Power, Control & Green Solutions

elsto Drives & Controls | Stokvis Group

Vectron

ACU-series

QUICK START GUIDE ACTIVE CUBE

Frequency inverter 230 V / 400 V / 525 V / 690 V
0.25 kW ... 400 kW

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General Information about the Documentation

For the series of devices ACU (Active Cube) isforthesafety-relatedcommissioning and operation to be complied with the following documentation:

- Operating instructions & Application manual “Functional Safety”.

When using communication interfaces and certain functions (in example for the interated PLC function) the corresponding manual is additional to be complied with.

This Quickstartguide contains the description for the mechanical installation with the Standard mounting kit. For other mounting variants (in example Cold Plate) please comply with the Operating instructions.

The German documentation is the original one. Other language versions are translated.

The thermal motor protection according to UL508c can be realized in devices that are marked with “TM included” below the nameplate. For devices without the mark “TM included” note according to UL508c: Motor overtemperature sensing is not provided by the drive.

The different instructions can be downloaded from thewebsite www.elsto.eu

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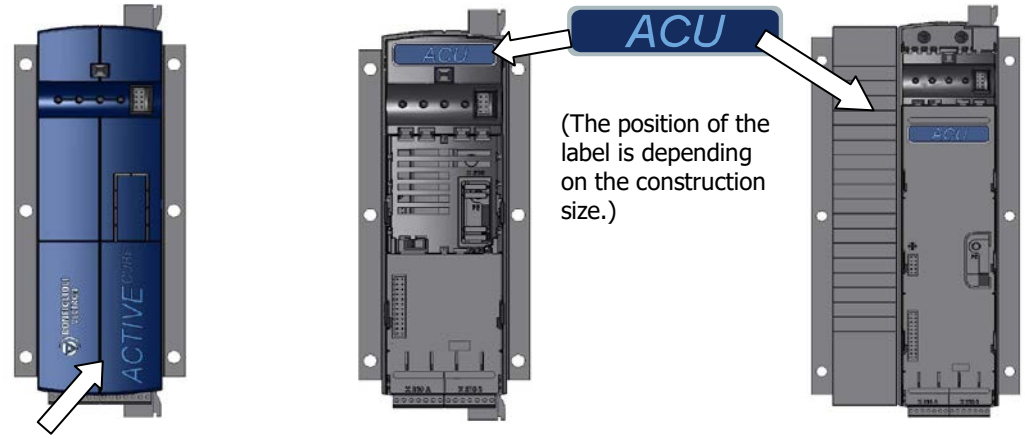
1 General information

This documentation describes the first steps for easy commissioning of ACTIVE Cube (ACU) frequency inverters.

The ACU series can be recognized by its label on the case and the identification below the top cover.



1.1 Safety instructions

⚠ WARNING

- Note and follow all safety and usage instructions in this manual.
- This manual must be read before installation and commissioning of the frequency inverter.
- Non-compliance with the safety and usage instructions may result in death, serious injuries and significant material damage.
- Only qualified technical personnel who is familiar with the installation, commissioning and use of frequency inverters may work on the frequency inverter.
- The electrical installation must be carried out by qualified electricians according to the general and regional safety and installation directives.
- Persons not familiar with the operation of the frequency inverter and children must not have access to the device.
- When working at the frequency inverter, comply with the relevant accident prevention regulations, the applicable standards BGV A2 (VBG 4), VDE 0100, standards governing work on systems with dangerous voltages (e.g. EN 50178) and other national directives.
- Prior to commissioning and start of operation as intended, all covers must be fixed, all standard equipment components of the frequency inverter must be installed, and the terminals must be checked.
- No connection work shall be carried out while voltage supply is switched on.
- Do not touch any terminals as long as the DC-link capacitors are charged.

  Size 1 to 7 (up to 132 kW): The DC link may have dangerous voltage levels even up to 3 minutes after shutdown.

  Size 8 (above 160 kW): The DC link may have dangerous voltage levels even up to 10 minutes after shutdown.

⚠ WARNING

- Do not touch the heat sink of the frequency inverter during operation. Danger of burns due to high surface temperatures.
- Do not remove any covers of the frequency inverter during operation.
- Please note that Bonfiglioli Vectron GmbH will not accept any responsibility for compatibility with third-party products (e.g. motors, cables, filters, etc.). If you use the device in combination with third-party products, you do so at your own risk.
- The earth leakage current of the inverter can be greater than AC 3.5 mA or DC 10 mA.
- According to EN61800-5-1 please note: This product can cause a direct current in the protective earth conductor. When a residual current device (RCD) or a residual current monitor (RCM) is used for protection in the event of direct or indirect contact, only an RCD or RCM of Type B is permissible on the power supply side of this product.
- Never touch electronic components or terminals.
- Do not commission any damaged components.
- Any repair work may only be carried out by the manufacturer or persons approved/licensed by the manufacturer.
- Any repair work must be carried out by qualified electricians.
- Except for modifications described in this document, the frequency inverter must not be changed in any way.
- Do not connect unsuitable voltage sources.
- Keep the instructions accessible to the user.

NOTE

The frequency inverter may be connected to power supply every 60 s.

This must be considered when operating a mains contactor in jog operation mode. For commissioning or after an emergency stop, a non-recurrent, direct restart is permissible.

NOTE

For more information about the range of functions of the frequency inverter and about operation, maintenance and storage, refer to the co-applicable Operating Instructions.

1.2 Designated use

The product is a frequency inverter. It is designed for

- Installation in machines and electrical equipment
- Industrial environments

The frequency inverters are electrical drive components intended for installation in industrial plants or machines. Commissioning and start of operation is not allowed until it has been verified that the machine meets the requirements of the EC Machinery Directive 2006/42/EC and DIN EN 60204-1.

The frequency inverters meet the requirements of the low voltage directive 2006/95/EEC and DIN EN 61800-5-1. CE-labeling is based on these standards. Responsibility for compliance with the EMC Directive 2004/108/EC lies with the operator.

Frequency inverters are only available at specialized dealers and are exclusively intended for commercial use as per EN 61000-3-2.

No capacitive loads may be connected to the frequency inverter.

1.3 Transport and storage

- Ambient temperature: -25 ... 55 °C
- Relative humidity: 5 ... 95%, no water condensation
- Store product in its original package in dust-free room.
- Avoid high temperatures.
- After one year of storage, connect the device to mains voltage for 60 minutes.

1.4 After unpacking

- Check if the delivered devices corresponds to the order.
- Check the device for transport damage and completeness.
- Any defects/damage must be reported to the supplier immediately.

1.5 Place of installation

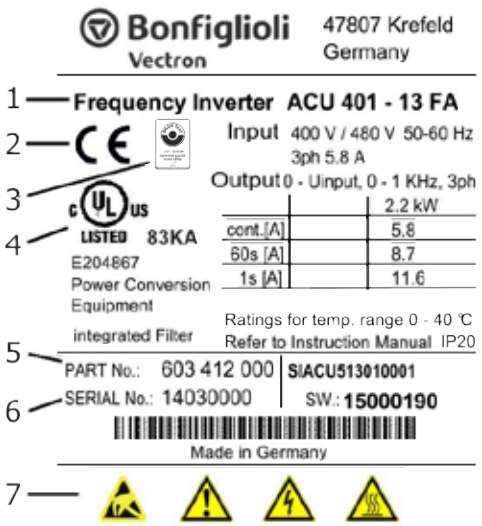
- In rooms without weather exposure.
- Avoid direct insolation.
- Avoid dust.
- Not in the neighborhood of strong electromagnetic fields.
- Not in the neighborhood of inflammable material.
- Provide for sufficient cooling. Install a fan if the frequency inverter is installed in a closed electrical cabinet.
- Altitude of installation: ≤ 4000 m, above 1000 m with reduced power (reduced output current).
- Ingress protection rating of frequency inverter: IP20.

1.6 Operating conditions

- Ambient temperature: 0…55°C, as from 40°C, power reduction should be considered.
- Relative humidity: max. 85%, no water condensation.
- Ambient pressure: 70 ... 106 kPa to be checked
- The frequency inverter may be operated in TN-, TT and IT mains.
  Operation in corner-grounded TN systems is not allowed.
- The frequency inverter may be connected to power supply every 60 s. If the unit is switched on more frequently, it may be damaged. This must be considered when operating a mains contactor in jog operation mode.
- Maximum permissible, prospective short circuit current at the grid connection:
  up to 132 kW device power (size 7): 5 kA;
  above 160 kW device power (size 8): ≥ 30 kA

2 Frequency inverter – Type

- Identify the type of frequency inverter.
- Check if frequency inverter rated voltage matches the local mains voltage.



Identifications	
1	Type identifier, e.g. ACU 401-13 FA 401: Rated voltage 400 V 13: Recommended power
2	Marking for UL508c (where applicable).
3	Part number
4	Serial Number
5	Warning symbols: Warning! Components sensitive to electrostatic energy. Warning! High leakage current. Warning! Dangerous voltage. Danger of electric shock. Warning! Hot surfaces.

Identifier	Size	Recommended power ACU 201: AC 1x230V / 3x230V
-01	1	0.25 kW
-03		0.37 kW
-05		0.55 kW
-07		0.75 kW
-09		1.1 kW
-11	2	1.5 kW
-13		2.2 kW
-15		3.0 kW[1)]
-18	3	4.0 kW
-19		5.5 kW[2)]
-21	4	7.5 kW[2)]
-22		9.2 kW[2)]

Identifier	Size	Recommended power ACU 401: AC 3x400V
-01	1	0.25 kW
-03		0.37 kW
-05		0.55 kW
-07		0.75 kW
-09		1.1 kW
-11		1.5 kW
-12	2	1.85 kW
-13		2.2 kW
-15		3.0 kW
-18		4.0 kW
-19	3	5.5 kW
-21		7.5 kW
-22		9.2 kW
-23	4	11.0 kW
-25		15.0 kW
-27	5	18.5 kW
-29		22.0 kW
-31		30.0 kW
-33	6	37.0 kW
-35		45.0 kW
-37		55.0 kW
-39		65.0 kW
-43	7	75.0 kW
-45		90.0 kW
-47		110.0 kW
-49		132.0 kW
-51	8	160.0 kW
-53		200.0 kW
-55		250.0 kW
-57		315.0 kW
-59		355,0 kW
-61		400,0 kW

Identifier	Size	Recommended power ACU 501: AC 3x525V ACU 601: AC 3x690V
-51	8	160.0 kW
-53		200.0 kW
-55		250.0 kW
-57		315.0 kW
-59		355.0 kW
-61		400.0 kW

[1)] Maximum output current = 9.5 A with single-phase and two-phase connection

[2)] Three-phase connection permissible only.

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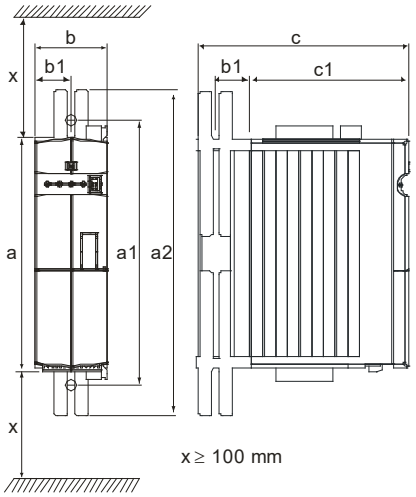
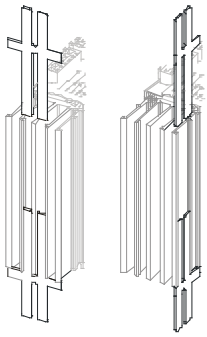
3 Mechanical installation

⚠ WARNING

- During installation, comply with the following installation and safety instructions as well as the installation and safety instructions of the co-applicable documents.
- Mount the devices with sufficient clearance to other components so that the cooling air can circulate freely. Avoid soiling by grease and air pollution by dust, aggressive gases, etc.
- Make sure that no foreign particles (e.g. dust, chips, wires, screws, tools) can get inside the frequency inverter.
- Install the frequency inverter on a non-flammable surface.
- The frequency inverter may only be installed in vertical position.
- Screw the frequency inverter on a metal surface (unpainted).
- The frequency inverter must be groanded.
- For equipotential bonding, connect the frequency inverter, electrical cabinet, motor case, filter, etc. to a common groanding point via short cables.

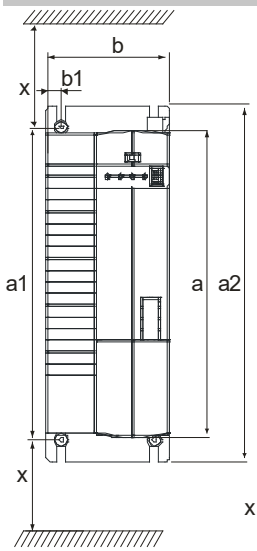
ACU 201 sizes 1 and 2 (up to 3.0 kW)
ACU 401 sizes 1 and 2 (up to 4.0 kW)

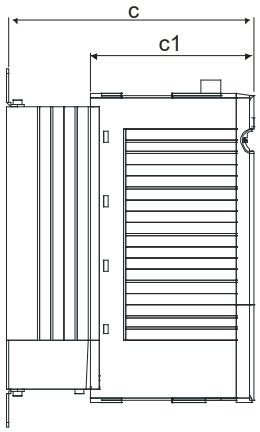


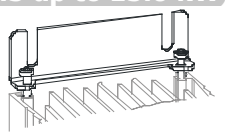


Screw fixing brackets to heat sink and mounting plate.

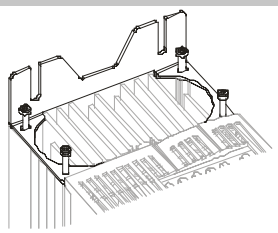
ACU 201 size 3 and 4 (4.0 up to 9.2 kW)
ACU 401 size 3 and 4 (5.5 up to 15.0 kW)

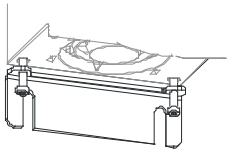




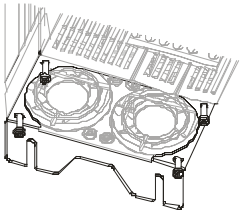


Top fixing brackets
(M4x20 screws)





Bottom fixing brackets
(M4x60 screws)



Screw fixing brackets to heat sink and mounting plate.

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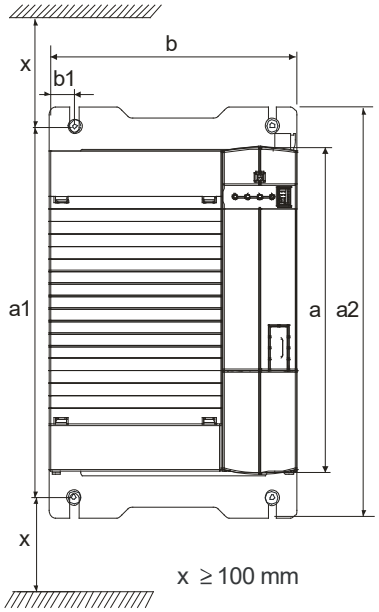
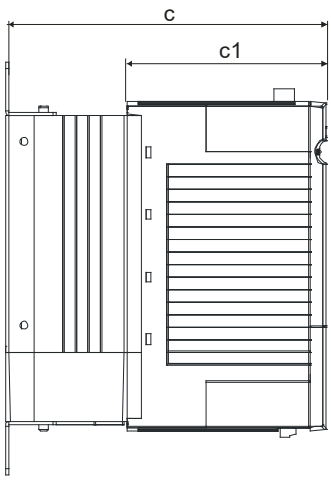
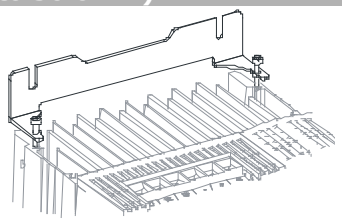
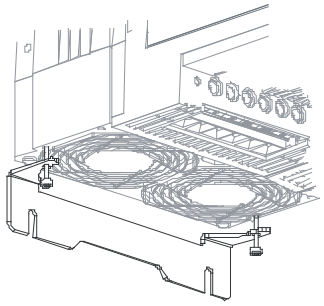
ACU 401 Size 5 (18.5 up to 30.0 kW)







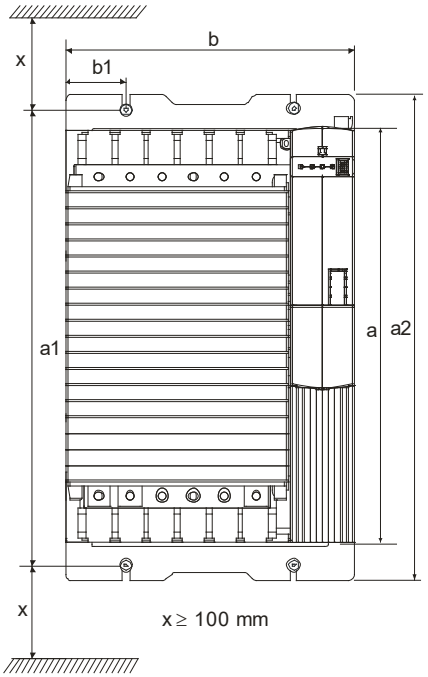
Top screw fixture
M4x20

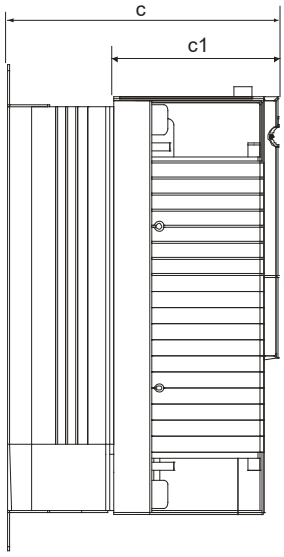


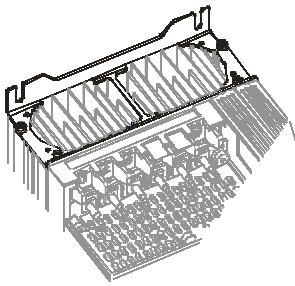
Bottom screw fixture
M4x20

Screw fixing brackets to heat sink of frequency inverter and mounting plate.

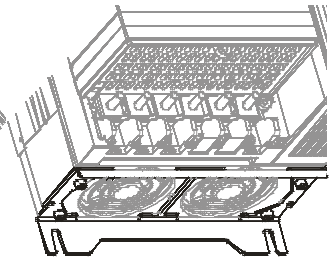
ACU 401 Size 6 (37.0 up to 65.0 kW)







Top screw fixture
M5x20



Bottom screw fixture
M5x20

Screw fixing brackets to heat sink of frequency inverter and mounting plate.

Dimensions without optional components:

	Dimensions in mm				Assembly dimensions in mm			
	kW	**a**	**b**	**c**	**a1**	**a2**	**b1**	**c1**
ACU 201	**0.25…1.1**	190	60	178	210…230	260	30	133
	1.5…3.0	250	60	178	270…290	315	30	133
	4.0…5.5	250	100	200	270…290	315	12	133
	7.5…9.2	250	125	200	270…290	315	17.5	133
ACU 401	**0.55…1.5**	190	60	178	210…230	260	30	133
	1.85…4.0	250	60	178	270…290	315	30	133
	5.5…9.2	250	100	200	270…290	315	12	133
	11.0…15.0	250	125	200	270…290	315	17.5	133
	18.5…30.0	250	200	260	270…290	315	20	160
	37.0…65.0	400	275	260	425…445	470	20	160

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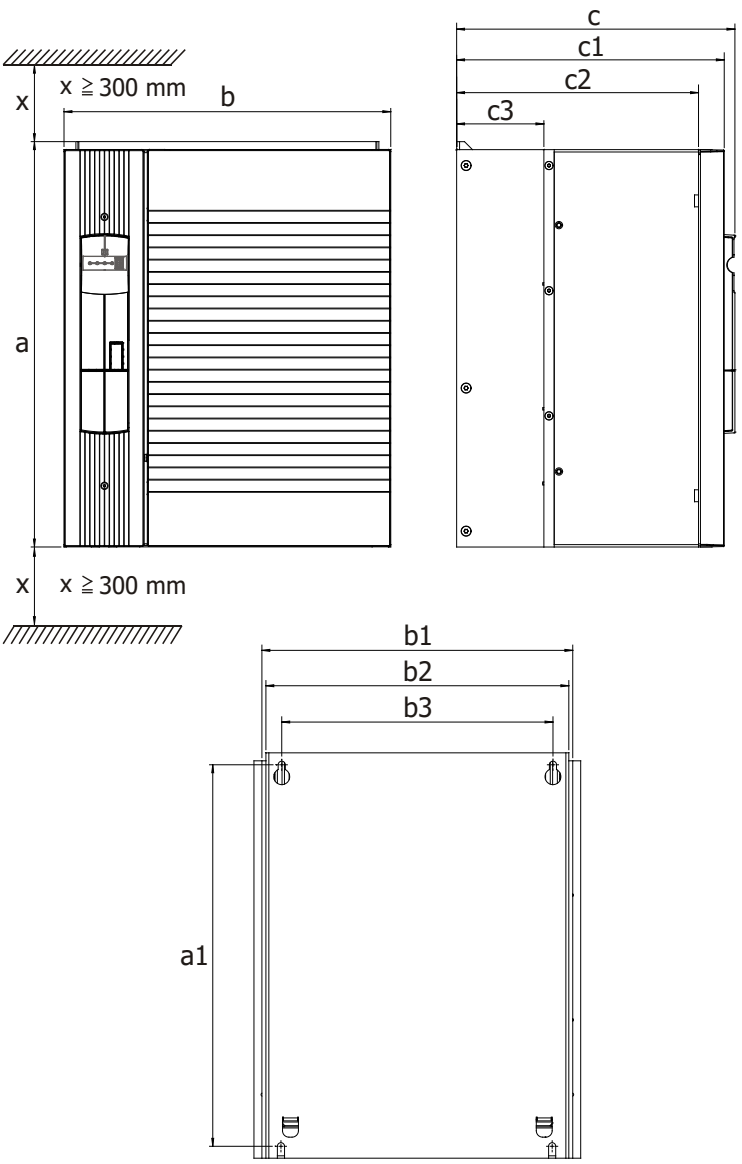
ACU 401 size 7 (75.0 up to 132.0 kW)



Diameter of fixing holes is 9 mm.
Screw rear wall of heat sink of frequency inverter to mounting plate.

Dimensions **without** optional components:

	Dimensions in mm				Assembly dimensions in mm						
ACU 401	**kW**	a	b	c	a1	b1	b2	b3	c1	c2	c3
	75.0...132.0	510	412	351	480	392	382	342	338	305	110

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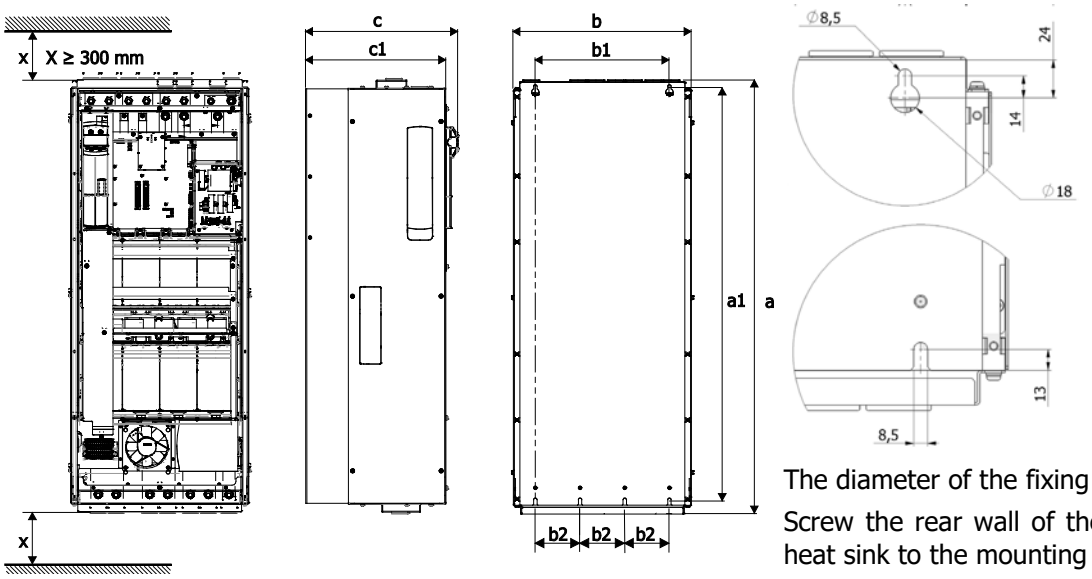
ACU 401 size 8 (160 up to 400 kW)
ACU 501 size 8 (160 up to 400 kW)
ACU 601 size 8 (160 up to 400 kW)



The diameter of the fixing holes is 8.5 mm.

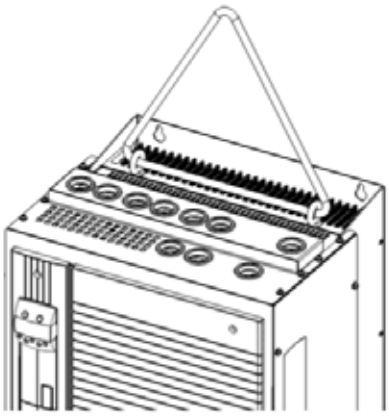
Screw the rear wall of the frequency inverter heat sink to the mounting plate.

Dimensions in mm				Assembly dimensions in mm				
Type	kW	a	b	c	a1	b1	b2	c1
ACU 401 **ACU 501** **ACU 601**	160.0…400.0	1063	439	375	997	330	110	345

NOTE

Before unpacking the frequency inverter, move it as close as possible to the intended installation site.

- First remove the protective packaging.
- Screw 2 jack rings in the fastening screw thread.
- When lifting, transporting and installing use of the jack rings and a crane. The crane must be designed according to the weight of the drive.



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4 Electrical installation

⚠ DANGER

- The five safety rules must be complied with.
- Disconnect the frequency inverter from mains voltage and protect it against being energized unintentionally.
- Verify safe isolation from power supply.
- When the frequency inverter is disconnected from power supply, the mains, DC-link voltage and motor terminals may still be live for some time. Wait for some minutes until the DC link capacitors have discharged before starting to work at the unit.
- **Switch off power supply before connecting or disconnecting** the mains cable to/from terminal **X1**, the motor cables and the brake resistor to/from terminal **X2**.

NOTE

- The cables connected to the frequency inverters may not be subjected to high-voltage insulation tests.
- Use copper cables for 30 °C ambient temperature.
- The earth leakage current of the inverter can be greater than AC 3.5 mA or DC 10 mA.

NOTE

- According to EN61800-5-1 please note: This product can cause a direct current in the protective earth conductor. When a residual current device (RCD) or a residual current monitor (RCM) is used for protection in the event of direct or indirect contact, only an RCD or RCM of Type B is permissible on the power supply side of this product.

4.1 EMC information and Connection

The frequency inverter is designed according to the requirements and limit values of product norm EN 61800-3 with an interference immunity factor (EMI) for operation in industrial applications. Electromagnetic interference is to be avoided by expert installation and observation of the specific product information.

Measures

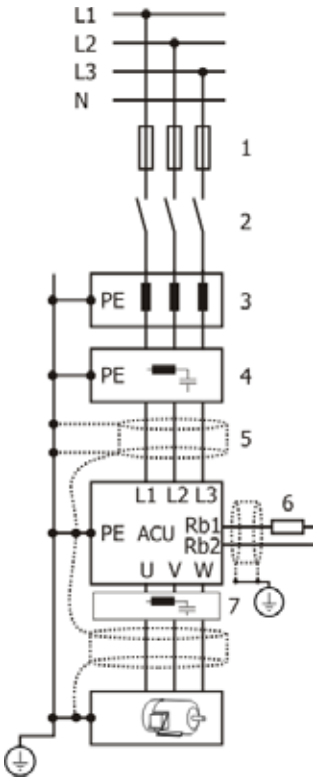
Install the frequency inverters and commutating chokes on a metal mounting panel. Ideally, the mounting panel should be galvanized, not painted.

Provide proper equipotential bonding within the system or plant. Plant components such as electrical cabinets, control panels, machine frames must be connected by means of PE cables, i.e. sufficient area and with good conductivity.

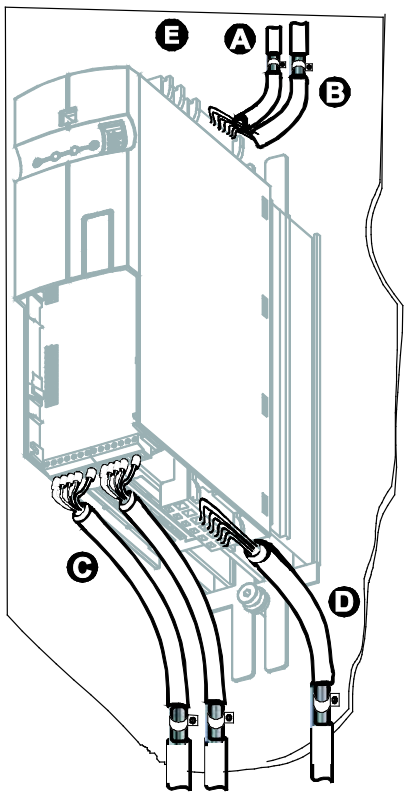
The shield of the control cables is to be connected to ground potential properly, i.e. with good conductivity, on both sides (shield clamp). Mount shield clamps for cable shields close to the unit.

Connect the frequency inverter, the commutating choke, external filters and other components to an earthing point via short cables.

Excessive cable length and loosely suspended cabling must be avoided. Contactors, relays and solenoids in the electrical cabinet are to be provided with suitable interference suppression components.



1 Fuse
2 Circuit breaker
3 Line choke (optional)
4 Input filter (optional)
5 Cable shield
6 Brake resistor (optional)
7 Output filter (optional)



Ⓐ Mains connection

The mains supply cable may be as long as required. To be installed separate from control, data and motor cable.

Ⓑ DC-link connection

The frequency inverter is to be connected to the same mains potential or a common direct voltage source. Cables with a length >300 mm must be shielded, the cable shield must be connected to the mounting plate on both sides. Use twisted cables where possible.

Ⓒ Control connection

Control and signal cables must be kept physically separate from the power cables. Analog signal lines are to be connected to the shield potential on one side. Install sensor cables separate from motor cables.
The low-voltage circuits (in example terminal X210A, X210B) are separated by protective separation and protection from the main voltage circuit (in example U, V, W).

Ⓓ Motor and Brake resistor

The shield of the motor cable is to be connected to ground potential properly on both sides. On the motor side use a metal compression gland. On the frequency inverter side the shield clamp is to be used. The signal cable used for monitoring the motor temperature must be kept separate from the motor cable. Connect the shield of this line on both sides. If a brake resistor is used, the connection cable must also be shielded, and the shield is to be connected to earth potential on both sides.

Ⓔ Relay

The Relay allows the operation of current intensive signals.

With size 8 and mains operation AC 3x 525 V or AC 3x690 3x525 V the terminal X13 must be connected additionally. Follow the connection instructions for size 8.

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Line choke
Line chokes reduce mains harmonics and reactive power. In addition, a longer service life of the frequency inverter is possible. When using a line choke, note that line chokes may reduce the maximum output voltage of the frequency inverter. Install the line choke between the mains connection and the input filter.

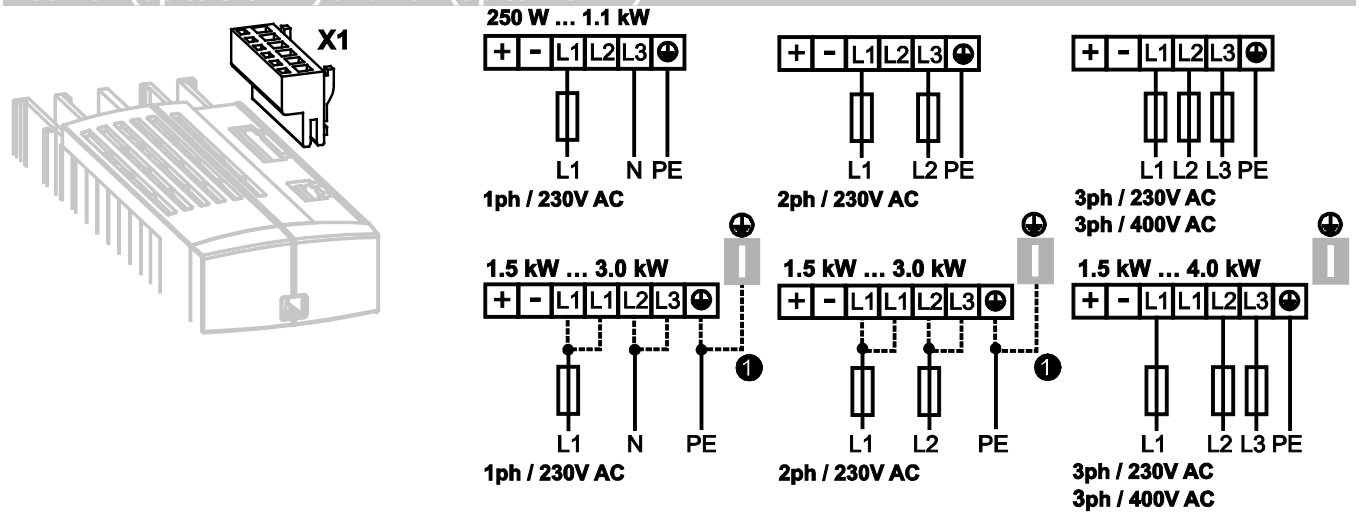
Input filter
Input filters reduce grid-bound, high-frequency radio interference voltage. Install input filter on the mains side upstream of the frequency inverter.

⚠ CAUTION

The frequency inverters meet the requirements of the low-voltage directive 2006/95/EEC and the requirements of the EC directive 2004/108/EC. The EMC product standard EN 61800-3 relates to the drive system. The documentation provides information on how the applicable standards can be complied if the frequency inverter is a component of the drive system. The declaration of conformity is to be issued by the supplier of the drive system.

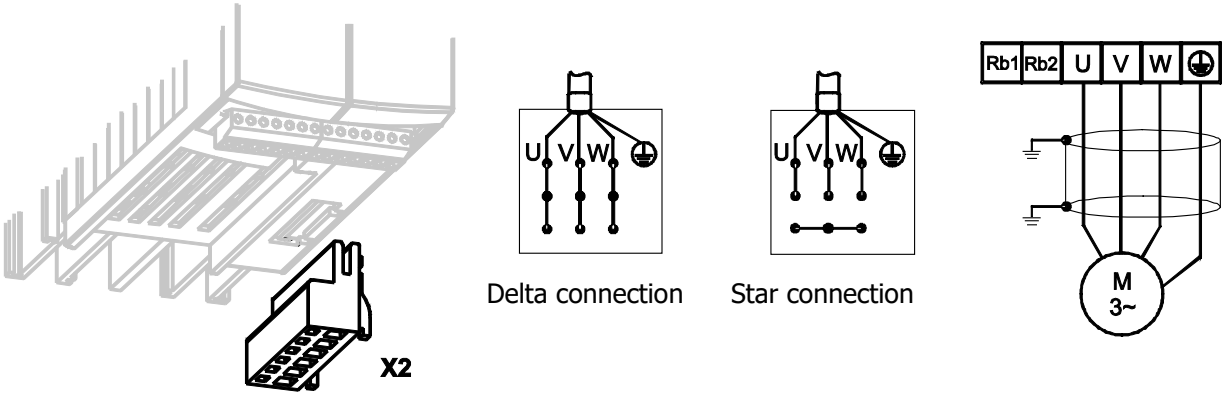
4.1.1 ACU 201 (up to 3.0 kW) and 401 (up to 4.0 kW)

Mains connection, X1
ACU 201 (up to 3.0 kW) and 401 (up to 4.0 kW)



❶ With a mains current above 10 A, mains power connections 230 V 1ph/N/PE and 2ph/PE are to be done on two terminals.

Motor connection
ACU 201 (up to 3.0 kW) and 401 (up to 4.0 kW)



For connection of a braking resistor, use terminals R_{b1} and R_{b2}.

Use for connection of Protective Earth of the mains and motor cables the provided terminals X1 and X2. Other connection options for connecting Protective Earth of the mains and motor cables are not permitted.

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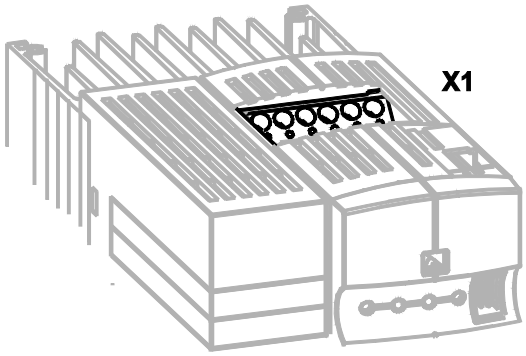
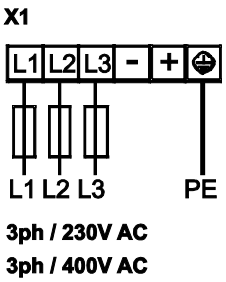
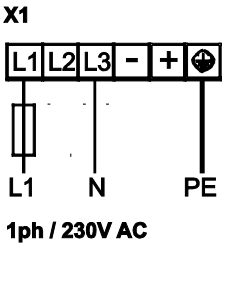
4.1.2 ACU 201 (4.0 up to 9.2 kW) and ACU 401 (5.5 and 15.0 kW)

Mains connection
ACU 201 (4.0 up to 9.2 kW) and ACU 401 (5.5 and 15.0 kW)





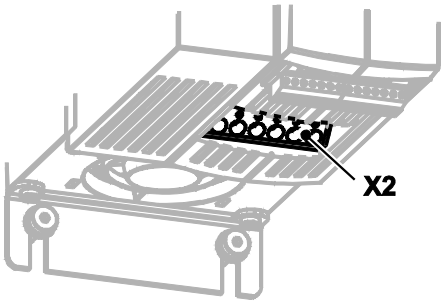
ACTIVE Cube 201-18 (4.0 kW):

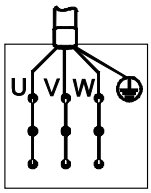


ACU 201-18 (4.0 kW): single- and three-phase connection possible.

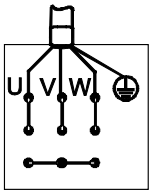
ACU 201-19 (5.5 kW) and higher: three-phase connection possible

Motor connection
ACU 201 (4.0 up to 9.2 kW) and ACU 401 (5.5 and 15.0 kW)

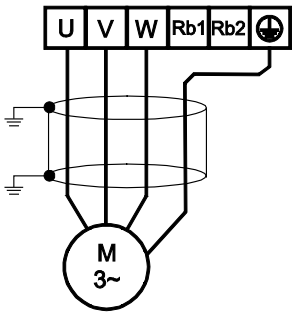




Delta connection



Star connection

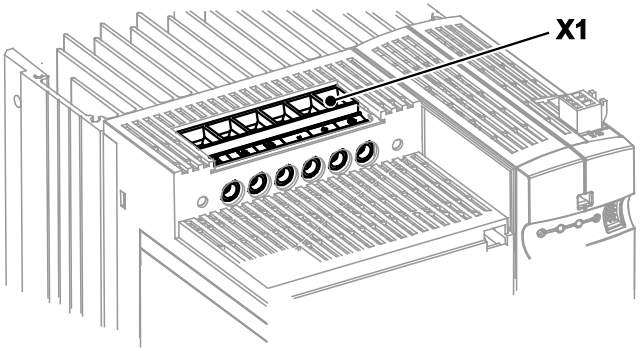


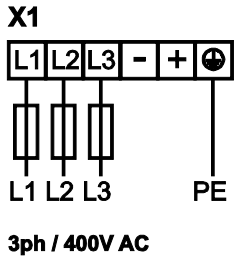
For connection of a braking resistor, use terminals R_{b1} and R_{b2}.

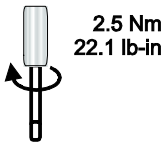
Use for connection of Protective Earth of the mains and motor cables the provided terminals X1 and X2. Other connection options for connecting Protective Earth of the mains and motor cables are not permitted.

4.1.3 ACU 401 (18.5 up to 30.0 kW)

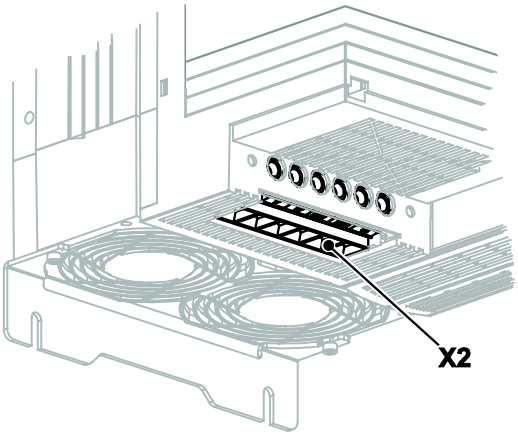
Mains connection
ACU 401 (18.5 up to 30.0 kW)

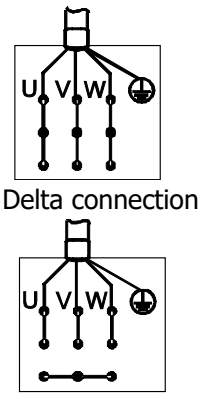


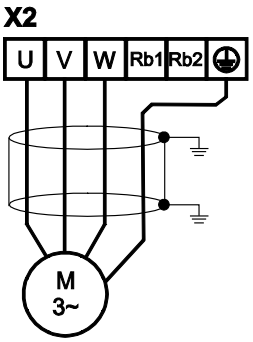


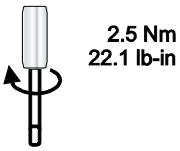


Motor connection
ACU 401 (18.5 up to 30.0 kW)









Use for connection of Protective Earth of the mains and motor cables the provided terminals X1 and X2. Other connection options for connecting Protective Earth of the mains and motor cables are not permitted.

For connection of a braking resistor, use terminals R_{b1} and R_{b2}.

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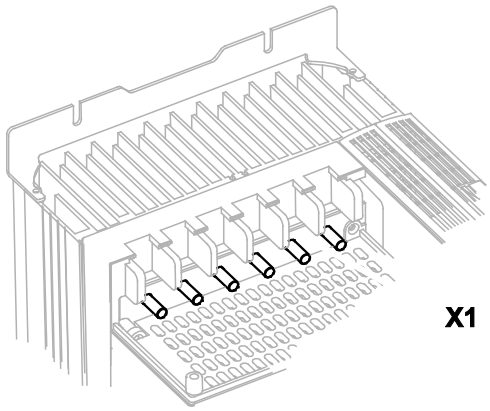
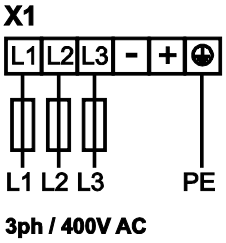
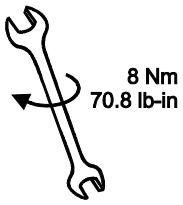
4.1.4 ACU 401 (37.0 up to 65.0 kW)

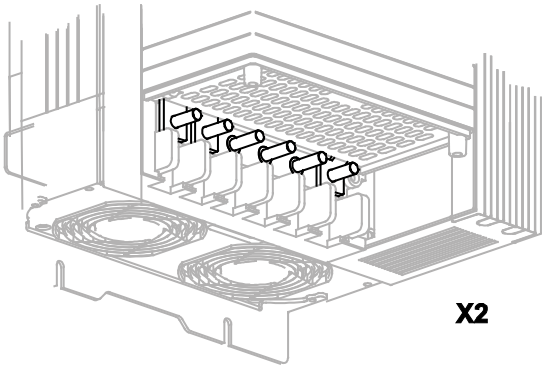
Mains connection
ACU 401 (37.0 up to 65.0 kW)

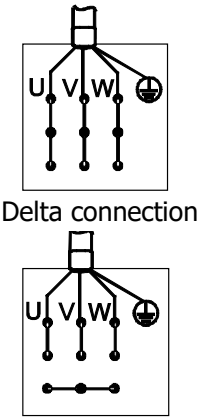


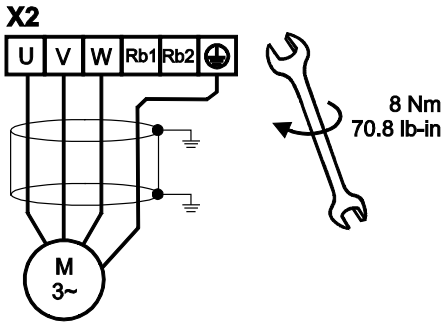




Motor connection
ACU 401 (37.0 up to 65.0 kW)







Use for connection of Protective Earth of the mains and motor cables the provided terminals X1 and X2. Other connection options for connecting Protective Earth of the mains and motor cables are not permitted.

For connection of a braking resistor, use terminals R_{b1} and R_{b2}.

The protection class IP20 is achieved with mounted covers. Make sure that the covers are always mounted for operation.

Optionally, devices of this size are available without brake chopper. These devices are designed without connecting terminals for the braking resistor.

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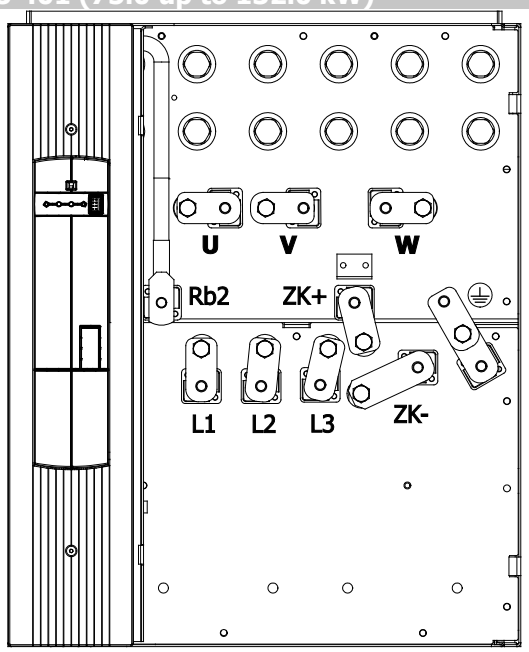
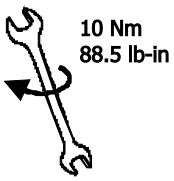
4.1.5 ACU 401 (75.0 up to 132.0 kW)

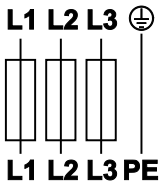
ACU 401 (75.0 up to 132.0 kW)



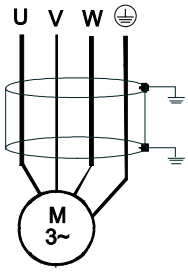


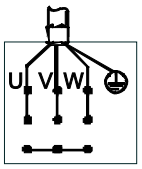
Threaded bolt M8x20

Mains connection

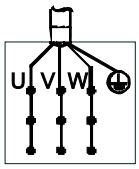


Motor connection



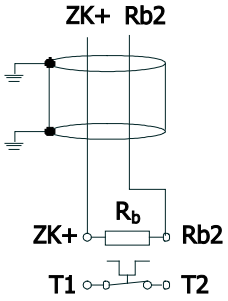


Star connection



Delta connection

Connection of braking resistor with temperature switch



The protection class IP20 is achieved with mounted covers. Make sure that the covers are always mounted for operation.

Optionally, devices of this size are available without brake chopper. These devices are designed without connecting terminals for the braking resistor.

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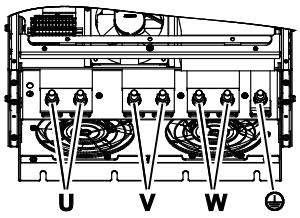
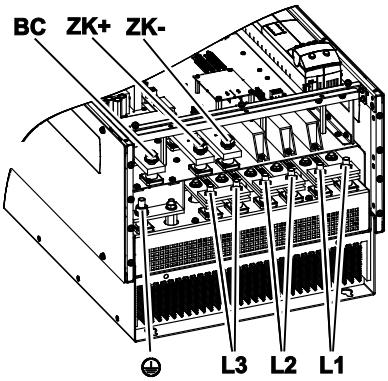
4.1.6 ACU 401 (160.0 up to 400.0 kW)

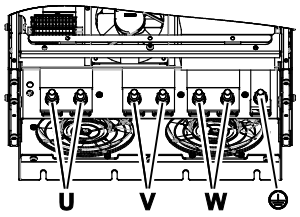
ACU 401 (160.0 up to 400.0 kW)

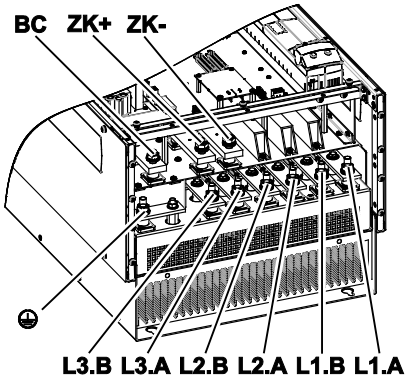
3 Phases:

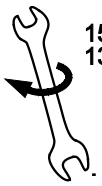




6 Phases:





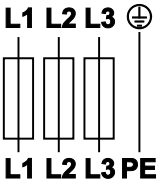


threaded bolt M10x20

The protection class IP20 is achieved with fitted covers. Make sure that the covers are always mounted for operation.

Mains connection

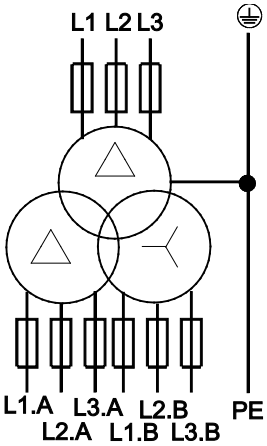
3 Phases:



3ph/400 V AC or 3ph/525 V or 3ph/690 V

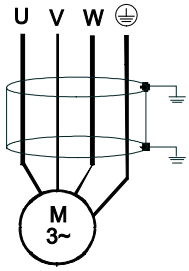
6 Phases*:

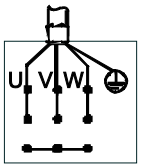
3ph/400 V AC or 3ph/525 V or 3ph/690 V



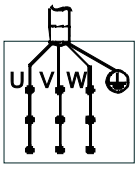
6ph/400 V AC or 6ph/525 V or 6ph/690 V

Motor connection



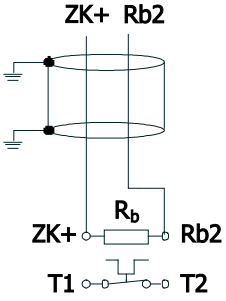


Star connection



Delta connection

Connection of braking resistor with temperature switch



* The 6-phase connection must be done through the same mains connections and a suitable transformer (in example one Delta and one Star winding on the secondary side), which shifts all phases to each other by 30°. Alternatively two transformers can be used (one with Delta winding, one with Star winding on the secondary side).

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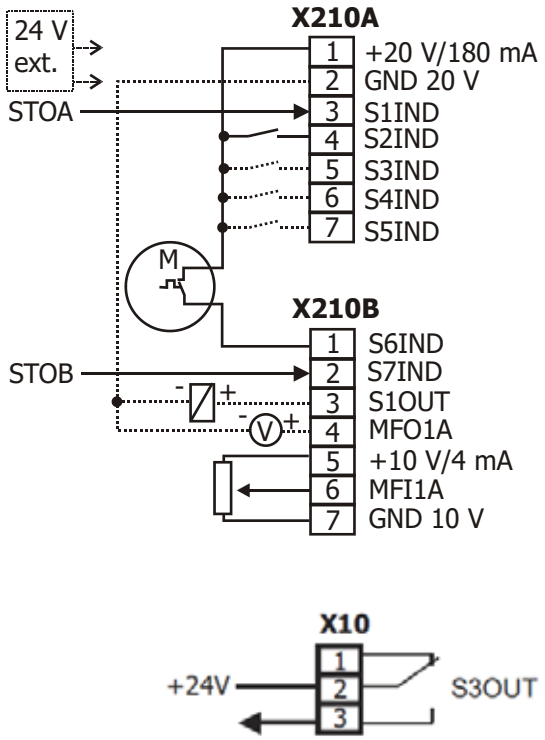
4.2 Control terminals

⚠ CAUTION

Power supply must be turned off before connecting control inputs and outputs. Otherwise the device may be destroyed.



Control terminal X210A		
X210A.1	Voltage output DC +20 V or input for external power supply DC 24 V ±10%	
X210A.2	GND 20 V/ GND 24 V (ext.)	
X210A.3	Digital Input STOA (first shut-down path)	Digital Input STOA (first shut-down path)
X210A.4	Digital inputs[1)]	
X210A.5		
X210A.6		
X210A.7		

Control terminal X210B		
X210B.1	Digital input[1)]	
X210B.2	digital input STOB (second shut down path)	digital input STOB (second shut down path)
X210B.3	digital output[1)]	
X210B.4	multifunction output[1)] (voltage signal proportional actual frequency, default setting)	
X210B.5	supply voltage +10 V for reference value potentiometer, (I_{max}=4 mA)	
X210B.6	multifunction input[1)] (reference speed 0 … +10 V, default setting)	
X210B.7	GND 10 V	

Relay output X10	
S3OUT	Free programmable Relay output

[1)] Control terminals are freely configurable..

Control „Safely disabled torque": Contacts on X210A.3 and X210B.2 open.
Release of frequency inverter: Contacts on X210A.3 and X210B.2 closed.

The above assignment of the functions to the control terminals is the default setting of parameter *Configuration* 30 to value **110** or **410**. The functions can be assigned to the control terminals as required. For more configurations, refer to the Operating Instructions.

Technical data of control terminals
Digital inputs (X210A.3 … X210B.2): Low Signal: DC 0 V … 3 V, High signal: DC 12 V … 30 V, input resistance: 2,3 kΩ, response time: 2 ms (STOA and STOB: 10 ms), PLC compatible
Digital output (X210B.3): Low Signal: DC 0 V… 3 V, High Signal: DC 12 V … 30 V, maximum output current: 50 mA, PLC compatible
Multifunction output (X210B.4): Analog signal: DC 19 … 28 V, maximum output current: 50 mA, pulse-width modulated (f_{PWM}= 116 Hz), digital signal: Low Signal: DC 0 V … 3 V, High signal: DC 12 V … 30 V, maximum output current: 50 mA, PLC compatible Frequency signal: Output voltage: DC 0 V … 24 V, maximum output current: 40 mA, maximum output frequency: 150 kHz
Multifunction input (X210B.6): Analog signal: Input voltage: DC 0 V … 10 V (R_i=70 kΩ), input current: DC 0 mA … 20 mA (R_i=500 Ω), digital signal: Low Signal: DC 0 V … 3 V, High signal: DC 12 V…30 V, response time: 4 ms, PLC compatible
Conductor cross-section: The signal terminals are suitable for the following cable sizes: With ferrule 0.25 … 1.0 mm² Without ferrule 0.14 … 1.5 mm²

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4.2.1 Relay output

Control terminal X10	
Ter.	**Description**
1 ... 3	Relay output, floating change-over contact, response time approx. 40 ms, maximum contact load: – make contact: AC 5 A / 240 V, DC 5 A (ohmic) / 24 V – break-contact: AC 3 A / 240 V, DC 1 A (ohmic) / 24 V

4.2.2 External 24 V power supply

The bidirectional control terminals X210A.1/ X210A.2 can be used as a voltage output or voltage input. By connecting an external power supply of DC 24 V ±10% to terminals X210A.1/X210A.2, the function of inputs and outputs as well as the communication can be parameterized and maintained, even when mains voltage is off.

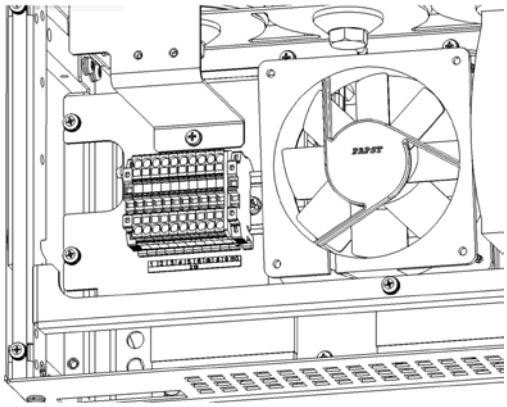
Requirements to be met by external power supply	
Input voltage range	DC 24 V ±10%
Rated input current	Max. 1.1 A
Peak inrush current	Typeically: < 25 A
External fuse	Via standard fuse elements for rated current, characteristic: slow
Safety	Safety extra low voltage (SELV) according to EN 61800-5-1

⚠ CAUTION

The digital inputs and the DC 24 V terminal of the electronic control equipment can withstand external voltage up to DC 30 V. Avoid higher voltage levels. Higher voltages may destroy the unit.

4.3 Auxiliary voltage terminals ACU size 8 (160...400 kW)

When using an ACU501 or ACU601 device the connection of 3 x AC 400 V on terminal X13 is necessary.



Terminal X13	
1 ... 6	Not used
7	⏚ PE
8	L1
9	L2
10	L3

Connection	
Connection power	≥ 1,2 kW
Connection voltage	400 V +- 10 %
Connection frequency	50 / 60 Hz

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5 Start-up procedure

The optional KP500 control unit is a practical tool for controlling the frequency inverter and setting and displaying the frequency inverter parameters. This unit is attached to the front of the frequency inverter.

Other ways of commissioning (e.g. by means of optional communication modules) are described in the co-applicable Operating Instructions.

5.1 Guided commissioning

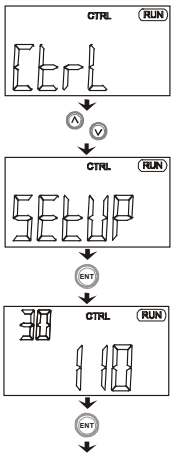
NOTE

The frequency inverter may be connected to power supply every 60 s. If the unit is switched on more frequently, it may be damaged. This must be considered when operating a mains contactor in jog operation mode.

- Disable release of frequency inverter; there may be no signals at inputs STOA (digital input S1IND/terminal X210A.3) and STOB (digital input S7IND/terminal X210B.2).
- Turn mains voltage on.

The frequency inverter will perform a self-test.

Before the start of guided commissioning, the motor should not have been operated, as a part of the machine data is dependent upon the operating temperature.



If the unit is in "as-delivered" condition or after resetting the unit to the factory settings, "SetUP" will be displayed automatically for guided commissioning. After successful commissioning, you can select the CTRL sub-menu in the main menu and use the function again.

- Use the ENT key to switch to the CTRL sub-menu.
- In the CTRL sub-menu, select the menu item "SetUP" and confirm by pressing the ENT key.
- Use the ENT key to select parameter Configuration 30.
- Use the arrow keys to enter the number 110 or 410.
  110: sensor-less regulation according to U/f characteristic
  410: sensor-less field-oriented control

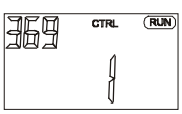
If the setup was changed, the "SEtUP" message will be displayed again.

- Confirm this message by pressing the ENT key in order to continue the commissioning procedure.

- After initialization, confirm the selected configuration by pressing the ENT key.
- Select the connected machine via parameter *Motor Type* **369**.

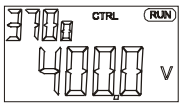
NOTE

If the motor Type is not entered correctly, the drive may be damaged.



Operation mode		Function
0 -	Unknown	The motor is not a standard Type.
1 -	Asynchronous	Three-phase asynchronous motor, squirrel cage
2 -	Synchronous	Three-phase synchronous motor
3 -	Reluctance	Three-phase reluctance motor
10 -	Transformer	Transformer with three primary windings

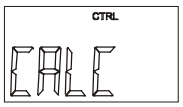
- Enter the motor data indicated on the rating plate in the following parameters.



No.	Description	No.	Description
370	Rated Voltage	374	Rated Cosine Phi
371	Rated Current	375	Rated Frequency
372	Rated Speed	376	Rated Mechanical Power

- Use the arrow keys to select the required parameter and edit the parameter value.
- Use the ENT key to confirm the selected parameter and the parameter values entered.

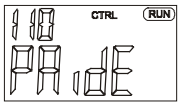
The rated data of the motor are to be entered according to the specifications on the rating plate for the motor connection Type used (star or delta connection). If the data entered deviate from the rating plate, the parameters will not be identified correctly. The rated data is to be parameterized as per the motor rating plate. Consider the increased rated current of the connected three-phase motor when the motor is switched from star to delta.



After input of the machine data, the calculation or examination of the parameters is started automatically. The display changes over to "CALC" for a short time. If the verification of the entered machine data is successful, the guided commissioning procedure continues with the identification of the parameters (automatic measurement of further machine data).

Note the warnings and error messages displayed during guided commissioning.

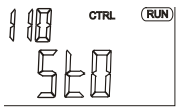
- To ignore the warning messages, press the ENT key. The guided commissioning is continued. However, it is recommended that the data be checked and corrected if necessary.
- To correct the entered parameter values after the warning or error message, press the ESC key. Use the arrow keys to switch to the parameter value to be corrected.



Further machine data are measured while the drive is at a standstill. These measurements will be entered automatically in the relevant parameters by the parameter identification feature.

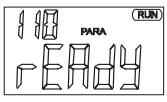
- Confirm the display "PAidE" by pressing the ENT key.

- Note the warnings or error messages upon completion of the parameter identification.



No signals at digital inputs S1IND (STOA) and S7IND (STOB). If signals were already applied at the beginning of the guided commissioning, the "StO" message is not displayed.

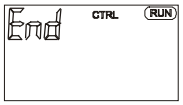
For release of the output stage, wiring of digital inputs S1IND (STOA) and S7IND (STOB) is required.



- Confirm the final "rEAdY" message by pressing the ENT key.

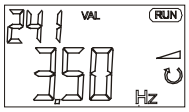
Canceling the operation with the ESC key or withdrawing the enable signal S1IND (STOA) or S7IND (STOP) results in an incomplete take-over of the values.

In the case of higher requirements as regards the accuracy of the speed/torque control, you should carry out the guided commissioning procedure once again under operating conditions because part of the machine data depends on the operating temperature.
During this procedure, confirm the rated machine values already entered.



- Confirm the "End" display by pressing the ENT key.

The guided commissioning of the frequency inverter is terminated via a reset and the initialization of the frequency inverter. The relay output X10 signals a fault.



After successful initialization of the frequency inverter, the factory-set parameter *Actual frequency* **241** is displayed.
The drive is accelerated to the set *Min. frequency* **418** (default 3.50 Hz) by:

- signals at digital inputs S1IND (STOA) and S7IND (STOB) and
- Start clockwise by rising signal edge at S2IND or
  Start anticlockwise by rising signal edge at S3IND

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6 Parameters

6.1 Description of parameters relevant to ACU

The parameters are partly set via the guided commissioning. The following overviews refer to configurations **110** and **410**. For additional configurations enabling setting of other parameters, refer to the Operating Instructions.

6.1.1 Adjustable parameters

Parameters relevant to ACU			
No.	**Description**	**Unit**	**Explanation**
28	Control Level	-	These instructions describe the parameters on Control Level 1. Higher control level parameters are described in the Operating Instructions and should only be set by expert users.
30	Configuration	-	The basic function of the control inputs and outputs as well as the assignment of the software modules is selected by the configuration. The selection is made during the guided commissioning.
34	Program	-	The factory settings of all parameters is restored or a fault message is acknowledged (alternative to signal at digital input STO).
369	Motor Type	-	Selection of connected motor or transformer. The selection is considered in the test of the entered rated values and the guided commissioning.
370	Rated Voltage	V	Enter the voltage indicated on the Type plate of the asynchronous motor.
371	Rated Current	A	Enter the rated current indicated on the Type plate of the asynchronous motor for the selected circuit.
372	Rated Speed	RPM	Enter the motor speed indicated on the Type plate of the asynchronous motor at rated frequency.
374	Rated Cosinus Phi	-	Enter the cos(ϕ) value indicated on the Type plate of the asynchronous motor.
375	Rated Frequency	Hz	Enter the rated frequency indicated on the Type plate of the asynchronous motor at the parameterized rated speed.
376	Rated Mech. Power	kW	Enter the power (in KW) indicated on the Type plate of the asynchronous motor.
400	Switching Frequency	Hz	The default switching frequency setting depends on the configuration (*Configuration* **110**: 2 kHz, *Configuration* **410**: 4 kHz). Higher switching frequencies reduce the motor noise, but require a reduction of the output current (refer to technical data in Operating Instructions)
401	Min. Switching Frequency	Hz	Frequency to which the switching frequency is reduced in case the frequency inverter is overloaded.
418	Min. Frequency	Hz	The start command entered via the control unit or digital inputs S2IND, S3IND results in an acceleration of the drive to the minimum frequency.
419	Max. Frequency	Hz	The speed range of the drive is limited by the maximum output frequency of the frequency inverter.
420	Acceleration (Clockwise)	Hz/s	The ramps define how quickly the output frequency is changed if the reference value changes or after a start, stop or brake command.
421	Deceleration (Clockwise)		

	452	Op. Mode Multifunction Input	-	The reference value at input MFI1 can be adjusted in this operation mode according to the connected signal source.
	480	Fixed Frequency 1	Hz	Switching between the fixed frequency values is done via the fixed frequency change-over of multifunction input MFI1 (Operation Mode *Multifunction Input* **452** to setting 3). Via the data set change-over S4IND, S5IND, the fixed frequency in one of the four data records can be selected. Up to 8 fixed frequencies can be parameterized and selected via the control of the digital inputs.
	481	Fixed Frequency 2		
	530	Op. Mode Digital Output 1	-	Various control and monitoring functions can be assigned to digital output S1OUT and relay output S3OUT.
	532	Op. Mode Digital Output 3		
	553	Op. Mode Analog Operation MFO1	-	Output MFO1 supplies a pulse width modulated signal (0 V ... 10 V) which is proportional to an actual value.
	570	Motor Temp. Operation Mode	-	Monitoring the motor temperature protects the drive system. Connect a suitable sensor to digital input S6IND.
	645	Operation Mode Synchronization	-	Synchronization to a rotating drive is useful in some applications such as pumps and fans or after acknowledgment of an error switch-off. If synchronization to the motor speed is not possible, the function is quit and a fault message is issued.
	651	Operation Mode Autostart	-	Automatic startup of the drive is permissible only in accordance with VDE 0113 (Section 5.4, 5.5), VDE 0100 Part 227 and the national regulations. Make sure that automatic startup does not result in any dangerous situation.
	670	Operation Mode Voltage Controller	-	The DC link voltage, which increases due to generatoric operation and/or deceleration operations, is limited by means of the voltage controller or an external braking resistor in order to avoid an error switch-off due to overvoltage.
1)	722	Integral Time 1	ms	The control behavior of configuration 410 is to be adapted, depending on the mechanical moment of inertia, via the integral time of the speed controller. The smaller the value is, the more dynamic the behavior. The increase in inherent instability of the system is proportional to the reduction of the integral time.
1)	728	Current Limit	A	The speed and torque can be controlled separately in configuration 410. The torque is limited to the rated torque if the current limit is the same as the Rated current 371 of the motor.

1) Parameter is active in configurations with field-oriented control (FOC), e.g. 210, 410.

NOTE

In the KP500 control unit, parameter numbers > 999 are shown in hexadecimal form (999, A00 … B5 … C66).

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6.1.2 Actual value parameters

Parameters relevant to ACU			
No.	**Description**	**Unit**	**Explanation**
211	R.m.s Current	A	Effective output current (motor current) of the frequency inverter calculated from the measurement in the three motor phases.
212	Output Voltage	V	Output voltage of frequency inverter modulated depending on the operating point of the motor
213	Active Power	kW	Calculated power of the asynchronous motor at the current operating point. Product of output voltage, current and cosine phi
240	Actual Speed	RPM	Speed of the asynchronous machine calculated using the machine model and the current load point.
241	Actual Frequency	Hz	The current output frequency of the frequency inverter or actual frequency of the drive calculated from the machine model.
259	Current Error	-	The cause of the error-switch-off and the corresponding error key are displayed. The current error is used for error diagnosis.
269	Warnings	-	If a critical condition is detected, this condition is indicated by the field WARN. The warning status can be displayed via parameter 269.
310	Last Error	-	The fault message is displayed immediately when a fault occurs. The frequency inverter will try to acknowledge some faults automatically, other faults will be reset via digital input S1IND. The last fault code is saved for fault diagnosis.

6.2 Parameter setting options

Parameter		Setting		
No.	**Description**	**Min.**	**Max.**	**Factory setting**
28	Control Level	1	3	1
370	Rated Voltage	$0.17 \cdot U_{FIN}$ [1)]	$2 \cdot U_{FIN}$ [1)]	U_{FIN} [1)]
371	Rated Current	$0.01 \cdot I_{FIN}$ [1)]	$10 \cdot o \cdot I_{FIN}$ [1)]	I_{FIN} [1)]
372	Rated Speed	96 min^{-1}	60 000 min^{-1}	n_N
374	Rated Cosine Phi	0.01	1.00	$\cos(\varphi)_N$
375	Rated Frequency	10.00 Hz	1000.00 Hz	50.00
376	Rated Mech. Power	$0.01 \cdot P_{FIN}$ [1)]	$10 \cdot P_{FIN}$ [1)]	P_{FIN} [1)]
400	Switching Frequency	2 kHz	16 kHz	2 kHz [2)] 4 kHz [3)]
401	Min. Switching Frequency	2 kHz	16 kHz	2 kHz
418	Minimum Frequency	0.00 Hz	999.99 Hz	3.50 Hz [2)] 0.00 Hz [3)]
419	Maximum Frequency	0.00 Hz	999.99 Hz	50.00 Hz
420	Acceleration (Clockwise)	0.00 Hz/s	9999.99 Hz/s	5.00 Hz/s
421	Deceleration (Clockwise)	0.01 Hz/s	9999.99 Hz/s	5.00 Hz/s
722	Integral Time 1	0 ms	60000 ms	- [6)]
728	Current Limit	0.0 A	$o \cdot I_{FIN}$ [1)]	$o \cdot I_{FIN}$ [1)]

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No.	Description	Setting	Factory setting
30	Configuration	110 – Sensorless Control 410 – Sensor-less field-oriented regulation For further configurations (incl. Servo motors), refer to Operating Instructions.	110
34	Program	111 – Parameter transfer 110 – Normal operation 123 – Reset 4444 – Reset parameters	110
369	Motor Type	0 – Unknown 1 – Asynchronous 2 – Synchronous 3 – Reluctance 10 – Transformer	1
452	Operation Mode Multifunction Input	1 – Voltage Input 2 – Current Input 3 – Digital Input	1: Standard value in configuration 110 and 410. Other configurations may deviate.
530	Op. Mode Digital Output 1	See Operating Instructions	
532	Op. Mode Digital Output 3		
553	Analog Operation MFO1		
570	Motor Temp. Operation Mode	0 – Off 1 – Warning only 2 – Error-Switch-Off 3 – Error-Switch-Off 1 min del. 4 – Error-Switch-Off 5 min del. 5 – Error-Switch-Off 10 min del.	0
645	Operation Mode Synchronization	see Operating Instructions	
651	Operation Mode Autostart	0 – Off 1 – On	0
670	Operation Mode Voltage Controller	0 – Off 1 – Ud-Limitation active 2 – Mains Support active 3 – Ud-Limit. Mains Supp. active 12 – Mains Support active, without chopper 13 – Udc-Limit. & Mains Supp. active, without chopper	0

1) I_{FIn}, U_{FIn}, P_{FIn}: Rated values of frequency inverter (listed in Operating Instructions in "Technical Data"), o: overload capability of frequency inverter
2) in configurations 1xx, 4xx
3) in configurations 2xx, 5xx, 6xx
4) Value -0.01 Hz/s means that the value of *Acceleration (Clockwise)* **420** is used.
5) Value -0.01 Hz/s means that the value of *Deceleration (Clockwise)* **421** is used.
6) machine-related

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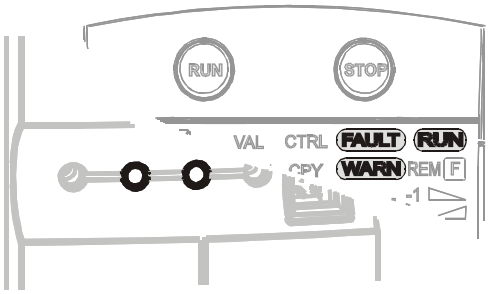
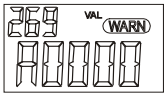
7 Control unit messages



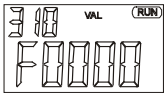
Status indication				
LED				
green	**red**	**Display**	**Description**	**Rotary field on motor**
off	off	-	no supply voltage	no
on	on	-	initialization and self-test	no
flashing	off	RUN flashing	ready, no output signal	no
on	off	RUN	operating message	yes
on	flashing	RUN + WARN	Operational message, current *Warning* **269**	yes
flashing	flashing	RUN + WARN	Ready for operation, current *Warning* **269**	no
off	flashing	FAULT flashing	*Current Error* **259** of frequency inverter	no
off	on	FAULT	*Current Error* **259**, acknowledge fault	no

7.1 Warning and error messages during operation



The code displayed via parameter *Warnings* **269** can be composed of several messages. Key A0088 signals warnings A0008 + A0080, for example.

Warning messages	
Key	**Meaning**
A0000	No warning present.
A0001	Frequency inverter overloaded, warning code (A0002 or A0004)
A0002	Frequency inverter overload (60 s). Check load behavior.
A0004	Short-term overload (1 s). Check motor and application parameters.
A0008	Max. heat sink temperature reached, check cooling system and fan.
A0010	Max. interior temperature reached, check cooling system and fan.
A0020	Speed set point is limited by a controller.
A0080	Max. motor temperature reached, check motor and sensor.
A0100	Mains phase failure, check mains fuses and supply cable.
A0400	Limit frequency reached; output frequency is limited.
A4000	DC link voltage has reached the Type-specific minimum.



Current Error **259** and *Last Error* **310** facilitates troubleshooting and error diagnosis with the shown error code.
The error message can be acknowledged via the control unit buttons and digital input STO.

Error messages		
Key		**Meaning**
F00	00	No fault has occurred.
Overload		
F01	02	Frequency inverter overloaded (60 s), check load behavior
	03	Short-term overload (1 s), check motor and application parameters
Heat sink		
F02	00	Heat sink temperature too high, check cooling system and fan.
	01	Temperature sensor defective or ambient temperature too low.

Interior		
F03	00	Interior temperature too high, check cooling system and fan.
	01	Interior temperature too low, check control cabinet heating.
Motor connection		
F04	00	Motor temperature too high or sensor defective, check connection S6IND.
	03	Phase failure, check motor and wiring.
Output current		
F05	00	Overloaded, check load situation and ramps.
	03	Short circuit or earth fault, check motor and wiring.
	05	Asymmetric motor current, check current and wiring.
	06	Motor phase current too high, check motor and wiring.
	07	Message from phase monitoring, check motor and wiring.
DC-Link Voltage		
F07	00	DC link voltage too high, check deceleration ramps and connected brake resistor.
	01	DC link voltage too low, check mains voltage.
	02	Mains failure, check mains voltage and circuit.
	03	Phase failure, check mains fuse and circuit.
	04	Mains voltage UDC too high when turned on, check voltage.
	05	Mains voltage BC too high when turned on, check voltage.
	06	Mains voltage MC too high when turned on, check voltage.
Electronic voltage		
F08	01	Electronics voltage too low, check control terminals.
	04	Electronic voltage too high, check wiring of control terminals.
Output frequency		
F11	00	Output frequency too high, check control signals and settings.
	01	Max. frequency achieved by control, check deceleration ramps and connected brake resistor.
Safety function STO		
F12	01	Diagnosis error of function STO; at least one of the shut-down paths STOA and STOB is defective. Check the devices connected to the shut-down paths; check wiring and EMC.
	04	Software self-diagnosis has detected an internal error. Parameter *Error Environment 1* **262** describes the cause of the error. Consult BONFIGLIOLI customer service.
	05	Fault message of 5-second monitoring. Shut-down paths STOA and STOB were not actuated at the same time, but with an offset of more than 5 seconds. Check addressing of shut-down paths or control of protection provision.
Motor connection		
F13	00	Earth fault at output, check filter and cabling.
	10	Minimum current monitoring, check motor and wiring.
Control connection		
F14	01	Reference value on multifunction input 1 faulty, check signal.
	07	Overcurrent on multifunction input 1, check signal.

7.2 Status messages during commissioning (SS...)

The following status messages are possible when Setup is run:

Status message		Meaning
SS000	OK	Auto set-up routine has been carried out.
SS001	PC Phase 1	The plausibility check (PC) of the motor data is active.
SS002	PC Phase 2	The calculation of dependent parameters is active.
SS003	STO	The parameter identification requires release on digital input STOA and STOB.
SS004	Parameter Identification	The rated motor values are checked by the parameter identification feature.
SS010	Setup already active	The setup routine via the control panel is being carried out.
SS030	No release signal	The parameter identification requires controller release on digital inputs STOA and STOB.
SS031	Error – see 259	Error during the auto set-up routine. Check the value of *Current Error* **259.**
SS032	Warning Phase Asymmetry	The parameter identification feature diagnosed an unbalance during the measurements in the three motor phases.
SS099	Setup not carried out yet.	Self-setup has not yet been carried out.

7.3 Warning and error messages during commissioning (SA.../SF...)

Warning messages during guided commissioning	
Code	**Meaning / Measure**
SA000	No warning message present.
SA001	The value of the parameter *Rated Voltage* **370** is out of the rated voltage range of the frequency inverter The maximum reference voltage is indicated on the nameplate of the frequency inverter.
SA002	For a three-phase motor, the calculated efficiency is in the limit range. Check the values entered for parameters *Rated Voltage* **370**, *Rated Current* **371** and *Rated Power* **376**.
SA003	The value entered for parameter *Rated Cos phi* **374** is outside of the normal range (0.6 to 0.95). Check the value.
SA004	For three-phase motor, the calculated slip is in the limit range. Check the values entered for parameters *Rated Speed* **372** and *Rated Frequency* **375**.

Warning messages after guided commissioning	
Code	**Meaning / Measure**
SA011	Current Controller non typical value; refer to the Operating Instructions.
SA012	Current Controller non typical value with 2 kHz; refer to the Operating Instructions.
SA014	Current Controller non typical value with 4 kHz; refer to the Operating Instructions.
SA018	Current Controller non typical value with 8 kHz; refer to the Operating Instructions.
SA0021 SA0022	Stator resistance (SA0021) or rotor resistance (SA0022) is very high. The following causes are possible: The motor cable cross-section is not sufficient. The motor cables are too long. The motor cables are not connected correctly. The contacts are not in a proper condition (corrosion).
SA031	Shorten Motor Line using Switching frequency 16 kHz.
SA032	Shorten Motor Line using Switching frequency 12 kHz and higher.
SA033	Shorten Motor Line using Switching frequency 8 kHz and higher.
SA041	The slip speed was not determined correctly. Check the values entered for parameter *Rated Speed* **372** and *Rated Frequency* **375**.
SA042	The slip speed was not determined correctly. Check the values entered for parameter *Rated Speed* **372** and *Rated Frequency* **375**.

Warning messages after guided commissioning	
Code	**Meaning / Measure**
SA0051	The machine data for star connection were entered, the motor, however, is connected in delta. For star operation, change the motor cable connection. For delta operation, check the entered rated motor values. Repeat the parameter identification
SA0052	The machine data for delta connection were entered, the motor, however, is connected in star. For delta operation, change the motor cable connection. For star operation, check the entered rated motor values. Repeat the parameter identification
SA0053	A phase asymmetry was measured. Check the cables at the terminals of the motor and the frequency inverter for proper connection and check the contacts for corrosion.
SA054	The Resolver angle was not estimated correctly.

Error messages during guided commissioning	
Code	**Meaning / Measure**
SF000	No error message exists
SF001	The value entered for parameter *Rated Current* **371** is too low. Correct the value.
SF002	The value for parameter *Rated Current* **371** is too high referred to parameters *Rated Power* **376** and *Rated Voltage* **370**. Correct the values.
SF003	The value entered for parameter *Rated Cos phi* **374** is incorrect (greater than 1 or less than 0.3). Correct the value.
SF004	The calculated slip frequency is negative. Correct the values entered for parameters *Rated Speed* **372** and *Rated Frequency* **375**.
SF005	The calculated slip frequency is too high. Correct the values entered for parameters *Rated Speed* **372** and *Rated Frequency* **375**.
SF006	The calculated total output of the drive is lower than the rated power. Correct the value entered for parameter *Rated power* **376**.
SF007	The set configuration is not supported by the guided commissioning. In this document, Configurations 110 and 410 are described. Select one of these configurations for parameter *Configuration* **30**.

Error messages after guided commissioning	
Code	**Meaning / Measure**
SF0011 SF0012	The main or leakage inductance measurement has failed because the motor has a high slip. Correct the rated motor values in parameters 370, 371, 372, 374, 375 and 376. Carry out the guided commissioning once again. In case an error message is displayed again for parameter *Configuration* **30**, enter value 110 (sensor-less control according to U/f characteristic) if value 410 was set so far. Carry out the guided commissioning once again.
SF0021 SF0022	The measurement of the stator or rotor resistance did not deliver a plausible value. Check the cables at the terminals of the motor and the frequency inverter for proper connection and check the contacts for corrosion and safe contact. Repeat the parameter identification
SF026	The setup-routine is aborted.

8 Technical data

8.1 Size 1 ACU 201 (0.25 up to 1.1 kW, 230 V)

Type							
ACU 201			-01	-03	-05	-07	-09
Size			1				
Output, motor side							
Recommended motor shaft power	P	kW	0.25	0.37	0.55	0.75	1.1
Output current	I	A	1.6	2.5	3.0	4.0	5.4 [5]
Long-term overload current (60 s)	I	A	3.2	5.0	4.5	6.0	7.3
Short-term overload current (1 s)	I	A	3.2	5.0	6.0	8.0	8.0
Output voltage	U	V	Maximum input voltage, three-phase				
Protection	-	-	Short circuit / earth fault proof				
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency				
Switching Frequency	f	kHz	2, 4, 8, 12, 16				
Output, braking resistor							
Min. Brake resistance	R	Ω	100	100	100	100	100
Recommended Brake resistance (U_{dBC} = 385 V)	R	Ω	430	300	230	160	115
Input, mains side							
Mains current[3] 3ph 1ph/N/PE; 2ph	I	A	1.6 2.9	2.5 4.5	3 5.4	4 7.2	5.5 [1] 9.5 [2]
Mains voltage	U	V	184 ... 264				
Mains frequency	f	Hz	45 ... 66				
Fuse 3ph 1ph/N; 2ph	I	A	6 6	6 10			10 16
UL-Type 250 VAC RK5, 3ph 1ph/N; 2ph	I	A	6 6	6 10			10 15
Mechanical							
Dimensions	HxWxD	mm	190 x 60 x 175				
Weight approx.	m	kg	1.2				
Ingress protection rating	-	-	IP20 (EN60529)				
Connection terminal	A	mm^2	0.2 ... 1.5				
Form of assembly	-	-	vertical				
Ambient conditions							
Energy dissipation (2 kHz Switching Frequency)	P	W	32	38	43	53	73
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	T_L	°C	-25 ... 55				
Transport temperature	T_T	°C	-25 ... 70				
Relative humidity	-	%	15 ... 85; not condensing				

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [6]					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
0.25 kW	1.6 A	1.6 A	1.6 A	1.3 A	1.1 A
0.37 kW	2.5 A	2.5 A	2.5 A	2.1 A	1.7 A
0.55 kW	3.0 A	3.0 A	3.0 A	2.5 A	2.0 A
0.75 kW	4.0 A	4.0 A	4.0 A	3.4 A	2.7 A
1.1 kW	5.4 A [2]	5.4 A [2] [5]	5.4 A [2] [5]	4.5 A [2] [5]	3.7 A [5]

[1] Three-phase connection requires a commutating choke.
[2] One- and two-phase connection requires a commutating choke.
[3] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[4] Maximum output current = 9.5 A with single-phase and two-phase connection
[5] Reduction of switching frequency in thermal limit range
[6] Maximum current in continuous operation

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8.2 Size 2 ACU 201 (1.5 up to 3.0 kW, 230 V)

Type					
ACU 201			-11	-13	-15
Size			2		
Output, motor side					
Recommended motor shaft power	P	kW	1.5	2.2	3.0 [4]
Output current	I	A	7.0	9.5	12.5 [4] [5]
Long-term overload current (60 s)	I	A	10.5	14.3	16.2
Short-term overload current (1 s)	I	A	14.0	19.0	19.0
Output voltage	U	V	Maximum input voltage, three-phase		
Protection	-	-	Short circuit / earth fault proof		
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency		
Switching Frequency	f	kHz	2, 4, 8, 12, 16		
Output, braking resistor					
Min. Brake resistance	R	Ω	37	37	37
Recommended Brake resistance (U_{dBC} = 385 V)	R	Ω	75	55	37
Input, mains side					
Mains current [3] 3ph 1ph/N; 2ph	I	A	7 13.2	9.5 16.5 [2]	10.5 [1] 16.5 [2] [4]
Mains voltage	U	V	184 ... 264		
Mains frequency	f	Hz	45 ... 66		
Fuse 3ph 1ph/N; 2ph	I	A	10 16	16 20	16 20
UL-Type 250 VAC RK5, 3ph 1ph/N; 2ph	I	A	10 15	15 20	15 20
Mechanical					
Dimensions	HxWxD	mm	250 x 60 x 175		
Weight approx.	m	kg	1.6		
Ingress protection rating	-	-	IP20 (EN60529)		
Connection terminal	A	mm^2	0.2 ... 1.5		
Form of assembly	-	-	vertical		
Ambient conditions					
Energy dissipation (2 kHz Switching Frequency)	P	W	84	115	170
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)		
Storage temperature	T_L	°C	-25 ... 55		
Transport temperature	T_T	°C	-25 ... 70		
Relative humidity	-	%	15 ... 85; not condensing		

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [6]					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
1.5 kW	7.0 A	7.0 A	7.0 A	5.9 A	4.8 A
2.2 kW	9.5 A [2]	9.5 A [2]	9.5 A [2]	8.0 A [2]	6.5 A
3.0 kW [2] [4]	12.5 A [1]	12.5 A [1] [5]	12.5 A [1] [5]	10.5 A [1] [5]	8.5 A [5]

[1] Three-phase connection requires a commutating choke.
[2] One- and two-phase connection requires a commutating choke.
[3] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[4] Maximum output current = 9.5 A with single-phase and two-phase connection
[5] Reduction of switching frequency in thermal limit range
[6] Maximum current in continuous operation

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8.3 Sizes 3 and 4 ACU 201 (4.0 up to 9.2 kW, 230 V)

Type						
ACU 201			-18	-19	-21	-22
Size			3		4	
Output Motorseitig						
Recommended motor shaft power	P	kW	4.0	5.5 [4)]	7.5 [4)]	9.2 [4)]
Output current	I	A	18.0	22.0	32.0	35.0
Long-term overload current (60 s)	I	A	26.3	30.3	44.5	51.5
Short-term overload current (1 s)	I	A	33.0	33.0	64.0	64.0
Output voltage	U	V	Maximum input voltage, three-phase			
Protection	-	-	Short circuit / earth fault proof			
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency			
Switching Frequency	f	kHz	2, 4, 8, 12, 16			
Output, braking resistor						
Min. Brake resistance	R	Ω	24	24	12	12
Recommended Brake resistance (U_{dBC} = 385 V)	R	Ω	30	24	16	12
Input, mains side						
Mains current [3)] 3ph 1ph/N; 2ph	I	A	18 28 [2) 7)]	20 [1)] - [4)]	28.2 [1)] - [4)]	35.6 [1)] - [4)]
Mains voltage	U	V	184 ... 264			
Mains frequency	f	Hz	45 ... 66			
Fuse 3ph 1ph/N; 2ph	I	A	25 35	25 - [4)]	35 - [4)]	50 - [4)]
Mechanical						
Dimensions	HxWxD	mm	250x100x200		250x125x200	
Weight approx.	m	kg	3.0		3.7	
Ingress protection rating	-	-	IP20 (EN60529)			
Connection terminal	A	mm^2	0.2 ... 6		0.2 ... 16	
Form of assembly	-	-	vertical			
Ambient conditions						
Energy dissipation (2 kHz Switching Frequency)	P	W	200	225	310	420
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)			
Storage temperature	T_L	°C	-25 ... 55			
Transport temperature	T_T	°C	-25 ... 70			
Relative humidity	-	%	15 ... 85; not condensing			

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [6)]					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
4.0 kW	18.0 A [2)]	18.0 A [2)]	18.0 A [2)]	15.1 A [2)]	12.2 A
5.5 kW [4)]	23.0 A [1)]	22.7 A [1), 5)]	22.0 A [1), 5)]	18.5 A [5)]	15.0 A [5)]
7.5 kW [4)]	32.0 A [1)]	32.0 A [1)]	32.0 A [1)]	26.9 A [1)]	21.8 A
9.2 kW [4)]	40.0 A [1)]	38.3 A [1), 5)]	35.0 A [1), 5)]	29.4 A [1), 5)]	23.8 A [5)]

[1)] Three-phase connection requires a commutating choke.
[2)] One- and two-phase connection requires a commutating choke.
[3)] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[4)] Three-phase connection permissible only.
[5)] Reduction of switching frequency in thermal limit range
[6)] Maximum current in continuous operation
[7)] Device for single-phase mains connection is not included in the product catalog. However, it is available upon request.

8.4 Size 1 ACU 401 (0.25 up to 1.5 kW, 400 V)

Type								
ACU 401			-01	-03	-05	-07	-09	-11
Size			1					
Output, motor side								
Recommended motor shaft power	P	kW	0.25	0.37	0.55	0.75	1.1	1.5
Output current	I	A	1.0	1.6	1.8	2.4	3.2	3.8 [3)]
Long-term overload current (60 s)	I	A	2.0	3.2	2.7	3.6	4.8	5.7
Short-term overload current (1 s)	I	A	2.0	3.2	3.6	4.8	6.4	7.6
Output voltage	U	V	Maximum input voltage, three-phase					
Protection	-	-	Short circuit / earth fault proof					
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency					
Switching Frequency	f	kHz	2, 4, 8, 12, 16					
Output, braking resistor								
Min. Brake resistance	R	Ω	300	300	300	300	300	300
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	930	930	930	634	462	300
Input, mains side								
Mains current [2)]	I	A	1.0	1.6	1.8	2.4	2.8 [1)]	3.3 [1)]
Mains voltage	U	V	320 ... 528					
Mains frequency	f	Hz	45 ... 66					
Fuses	I	A	6					
UL-Type 600 VAC RK5	I	A	6					
Mechanical								
Dimensions	HxWxD	mm	190 x 60 x 175					
Weight approx.	m	kg	1.2					
Ingress protection rating	-	-	IP20 (EN60529)					
Connection terminal	A	mm^2	0.2 ... 1.5					
Form of assembly	-	-	vertical					
Ambient conditions								
Energy dissipation (2 kHz Switching Frequency)	P	W	30	35	40	46	58	68
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)					
Storage temperature	T_L	°C	-25 ... 55					
Transport temperature	T_T	°C	-25 ... 70					
Relative humidity	-	%	15 ... 85, not condensing					

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [4)]					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
0.25 kW	1.0 A	1.0 A	1.0 A	0.8 A	0.7 A
0.37 kW	1.6 A	1.6 A	1.6 A	1.3 A	1.1 A
0.55 kW	1.8 A	1.8 A	1.8 A	1.5 A	1.2 A
0.75 kW	2.4 A	2.4 A	2.4 A	2.0 A	1.6 A
1.1 kW	3.2 A [1)]	3.2 A [1)]	3.2 A [1)]	2.7 A [1)]	2.2 A
1.5 kW [1)]	3.8 A	3.8 A [3)]	3.8 A [3)]	3.2 A [3)]	2.6 A [3)]

[1)] Three-phase connection requires a commutating choke.
[2)] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3)] Reduction of switching frequency in thermal limit range
[4)] Maximum current in continuous operation

8.5 Size 2 ACU 401 (1.85 up to 4.0 kW, 400 V)

Type						
ACU 401			-12	-13	-15	-18
Size			2			
Output, motor side						
Recommended motor shaft power	P	kW	1.85	2.2	3.0	4.0
Output current	I	A	4.2	5.8	7.8	9.0 [3]
Long-term overload current (60 s)	I	A	6.3	8.7	11.7	13.5
Short-term overload current (1 s)	I	A	8.4	11.6	15.6	18.0
Output voltage	U	V	Maximum input voltage, three-phase			
Protection	-	-	Short circuit / earth fault proof			
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency			
Switching Frequency	f	kHz	2, 4, 8, 12, 16			
Output, braking resistor						
Min. Brake resistance	R	Ω	136	136	136	92
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	300	220	148	106
Input, mains side						
Mains current [2]	I	A	4.2	5.8	6.8 [1]	7.8 [1]
Mains voltage	U	V	320 ... 528			
Mains frequency	f	Hz	45 ... 66			
Fuseen	I	A	6	10		
UL-Type 600 VAC RK5	I	A	6	10		
Mechanical						
Dimensions	HxWxD	mm	250 x 60 x 175			
Weight approx.	m	kg	1.6			
Ingress protection rating	-	-	IP20 (EN60529)			
Connection terminal	A	mm^2	0.2 ... 1.5			
Form of assembly	-	-	vertical			
Ambient conditions						
Energy dissipation (2 kHz Switching Frequency)	P	W	68	87	115	130
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)			
Storage temperature	T_L	°C	-25 ... 55			
Transport temperature	T_T	°C	-25 ... 70			
Relative humidity	-	%	15 ... 85, not condensing			

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current 4)					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
1.85 kW	4.2 A	4.2 A	4.2 A	3.5 A	2.9 A
2.2 kW	5.8 A	5.8 A	5.8 A	4.9 A	3.9 A
3.0 kW	7.8 A [1]	7.8 A [1]	7.8 A [1]	6.6 A [1]	5.3 A
4.0 kW	9.0 A [1]	9.0 A [1] [3]	9.0 A [1] [3]	7.6 A [1] [3]	6.1 A [3]

[1] Three-phase connection requires a commutating choke
[2] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3] Reduction of switching frequency in thermal limit range
[4] Maximum current in continuous operation

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8.6 Sizes 3 and 4 ACU 401 (5.5 up to 15.0 kW, 400 V)

Type							
ACU 401			-19	-21	-22	-23	-25
Size			3			4	
Output, motor side							
Recommended motor shaft power	P	kW	5.5	7.5	9.2	11.0	15.0
Output current	I	A	14.0	18.0	22.0 [3]	25.0	32.0
Long-term overload current (60 s)	I	A	21.0	26.3	30.3	37.5	44.5
Short-term overload current (1 s)	I	A	28.0	33.0	33.0	50.0	64.0
Output voltage	U	V	Maximum input voltage, three-phase				
Protection	-	-	Short circuit / earth fault proof				
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency				
Switching Frequency	f	kHz	2, 4, 8, 12, 16				
Output, braking resistor							
Min. Brake resistance	R	Ω	48	48	48	32	32
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	80	58	48	48	32
Input, mains side							
Mains current [2]	I	A	14.2	15.8 [1]	20.0 [1]	26.0	28.2 [1]
Mains voltage	U	V	320 ... 528				
Mains frequency	f	Hz	45 ... 66				
Fuses	I	A	16	25		35	
UL-Type 600 VAC RK5	I	A	20			30	40
Mechanical							
Dimensions	HxWx D	mm	250x100x200			250x125x200	
Weight approx.	m	kg	3.0			3.7	
Ingress protection rating	-	-	IP20 (EN60529)				
Connection terminal	A	mm^2	0.2 ... 6			0.2 ... 16	
Form of assembly	-	-	vertical				
Ambient conditions							
Energy dissipation (2 kHz Switching Frequency)	P	W	145	200	225	240	310
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)				
Storage temperature	T_L	°C	-25 ... 55				
Transport temperature	T_T	°C	-25 ... 70				
Relative humidity	-	%	15 ... 85, not condensing				

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current 4)					
Frequency inverter nominal power	Switching Frequency				
	2 kHz	4 kHz	8 kHz	12 kHz	16 kHz
5.5 kW	14.0 A	14.0 A	14.0 A	11.8 A	9.5 A
7.5 kW	18.0 A [1]	18.0 A [1]	18.0 A [1]	15.1 A [1]	12.2 A
9.2 kW [1]	23.0 A	22.7 A [3]	22.0 A [3]	18.5 A [3]	15.0 A [3]
11 kW	25.0 A	25.0 A	25.0 A	21.0 A	17.0 A
15 kW	32.0 A [1]	32.0 A [1]	32.0 A [1]	26.9 A [1]	21.8 A

[1] Three-phase connection requires a commutating choke
[2] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3] Reduction of switching frequency in thermal limit range
[4] Maximum current in continuous operation

8.7 Size 5 ACU 401 (18.5 up to 30.0 kW, 400 V)

Type					
ACU 401			-27	-29	-31
Size			5		
Output, motor side					
Recommended motor shaft power	P	kW	18.5	22.0	30.0
Output current	I	A	40.0	45.0	60.0
Long-term overload current (60 s)	I	A	60.0	67.5	90.0
Short-term overload current (1 s)	I	A	80.0	90.0	120.0
Output voltage	U	V	Maximum input voltage, three-phase		
Protection	-	-	Short circuit / earth fault proof		
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency		
Switching Frequency	f	kHz	2, 4, 8		
Output, braking resistor					
Min. Brake resistance	R	Ω	16		
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	26	22	16
Input, mains side					
Mains current [2]	I	A	42.0	50.0	58.0 [1]
Mains voltage	U	V	320 ... 528		
Mains frequency	f	Hz	45 ... 66		
Fuses	I	A	50		63
UL-Type 600 VAC RK5	I	A	50		60
Mechanical					
Dimensions	HxWxD	mm	250x200x260		
Weight approx.	m	kg	8		
Ingress protection rating	-	-	IP20 (EN60529)		
Connection terminal	A	mm^2	up to 25		
Form of assembly	-	-	vertical		
Ambient conditions					
Energy dissipation (2 kHz Switching Frequency)	P	W	445	535	605
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)		
Storage temperature	T_L	°C	-25 ... 55		
Transport temperature	T_T	°C	-25 ... 70		
Relative humidity	-	%	15 ... 85, not condensing		

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [3]			
Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
18.5 kW	40.0 A	40.0 A	40.0 A
22 kW	45.0 A	45.0 A	45.0 A
30 kW	60.0 A [1]	60.0 A [1]	60.0 A [1]

[1] Three-phase connection requires a commutating choke.
[2] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3] Maximum current in continuous operation

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8.8 Size 6 ACU 401 (37.0 up to 65.0 kW, 400 V)

Type						
ACU 401			-33	-35	-37	-39
Size			6			
Output, motor side						
Recommended motor shaft power	P	kW	37.0	45.0	55.0	65.0
Output current	I	A	75.0	90.0	110.0	125.0
Long-term overload current (60 s)	I	A	112.5	135.0	165.0	187.5
Short-term overload current (1 s)	I	A	150.0	180.0	220.0	250.0
Output voltage	U	V	Maximum input voltage, three-phase			
Protection	-	-	Short circuit / earth fault proof			
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency			
Switching Frequency	f	kHz	2, 4, 8			
Output, braking resistor [5]						
Min. Brake resistance	R	Ω	7.5			
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	13	11	9	7.5
Input, mains side						
Mains current [2]	I	A	87.0	104.0	105.0 [1]	120.0 [1]
Mains voltage	U	V	320 ... 528			
Mains frequency	f	Hz	45 ... 66			
Fuses	I	A	100	125	125	125
UL-Type 600 VAC RK5	I	A	100	125	125	125
Mechanical						
Dimensions	HxWx D	mm	400x275x260			
Weight approx.	m	kg	20			
Ingress protection rating	-	-	IP20 (EN60529)			
Connection terminal	A	mm^2	up to 70			
Form of assembly	-	-	Vertical			
Ambient conditions						
Energy dissipation (2 kHz Switching Frequency)	P	W	665	830	1080	1255
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)			
Storage temperature	T_L	°C	-25 ... 55			
Transport temperature	T_T	°C	-25 ... 70			
Relative humidity	-	%	15 ... 85, not condensing			

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [4]			
Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
37 kW	75.0 A	75.0 A	75.0 A
45 kW	90.0 A	90.0 A	90.0 A
55 kW	110.0 A [1]	110.0 A [1]	110.0 A [1]
65 kW	125.0 A [1] [3]	125.0 A [1] [3]	125.0 A [1] [3]

[1] Three-phase connection requires a commutating choke.
[2] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3] Reduction of switching frequency in thermal limit range
[4] Maximum current in continuous operation
[5] As an option, the frequency inverter of this size is available without internal brake transistor.

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8.9 Size 7 ACU 401 (75.0 up to 132.0 kW, 400 V)

Type						
ACU 401			-43	-45	-47	-49
Size			7			
Output, motor side						
Recommended motor shaft power	P	kW	75	90	110	132
Output current	I	A	150	180	210	250
Long-term overload current (60 s)	I	A	225	270	315	332
Short-term overload current (1 s)	I	A	270	325	375	375
Output voltage	U	V	Maximum input voltage, three-phase			
Protection	-	-	Short circuit / earth fault proof			
Rotary field frequency	f	Hz	0 ... 1000, depending on switching frequency			
Switching Frequency	f	kHz	2, 4, 8			
Output, braking resistor (external) [5)]						
Min. Brake resistance	R	Ω	4.5		3.0	
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	6.1	5.1	4.1	3.8
Input, mains side						
Mains current [2)]	I	A	143 [1)]	172 [1)]	208 [1)]	249 [1)]
Mains voltage	U	V	320 ... 528			
Mains frequency	f	Hz	45 ... 66			
Fuses	I	A	160	200	250	315
Fuses as per UL[6)] Fa. Cooper Bussmann	Type		FWH-250A	FWH-300A	FWH-350A	FWH-400A
Mechanical						
Dimensions	HxWxD	mm	510 x 412 x 351			
Weight approx.	m	kg	45		48	
Ingress protection rating	-	-	IP20 (EN60529)			
Connection terminal	A	mm^2	up to 2 x 95			
Form of assembly	-	-	Vertical			
Ambient conditions						
Energy dissipation (2 kHz Switching Frequency)	P	W	1600	1900	2300	2800
Coolant temperature	T_n	°C	0 ... 40 (3K3 DIN IEC 721-3-3)			
Storage temperature	T_L	°C	-25 ... 55			
Transport temperature	T_T	°C	-25 ... 70			
Relative humidity	-	%	15 ... 85, not condensing			

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [4)]			
Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
75 kW	150 A	150 A	150 A
90 kW	180 A	180 A	180 A
110 kW	210 A	210 A	210 A [3)]
132 kW	250 A	250 A	250 A [3)]

[1)] Three-phase connection requires a commutating choke.
[2)] Mains current with relative mains impedance ≥ 1% (see chapter "Electrical installation")
[3)] Reduction of switching frequency in thermal limit range
[4)] Maximum current in continuous operation
[5)] As an option, the frequency inverter of this size is available without internal brake transistor.
[6)] For UL-compliant fusing, the specified Cooper Bussmann fuses must be used. Other fuses must not be used for UL-conforming fusing.

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8.10 Size 8 ACU 401 (160.0...400.0 kW, 400 V)

Type								
ACU 401			-51	-53	-55	-57	-59	-61
Size			8					
Output, motor side								
Recommended motor shaft power	P	kW	160	200	250	315	355	400
Output current	I	$A_{eff.}$	305	380	475	595	645	735
Long-term overload current (60 s) [1]	I	$A_{eff.}$	460	570	715	895	970	1100
Short-term overload current (1 s) [2]	I	$A_{eff.}$	550	685	855	1070	1160	1330
Output voltage	U	$V_{eff.}$	Maximum input voltage, three-phase					
Protection	-	-	Short circuit / earth fault proof					
Rotary field frequency	f	Hz	±500 Hz [3]					
Switching Frequency	f	kHz	2, 4, 8 [4]					
Output, braking resistor (external) [5]								
Min. Brake resistance	R	Ω	1.20	1.20	1.20	0.80	0.80	0.80
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	1.50	1.50	1.50	1.00	1.00	1.00
Input, mains side								
Mains current [6]	I	A	280	350	440	550	620	690
Mains voltage	U	V	400					
Mains frequency	f	Hz	50 (60)					
Fuses [7]	I	A	400	500	630	700	800	900
Fuses as per UL [8] in preperation	Type							
Mechanical								
Dimensions	HxWxD	mm	1067 x 439 x 375					
Weight approx.	m	kg	120	120	120	140	140	140
Ingress protection rating	-	-	IP20 (EN60529)					
Connection terminal	A	mm^2	up to 2 x 240					
Form of assembly	-	-	Vertical					
Ambient conditions								
Energy dissipation (2 kHz Switching Frequency)	P	W	3800	4500	5600	6300	6850	7900
Coolant temperature	T_n	°C	-25 … 45 (3K3 DIN IEC 60721-3-3)					
Storage temperature	T_L	°C	-25 ... 55					
Transport temperature	T_T	°C	-25 ... 70					
Relative humidity	-	%	15 ... 85, not condensing					

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [9]

Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
160 kW	305	305	305
200 kW	380	380	380
250 kW	475	475	475
315 kW	595	595	595
355 kW	645	645	645
400 kW	735	735	735

[1] Power reduction with torsional frequencies below 10 Hz
[2] Only with torsional frequencies above 10 Hz
[3] depending on switching frequency
[4] Reduction of switching frequency possible on certain conditions
[5] As an option, the frequency inverter of this size is available without internal brake transistor.
[6] Rated value with recommended motor power, 400V mains voltage and mains inductance U_K=4%
[7] Semiconductor fuses recommended (in example Bussmann Type 170M)
[8] For UL-compliant fusing, the specified fuses must be used.
[9] Maximum current in continuous operation

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8.11 Size 8 ACU 501 (160.0...400.0 kW, 525 V)

Type								
ACU 501			-51	-53	-55	-57	-59	-61
Size			8					
Output, motor side								
Recommended motor shaft power	P	kW	160	200	250	315	355	400
Output current	I	$A_{eff.}$	230	290	360	450	490	560
Long-term overload current (60 s) [1]	I	$A_{eff.}$	345	435	540	675	735	840
Short-term overload current (1 s) [2]	I	$A_{eff.}$	420	520	650	810	880	1000
Output voltage	U	$V_{eff.}$	Maximum input voltage, three-phase					
Protection	-	-	Short circuit / earth fault proof					
Rotary field frequency	f	Hz	±500 Hz [3]					
Switching Frequency	f	kHz	2, 4, 8 [4]					
Output, braking resistor (extern) [5]								
Min. Brake resistance	R	Ω	1.20	1.20	1.20	0.80	0.80	0.80
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	2.70	2.70	2.70	1.50	1.50	1.50
Input, mains side								
Mains current [6]	I	A	215	270	335	420	470	525
Mains voltage [7]	U	V	525					
Mains frequency	f	Hz	50 (60)					
Fuses [8]	I	A	315	350	450	550	630	700
Fuses as per UL [9] in preperation	Type							
Mechanical								
Dimensions	HxWxD	mm	1067 x 439 x 375					
Weight approx.	m	kg	120	120	120	140	140	140
Ingress protection rating	-	-	IP20 (EN60529)					
Connection terminal	A	mm^2	up to 2 x 240					
Form of assembly	-	-	Vertical					
Ambient conditions								
Energy dissipation (2 kHz Switching Frequency)	P	W	3800	4500	5600	6300	6850	7900
Coolant temperature	T_n	°C	-25 ... 45 (3K3 DIN IEC 60721-3-3)					
Storage temperature	T_L	°C	-25 ... 55					
Transport temperature	T_T	°C	-25 ... 70					
Relative humidity	-	%	15 ... 85, not condensing					

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [10]

Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
160 kW	230	230	230
200 kW	290	290	290
250 kW	360	360	360
315 kW	450	450	450
355 kW	490	490	490
400 kW	560	560	560

[1] Power reduction with torsional frequencies below 10 Hz
[2] Only with torsional frequencies above 10 Hz
[3] depending on switching frequency
[4] Reduction of switching frequency possible on certain conditions
[5] As an option, the frequency inverter of this size is available without internal brake transistor.
[6] Rated value with recommended motor power, 400V mains voltage and mains inductance U_K=4%
[7] Note, that in addition to the AC 3x 525V connection a connection of AC 3x 400 V is required, see chapter 4.3.
[8] Semiconductor fuses recommended (in example Bussmann Type 170M)
[9] For UL-compliant fusing, the specified fuses must be used.
[10] Maximum current in continuous operation

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8.12 Size 8 ACU 601 (160.0...400.0 kW, 690 V)

Type								
ACU 601			-51	-53	-55	-57	-59	-61
Size			8					
Output, motor side								
Recommended motor shaft power	P	kW	160	200	250	315	355	400
Output current	I	$A_{eff.}$	180	230	280	350	400	450
Long-term overload current (60 s) [1]	I	$A_{eff.}$	270	350	420	530	600	675
Short-term overload current (1 s) [2]	I	$A_{eff.}$	330	420	510	630	720	810
Output voltage	U	$V_{eff.}$	Maximum input voltage, three-phase					
Protection	-	-	Short circuit / earth fault proof					
Rotary field frequency	f	Hz	±500 Hz [3]					
Switching Frequency	f	kHz	2, 4, 8 [4]					
Output, braking resistor (extern) [5]								
Min. Brake resistance	R	Ω	3.00	3.00	3.00	1.80	1.80	1.80
Recommended Brake resistance (U_{dBC} = 770 V)	R	Ω	5.00	5.00	5.00	3.00	3.00	3.00
Input, mains side								
Mains current [6]	I	A	160	200	250	320	360	410
Mains voltage [7]	U	V	690 (reduced for UL: 600)					
Mains frequency	f	Hz	50 (60)					
Fuses [8]	I	A	250	315	350	450	500	550
Fuses as per UL [9] in preparation	Type							
Mechanical								
Dimensions	HxWxD	mm	1067 x 439 x 375					
Weight approx.	m	kg	120	120	120	140	140	140
Ingress protection rating	-	-	IP20 (EN60529)					
Connection terminal	A	mm^2	up to 2 x 240					
Form of assembly	-	-	Vertical					
Ambient conditions								
Energy dissipation (2 kHz Switching Frequency)	P	W	3200	3950	4500	5500	6250	6900
Coolant temperature	T_n	°C	-25 ... 45 (3K3 DIN IEC 721-3-3)					
Storage temperature	T_L	°C	-25 ... 55					
Transport temperature	T_T	°C	-25 ... 70					
Relative humidity	-	%	15 ... 85, not condensing					

If required by the customer, the switching frequency may be increased if the output current is reduced at the same time. Comply with the applicable standards and regulations for this operating point.

Output current [10]			
Frequency inverter nominal power	Switching Frequency		
	2 kHz	4 kHz	8 kHz
160 kW	305	305	305
200 kW	380	380	380
250 kW	475	475	475
315 kW	595	595	595
355 kW	645	645	645
400 kW	735	735	735

[1] Power reduction with torsional frequencies below 10 Hz
[2] Only with torsional frequencies above 10 Hz
[3] depending on switching frequency
[4] Reduction of switching frequency possible on certain conditions
[5] As an option, the frequency inverter of this size is available without internal brake transistor.
[6] Rated value with recommended motor power, 400V mains voltage and mains inductance U_K=4%
[7] Note, that in addition to the AC 3x 525V connection a connection of AC 3x 400 V is required, see chapter 4.3.
[8] Semiconductor fuses recommended (in example Bussmann Type 170M)
[9] For UL-compliant fusing, the specified fuses must be used.
[10] Maximum current in continuous operation

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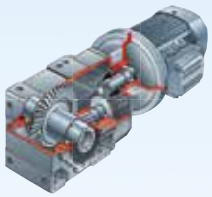
Sales program

Controls

- Frequency inverters/DC controllers
- Servo controls/PLC's
- Scada/adaptive control systems
- Pulse generators/Encoders/Tacho's
- Industrial control components



Reductors

- Worm gears
- Gearbox
- Planetary gearbox
- Servo drivers
- Mobile drives

Motors

- Three phase motors (with brake)/Single phase motors (with brake)
- Servo motors (with brake)/DC motors (with brake)
- ATEX/Explosion proof motors (with brake)
- Vibrator motors
- Hydraulic motors and brakes

Couplings

- Rigid/Semi rigid couplings
- Flexible/(High) elastic couplings
- Start/Clutch couplings
- Overrun/Safety couplings
- Brake/Clutch combination units

Open transmissions

- Gear transmissions
- Belt transmissions
- Chain transmissions
- Clamping bushes

Components

- Linear drives/Spindle drives
- Brakes (Disc/Block/Hydraulic/Pneumatic)
- Remote control cables
- Universal bearings/Safety chucks/Winding shafts
- Hydraulic valves and components

Transport

- Winches/Hoists /Lifting and hoisting accessories
- Lift tables/Lifting appliances
- Cargo lifts/Domestic lifts
- Internal logistic systems
- Transport equipment

Services

- Repair, Overhaul and maintenance of all makes and types of transmission components
- MRO (Maintenance Repair Overhaul)
- Diagnostics, preventive and corrective maintenance "On and of site"
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- Engineering and manufacturing of bespoke transmissions and refits
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- Repair, Overhaul and maintenance of all makes and types of transmission components.
- Maintenance Repair Overhaul.
- Winding an balancing of electric motors.

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- Overhaul of generator sets.
- Specialist in ATEX maintenance.
- Regional Sales of electro mechanical transmissions and inverters.

STOLK Services
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