possible

Fuses for CE at 500…690 V

		Mains supply						Motor output
		No. of phases	Circuit breaker $I_{Therm\ 690V}$	Mains short circuit current	Max. connection [mm²] (per phase)	Mains fuse "Inverter protection" "sf" (per phase)		Max. motor cable [mm²] (per phase)
ATV71Q	C11Y	3	175 A	28 (100)	2x 120 (M10)	200 A sf	C	2x 120 (M10)
	C13Y	3	205 A	35 (100)	2x 120 (M10)	250 A sf	C	2x 120 (M10)
	C16Y	3	245 A	35 (100)	2x 120 (M10)	315 A sf	C	2x 120 (M10)
	C20Y	3	320 A	35 (100)	4x 185 (M12)	400 A sf	D	4x 185 (M12)
	C25Y	3	385 A	35 (100)	4x 185 (M12)	500 A sf	D	4x 185 (M12)
	C31Y	3	475 A	42 (100)	4x 185 (M12)	630 A sf	D	4x 185 (M12)
	C40Y	6	615 A	42 (100)	4x 185 (M12)	2x 400 A sf 2.)	D	6x 185 (M12)
	C50Y	6	750 A	42 (100)	4x 185 (M12)	2x 500 A sf 2.)	D	6x 185 (M12)
	C63Y	6	925 A	42 (100)	4x 185 (M12)	2x 630 A sf 2.)	D	6x 185 (M12)

() In combination with the optional line reactor possible

It is recommended to use super fast (semiconductor) fuses. Standard fast fuses or circuit breakers can also be used but the rectifier could be damaged in case of an internal fault.

To protect the rectifier in case of a short-circuit the used fuses should not exceed the following I^2t values (referring to 10 ms):

ATV71Q●●●N4:	C	D	E	F
	$160.10^3\ A^2s$	$320.10^3\ A^2s$	$780.10^3\ A^2s$	$1000.10^3\ A^2s$

ATV71Q●●●N4	C	D
	$200.10^3\ A^2s$	$720.10^3\ A^2s$

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

If the mains fuses blow the inverter already has a primary defect. Therefore, exchanging the blown fuses and switching the inverter on again is not effective. Consequently, the use of circuit breakers is not advantageous and has additionally the disadvantage of a slower switch-off ad. A circuit breaker with motor drive has to be seen in fact as an alternative to the line contactor.

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

UL/CSA

In addition to semiconductor fuses (with UL approval, nominal values in accordance with column Mains fuses "inverter protection" "sf") the use of class J and class T fuses according to the tables below is permitted.

Fuses for UL/CSA at 460 V

		Mains supply					Motor output
		No. of phases	Circuit breaker $I_{Therm\ 460V}$	Mains short circuit current accord. UL listing	Max. connection [mm²] (per phase)	UL fuse 600 V type Fast Acting (per phase)	Max. motor cable [mm²] (per phase)
ATV71Q	D90N4	3	215 A	10 (100)	2x 250 MCM (M10)	Class J 300 A max.	2x 250 MCM (M10)
	C11N4	3	260 A	10 (100)	2x 250 MCM (M10)	Class J 350 A max.	2x 250 MCM (M10)
	C13N4	3	340 A	18 (100)	2x 250 MCM (M10)	Class J 400 A max.	2x 250 MCM (M10)
	C16N4	3	420 A	18 (100)	4x 400 MCM (M12)	Class J 450 A max.	4x 400 MCM (M12)
	C20N4	3	500 A	18 (100)	4x 400 MCM (M12)	Class J 600 A max.	4x 400 MCM (M12)
	C25N4	3	665 A	30 (100)	4x 400 MCM (M12)	Class T 800 A max.	4x 400 MCM (M12)
	C31N4	6	820 A	30 (100)	4x 400 MCM (M12)	Semiconductor fuse 900 A max.	6x 400 MCM (M12)
	C40N4	6	990 A	30 (100)	4x 400 MCM (M12)	Class J 2x600 A max.	6x 400 MCM (M12)
	C50N4	6	1140 A	30 (100)	4x 400 MCM (M12)	Class T 2x800 A max.	6x 400 MCM (M12)

() In combination with the optional line reactor possible

Fuses for UL/CSA at 600 V

		Mains supply					Motor output
		No. of phases	Circuit breaker $I_{Therm\ 600V}$	Mains short circuit current accord. UL listing	Max. connection [mm²] (per phase)	Mains fuse "Inverter protection" "sf" (per phase)	Max. motor cable [mm²] (per phase)
ATV71Q	C11Y	3	175 A	28 (100)	2x 250 MCM (M10)	Class J 200A max.	2x 250 MCM (M10)
	C13Y	3	205 A	35 (100)	2x 250 MCM (M10)	Class J 250A max.	2x 250 MCM (M10)
	C16Y	3	245 A	35 (100)	2x 250 MCM (M10)	Class J 300A max.	2x 250 MCM (M10)
	C20Y	3	320 A	35 (100)	4x 400 MCM (M12)	Class J 400A max.	4x 400 MCM (M12)
	C25Y	3	385 A	35 (100)	4x 400 MCM (M12)	Class J 500A max.	4x 400 MCM (M12)
	C31Y	3	475 A	42 (100)	4x 400 MCM (M12)	Class J 600A max.	4x 400 MCM (M12)
	C40Y	6	615 A	42 (100)	4x 400 MCM (M12)	Class J 2x 400A max.	6x 400 MCM (M12)
	C50Y	6	750 A	42 (100)	4x 400 MCM (M12)	Class J 2x 500A max.	6x 400 MCM (M12)
	C63Y	6	925 A	42 (100)	4x 400 MCM (M12)	Class J 2x 600A max.	6x 400 MCM (M12)

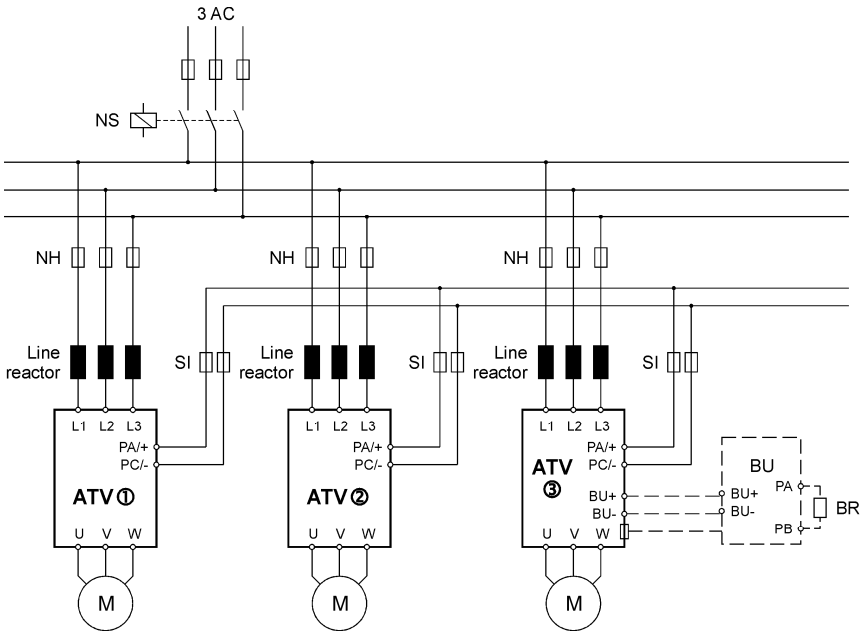
() In combination with the optional line reactor possible

The inverters are designed for operation on a transformer with matching power. In case of networks with higher short-circuit power an external choke is absolutely necessary and it is always recommended to reduce the current harmonics.

DC coupling

DC-coupling of several ATV71Q with a line contactor

It is advisable to couple the DC links in case of applications which have to perform full motor power on the one hand and which should act also in generator operation due to the energy exchange over the DC link on the other hand (e.g. roller conveyors, conveyer belts,...).



NS .....Line contactor
Because of the installation of a common line contactor, the charging circuits of the individual inverters act in parallel when the mains is switched on and thus they cannot be overloaded.

NH.....Device protection on the main side
In order to protect each rectifier against overload, keep the recommended fuses in chapter "Fuses". Consequential damages of the charging circuit during mains switch-on can be avoided by using a fuse monitoring which acts on the digital input "External fault" or on the line contactor.

SI.....Fuse in the DC link according to table in chapter "Fuses for DC-coupled inverters", page 44

①, ②, ③ .....Frequency inverter
Basically , the number of devices and their size is arbitrary, but between the biggest and smallest device only three power ratings are possible.

Line reactor.....The option line reactor is absolutely necessary !

BU / BR.....Braking unit and braking resistor for short-time reduction of the generator power
For example, if all drives should be shut down at the same time, the resulting energy will be relieved in the braking resistor.
The use of a braking unit is not obligatory.

NOTICE

The ATV71Q frequency inverters can be operated at the same DC bus. However, some parameters have to be adjusted appropriate (see Programming manual).

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 an earth fault, the inverter may be damaged or destroyed.

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

ATV71Q master drive with slave(s) at the DC link

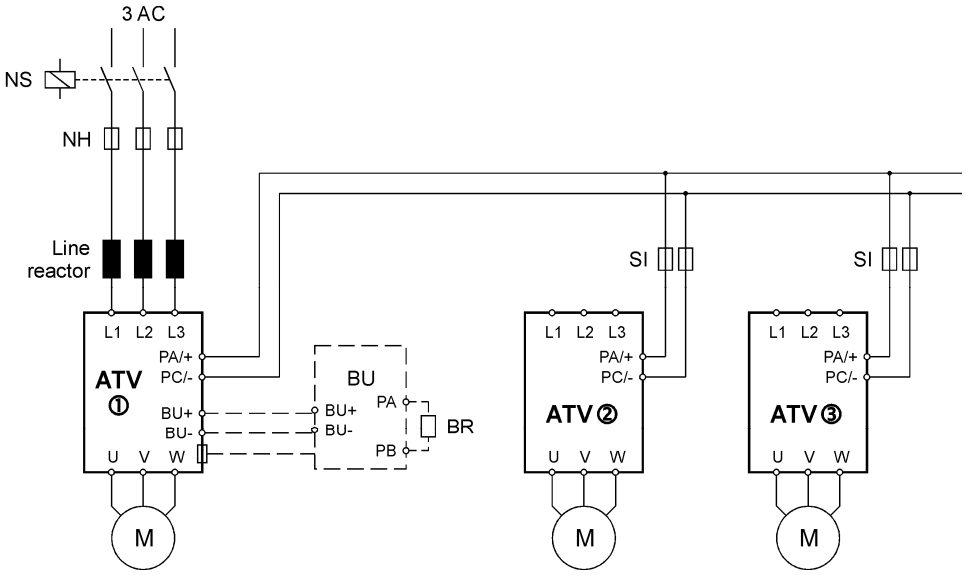
Applications, which include drives which operate as generator (during braking operation) as well as one or several drives which operate as motor, can act very economic in case of a DC supply (e.g. re-/unwinder, straighteners, motor test benches, roller conveyors, hoisting applications,...).

⚠ WARNING

OVERLOAD OF THE RECTIFIER

- However, at any time there must not be needed more motor power than power which is required for the rectifier of the main drive (e.g. 250 kW + 20 % for 60 s for ATV61QC25N4 or ATV71QC20N4).
- DC supplied drives must not be connected during operation !

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



①.....Frequency inverter (main drive)
This inverter defines the maximum possible motor power of the whole drive group. It is able to charge three similar devices (or several smaller devices with same total power).

②, ③.....DC supplied inverters (slaves)

Line reactor.....The option line reactor is absolutely necessary !

SI.....Semiconductor fuse according to table in chapter "Fuses for DC-coupled inverters", page 44.
It does not makes sense to install switching devices in the DC circuit because closing the switching device would lead unintended triggering of the fuses as a result of the high charging current.

BU / BR.....Braking unit and braking resistor for short-time reduction of the generator power
For example, if all drives should be shut down at the same time, the resulting energy will be relieved in the braking resistor.
The use of a braking unit is not obligatory.

NOTICE

At the master drive the braking function has to be activated. The slave(s) have to be parameterized for operation with an external braking unit.

⚠ 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 an earth fault, the inverter may be damaged or destroyed.

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

Fuses for DC-coupled inverters

Only semiconductor fuses are suitable for DC applications. Due to their construction they can switch off at DC voltages as well as AC voltages.

DC mains supply	400 V	440 V	460 V
Nominal voltage Voltage range Overvoltage shut-down	560 V DC 405...650 V DC 1.50 x U_{N-DC}	620 V DC 450...685 V DC 1.35 x U_{N-DC}	680 V DC 490...745 V DC 1.25 x U_{N-DC}
Nominal current DC (approx.)	1.15 x I_{MOTOR}	1.15 x I_{MOTOR}	1.15 x I_{MOTOR}
Type of fuse, Nominal voltage	690 V sf	690 V sf	690 V sf

Frequency inverter	Mains fuse "Inverter protection" "sf"
ATV71QD90N4	315 A
ATV71QC11N4	400 A
ATV71QC13N4	500 A
ATV71QC16N4	630 A
ATV71QC20N4	700 A
ATV71QC25N4	900 A
ATV71QC31N4	1250 A
ATV71QC40N4	1400 A
ATV71QC50N4	1600 A

DC mains supply	500 V	600 V	690 V
Nominal voltage Voltage range Overvoltage shut-down	700 V DC 620...780 V DC 1.50 x V_{N-DC}	840 V DC 720...930 V DC 1.3 x V_{N-DC}	960 V DC 820...1070 V DC 1.15 x V_{N-DC}
Nominal current DC (approx.)	1.15 x I_{MOTOR}	1.15 x I_{MOTOR}	1.15 x I_{MOTOR}
Type of fuse, Nominal voltage	1100 V DC *)	1100 V DC *)	1100 V DC *)

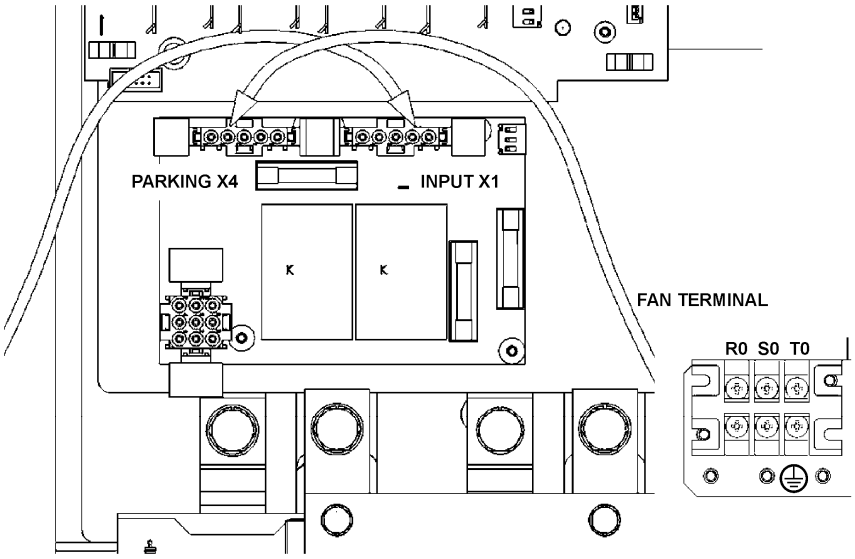
*) 1100 V DC rated voltage at 10 ms L/R

MX frequency inverter	Mains fuse for DC-supply "inverter protection" ("Ferraz Protistor DC-fuse gR" or similar)
ATV71QC11Y	250 A (D121GC75V250EF)
ATV71QC13Y	315 A (D122GC75V315EF)
ATV71QC16Y	350 A (D122GC75V350EF)
ATV71QC20Y	450 A (D122GD75V450EF)
ATV71QC25Y	630 A (D2122GC75V630TF) (or 2 x 315 A parallel)
ATV71QC31Y	800 A (D2122GC75V800TF) (or 2 x 400 A parallel)
ATV71QC40Y	900 A (D2122GD75V900TF) (or 2 x 450 A parallel)
ATV71QC50Y	1250 A (D2123GD75V12CTF) (or 2 x 630 A parallel)
ATV71QC63Y	1500 A (D2123GD75V1500TF) (or 2 x 750 A parallel)

Internal / External fan supply at ATV71Q•••N4

At the ATV71Q devices there is additionally to the water cooling of the power part an air circulation via AC fans. These fans are supplied by the mains from the inverter as factory default. Alternatively also an external voltage supply is possible (e.g. Inverter supply via DC bus).

Internal supply (delivery state)



If the external fan supply is used, the connectors X1 and X4 of the fan control board have to be exchanged and an auxiliary voltage with the following technical data has to be provided:

Fan voltage: 380 V -10 % … 440 V +10 % / 50 Hz ±5 %
380 V -10 % … 480 V +10 % / 60 Hz ±5 %

Power:

	ATV71QD90N4 … C13N4:	550 VA
	ATV71QC16N4 … C25N4:	1100 VA
	ATV71QC31N4 … C50N4:	2200 VA *)
*)	VW3 A7 102:	550 VA

In case of low charge the power part fans are switched off depending on the temperature. The fans for the control part start running as soon as the inverter is applied with voltage.

Life cycle of fans: approx. 48,000 hours

The ambient condition has an effect on the life cycle of the fans.

If the inverter is permanently supplied with mains voltage, the control part fans should be replaced precautionary after five years!

External fan supply at ATV71Q•••Y

At the ATV71Q devices there is additionally to the water cooling of the power part an air circulation via AC fans. The voltage supply required therefor has to be provided external.

Technical data for fan supply:

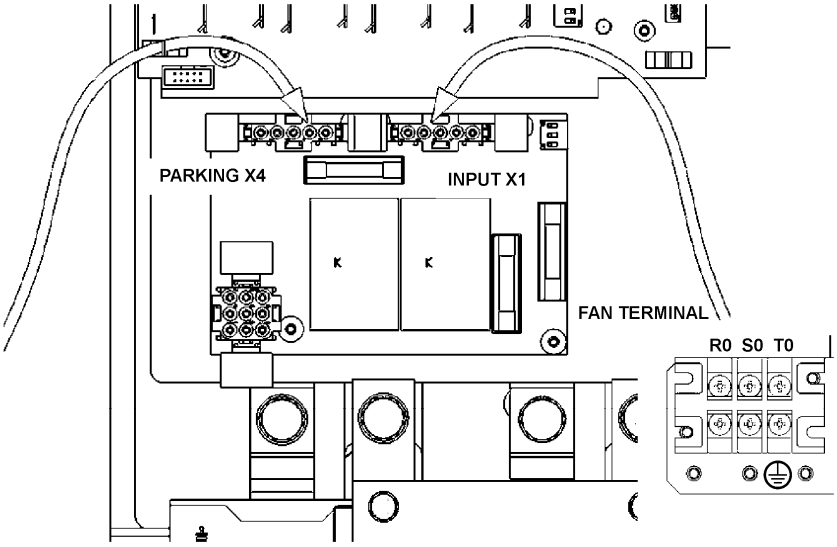
Fan voltage: 400 V -10 % … 440 V +10 % / 50 Hz ±5 %
400 V -10 % … 480 V +10 % / 60 Hz ±5 %

Power:

ATV71QC11Y … C16Y:	550 VA
ATV71QC20Y … C31Y:	1100 VA *)
ATV71QC40Y … C63Y:	2200 VA *)
*) VW3 A7 103 or VW3 A7 103:	550 VA

According to the external fan supply the connectors X1 and X4 of the fan control board have to be plugged as illustrated.

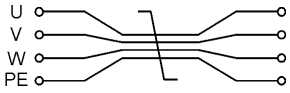
External supply (delivery state)



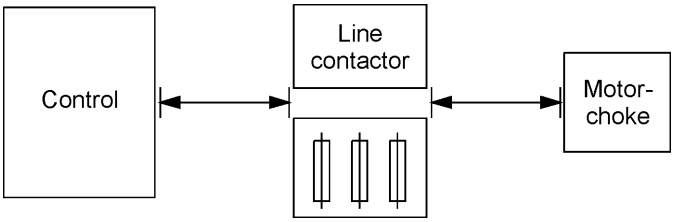
CAUTION
RISK OF OVERHEATING OF THE FREQUENCY INVERTER For sufficient cooling of the frequency inverter the external fan supply of 3AC 400…480 V must be connected at all ATV71Q•••Y. **Failure to follow this instruction can result in equipment damage.**

Basic notes for connection

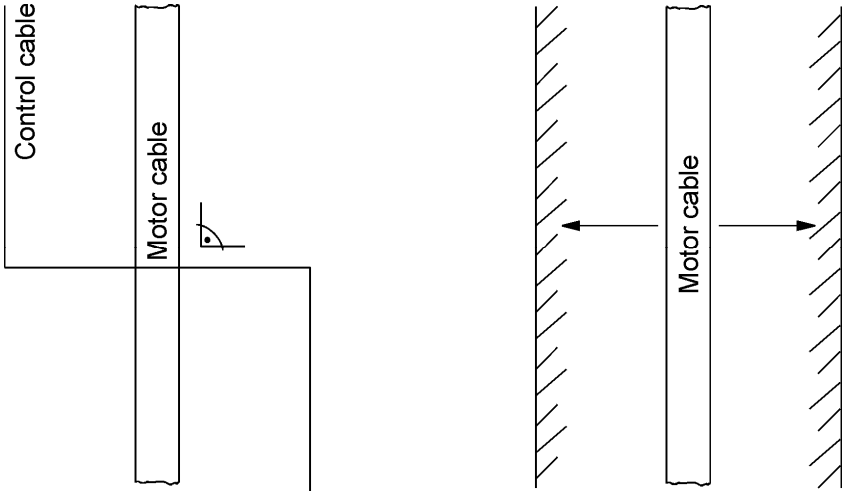
1. **Power cables, especially motor cables, with single wires should be always laid closely bundled with the corresponding PE conductor.**



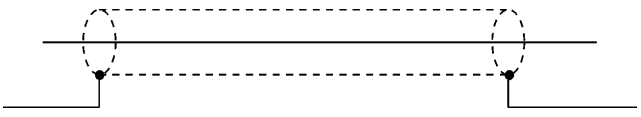
2. **Control, mains supply and motor output should be arranged separately from each other, if possible.**



3. **Never lay control cables, mains supply or motor cables in the same cable conduit !!**



4. **Use only screened control cables (exception: relay contacts and possibly digital inputs if they are laid completely separated from the power cables). Always ground the screen at both ends (exception: In case of problems with ground loops due to compensation currents which heat the screen, only the signal input side is grounded or a parallel compensation line is used).**



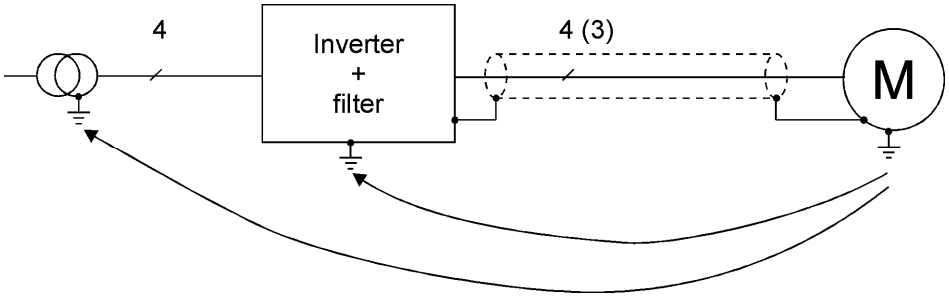
5. **Perform EMC grounding of the RFI filter, the mounting plate and the cubicle.**

   The inductance of "grounding" is extremely significant because the measurement of power failures as well as the existing influences on other loads are related to earth potential. That means that ground connections with large surface, which are arranged parallel to the yellow-green protective grounding PE, are particular important.

6. **The motor cable screen prevents that interference currents drain off via the grounded motor (motor footing). The screen returns them back to the line filter of the inverter.**

   Furthermore the motor cable screen reduces the radiated emissions as well as the coupling into neighbouring lines.

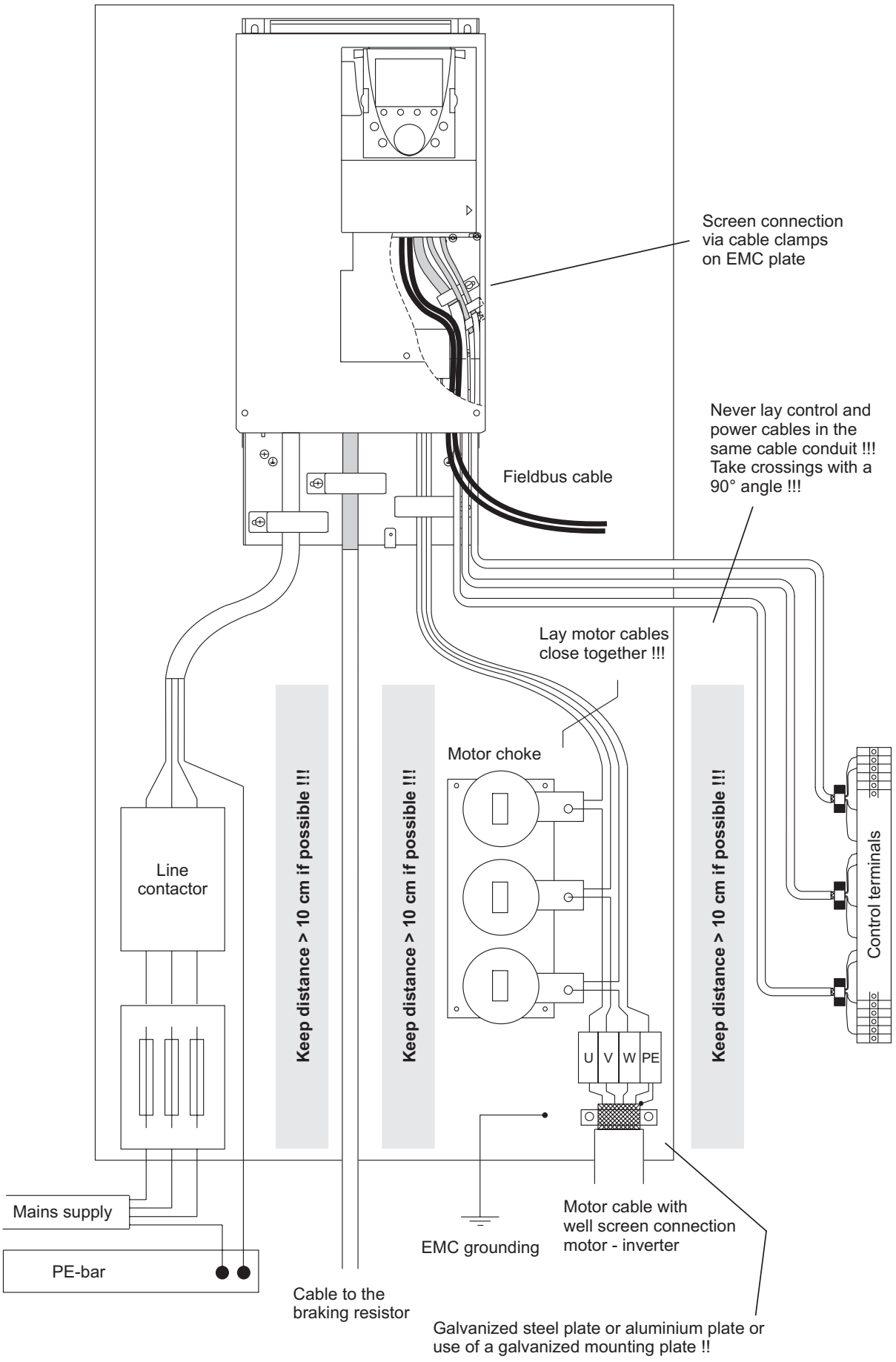
   Therefore, screened 4-pole motor cables should be used and the screen should be connected at both ends in accordance with the valid HF rules. The type of screen material (copper or steel) is less important than the well connection at both ends. Alternatively, a closed and well conductive cable conduit can be used which is continuously connected.



   A cheap alternative (for the use in industrial environments) for large cable diameters are power cables with concentric protective conductor (e.g. NYCY or NYCWY). Thereby, the protective conductor assumes the protective function of the PE conductor as well as the screening effect.

Notes for wiring the power terminals

Enclosure installation



Specification of the control terminals

Safe Standstill

The ATV71Q frequency inverters include the "Safe Standstill" function as standard (Power Removal, certificate no. 72148-2 /2006). This function prevents any unintended start-up of the motor and guarantees the safety of the machine and plant personnel.

This safety function complies with:

- the standard for safety of machinery EN 954-1 / ISO 13849-1, category 3
- the standard for functional safety IEC/EN 61508, SIL2 capability
  (functional safety of processes and systems and electrical/electronic/programmable electronic safetyrelated systems)

  The SIL (Safety Integrity Level) capability depends on the connection diagram for the drive and for the safety function. Failure to observe the setup recommendations could inhibit the SIL capability of the "Power Removal" safety function.
- the definition of the product standard IEC/EN 61800-5-2 for both stop functions:
  - Safe Torque Off (“STO”)
  - Safe Stop 1 (“SS1”)

Following circuit variations are provided:

Circuit variation	Safety function
using a line contactor	**Safety category 1** according to EN 954-1 category 1; IEC/EN 61508, SIL1 **Stop category 0** according to IEC/EN 60204-1
using a motor switch	**Safety category 1** according to EN 954-1 category 1; IEC/EN 61508, SIL1 **Stop category 0** according to IEC/EN 60204-1
using the digital input PWR "Safe Standstill"	**Safety category 3** according to EN 954-1 category 3; IEC/EN 61508, SIL2 **Stop category 0** according to IEC/EN 60204-1
using the digital input PWR "Safe Standstill" with controlled deceleration	**Safety category 3** according to EN 954-1 category 3; IEC/EN 61508, SIL2 **Stop category 1** according to IEC/EN 60204-1

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

The analog input AI1 with differential amplifier (as well as AI3 of the extended I/O extension card) enables the reference assignment decoupled from the ground.

DANGER

UNEXPECTED OPERATION OF THE DEVICE

Keep the maximum cable length of 15 m for the wiring of the safety input PWR "Safe standstill".

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

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

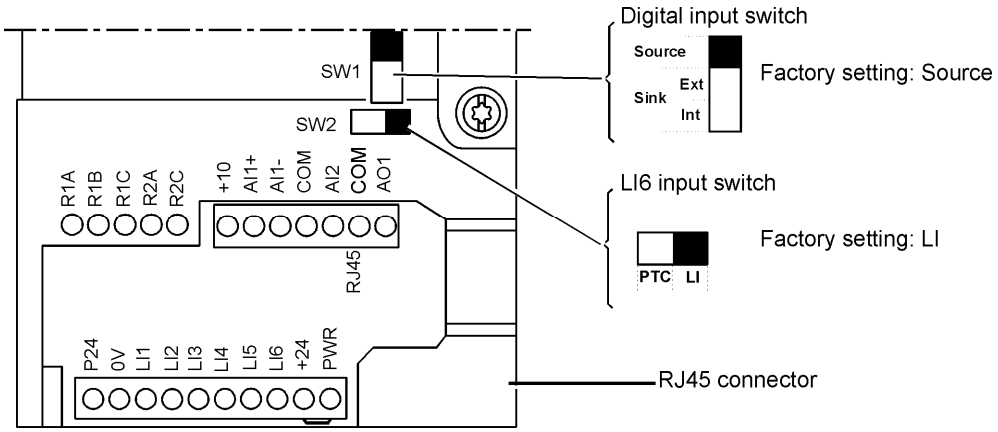
DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

All connected circuits must fulfil the requirements for protective separation to guarantee protective separation.

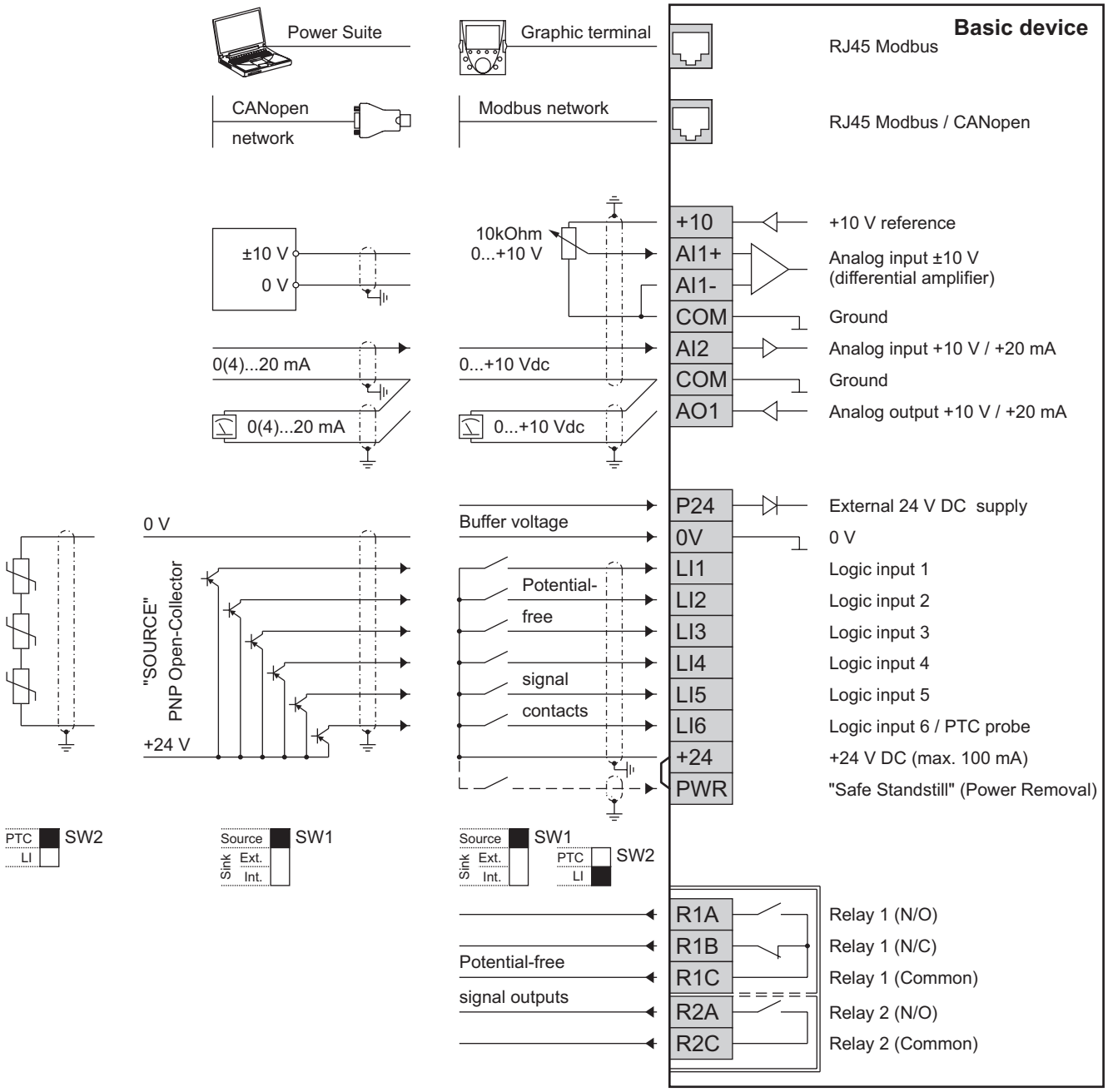
Failure to follow these instructions will result in death or serious injury.

Arrangement of control terminals



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

Standard control terminals of the frequency inverter



The use of the individual inputs and outputs as well as their limits can be adjusted by means of the device software. Only the alternative use of the logic input LI6 for motor thermistor monitoring and the selection of the switching method for all logic inputs has to be adjusted by means of the sliding switch.

The inverters ATV71Q are equipped with a built-in interface for control via Modbus. In addition to the external wiring (connection to the T-pieces in the bus line) only the adjustment of few parameters is necessary.

Alternatively, this interface can be also used for the CANopen bus. Therefore, an adapter (VW3 CAN A71) is required for conversion of the RJ45 plug to SUB-D (CANopen standard CiA DRP 303-1). The bus wiring is taken by connection to the next device.

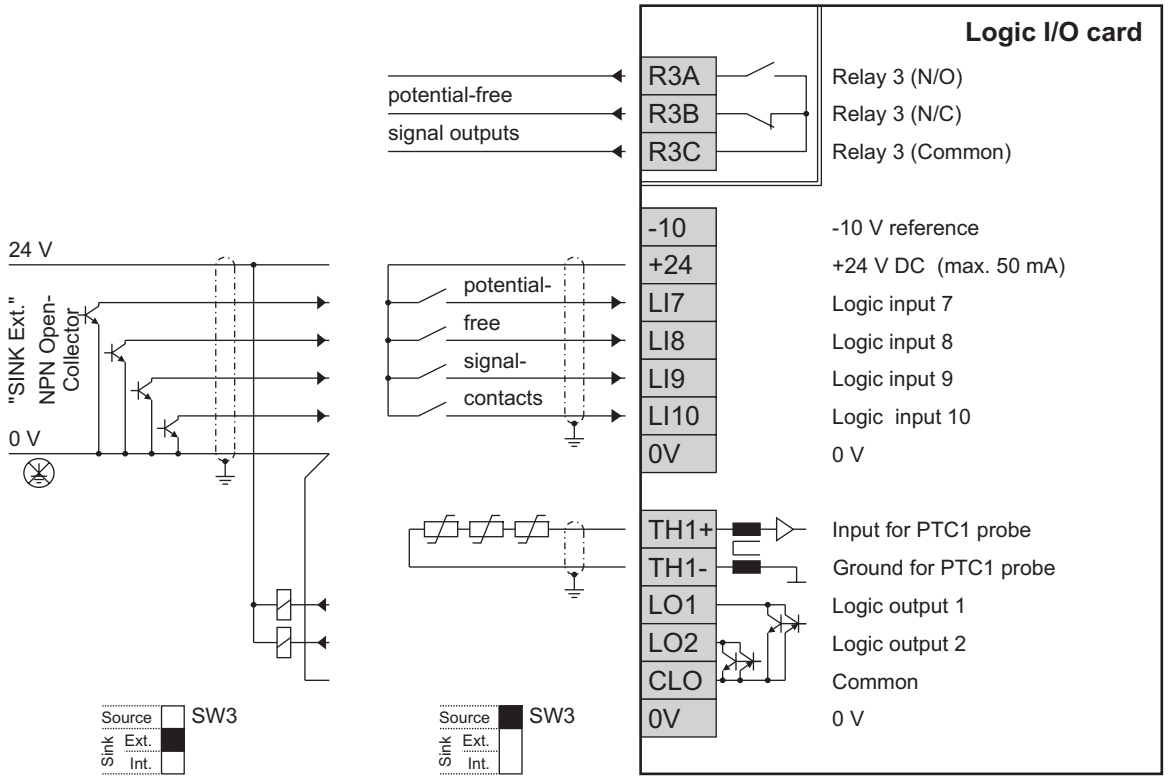
Specifications of the standard control terminals in the inverter

Terminal	Designation	Specification
+10	Voltage supply for potentiometer 1...10 kΩ	+10 V DC (10.5 V ±0.5 V) max. 10 mA; short-circuit proof
AI1+ AI1-	Analog input AI1 (Usage and limits can be parameterized)	-10...+10 V DC, differential amplifier, floating up to max. 24 V *) Reaction time 2 ms ±0.5 ms, resolution 11 Bits + 1 sign bit, accuracy ±0.6 % at Δϑ = 60 °C (140 °F), linearity ±0.15 %
COM	Ground	0 V reference potential for analog in-/outputs
AI2	Analog input AI2 (Selection, usage and limits can be parameterized)	– 0...+10 V DC (floating up to max. 24 V), impedance 30 kΩ *) or – 0(4)...20 mA, impedance 250 Ω Reaction time 2 ms ±0.5 ms, resolution 11 Bits, Accuracy ±0.6 % at Δϑ = 60 °C (140 °F), linearity ±0.15 %
COM	Ground	0 V reference potential for analog in-/outputs
AO1	Analog output AO1 (Selection, usage and limits can be parameterized)	– 0...+10 V DC, load impedance 500 Ω *) or – 0(4)...20 mA, max. load impedance 500 Ω Resolution 10 Bits, reaction time 2 ms ± 0.5 ms, accuracy ±1 % at Δϑ = 60 °C (140 °F), linearity ±0.2 %
P24	Supply buffer voltage	+24 V DC (min. 19 V, max. 30V) external supply of the control part, power demand 30 W
0 V	Ground	Reference potential of the logic inputs and 0 V of the external voltage supply P24
LI1 LI2 LI3 LI4 LI5	Logic inputs LI1...LI5 (Usage can be parameterized, Sink/Source-switching with selector switch SW1)	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 2 ms ±0.5 ms Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 SW1 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW1 at Sink Int. or Sink Ext.: High < 10 V DC, Low > 16 V DC
LI6 (PTC)	Logic input LI6 or Input for PTC probe (Usage can be parameterized, Sink/Source-switching with selector switch SW2)	– *Selector switch SW2 at LI (factory setting):* Logic input LI6, same data as with LI1 up to LI5 – *Selector switch SW2 at PTC:* PTC probe, for max. 6 PTC thermistors in series *) Thermistor nominal value < 1.5 kΩ, threshold value 3 kΩ, Disengaging value 1.8 kΩ, short-circuit monitoring at < 50 Ω
+24	Sampling voltage for logic inputs (Sink/Source-switching with selector switch SW1)	– *Selector switch SW1 in position Source or Sink int.:* +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 100 mA (incl. all options) – *Selector switch SW1 in position Sink Ext.:* Input for external voltage supply +24 V DC of the logic inputs
PWR	Input of the safety function "Safe Standstill" (Power Removal)	Logic input 24 V DC (max. 30 V) *) Impedance 1.5 kΩ, filter time 10 ms, High > 17 V, Low < 2 V If PWR is not connected to 24 V, the starting of the motor is not possible (according to the standard for functional safety EN 954-1 / ISO 13849-1, IEC / EN 61508) and IEC/EN 61800-5-2
R1A R1B R1C	Relay output 1 (R1A N.O. contact, R1B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 7 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Sampling voltage must correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.
R2A R2C	Relay output 2 (R2A N.O. contact)	

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

*) Screen the wiring and lay the cables separate from the motor cable !
The maximum cable length for the PTC probe is 20 m and 15 m for the safety input PWR "Safe Standstill".

Control terminals of the logic I/O card



The logic I/O card is an cost-effective solution with additional digital inputs and outputs, one relay output and one high-quality thermistor input. The card cannot be used twice.

The setting for positive or negative logic of the option card can be taken independent from the logic inputs of the basic device using sliding switch SW3.

Parameters that belong to the inputs and outputs of the option cards are only available at the inverter when the card(s) are plugged. Thus, wrong parameterization of functions close to the terminals is extensively prevented.

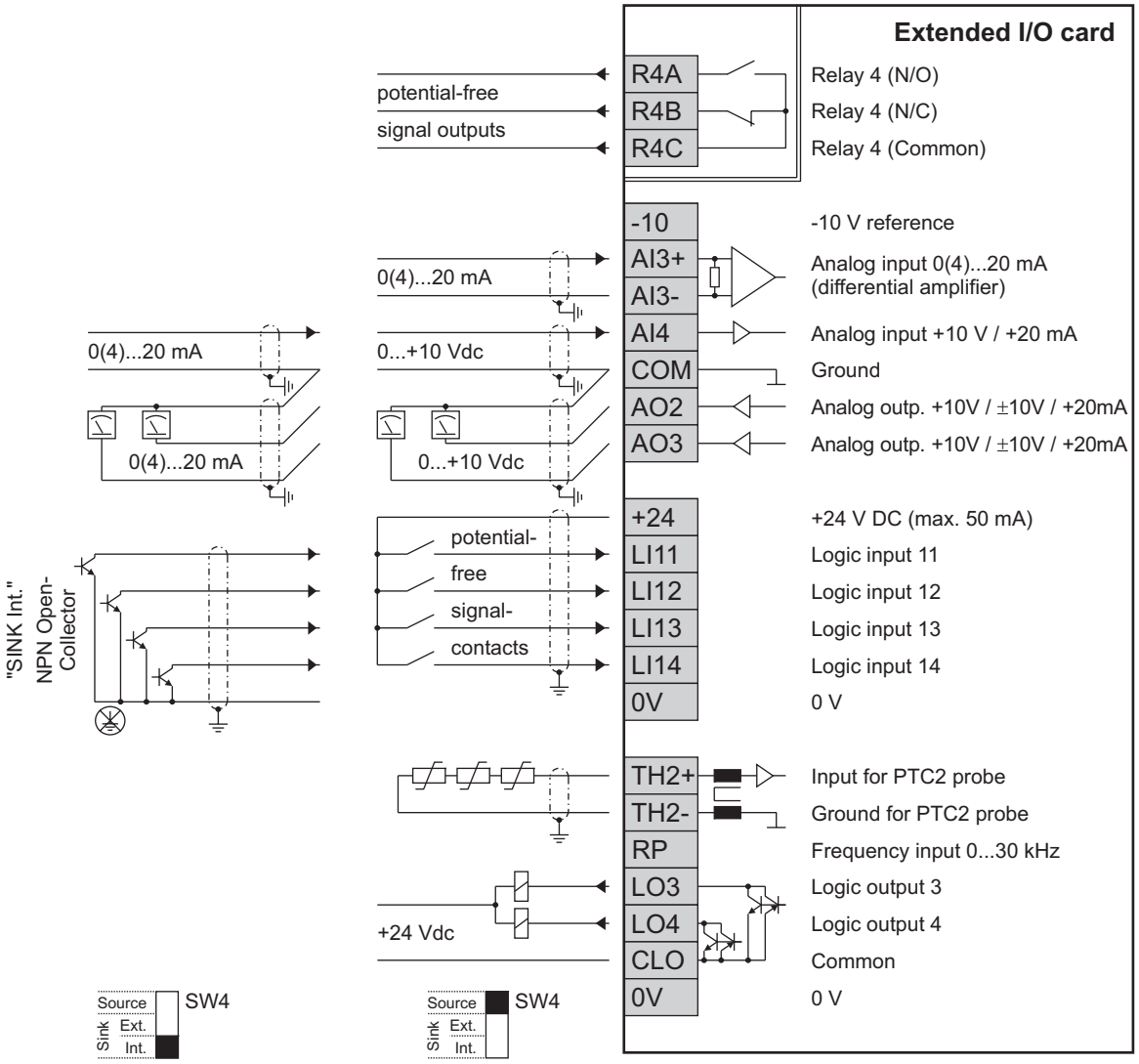
Specification of the control terminals at the logic I/O card

Terminal	Designation	Specification
R3A R3B R3C	Relay output 3 (R3A N.O. contact, R3B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 7 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Sampling voltage must correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.
-10	Voltage supply for potentiometer 1...10 kΩ	-10 V DC (-10.5 V ±0.5 V) max. 10 mA; short-circuit proof
+24	Sampling voltage for logic inputs (Sink/Source-switching with selector switch SW3)	– *Selector switch SW3 in position Source or Sink int.:* +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 50 mA (for basic device and options) – *Selector switch SW3 in position Sink Ext.:* Input for external voltage supply +24 V DC of the logic inputs
LI7 LI8 LI9 LI10	Logic inputs LI7...LI10 (Usage can be parameterized, Sink/Source-switching with selector switch SW1)	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 2 ms ±0.5 ms Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 SW3 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW3 at Sink Int. or Sink Ext.: High < 10 V DC, Low > 16 V DC
0 V	Ground	0 V reference potential for logic inputs
TH1+ TH1-	PTC1 probe	for max. 6 PTC thermistors in series *) Thermistor nominal value < 1.5 kΩ, threshold value 3 kΩ, Disengaging value 1.8 kΩ, short-circuit monitoring at < 50 Ω
LO1	Logic output DO1 (Usage can be parameterized)	+24 V DC Open-Collector-Outputs, floating ground Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 Switching capacity max. 200 mA at 12...30 VDC Reaction time: 2 ms ±0.5 ms
LO2	Logic output DO2 (Usage can be parameterized)	
CLO	Common	Reference potential of logic outputs
0 V	Ground	0 V general use

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

*) Screen the wiring and lay the cables separate from the motor cable !

Control terminals of the I/O extension card



The extended I/O card can be plugged in addition or as an alternative to the logic I/O card. The card cannot be used twice.

The setting for positive or negative logic of the option card can be taken independent from the logic inputs of the basic device using sliding switch SW4.

Specification of the control terminals at the extended I/O card

Terminal	Designation	Specification
R4A R4B R4C	Relay output 4 (R4A N.O. contact, R4B N.C. contact)	Switching capacity min. 3 mA at 24 V DC (relay as good as new) Switching capacity max. 5 A at 250 V AC (cos φ = 1) or 30 V DC, max. 2 A at 250 V AC (cos φ = 0.4) or 30 V DC (L/R = 7 ms) Reaction time 10 ms ±0.5 ms, life cycle 100,000 switching cycles at max. switching capacity Sampling voltage must correspond to overvoltage category II so that the PELV conditions for the remaining control terminals are fulfilled.
-10	Voltage supply for potentiometer 1...10 kΩ	-10 V DC (-10.5 V ±0.5 V) max. 10 mA; short-circuit proof
AI3+ AI3-	Analog input AI3 (Usage and limits can be parameterized)	0(4)...20 mA, differential amplifier, impedance 250 Ω, Reaction time 5 ms ±1 ms, resolution 11 Bits + 1 sign bit, accuracy ±0.6 % at Δϑ = 60 °C (140 °F), linearity ±0.15 %
AI4	Analog input AI4 (Selection, usage and limits can be parameterized)	– 0...+10 V DC (floating up to max. 24 V), impedance 30 kΩ *) or – 0(4)...20 mA, impedance 250 Ω Reaction time 5 ms ±1 ms, resolution 11 Bits, Accuracy ±0.6 % at Δϑ = 60 °C (140 °F), linearity ±0.15 %
COM	Ground	0 V reference potential for analog in-/outputs
AO2	Analog output AO2	– 0...10 V DC or -10/+10 V DC according to software configuration, min. load impedance 500 Ω *) or – 0(4)...20 mA, max. load impedance 500 Ω Resolution 10 Bits, reaction time 5 ms ± 1 ms, accuracy ±1 % at Δϑ = 60 °C (140 °F), linearity ±0.2 %
AO3	Analog output AO3	
+24	Sampling voltage for logic inputs (Sink/Source-switching with selector switch SW4)	– *Selector switch SW4 in position Source or Sink int.:* +24 V DC (min. 21 V, max. 27 V), short-circuit proof max. 50 mA (for basic device and options) – *Selector switch SW4 in position Sink Ext.:* Input for external voltage supply +24 V DC of the logic inputs
LI11 LI12 LI13 LI14	Logic inputs LI11...LI14 (Usage can be parameterized, Sink/Source-switching with selector switch SW4)	+24 V DC (max. 30 V), impedance 3.5 kΩ, reaction time 5 ms ±1 ms Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 SW4 at Source (factory setting): High > 11 V DC, Low < 5 V DC SW4 at Sink Int. or Sink Ext.: High < 10 V DC, Low > 16 V DC
0 V	Ground	0 V reference potential for logic inputs
TH2+ TH2-	PTC2 probe	for max. 6 PTC thermistors in series *) Thermistor nominal value < 1.5 kΩ, threshold value 3 kΩ, Disengaging value 1.8 kΩ, short-circuit monitoring at < 50 Ω,
RP	Frequency input FP	Frequency range 0...30 kHz, 1:1 ±10 %, reaction time 5 ms ±1 ms Input voltage 5 V DC, 15 mA Series resistor for 12 V = 510 Ω, for 15 V = 910 Ω, for 24 V = 1.3 kΩ (max. 30 V); High > 3.5 V, Low < 1.2 V
LO3	Logic output LO3 (Usage can be parameterized)	+24 V DC Open-Collector-Outputs, floating ground Positive logic (Source) or negative logic (Sink) compatible with Level 1 PLC Standard IEC 65A-68 Switching capacity max. 200 mA at 12...30 VDC Reaction time: 2 ms ±0.5 ms
LO4	Logic output LO4 (Usage can be parameterized)	
CLO	Common	Reference potential of logic outputs
0 V	Ground	0 V general use

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

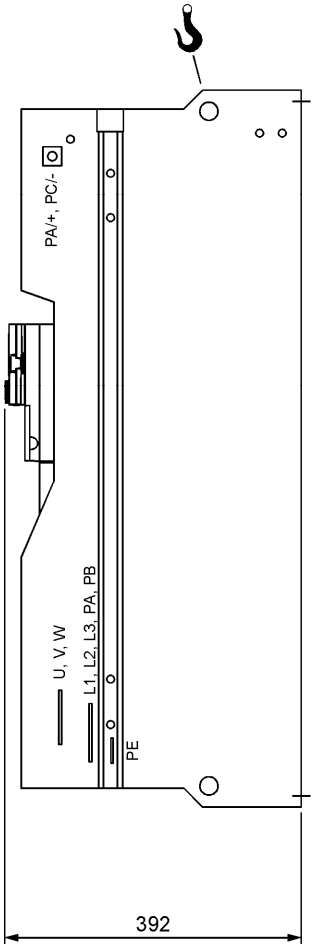
*) Screen the wiring and lay the cables separate from the motor cable !

Dimensions

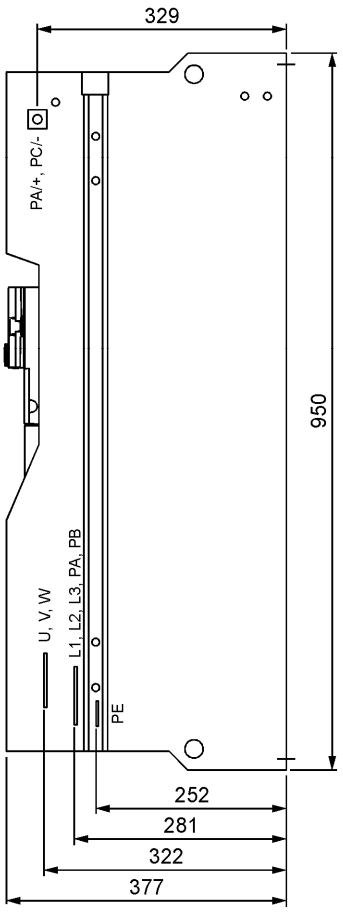
ATV71QD90N4...C13N4

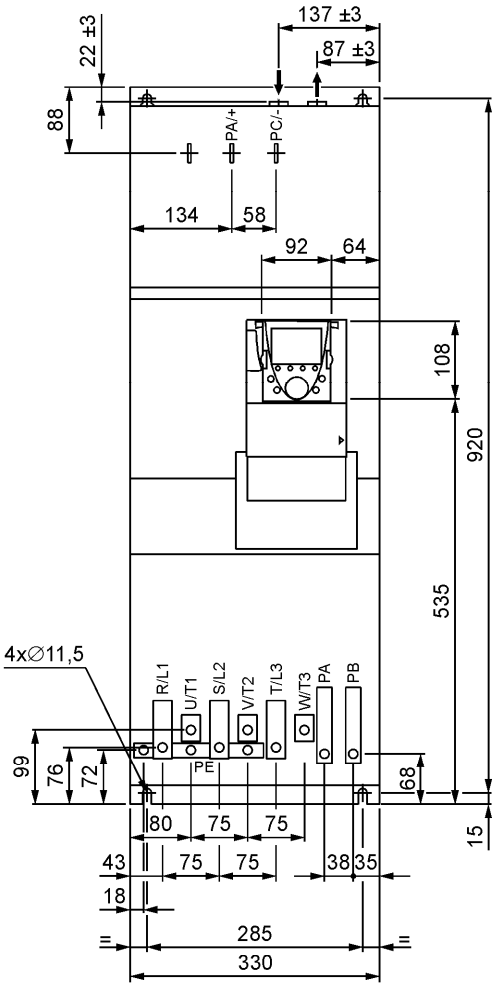
Dimensions

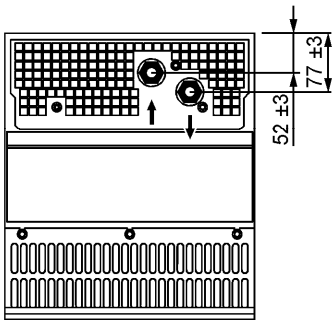
with 2 option cards



Basic device without or with 1 option card







Power terminals

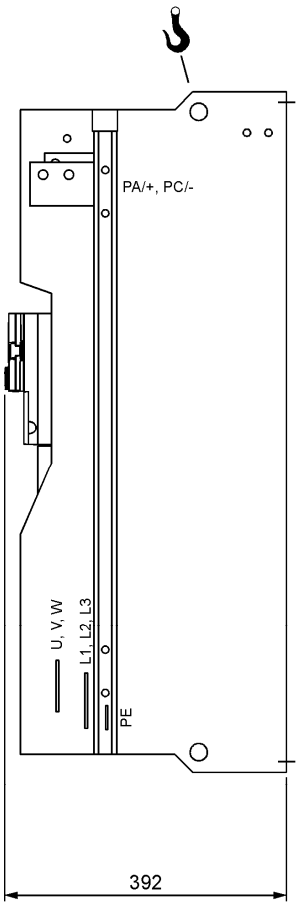
Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	2x 120 mm^2 (2x 250 MCM)
PA, PB	M10	24 Nm (212 lb.in)	120 mm^2 (250 MCM)
Mains and motor	M10	24 Nm (212 lb.in)	2x 120 mm^2 (2x 250 MCM)
PE mains and PE motor	M10	24 Nm (212 lb.in)	120 mm^2 (250 MCM)

Technical data

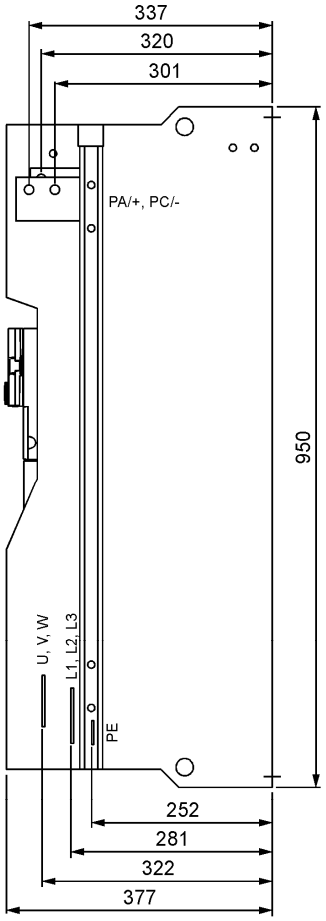
Frequency inverter ATV71Q	D90N4	C11N4	C13N4
Area of liquid cooling - power part			
Losses at 100% I_N	1900 W	2100 W	2400 W
Flow rate	8 l/min	8 l/min	8 l/min
Pressure drop	< 1.5 bar	< 1.5 bar	< 1.5 bar
Filling quantity	0.2 l	0.2 l	0.2 l
Area of air cooling - control part			
Losses at 100% I_N	600 W	700 W	800 W
Weight	80 kg	80 kg	80 kg

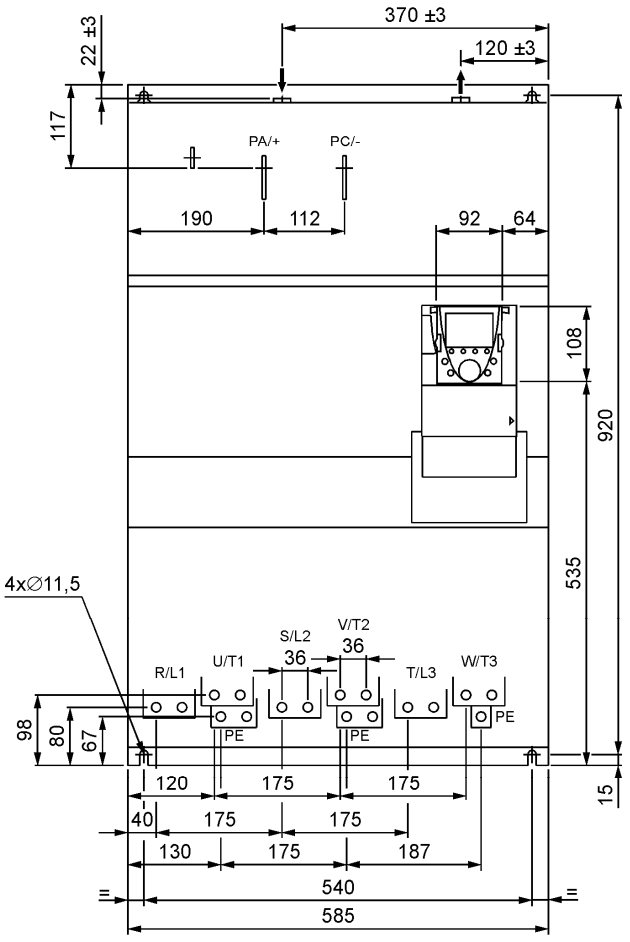
Dimensions

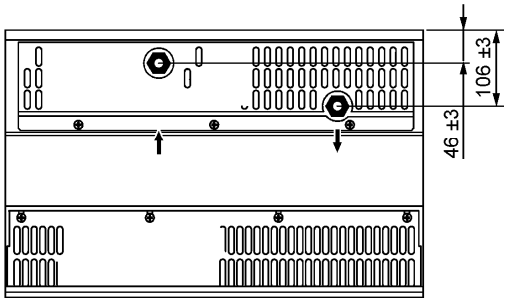
with 2 option cards



Basic device without or with 1 option card







Power terminals

Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
BU+, BU-	M10	24 Nm (212 lb.in)	internal connection
Mains and motor	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
PE mains and PE motor	M12	41 Nm (360 lb.in)	2x 185 mm^2 (2x 400 MCM)

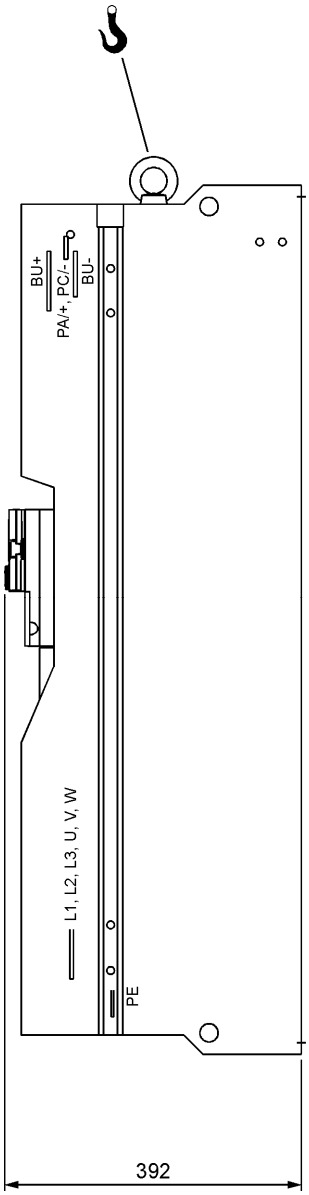
Technical data

Frequency inverter ATV71Q	C16N4	C20N4	C25N4
Area of liquid cooling - power part			
Losses at 100% I_N	2900 W	3700 W	5000 W
Flow rate	24 l/min	24 l/min	24 l/min
Pressure drop	< 1 bar	< 1 bar	< 1 bar
Filling quantity	0.4 l	0.4 l	0.4 l
Area of air cooling - control part			
Losses at 100% I_N	1100 W	1300 W	1500 W
Weight	140 kg	140 kg	140 kg

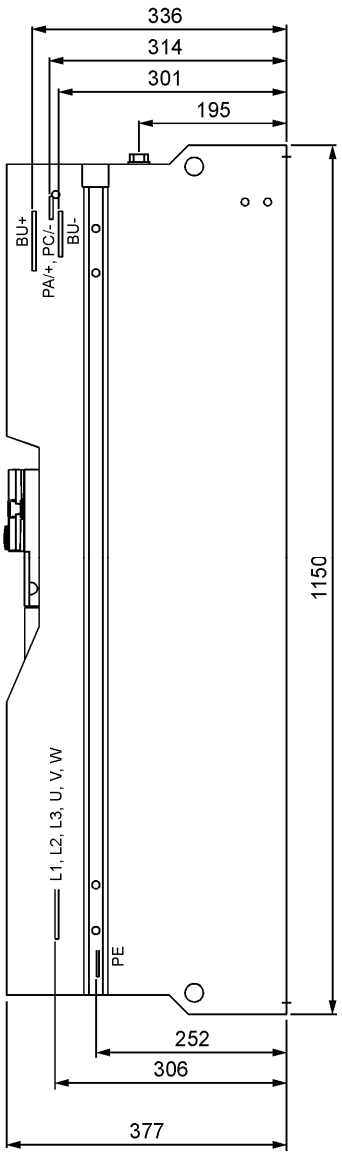
ATV71QC31N4...C50N4

Dimensions

with 2 option cards

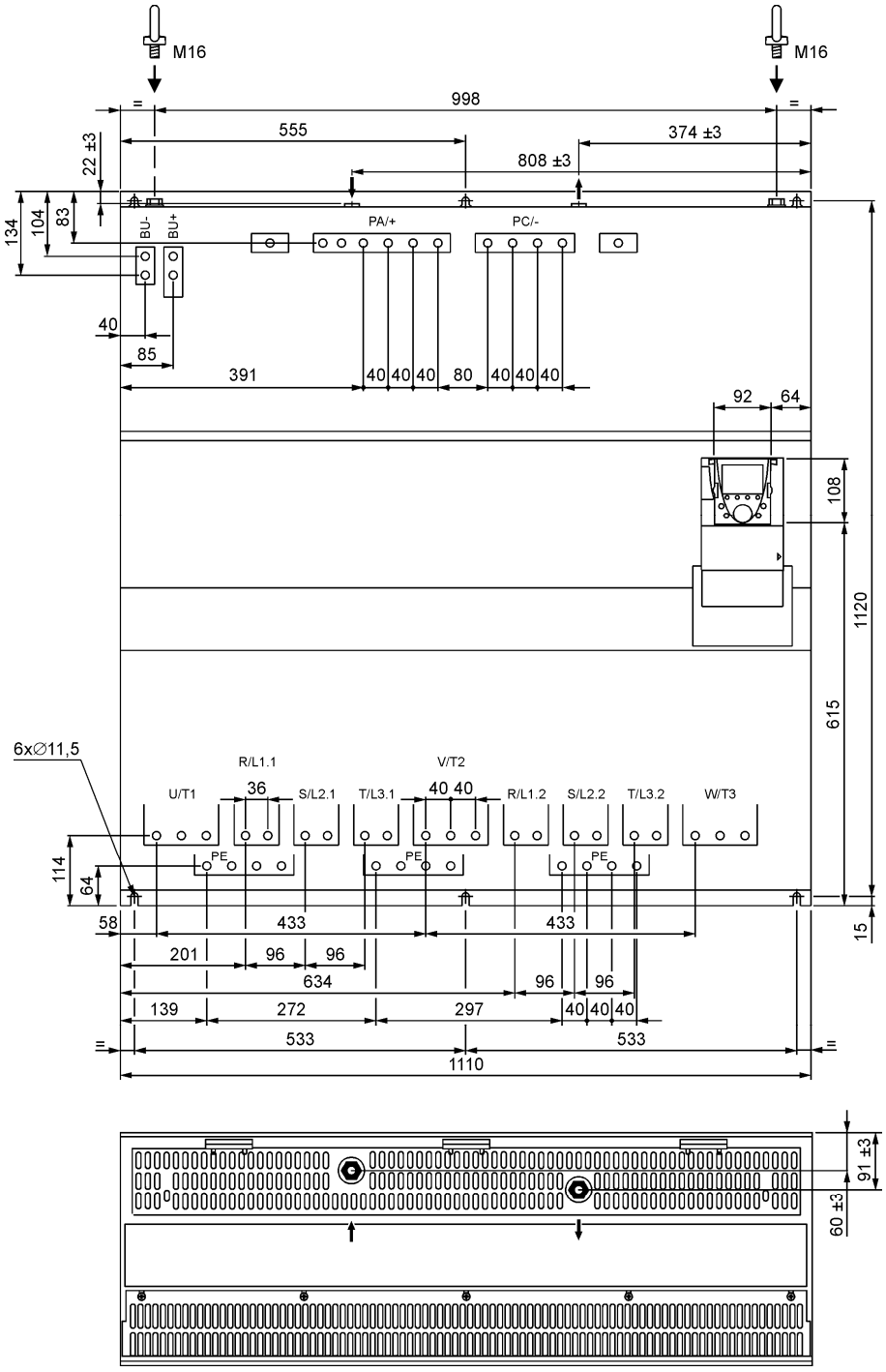


Basic device without or with 1 option card



Technical data

Frequency inverter ATV71Q	C31N4	C40N4	C50N4
Area of liquid cooling - power part			
Losses at 100% I_N	5200 W	6700 W	8800 W
Flow rate	24 l/min	24 l/min	24 l/min
Pressure drop	< 2 bar	< 2 bar	< 2 bar
Filling quantity	0.7 l	0.7 l	0.7 l
Area of air cooling - control part			
Losses at 100% I_N	1900 W	2200 W	2800 W
Weight	300 kg	300 kg	300 kg



Power terminals

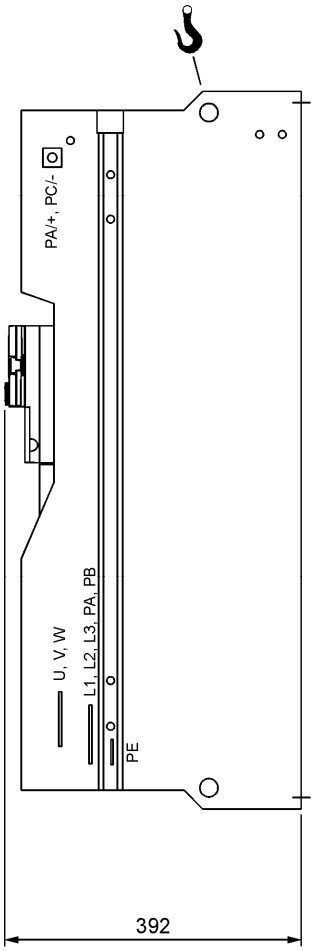
Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	8x 185 mm² (8x 400 MCM)
BU+, BU-	M12	41 Nm (360 lb.in)	internal connection
Mains	M12	41 Nm (360 lb.in)	2x 4x 185 mm² (2x 4x 400 MCM)
Motor *)	M12	41 Nm (360 lb.in)	6x 185 mm² (6x 400 MCM)
PE mains and PE motor	M12	41 Nm (360 lb.in)	4x 185 mm² (4x 400 MCM)

*) To improve the access to the phase V/T2 read the remark at page 70

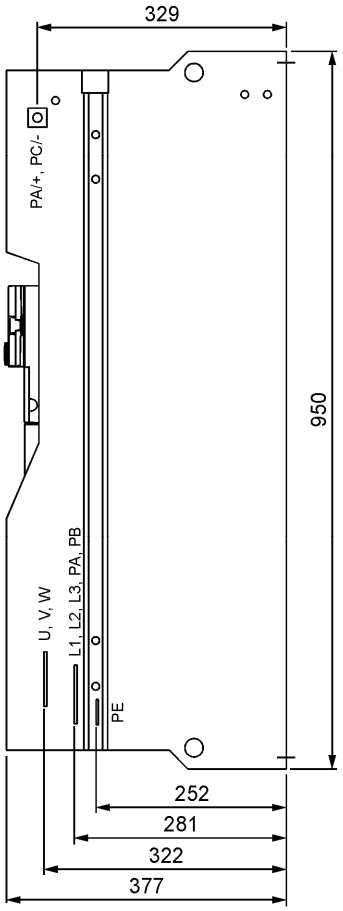
ATV71QC11Y...C16Y

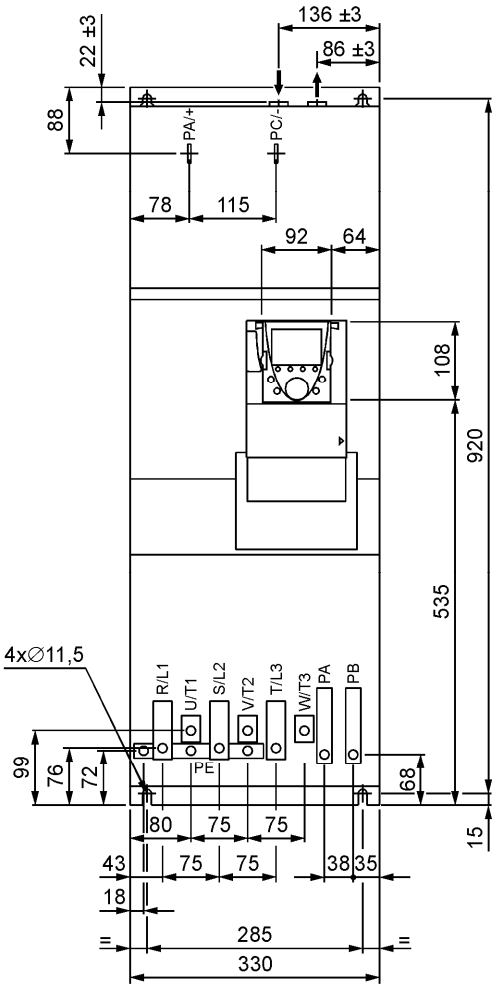
Dimensions

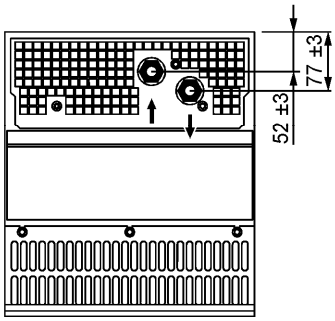
with 2 option cards



Basic device without or with 1 option card







Power terminals

Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	2x 120 mm^2 (2x 250 MCM)
PA, PB	M10	24 Nm (212 lb.in)	120 mm^2 (250 MCM)
Mains and motor	M10	24 Nm (212 lb.in)	2x 120 mm^2 (2x 250 MCM)
PE mains and PE motor	M10	24 Nm (212 lb.in)	120 mm^2 (250 MCM)

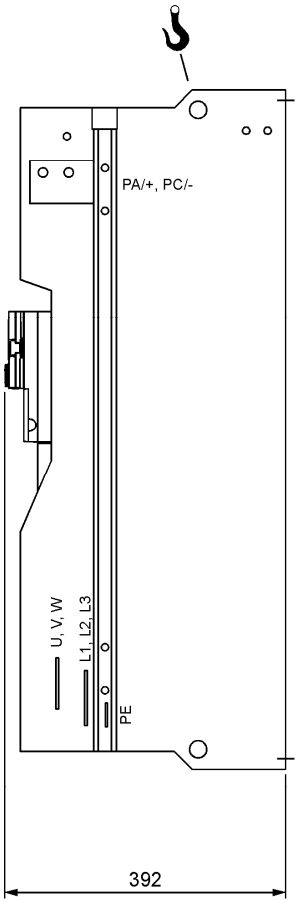
Technical data

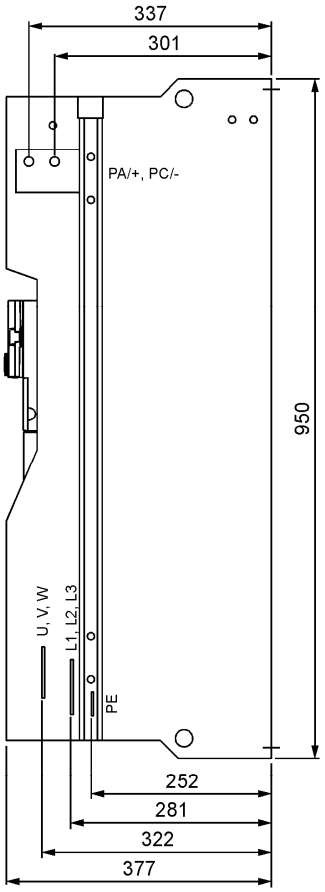
Frequency inverter ATV71Q	C11Y	C13Y	C16Y
Area of liquid cooling - power part			
Losses at 100% I_N	1700 W	2100 W	2600 W
Flow rate	8 l/min	8 l/min	8 l/min
Pressure drop	< 1.5 bar	< 1.5 bar	< 1.5 bar
Filling quantity	0.2 l	0.2 l	0.2 l
Area of air cooling - control part			
Losses at 100% I_N	600 W	700 W	800 W
Weight	80 kg	80 kg	80 kg

ATV71QC20Y...C31Y

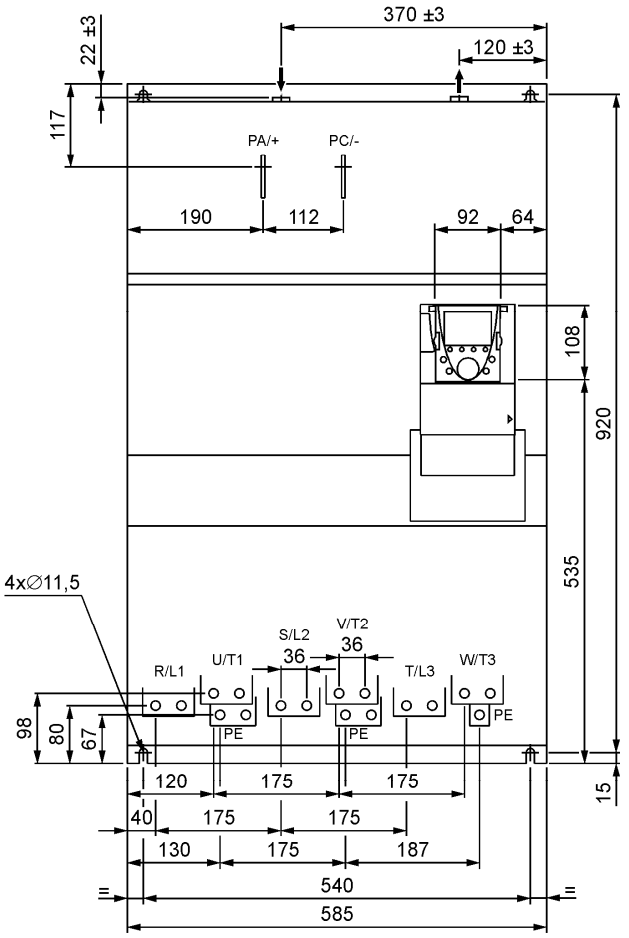
Dimensions

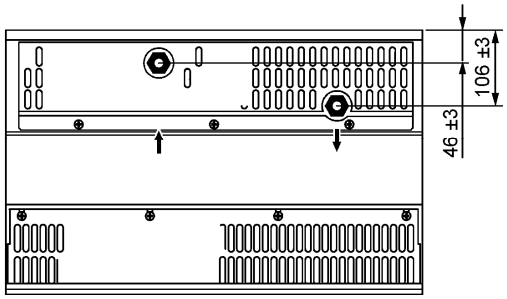
with 2 option cards





Basic device without or with 1 option card





Power terminals

Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
BU+, BU-	M12	41 Nm (360 lb.in)	internal connection
Mains and motor	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
PE mains and PE motor	M12	41 Nm (360 lb.in)	2x 185 mm^2 (2x 400 MCM)

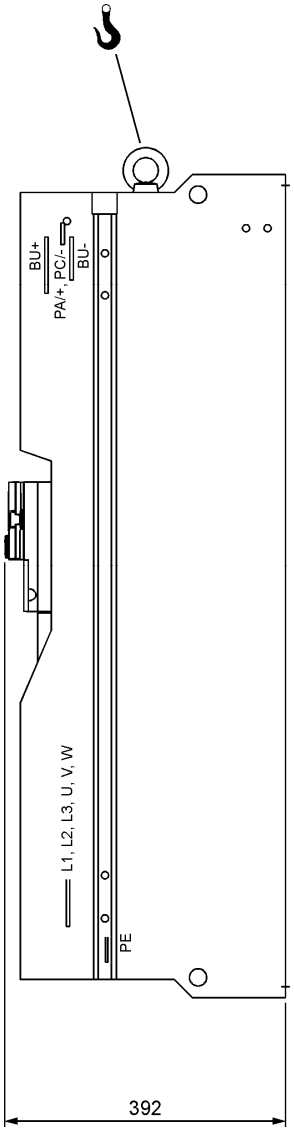
Technical data

Frequency inverter ATV71Q	C20Y	C25Y	C31Y
Area of liquid cooling - power part			
Losses at 100% I_N	3000 W	4000 W	4900 W
Flow rate	24 l/min	24 l/min	24 l/min
Pressure drop	< 1 bar	< 1 bar	< 1 bar
Filling quantity	0.4 l	0.4 l	0.4 l
Area of air cooling - control part			
Losses at 100% I_N	1000 W	1200 W	1400 W
Weight	140 kg	140 kg	140 kg

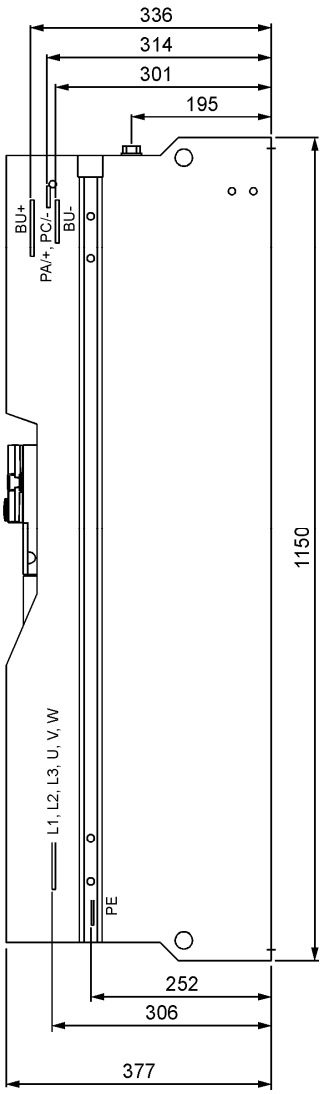
ATV71QC40Y...C63Y

Dimensions

with 2 option cards

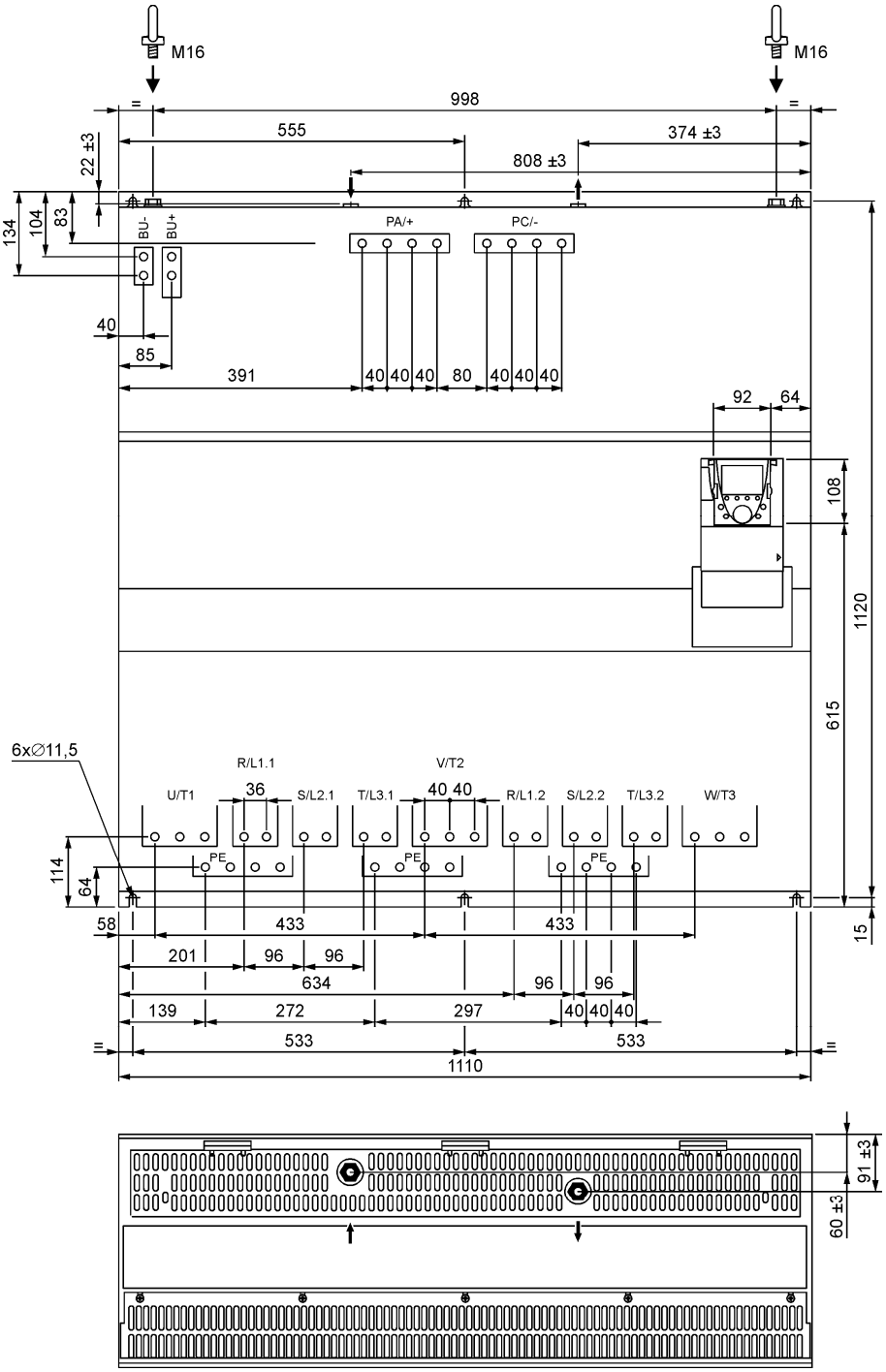


Basic device without or with 1 option card



Technical data

Frequency inverter ATV71Q	C40Y	C50Y	C63Y
Area of liquid cooling - power part			
Losses at 100% I_N	5700 W	7400 W	9300 W
Flow rate	24 l/min	24 l/min	24 l/min
Pressure drop	< 2 bar	< 2 bar	< 2 bar
Filling quantity	0.7 l	0.7 l	0.7 l
Area of air cooling - control part			
Losses at 100% I_N	1900 W	2300 W	2700 W
Weight	300 kg	300 kg	300 kg



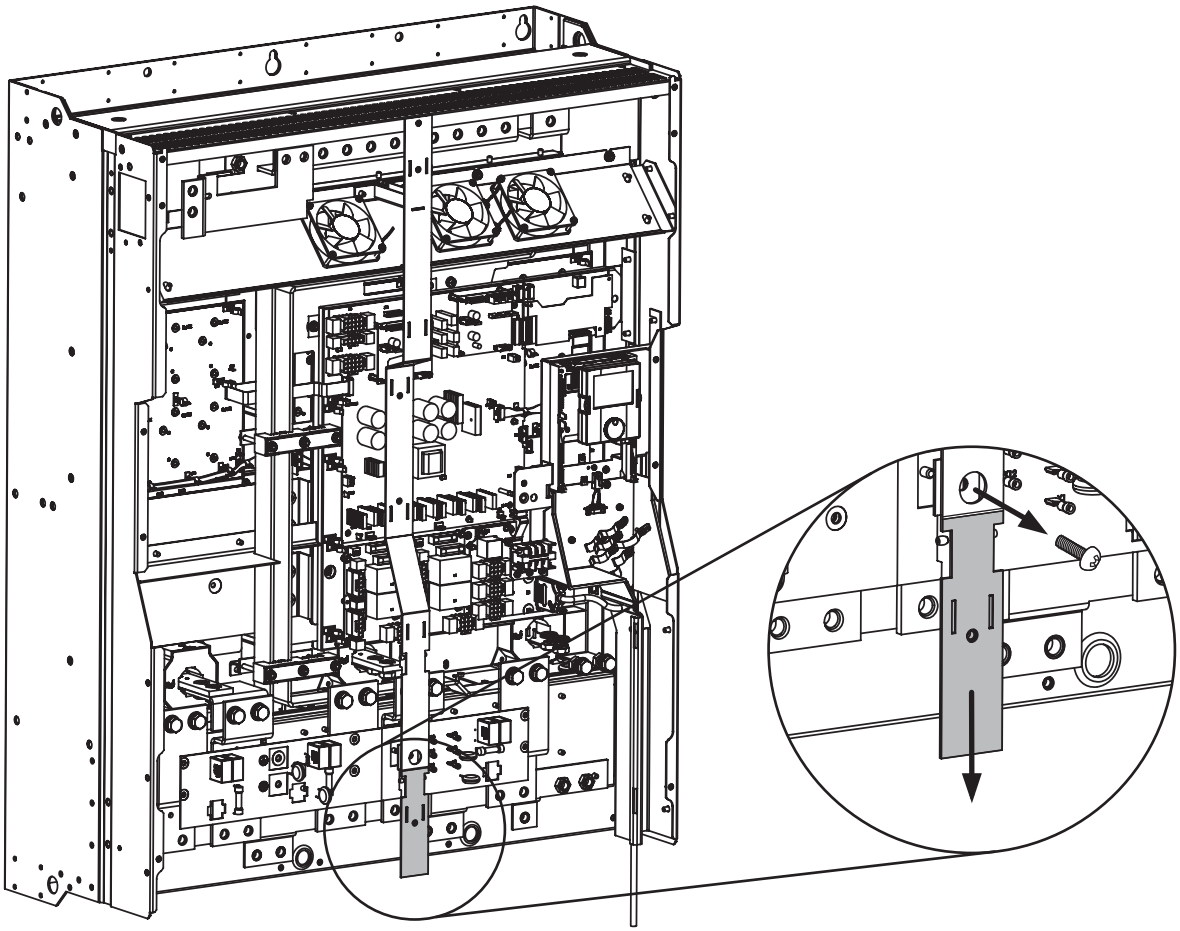
Power terminals

Designation	Connection	Tightening torque	Max. connection cross-section
PA/+ and PC/-	M12	41 Nm (360 lb.in)	8x 185 mm² (8x 400 MCM)
BU+, BU-	M12	41 Nm (360 lb.in)	internal connection
Mains	M12	41 Nm (360 lb.in)	2x 4x 185 mm² (2x 4x 400 MCM)
Motor *)	M12	41 Nm (360 lb.in)	6x 185 mm² (6x 400 MCM)
PE mains and PE motor	M12	41 Nm (360 lb.in)	4x 185 mm² (4x 400 MCM)

*) To improve the access to the phase V/T2 read the remark at page 70

Access to phase V/T2

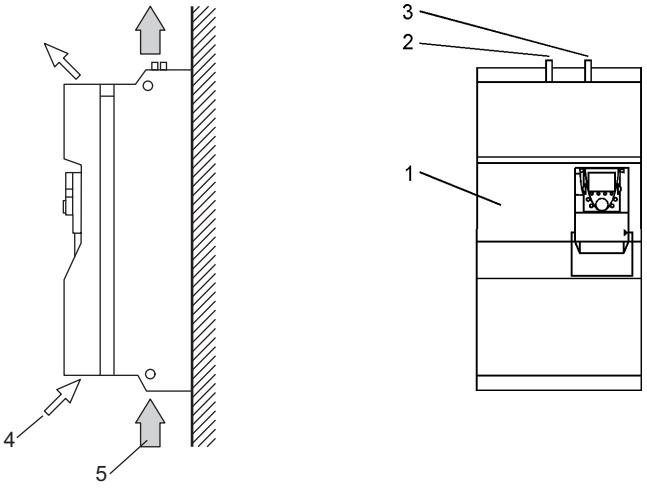
Therefor unscrew the lower part of the middle front cover support.
Required tool: Torx TX30



Installation remarks

Wall-mounting

The inverters ATV71Q are designed for installation on the wall, in an electrical room or into an enclosure. The devices are built according to pollution degree 2. If the environment does not correspond to these conditions then the necessary transition of the pollution degree must be provided e.g. by means of an enclosure.



1 ATV71Q
2 Cooling water inlet
3 Cooling water return
4 Cooling air for control part
5 Cooling air for power part (only capacitors)

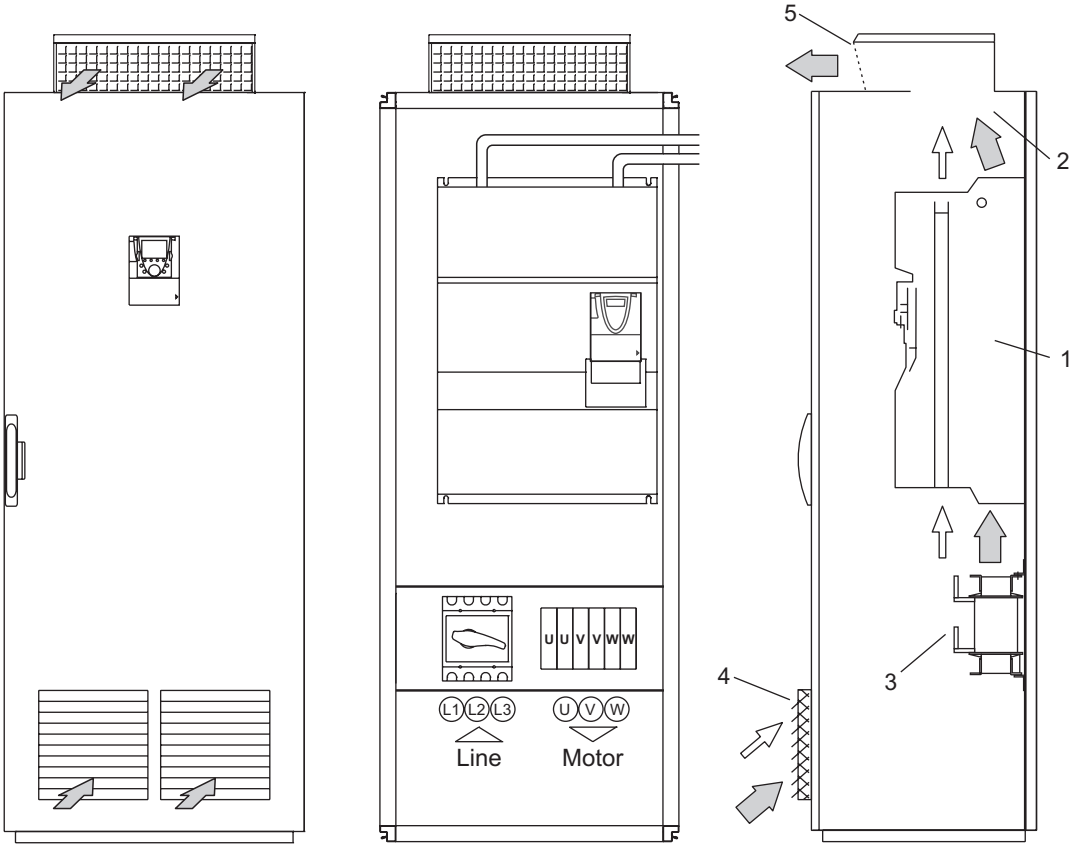
Cubicle installation IP23

Reduction of losses in the electrical room

The water cooling of the ATV71Q inverters enables a high reduction of the losses accumulating in the electrical room. Thus the installation of an expensive air conditioning can be avoided.

The cooling water circuit can exhaust about 75 % of the accumulating losses out of the inverter enclosure. The losses of control electronics, wiring, line and motor choke, fuses and so on are eliminated via forced air cooling.

The illustration shows the typical enclosure design in protection degree IP23.



1 ATV71Q
2 Cooling water inlet / return
3 Enclosure components
(main switch, fuses, line and motor chokes, …)
4 Cooling air inlet (without filter mat) for control part and enclosure components
5 Air outlet via metal cover or cover hood

CAUTION
RISK OF OVERHEATING OF THE FREQUENCY INVERTER AND COMPONENTS
When the frequency inverter is installed without any elements for routing the air flow like in the example above, adequate openings for air in- and outlet must be provided.
ATV71QD90N4…C13N4 and ATV71QC11Y...C16Y: Minimum cross section 4 dm²
ATV71QC16N4…C25N4 and ATV71QC20Y...C31Y: Minimum cross section 6 dm²
ATV71QC31N4…C50N4 and ATV71QC40Y...C63Y: Minimum cross section 10 dm²
Failure to follow this instruction can result in equipment damage.

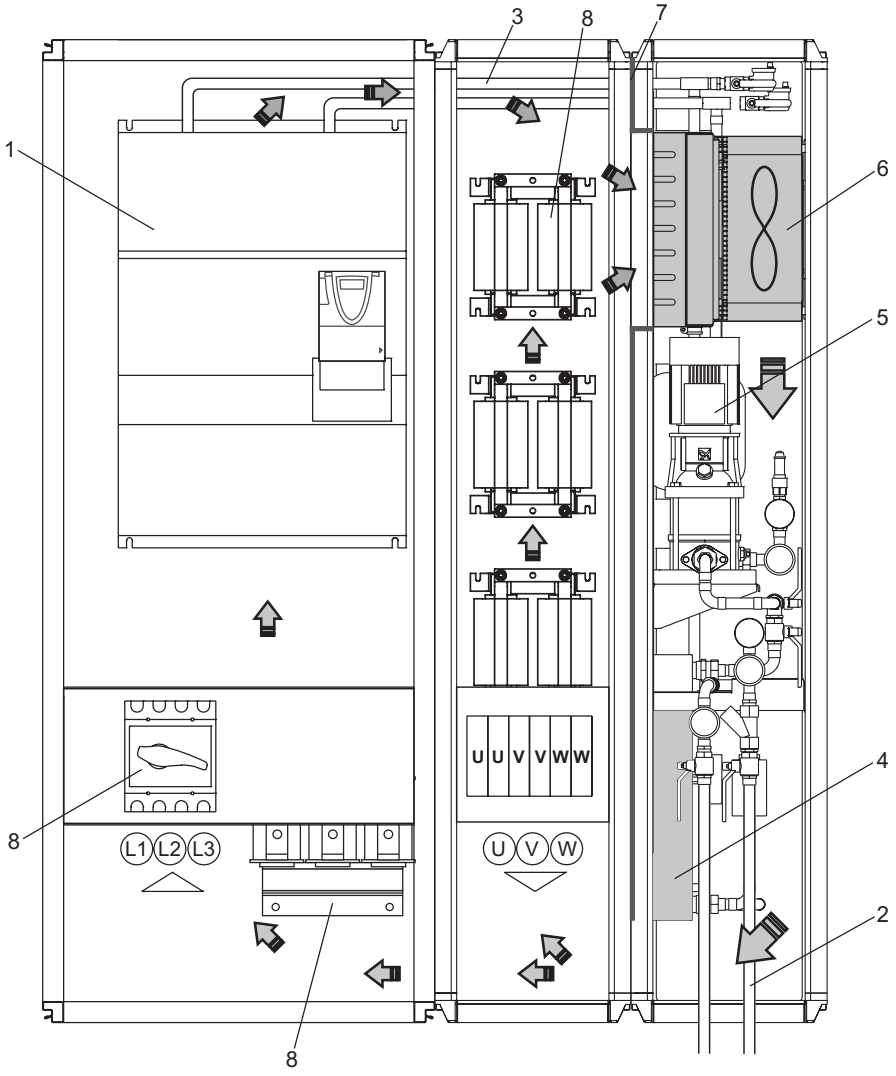
Cubicle installation IP55

Completely closed enclosure

The water cooling of the ATV71Q inverters enables in combination with an additional air/water heat exchanger the dissipation of 100 % of the accumulating losses out of the enclosure. Thereby the enclosure (the enclosure group) is absolutely sealed and does not require any air exchange with the environment.

The temperature of the external cooling water is about +5...+35°C, the air temperature outside the enclosure can be up to +50°C.

The illustration shows the typical enclosure design in protection degree IP55.



1 ATV71Q
2 External cooling circuit - cooling water inlet / return
3 Internal cooling circuit - cooling water inlet / return
4 Water/water heat exchanger
5 Circulating pump for internal cooling circuit
6 Air/water heat exchanger for cooling the enclosure air
7 Separation wall
8 Enclosure components (main switch, fuses, line and motor chokes, …)

CAUTION
RISK OF OVERHEATING OF THE FREQUENCY INVERTER AND COMPONENTS The additional heat exchanger has to be dimensioned in such a way that it can absorb next to the control losses of the inverter also the losses of other enclosure components (wiring, line and motor chokes, ...). The device-internal fan can be used to force the necessary air circulation. **Failure to follow this instruction can result in equipment damage.**

Remarks for cooling

Division of losses

The losses of the frequency inverter are divided into power part losses, which are exhausted by the cooling water, and the losses of the control part, which are exhausted by device-internal fans to the ambient air.

The real losses of the individual inverters are given in chapter "Dimensions", page 58.

Control of the cooling circuit

CAUTION
RISK OF OVERHEATING OF THE FREQUENCY INVERTER Make sure that • the frequency inverter is never operated without cooling. • the coolant pump is running as soon (or better before) the start command is given. • the inverter changes to impulse inhibit when the pump breaks down or is running dry. • the coolant pump continues running for at least 5 minutes in order to avoid reheating. **Failure to follow this instruction can result in equipment damage.**

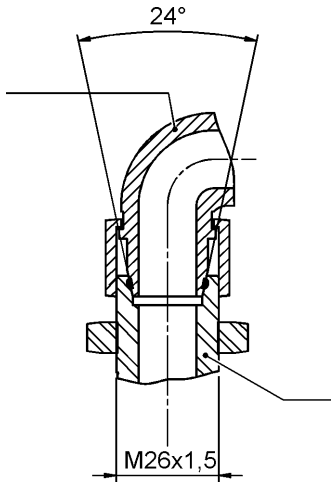
Connecting remarks for the cooling circuit

During installation of the inverter observe enough free space above the device (min. 200mm) for laying the cooling pipes.

Consider the tightening torque of 35 Nm for the pipe connections in order to avoid damages of the internal pipe system.

The connection can be realized as straight or swivel elbow connection.

DKOL connection with O-ring of NBR for pipe connection according to DIN 2353-L/pipe diameter=18mm
Material: steel zinc coated, CR6 free
and functional nut with width across flat S=32mm and internal thread M26x1.5
Material: steel zinc coated, CR6 free
(Material: stainless steel at industry and clear water)



24° bulkhead fitting for pipe connection according to DIN 2353-L/pipe diameter=18mm and external thread M26x1.5
Material: stainless steel

Leak-tightness

Check the whole cooling circuit for leaks preferably with air and soap sud.

Coolant

Due to the robust design of the cooling pipes inside the inverter, different types of coolant can be used:

- Industrial water (process water)
  The cleanness of the water and the content of aggressive materials is significant for the availability and the maintenance intervals of the whole drive unit. Thus it is recommended to check the process water for the following limits:
  - pH-value 6…9
  - Degree of hardness < 20°dH
  - Chlorides < 100 mg/l
  - Iron < 0.5 mg/l
  - Particle size max. 300 µm
- Water-glycol-mixture
  At a mixture ratio of 60 % water and 40 % Antifrogen N (company Clariant) the freezing point is at -25°C. A higher glycol ratio reduces the heat conduction, a lower ratio reduces the frost resistance.
  The coolant corresponds with water pollution class 1 according VwVwS 1999. Observe DIN 52 900 (about propandiol and ethylene glycol) when disposing the coolant.
- Clear water (de-ionized water)
  For UL applications the use of clear water is necessary, whereby admixing a ratio of 0.2…0.25 % for protection against corrosion (type NALCO TRAC 100) is allowed. Regular check of the insulation of the liquid is requested by the supplier NALCO.

CAUTION
RISK OF CORROSION DAMAGES INSIDE THE COOLING CIRCUIT
Ensure that all components of the cooling circuit comply with the requirements of the coolant!
Failure to follow this instruction can result in equipment damage.

Cooling circuit

Filling

When the frequency inverter has been connected professionally, the cooling circuit has to be filled with the selected coolant.

Frequency inverter		Filling quantity
ATV71QD90N4 ... C13N4	ATV71QC11Y ... C16Y	0.2 l
ATV71QC16N4 ... C25N4	ATV71QC20Y ... C31Y	0.4 l
ATV71QC31N4 ... C50N4	ATV71QC40Y ... C63Y	0.7 l

Flow rate

The internal cooling circuit has to be dimensioned according to the required flow rates and the specified pressure drop.

Frequency inverter		Flow rate	Pressure drop
ATV71QD90N4 ... C13N4	ATV71QC11Y ... C16Y	8 l/min (0.48 m³/h)	< 1.5 bar
ATV71QC16N4 ... C25N4	ATV71QC20Y ... C31Y	24 l/min 1.44 m³/h)	< 1 bar
ATV71QC31N4 ... C50N4	ATV71QC40Y ... C63Y	24 l/min 1.44 m³/h)	< 2 bar

When an additional air/water heat exchanger (serial to the inverter) is provided for cooling of the enclosure air, it has to be dimensioned according to the flow rate trough the inverter.

Temperature

The inlet temperature of the coolant to the inverter has to be in the range of +5°C...+55°C. In order to prevent condensate formation, the temperature of the coolant may be at most 10°K colder than the temperature inside the enclosure (depending on the relative humidity).

Temperature of air	Minimum inlet temperature depending on the relative humidity									
	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
50°C	10°C	21°C	28°C	34°C	38°C			Operation not permitted due to condensation		
45°C	6°C	17°C	24°C	29°C	34°C	38°C	40°C			
40°C	5°C	13°C	20°C	25°C	29°C	32°C	35°C	38°C	40°C	
35°C	5°C	10°C	16°C	20°C	23°C	27°C	30°C	33°C	35°C	
30°C	5°C	5°C	12°C	16°C	20°C	23°C	26°C	28°C	30°C	
25°C	5°C	5°C	7°C	12°C	15°C	18°C	21°C	23°C	25°C	
20°C	5°C	5°C	5°C	7°C	11°C	14°C	16°C	18°C	20°C	
15°C	5°C	5°C	5°C	5°C	6°C	9°C	11°C	13°C	15°C	
10°C	5°C	5°C	5°C	5°C	5°C	5°C	6°C	8°C	10°C	
5°C	5°C	5°C	5°C	5°C	5°C	5°C	5°C	5°C	5°C	

Keep the temperature of the coolant during operation as constant as possible. The temperature inside the enclosure must not exceed +50°C.

Pressure

The pressure in the cooling system of the inverter should be 1.5…2.5 bar when the pump is not running. During operation the pressure can increase for up to 4 bar. The maximum pressure of the inverter of 8 bar must not be exceeded.

Overpressure

In order to avoid damage of the inverter, an expansion tank and a safety valve for 8 bar have to be installed in the cooling circuit. In order to meet the requirements of UL/CSA, an overpressure valve of type KLUNKE VALVE 918BDCV01BJE0116 has to be used.

De-aerating

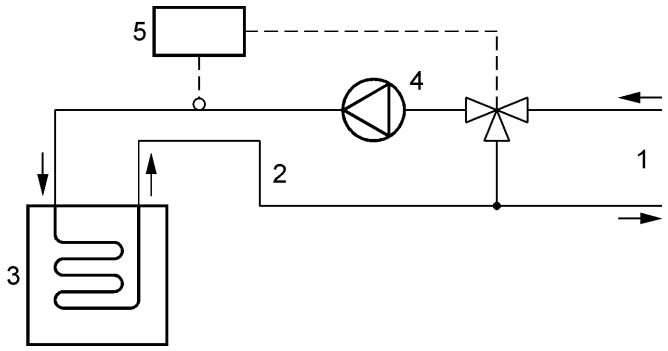
Deairing of the cooling system is done manually during commissioning. Thereby no special deairing of the inverter is necessary because it takes place automatically due to the high flow rate. For deairing during operation an automatic vent has to be installed.

Cooling systems

Open cooling circuit

In this system the frequency inverter is directly cooled with industrial water. Because of the wide temperature range and the exclusive use of corrosion-resistant steel in the cooling water pipes, the inverter is optimally prepared for this simple type of cooling system. Plane pipe walls and a generous flow cross-section also have a share in the high availability of the cooling system.

Due to the wide temperature range, also the serial connection of several aggregates (like motor, enclosure cooling, ...) in the cooling circuit is possible when observing the flow rate and condensation.



Legend	Temperature
1 Cooling circuit external area with "industrial water"	+5…+55°C
2 Cooling circuit internal area	+40...+55°C
3 Frequency inverter ATV71Q	Coolant inlet temperature: +40...+55°C
4 Components of the internal area: coolant pump, mixer, optionally pressure control valve, manometer and exhaust valve	
5 Thermostat for constant temperature of the internal cooling area (to avoid condensation) acting on the mixer	Reference value: +40...+55°C

CAUTION

RISK OF OBSTRUCTION INSIDE THE COOLING SYSTEM

In order to ensure operation without troubles we recommend the installation of a high-quality filter in any case.

Failure to follow this instruction can result in equipment damage.

CAUTION

RISK OF OVERHEATING AND CONDENSATION

Make sure that the lost heat from the power part of the inverter is dissipated and prevent condensation of the heat sink.

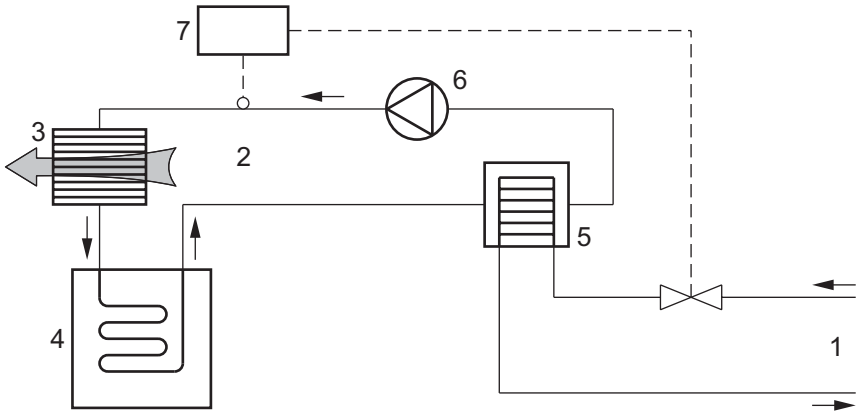
- The coolant pump has to be switched on when the inverter is started.
- Avoid condensation by using an adequate system for controlling the temperature inside the cooling circuit

Failure to follow this instruction can result in equipment damage.

Closed cooling circuit with water-heat exchange

In this system the internal cooling circuit of the inverter is connected to the external cooling circuit via a water/water heat exchanger. The marginally higher installation costs are compensated by the advantage of a nearly maintenance-free and especially reliable cooling system.

The low temperature level of the internal cooling circuit allows also serial connection of an air/water heat exchanger for cooling the enclosure air.



Legend		Temperature
1	External cooling circuit with "industrial water" and regulating valve	+5...+35°C
2	Internal cooling circuit (industrial water, water-glycol-mixture or de-ionized water with or without corrosion protection)	Inlet: +38...+40°C
3	Air/water heat exchanger for cooling the enclosure	Air outlet temperature < 45°C
4	Frequency inverter ATV71Q	Coolant inlet temperature: +40...+55°C
5	Components of the external cooling circuit: water/water heat exchanger, regulating valve, manometer, lock valves	
6	Components of the internal cooling circuit: coolant pump, pressure equalising tank, pressure control valve, manometer, exhaust valve and feed cocks	
7	Thermostat for constant temperature of the internal cooling circuit (to avoid condensation) acting on the regulating valve of the external cooling circuit	Reference value: +38...+40°C

CAUTION

RISK OF OVERHEATING AND CONDENSATION

Make sure that the lost heat from the power part of the inverter is dissipated and prevent condensation of the heat sink.

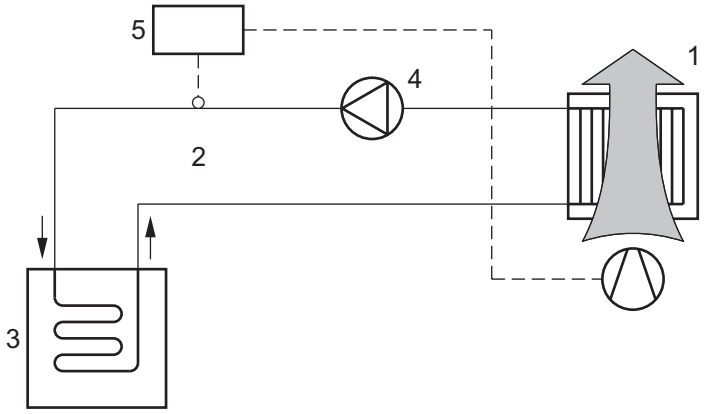
- The coolant pump has to be switched on when the inverter is started.
- Avoid condensation by using an adequate system for controlling the temperature inside the cooling circuit

Failure to follow this instruction can result in equipment damage.

Closed cooling circuit with air-heat exchange 1-stepped

In this system the internal cooling circuit of the inverter is cooled via an air/water heat exchanger with forced air flow. The system allows a certain spatial separation between the frequency inverter and the heat exchanger.

Due to the higher temperature level in the inlet of the internal cooling circuit, the upstream connection of an air/water heat exchanger for cooling the enclosure is not possible.



Legend		Temperature
1	"External" air/water heat exchanger with cooling air fan	Cooling air: +5...+40°C
2	Closed cooling circuit (industrial water, water-glycol-mixture or de-ionized water with or without corrosion protection)	+40...+55°C
3	Frequency inverter ATV71Q	Coolant inlet temperature: +40...+55°C
4	Components of the cooling circuit: coolant pump, pressure equalising tank, pressure control valve, manometer, exhaust valve and feed cocks	
5	Thermostat for constant temperature of the internal cooling circuit (to avoid condensation) acting on the speed of the cooling air fan	Reference value: +40 ... +55°C

CAUTION

RISK OF OVERHEATING AND CONDENSATION

Make sure that the lost heat from the power part of the inverter is dissipated and prevent condensation of the heat sink.

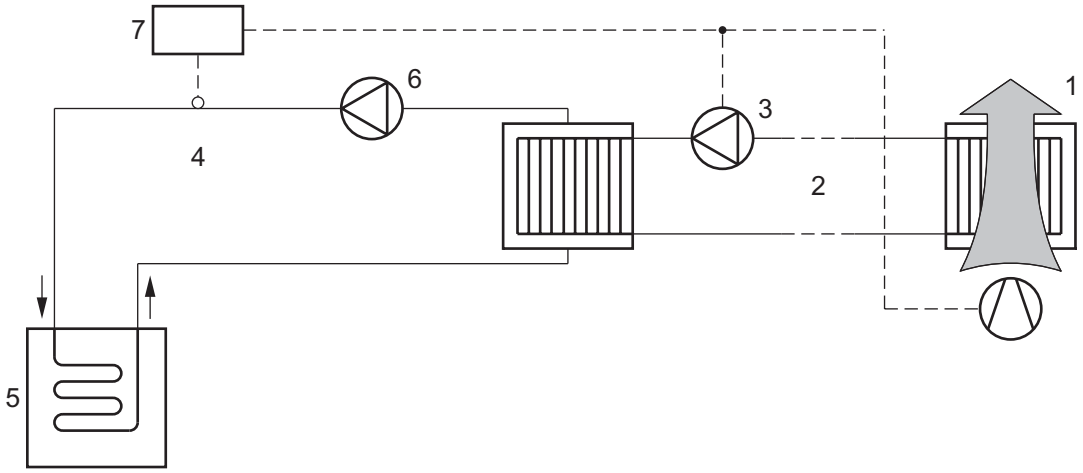
- The coolant pump has to be switched on when the inverter is started.
- Avoid condensation by using an adequate system for controlling the temperature inside the cooling circuit

Failure to follow this instruction can result in equipment damage.

Closed cooling circuit with air-heat exchange 2-stepped

In this system the closed, internal cooling circuit of the inverter is separated from the external cooling circuit via a water/water heat exchanger. It is cooled via an air/water heat exchanger with forced air flow. The system permits free placement of the heat exchanger at higher distances and difference in height. Furthermore it is possible to deliver a filled and checked inverter unit. On site only the installation of the external cooling circuit is necessary.

Due to the higher temperature level in the inlet of the internal cooling circuit, the upstream connection of an air/water heat exchanger for cooling the enclosure is not possible.



Legend	Temperature
1 "External" air/water heat exchanger with cooling air fan	Cooling air: -25...+40°C (depending on the used coolant)
2 External cooling circuit	-25...+50°C
3 Components of the external cooling circuit: coolant pump, pressure equalising tank, pressure control valve, manometer, exhaust valve and feed cocks	
4 Internal cooling circuit (industrial water, water-glycol-mixture or de-ionized water with or without corrosion protection)	+40...+55°C
5 Frequency inverter ATV71Q	Coolant inlet temperature: +40...+55°C
6 Components of the internal cooling circuit: water/water heat exchanger, coolant pump, pressure equalising tank, pressure control valve, manometer, exhaust valve and feed cocks	
7 Thermostat for constant temperature of the internal cooling circuit (to avoid condensation) acting on the speed of the cooling air fan and/or the pump in the external cooling circuit	Reference value: +40...+55°C

CAUTION

RISK OF OVERHEATING AND CONDENSATION

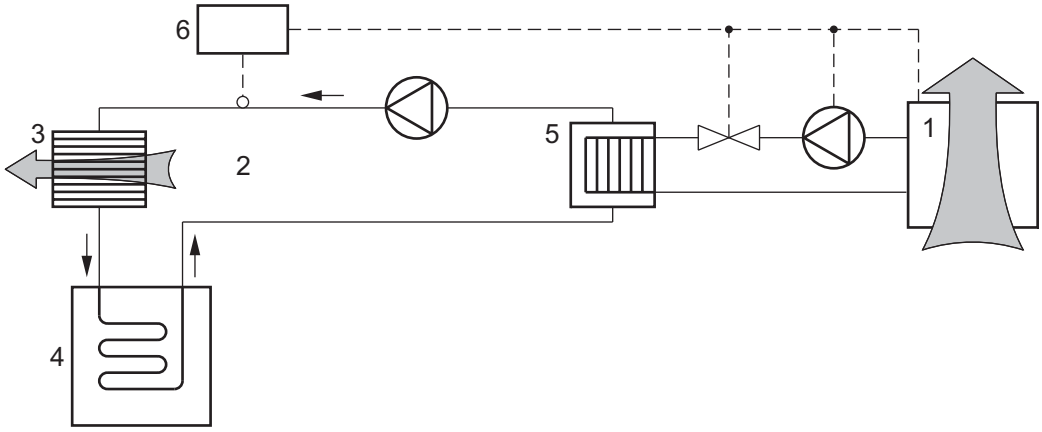
Make sure that the lost heat from the power part of the inverter is dissipated and prevent condensation of the heat sink.

- The coolant pump has to be switched on when the inverter is started.
- Avoid condensation by using an adequate system for controlling the temperature inside the cooling circuit

Failure to follow this instruction can result in equipment damage.

Closed cooling circuit with active heat exchange

In this system the internal cooling circuit of the inverter is cooled via a heat exchanger of an active cooling unit (that operates according to the principle of an air conditioning). The low temperature level of the internal cooling circuit resulting from the cooling unit allows also serial connection of an air/water heat exchanger for cooling the enclosure air.



Legend		Temperature
1	External active compressor cooling system	+5(-25)...+50°C
2	Internal cooling circuit (industrial water, water-glycol-mixture or de-ionized water with or without corrosion protection)	+38...+40°C
3	Air/water heat exchanger for cooling the enclosure	Air outlet temperature < 45°C
4	Frequency inverter ATV71Q	Recommended coolant inlet temperature: +40...+55°C
5	Components of the internal cooling circuit: water/water heat exchanger, coolant pump, pressure equalising tank, pressure control valve, manometer, exhaust valve and feed cocks	
6	Thermostat for constant temperature of the internal cooling circuit (to avoid condensation) acting on the external, active cooling system	Reference value: +38...+40°C

CAUTION

RISK OF OVERHEATING AND CONDENSATION

Make sure that the lost heat from the power part of the inverter is dissipated and prevent condensation of the heat sink.

- The coolant pump has to be switched on when the inverter is started.
- Avoid condensation by using an adequate system for controlling the temperature inside the cooling circuit

Failure to follow this instruction can result in equipment damage.

Options

Available options

To enlarge the field of applications for the frequency inverters ATV71Q, various options are available concerning control and operation, extensions referring to the electric arrangement and to increase the protection degree.

Motor rating		Altivar	Options			
kW	*HP*		Line reactor	Passive filter 400 V, 50 Hz	EMC filter	Motor choke
90	*125*	**ATV71QD90N4**	VW3 A4 559	VW3 A4 6●9	VW3 A4 410	VW3 A5 104
110	*150*	**ATV71QC11N4**	VW3 A4 559	VW3 A4 6●0	VW3 A4 410	VW3 A5 105
132	*200*	**ATV71QC13N4**	VW3 A4 560	VW3 A4 6●1	VW3 A4 410	VW3 A5 105
160	*250*	**ATV71QC16N4**	VW3 A4 561	VW3 A4 6●2	VW3 A4 411	VW3 A5 106
200	*300*	**ATV71QC20N4**	VW3 A4 569	VW3 A4 6●3	VW3 A4 411	VW3 A5 106
220	*350*	**ATV71QC25N4**	VW3 A4 564	VW3 A4 6●3	VW3 A4 411	VW3 A5 106
250	*400*	**ATV71QC25N4**	VW3 A4 564	2x VW3 A4 6●1	VW3 A4 411	VW3 A5 107
315	*500*	**ATV71QC31N4**	VW3 A4 565	2x VW3 A4 6●2	VW3 A4 412	VW3 A5 107
355	–	**ATV71QC40N4**	VW3 A4 569	2x VW3 A4 6●2	VW3 A4 412	VW3 A5 107
400	*600*	**ATV71QC40N4**	2x VW3 A4 569	2x VW3 A4 6●9	VW3 A4 412	VW3 A5 108
500	*700*	**ATV71QC50N4**	2x VW3 A4 564	3x VW3 A4 6●2	VW3 A4 413	VW3 A5 108

Motor rating		Altivar	Options			
kW	*HP*		Sinus filter	Braking unit	Resistor	Resistor hoisting
90	*125*	**ATV71QD90N4**	VW3 A5 207	–	VW3 A7 710	VW3 A7 811
110	*150*	**ATV71QC11N4**	VW3 A5 207	–	VW3 A7 711	VW3 A7 812
132	*200*	**ATV71QC13N4**	VW3 A5 208	–	VW3 A7 711	VW3 A7 812
160	*250*	**ATV71QC16N4**	VW3 A5 208	VW3 A7 101	VW3 A7 712	VW3 A7 813
200	*300*	**ATV71QC20N4**	VW3 A5 209	VW3 A7 101	VW3 A7 715	VW3 A7 814
220	*350*	**ATV71QC25N4**	VW3 A5 209	VW3 A7 101	VW3 A7 716	VW3 A7 815
250	*400*	**ATV71QC25N4**	VW3 A5 210	VW3 A7 101	VW3 A7 716	VW3 A7 815
315	*500*	**ATV71QC31N4**	VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816
355	–	**ATV71QC40N4**	VW3 A5 210	VW3 A7 102	VW3 A7 717	VW3 A7 816
400	*600*	**ATV71QC40N4**	VW3 A5 211	VW3 A7 102	VW3 A7 717	VW3 A7 816
500	*700*	**ATV71QC50N4**	VW3 A5 211	VW3 A7 102	VW3 A7 718	VW3 A7 817

Motor rating			Altivar	Options			
500 V	*575 V*	690 V		Line reactor	Motor choke	Braking unit	Resistor
kW	*HP*	kW					
90	*125*	*110*	**ATV71QC11Y**	VW3 A4 570	VW3 A5 104	–	VW3 A7 806
110	*150*	*132*	**ATV71QC13Y**	VW3 A4 571	VW3 A5 104	–	2x VW3 A7 805
132	–	*160*	**ATV71QC16Y**	VW3 A4 571	VW3 A5 105	–	2x VW3 A7 805
160	*200*	*200*	**ATV71QC20Y**	VW3 A4 560	VW3 A5 105	VW3 A7 103	2x VW3 A7 806
200	*250*	*250*	**ATV71QC25Y**	VW3 A4 572	VW3 A5 106	VW3 A7 103	2x VW3 A7 716
250	*350*	*315*	**ATV71QC31Y**	VW3 A4 572	VW3 A5 106	VW3 A7 103	2x VW3 A7 814
315	*450*	*400*	**ATV71QC40Y**	2x VW3 A4 568	VW3 A5 107	VW3 A7 104	2x VW3 A7 717
400	*550*	*500*	**ATV71QC50Y**	2x VW3 A4 572	VW3 A5 107	VW3 A7 104	2x VW3 A7 718
500	*700*	*630*	**ATV71QC63Y**	2x VW3 A4 572	VW3 A5 108	VW3 A7 104	2x VW3 A7 816

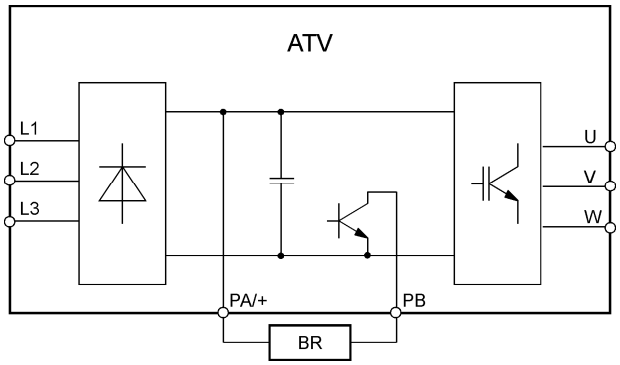
Braking unit

The use of a braking unit is required when more power is returned to the DC link during the braking procedure than the losses in the motor and inverter amount to or the application requires very short braking times.

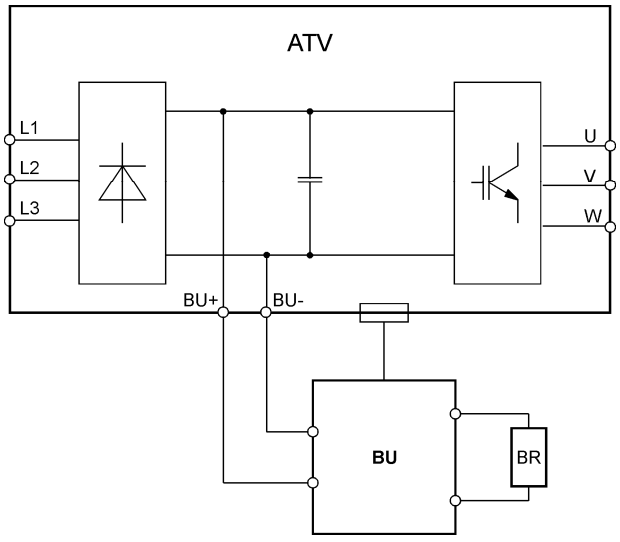
The braking unit (internally or as an external option) is controlled and monitored by the ATV71Q. If the DC link voltage exceeds an adjustable value due to a braking procedure, an external braking resistor is switched into the DC link as a consumer. The braking resistor converts the power incurred into heat and thus prevents a further rising of the DC link voltage and thus a shut-down with overvoltage.

CAUTION
OVERLOAD OF THE BRAKING RESISTOR Ensure for protection of the braking resistor that the correct data of the resistor are set at the inverter. If the braking resistor does not match the overload characteristic to be used or the local regulations require an additional protective device, a thermal relay should be integrated into the mains disconnection mechanism. **Failure to follow this instruction can result in equipment damage.**

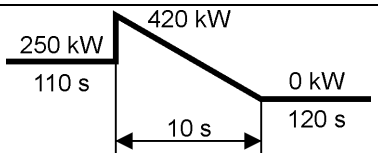
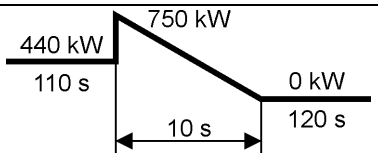
The frequency inverters ATV71QD90N4 … C13N4 and ATV71QC11Y … C16Y have a built-in braking transistor. It is thus only necessary to connect an external braking resistor BR and to activate the braking function.



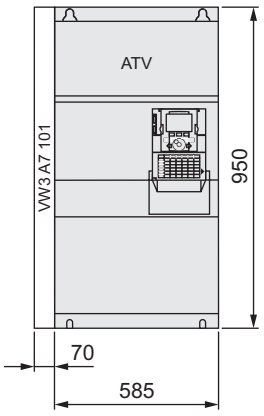
In case of the inverters ATV71QC16N4 … C50N4 and ATV71QC20Y … C63Y the braking unit is designed as an external option. It is supplied, controlled and monitored by the inverter as if it were integrated. An operation without an inverter or on a device other than the allocated one is thus not possible.



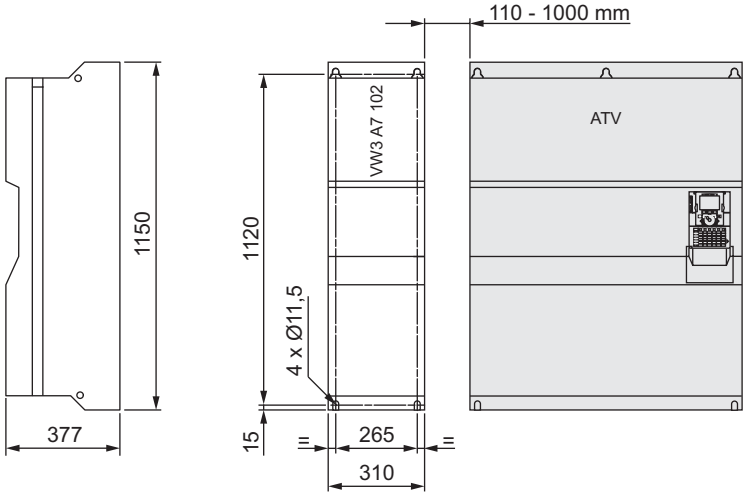
	General technical data
Mechanical vibration	according to IEC/EN 60068-2-6 1.5 mm in the range of 3...10 Hz, 0.6 g at 10...200 Hz (3M3 according to IEC/EN 60721-3-3)
Shock	according to IEC/EN 60068-2-27 4 g for 11 ms (3M2 according to IEC/EN 60721-3-3)
Operating temperature	-10...+45°C (3K3 according to IEC/EN 60721-3-3) up to +60°C with derating
Storage / Transport temperature	-25...+70°C
Protection degree	sideways, front IP31 top IP20 bottom 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
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 EN 50178
Basic standard	The devices are designed, built and tested on the basis of EN 50178.
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, 1st and 2nd environment, category C2, C3
Insulation	galvanic insulation in accordance with EN 50178 PELV (Protective Extra Low Voltage)
Approvals	CE, UL, CSA, GOST

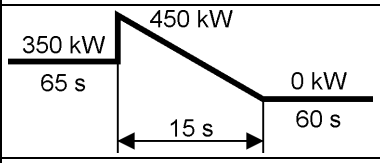
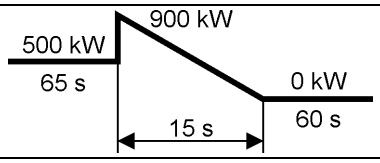
	Braking unit	
Order number	VW3 A7 101	VW3 A7 102
Peak braking power	420 kW	750 kW
Max. continuous braking power	200 kW	400 kW
Possible braking power depending on the duty cycle	420 kW for 5 % 320 kW for 15 % 250 kW for 50 %	750 kW for 5 % 550 kW for 15 % 440 kW for 50 %
Cycle time	240 s	240 s
Typ. braking power for crane operation		
Min. braking resistance	1.05 Ω	0.7 Ω
Losses at 100% I_N	550 W	1050 W
Volume of cooling air	100 m^3/h	600 m^3/h
Weight	30 kg	70 kg
Mounting	Mounting on the left side wall of the inverter. Thus, the total width of the device is increased to 655 mm.	Installation left to the frequency inverter. Connection lines for a distance of 110 mm to the inverter case are included in delivery. A distance up to 1 m is permitted with adapted line connections.

VW3 A7 101

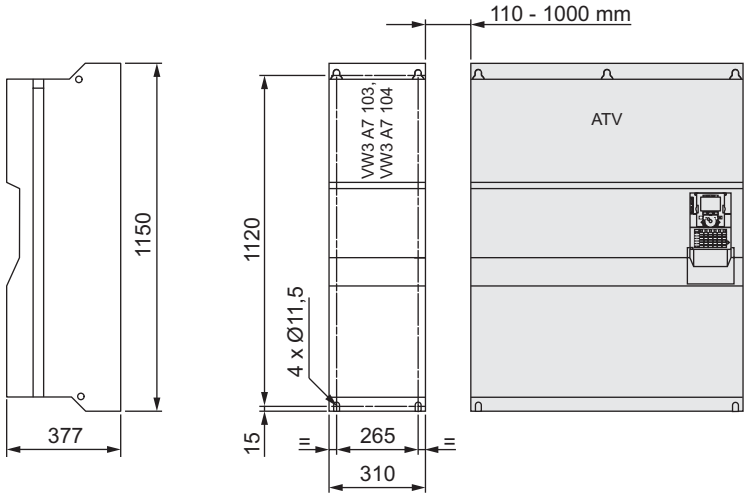


VW3 A7 102



	Braking unit	
Order number	VW3 A7 103	VW3 A7 104
Peak braking power	450 kW	900 kW
Max. continuous braking power	300 kW	400 kW
Possible braking power depending on the duty cycle	450 kW for 5 % 400 kW for 15 % 350 kW for 50 %	900 kW for 5 % 600 kW for 15 % 500 kW for 50 %
Cycle time	140 s	140 s
Typ. braking power for crane operation		
Min. braking resistance	2 Ω	1 Ω
Losses at 100% I_N	650 W	1500 W
Volume of cooling air	600 m^3/h	600 m^3/h
Weight	70 kg	70 kg
Mounting	Installation left to the frequency inverter. Connection lines for a distance of 110 mm to the inverter case are included in delivery. A distance up to 1 m is permitted with adapted line connections.	Installation left to the frequency inverter. Connection lines for a distance of 110 mm to the inverter case are included in delivery. A distance up to 1 m is permitted with adapted line connections.

VW3 A7 103 and VW3 A7 104



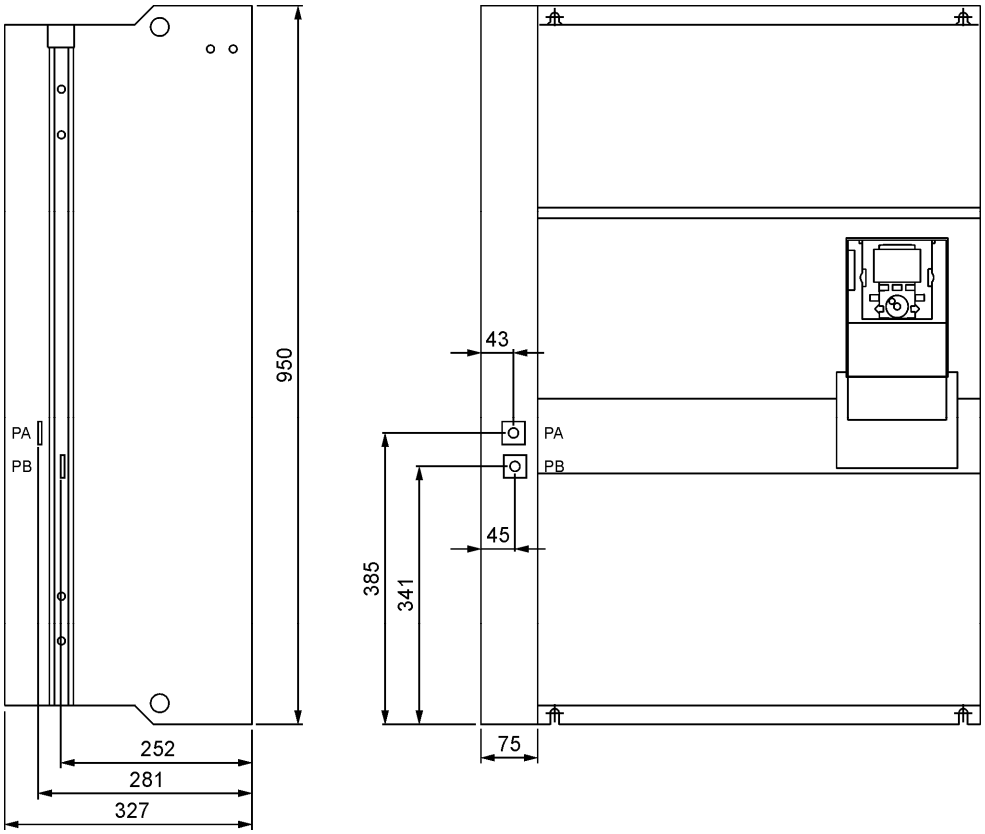
Installation and connection

The braking unit requires the following connecting lines:

- Control line (included in delivery)
- Supply cable for the fan (included in delivery)
- Power connection between the inverter and the braking unit (DC link terminals BU+ and BU–) (included in delivery)
- Power connection between the braking unit and the braking resistor (terminals PA and PB); max. 50 m
- Grounding of the braking unit at the bolt marked as PE

VW3 A7 101

Dimensions



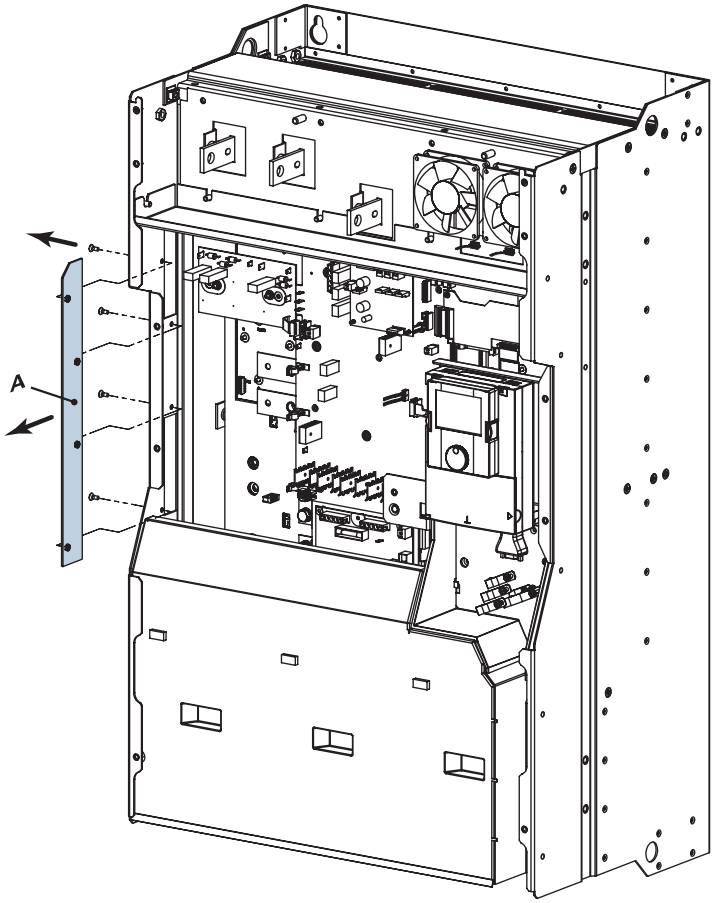
Power terminals

Designation	Connection	Tightening torque	Max. connection cross-section
BU+, BU-	M10	24 Nm (212 lb.in)	internal connection
PA, PB	M10	24 Nm (212 lb.in)	2x 95 mm^2 (2x AWG 4/0)

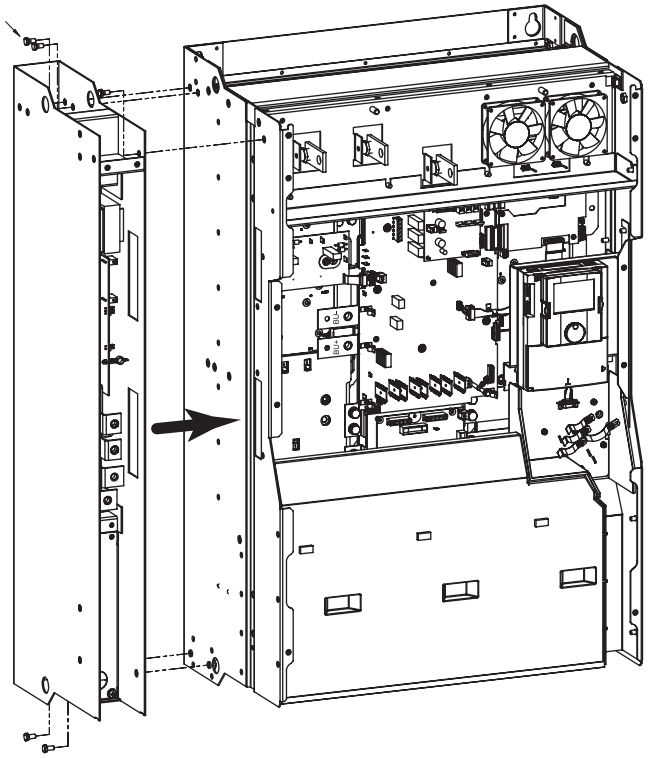
Installation

The braking unit is mounted on the left side of the inverter. Therefore follow these instructions:

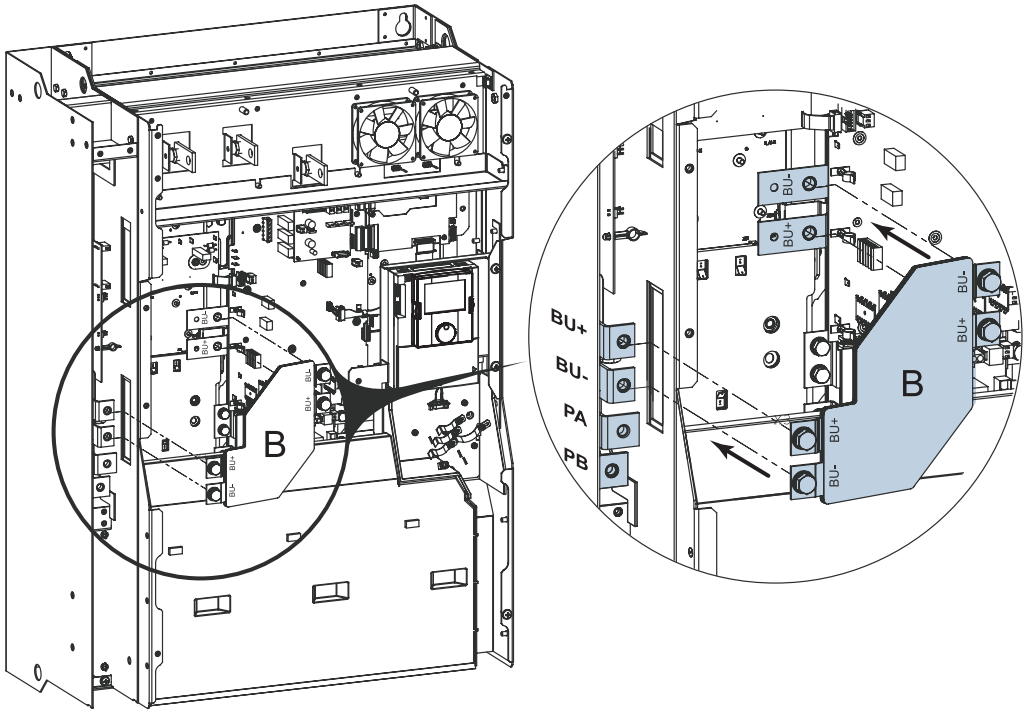
1. Mount the inverter.
2. Remove the front cover of the inverter in accordance with the safety instructions given in this document.
3. Detach the removable part A from the left-hand side of the inverter.



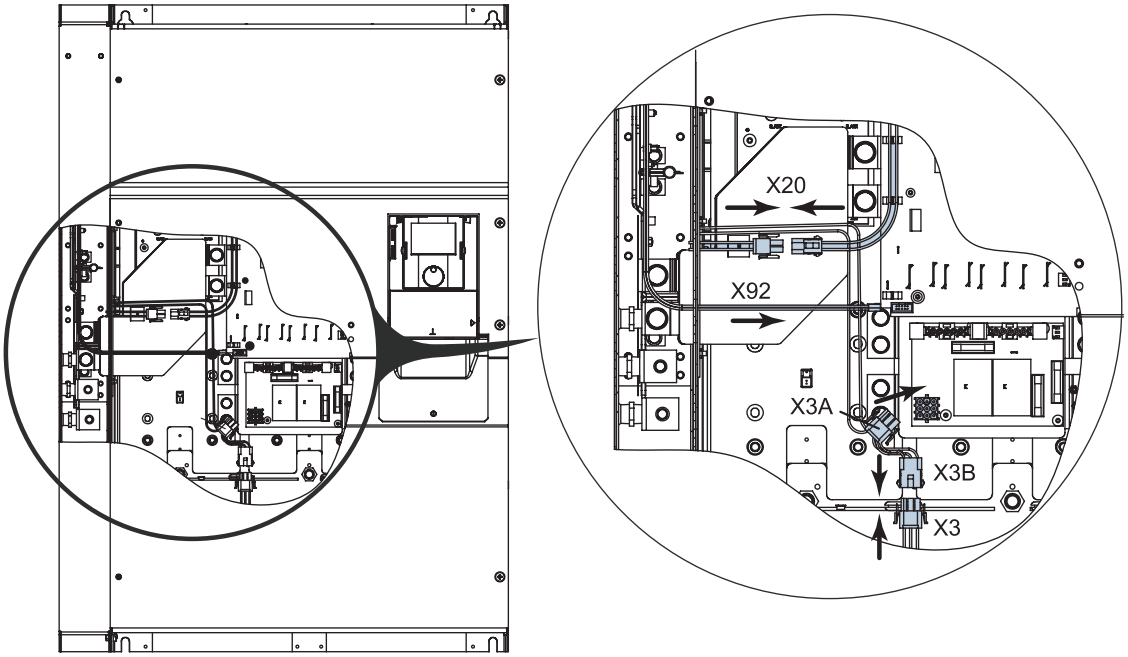
4. Mount the braking unit on the left-hand side of the inverter. There are 5 fixing points (5xM8).



5. Connect the busbars (B) between terminals BU- and BU+ of the inverter and terminals BU- and BU+ of the braking unit.
6. Connect the braking resistor to PA and PB.
   The busbar for connecting the braking unit to the inverter (BU+, BU-) is included in delivery.

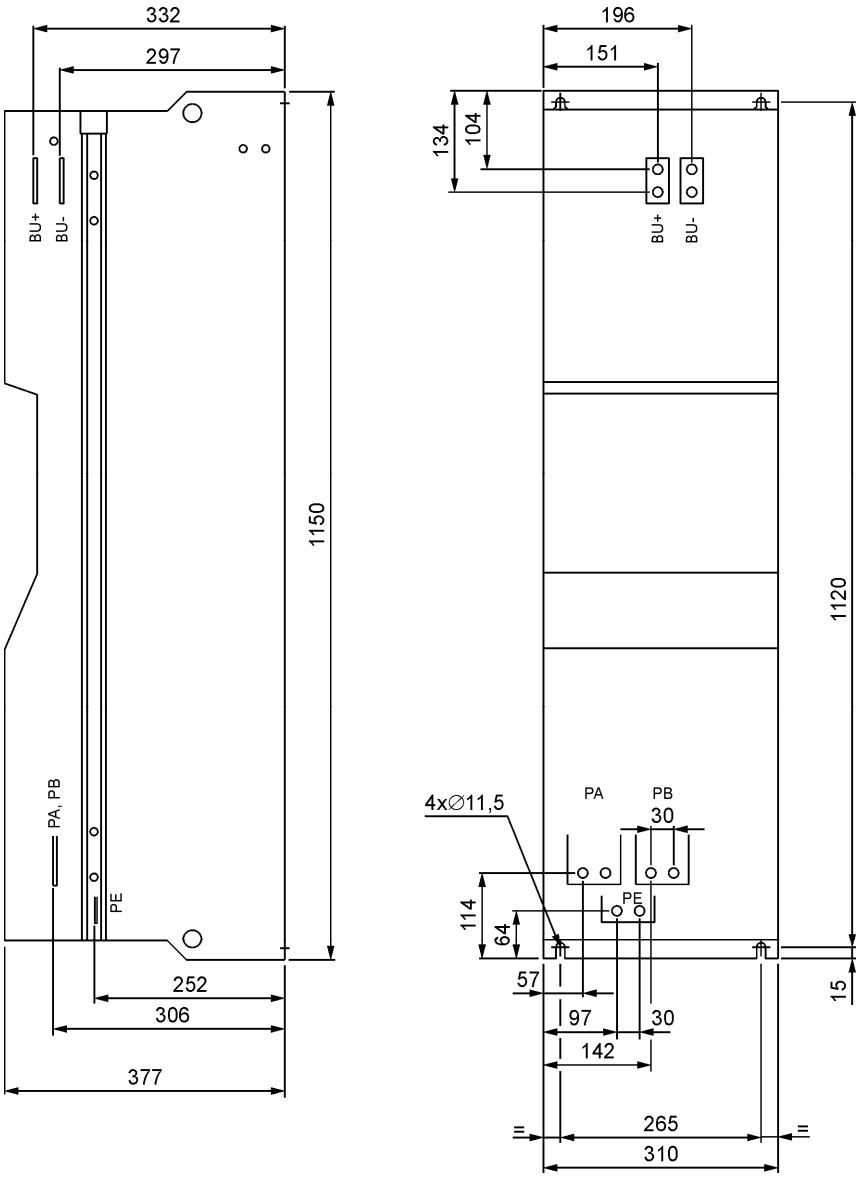


7. Connect the control cables:
   - Connect the control cable X20 of the braking unit to the cable X20 of the inverter.
   - Connect the control cable X92 of the braking unit to connector X20 of the inverter.
   - Disconnect cable X3 of the inverter from connector X3 on the inverter card.
   - Connect cable X3 of the inverter to cable X3B of the braking unit.
   - Connect cable X3A of the braking unit to connector X3 on the inverter card.



VW3 A7 102

Dimensions



Power terminals

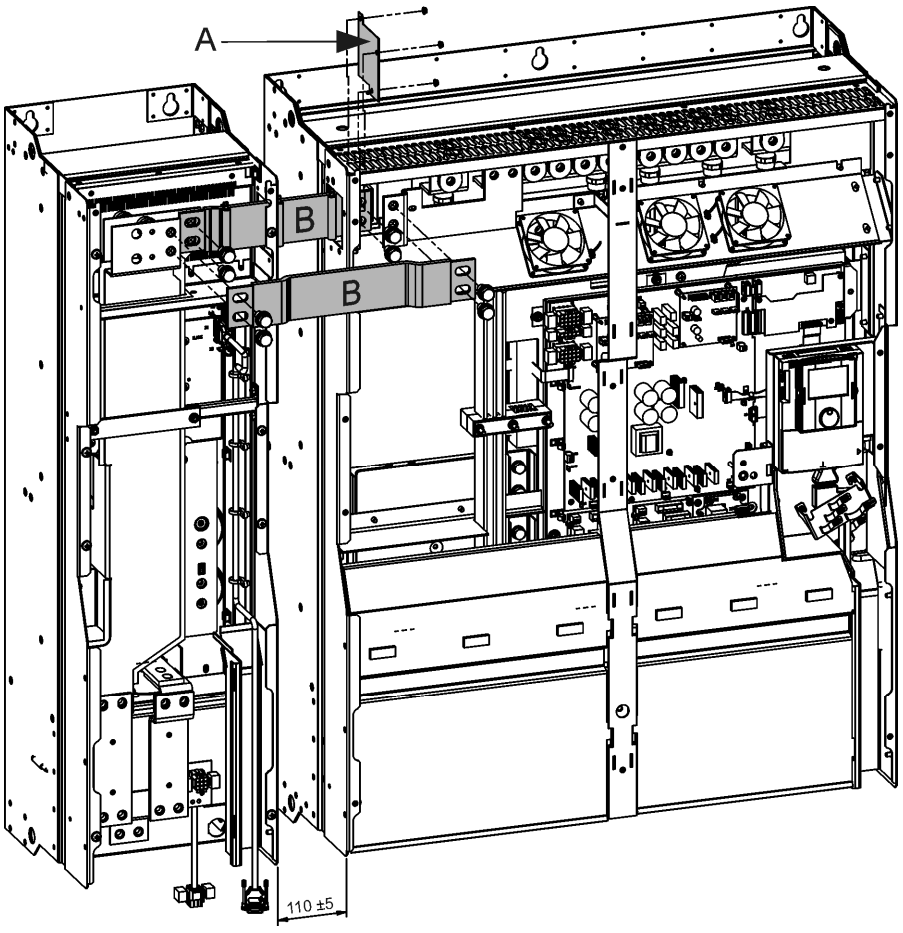
Designation	Connection	Tightening torque	Max. connection cross-section
BU+, BU-	M12	41 Nm (360 lb.in)	internal connection
PA, PB	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
PE	M12	41 Nm (360 lb.in)	2x 185 mm^2 (2x 400 MCM)

Installation

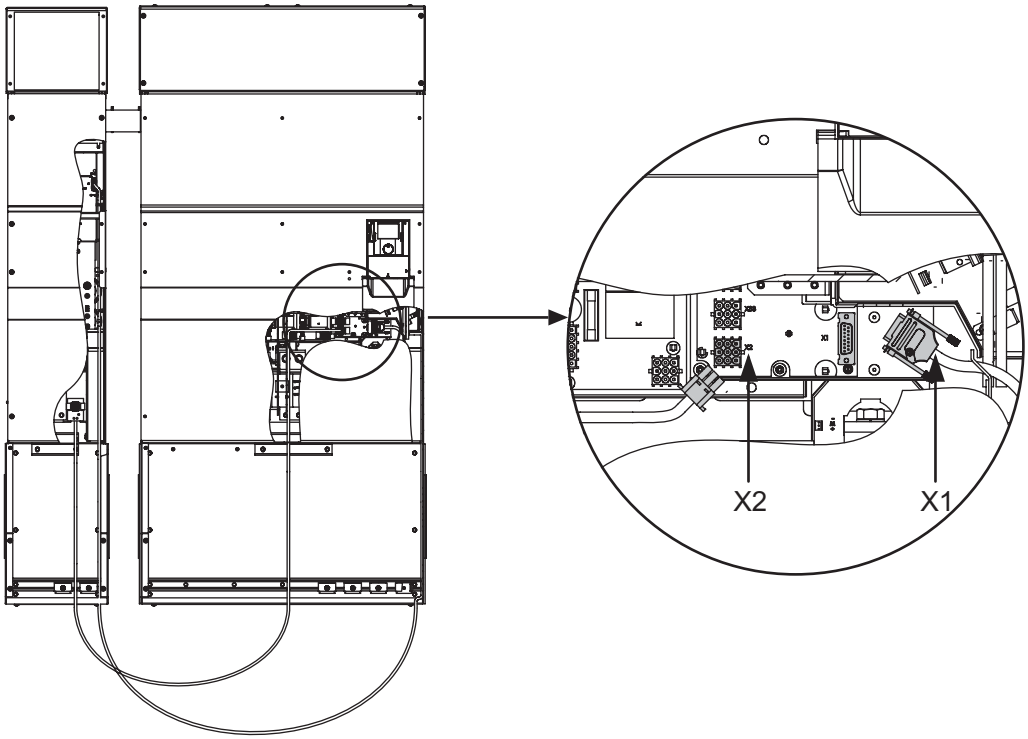
The braking unit is mounted on the left side of the inverter in a distance of 110 mm (± 5 mm). This distance results from the busbars which are included in delivery of the braking unit. When using own busbars (5 x 63 x 1 mm) it is possible to increase the distance up to one meter.

CAUTION
OVERLOAD OF THE CAPACITORS IN THE BRAKING UNIT The distance between the flexible busbars of the power part BU+ and BU- must not exceed 10 mm! **Failure to follow this instruction can result in equipment damage.**

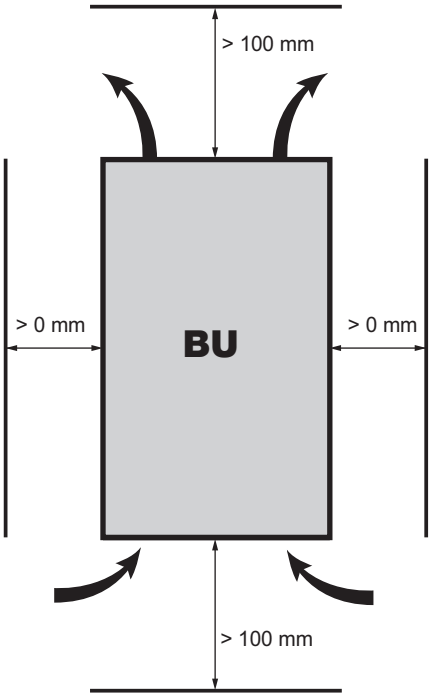
1. Mount the inverter and the braking unit.
2. Remove the front cover of the inverter in accordance with the safety instructions.
3. Detach the removable part A which is inside the inverter.
4. Connect the terminals BU- and BU+ of the inverter to the terminals BU- and BU+ of the braking unit using the busbars B.



5. Connect the control cables and the power supply of the fan:
   - Connect control cable X1 of the braking unit to connector X1 of the inverter.
   - Connect the cables of the braking unit for the power supply of the fan to connector X2 of the inverter.

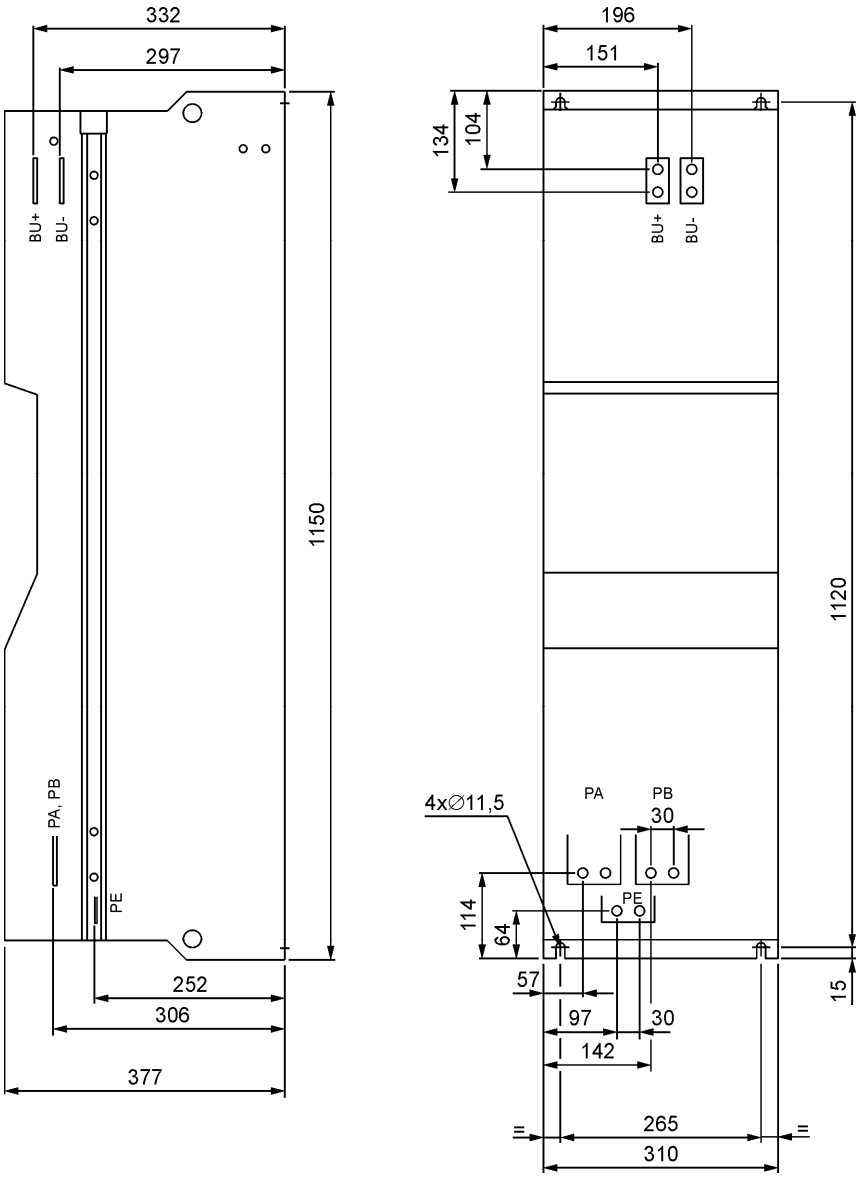


Distances to other devices or to the wall



VW3 A7 103, VW3 A7 104

Dimensions



Power terminals

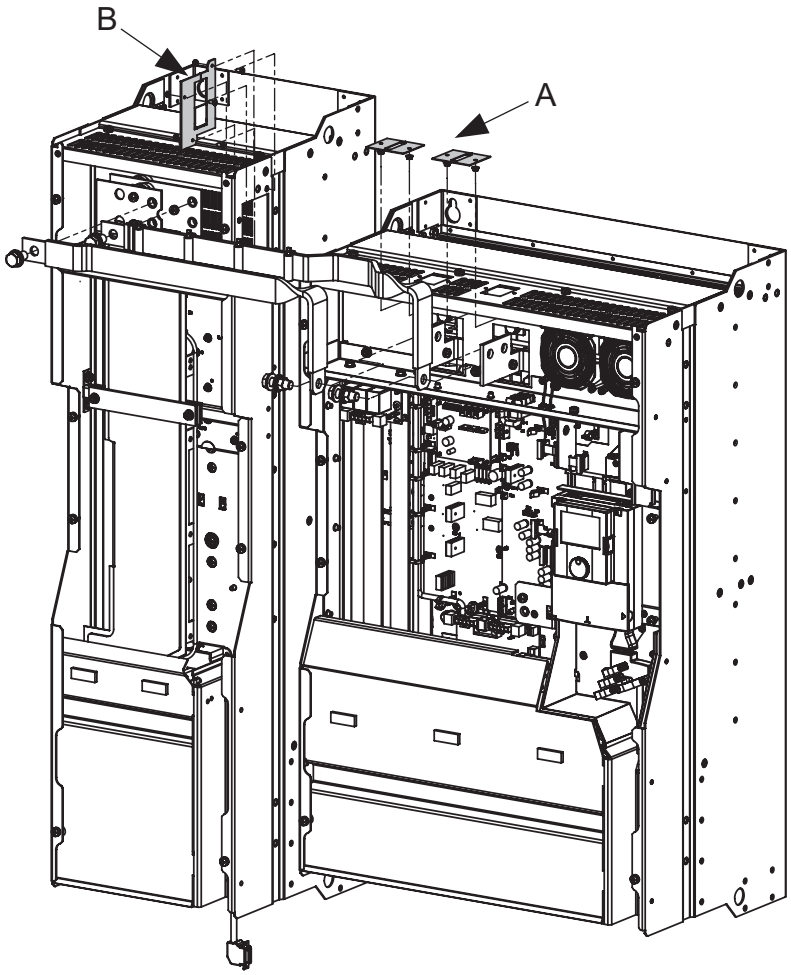
Designation	Connection	Tightening torque	Max. connection cross-section
BU+, BU-	M12	41 Nm (360 lb.in)	internal connection
PA, PB	M12	41 Nm (360 lb.in)	4x 185 mm^2 (4x 400 MCM)
PE	M12	41 Nm (360 lb.in)	2x 185 mm^2 (2x 400 MCM)

Installation VW3 A7 103

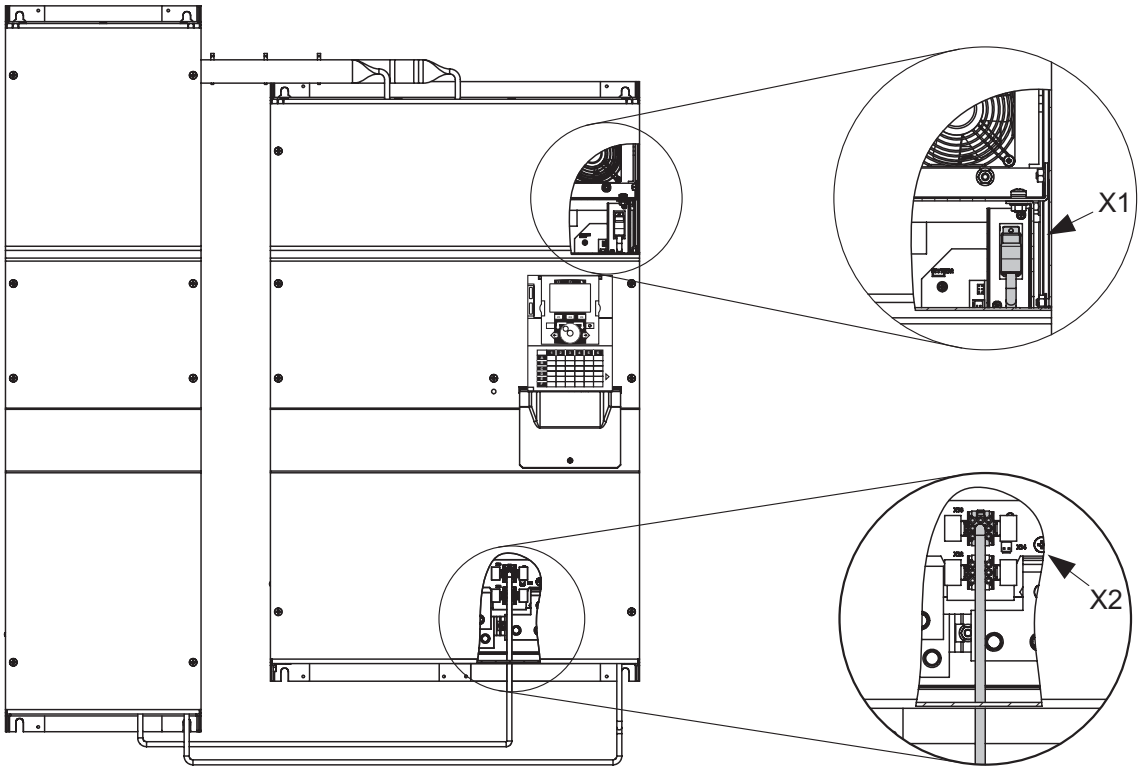
The braking unit is mounted on the left side of the inverter in a distance of 110 mm (± 5 mm). This distance results from the busbars which are included in delivery of the braking unit. When using own busbars (5 x 63 x 1 mm) it is possible to increase the distance up to one meter.

CAUTION
OVERLOAD OF THE CAPACITORS IN THE BRAKING UNIT The distance between the flexible busbars of the power part BU+ and BU- must not exceed 10 mm! **Failure to follow this instruction can result in equipment damage.**

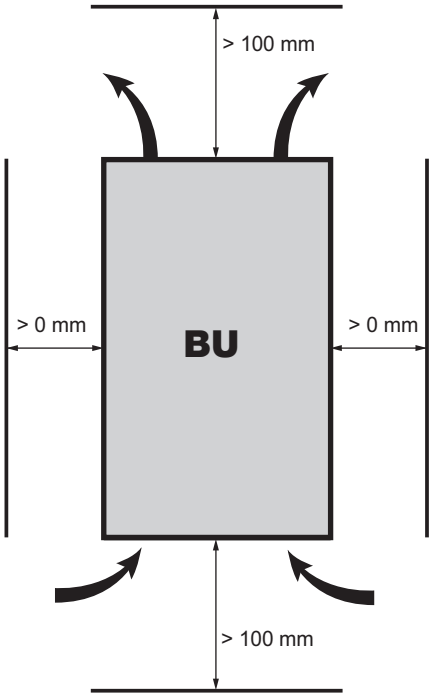
1. Mount the inverter and the braking unit.
2. Remove the front cover of the inverter in accordance with the safety instructions.
3. Detach the removable part A of the inverter and part B of the braking unit.
4. Put the busbars through it and reinstall parts A and B together with the busbars.
5. Connect the terminals BU- and BU+ of the inverter to the terminals BU- and BU+ of the braking unit using the busbars.



6. Connect the control cables and the power supply of the fan:
   - Connect control cable X1 of the braking unit to connector X1 of the inverter.
   - Connect the cables of the braking unit for the power supply of the fan to connector X2 of the inverter.



Distances to other devices or to the wall

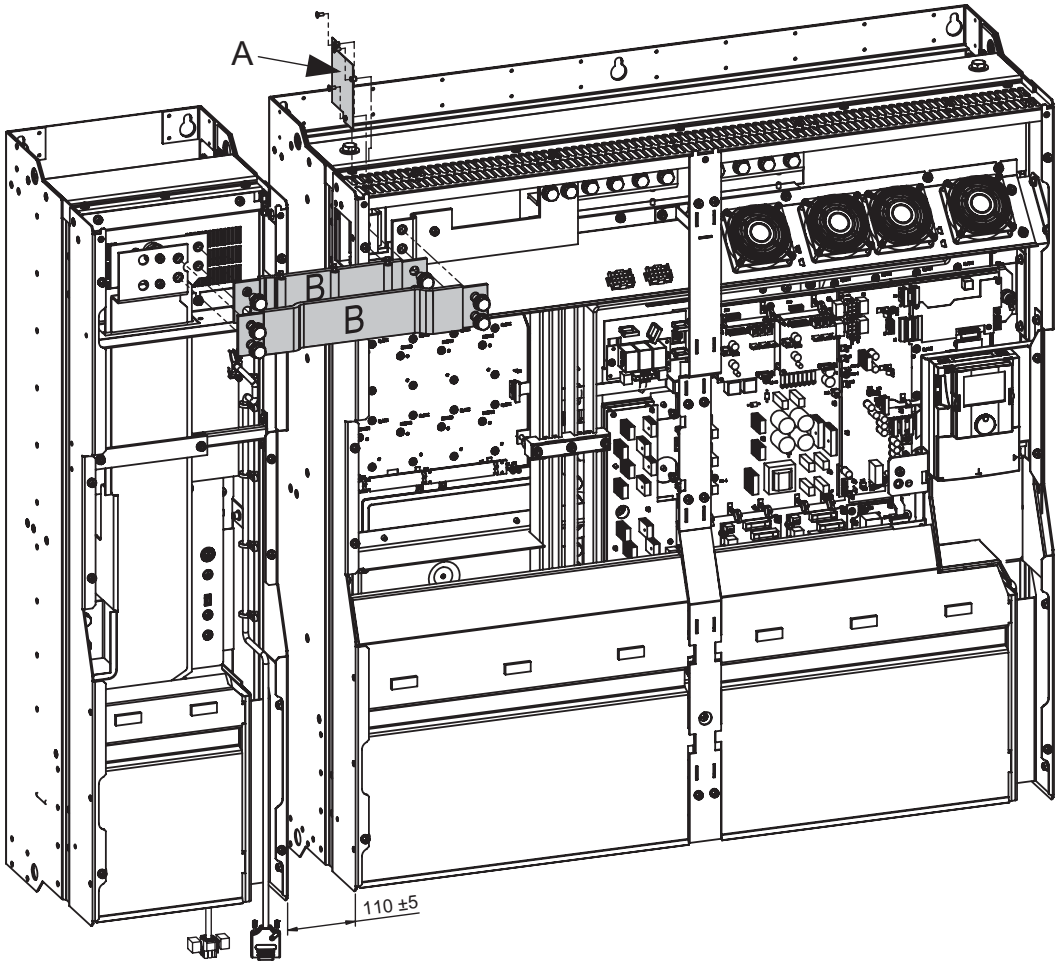


Installation VW3 A7 104

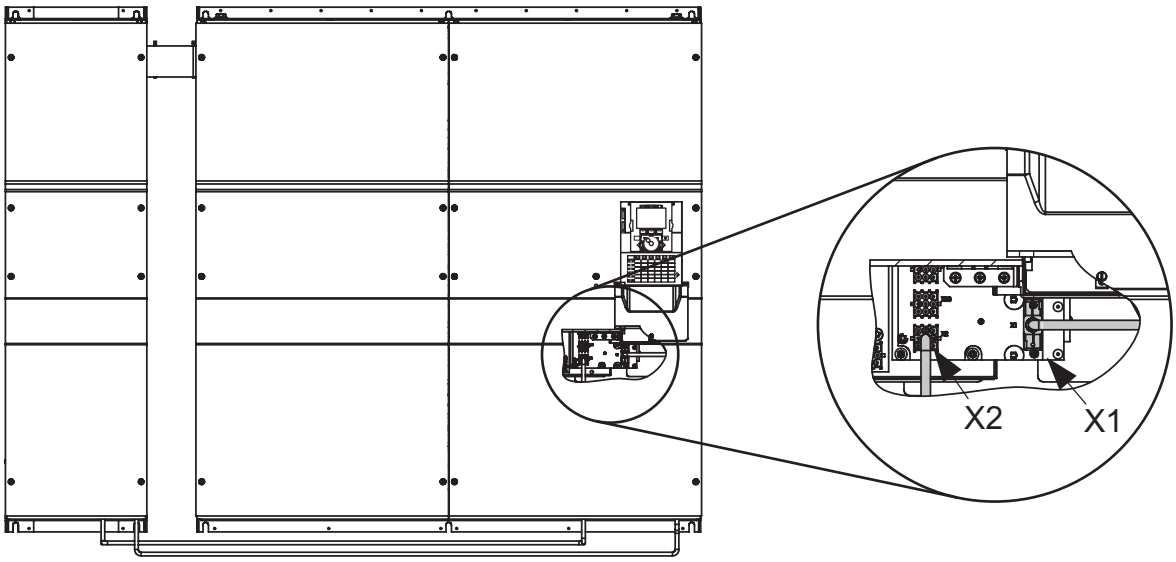
The braking unit is mounted on the left side of the inverter in a distance of 110 mm (± 5 mm). This distance results from the busbars which are included in delivery of the braking unit. When using own busbars (5 x 63 x 1 mm) it is possible to increase the distance up to one meter.

CAUTION
OVERLOAD OF THE CAPACITORS IN THE BRAKING UNIT The distance between the flexible busbars of the power part BU+ and BU- must not exceed 10 mm! **Failure to follow this instruction can result in equipment damage.**

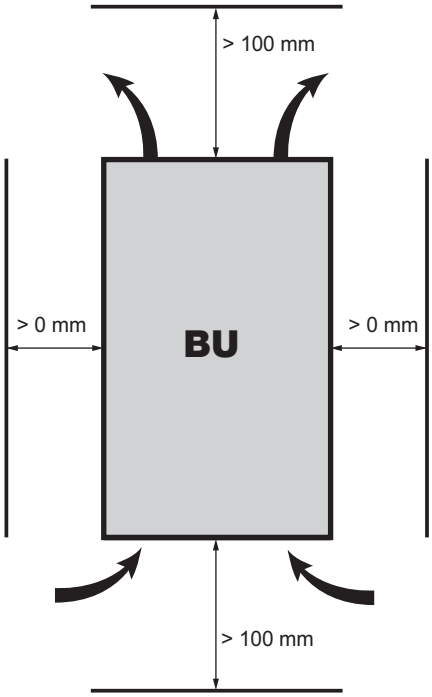
1. Mount the inverter and the braking unit.
2. Remove the front cover of the inverter in accordance with the safety instructions.
3. Detach the removable part A from the inverter.
4. Connect the terminals BU- and BU+ of the inverter to the terminals BU- and BU+ of the braking unit using the busbars B.



5. Connect the control cables and the power supply of the fan:
   - Connect control cable X1 of the braking unit to connector X1 of the inverter.
   - Connect the cables of the braking unit for the power supply of the fan to connector X2 of the inverter.



Distances to other devices or to the wall



Commissioning

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read the safety notes in chapter "Safety informations", page 7 completely and carefully before commissioning.

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

Proceeding

Check of power wiring

- The mains supply must be connected to the terminals L1 / L2 / L3.
- Check the external fan supply. For ATV71Q●●●Y it has to be connected to terminals R0 / S0 / T0! (See also chapter "External fan supply at ATV71Q●●●Y", page 46)
- Check whether the mains fuses correspond to the table in chapter "Fuses", page 40.
- Does the length of the motor cable correspond with the allowed limits (see data sheet on www.schneider-electric.com) and is a motor choke integrated, if required?

Checking the cooling water circuit

(See chapter "Remarks for cooling", page 74 for further information.)

- Check whether the frequency inverter is integrated into the cooling system correctly.
- Check whether the inlet and the return are correctly connected.
- Check the whole cooling circuit for leak-tightness.
- Fill and deaerate the cooling circuit.
- The static operating pressure must be between 1.5 and 2.5 bar.

Check the EMC measures

- Does the setting of the built-in RFI-filter correspond to the mains situation (TT, TN or IT, Corner Grounded)? See also chapter "Nongrounded mains", page 16.
- The screen of the motor cable must have a well HF connection on the motor and inverter side.
- All low-level control wires (also the logic inputs) have to be screened and taken separately from the motor cables.
- The frequency inverter (enclosure) requires a large surface connection to ground in order to keep the permitted interference limits.

Power up the device without run command

- To avoid an unintentional start you have to ensure that the input PWR (POWER REMOVAL) is deactivated (state 0).
- Check the line voltage and turn it on.
- Perform a check measurement:
  - Are the three phase voltages available and are they symmetrical?
    (observe the regulation "Work on Live Equipment")
- Check the control according to the delivered circuit diagrams and put it into operation.

Select the language and the access level

- When the drive is powered up the first time, the user will automatically be guided through the menus as far as [1 DRIVE MENU]. You have to choose the language and the access level.
  (see "Simplified manual" and "Programming manual" for further information)

Configuration of the menu [SIMPLY START]3

(see "Simplified manual" and "Programming manual" for further information)

- The parameters of this submenu have to be configured and the motor measurement must be executed before running the motor.

Start of the drive in panel operation

- Ask for release before start-up!
- Activate (state 1) input PWR (POWER REMOVAL) again.
- Switch the keypad to panel control.
- Start the drive by pressing the RUN key
  - Check whether the flow rate of the coolant is sufficient as soon as a start command is given.
  - Pay attention that no condensation takes place at the cooling system.
  - Check the direction of the motor rotation of the drive at small output frequency.
- Try different speeds and check the charge of the drive.

Remote operation

- Before switching back to Remote-operation check the active reference values and control commands.
- Switch back to Remote-operation and check the power parameters and the reactions to the control commands again.

Data storage and protocols

- Lock unintended operating modes by adequate parameter adjustment.
- Save all application parameters.
- Read-out all parameters with the PC program "Power Suite" and print out the whole list if necessary.

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