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Hitachi frequency inverter series

Getting Started WJ-C1

WJ-C1 series

Safety and warning information

Before installing and commissioning the frequency inverter, please read this Getting Started carefully and observe all warnings and safety instructions. Always keep this Getting Started within easy reach near the frequency inverter.

Definition of clues

WARNING

Failure to follow these instructions can result in death, serious injury or significant property damage.

DANGER

Failure to follow these instructions could result in minor injury or property damage.

General

WARNING

- **This frequency converter generates dangerous electrical voltages and controls dangerously rotating, mechanical parts. Failure to follow the instructions given in this manual can result in death, serious injury or significant property damage.**
- **Installation, commissioning and maintenance of these drives may only be carried out by qualified personnel who are fully familiar with the functionality of the equipment and the entire machine.**
- **Frequency converters and line filters have capacitors that carry dangerously high voltages even after the mains has been switched off. Therefore, after switching off the mains voltage, wait at least 10 minutes before opening the device and working on it and check the intermediate circuit voltage between P(+) and N(–) as well as the voltage at the mains connection terminals with a suitable measuring device. It is important to ensure that no live parts are touched.**
- **Ground the frequency inverter and line filter at the connections provided and ensure that the leakage current exceeds 3.5mA. The minimum cross-section of the protective earthing conductor must comply with local safety regulations for high leakage current equipment (EN60204, EN61800-5-1).**
- **Earth fault protection only serves to protect the inverter and not to protect people.**
  Frequency converters powered by a three-phase network (C1-…HF) can cause a direct current in the protective earth conductor. Where a residual current device (RCD) or residual current monitoring device (RCM) is used for protection in the event of direct or indirect contact, only a Type B RCD or RCM is permitted on the power supply side of the drive
  (EN60204, EN61800-5-1).
- **The stop button on the built-in control panel must not be used for emergency stop purposes. The stop button can be deactivated using function b087.**
- **Stick the attached sticker with the danger warnings in the relevant national language clearly visible on the frequency converter.**
- **To avoid injuries and damage, do not touch any components inside the housing - neither with your hands nor with any objects - when mains voltage is present or the intermediate circuit capacitors are not discharged. Do not work on the wiring when mains voltage is present.**
- **Take special care when activating the automatic restart. To prevent injuries due to the frequency inverter restarting uncontrollably after a power failure, install a switching element on the power supply side that drops out in the event of a power failure and can only be switched on again by manual operation when the voltage returns (e.g. contactor, etc.).**
- **Please contact the engine or machine manufacturer if standard motors are used Frequencies >60Hz should be operated.**

WARNING

- **Make sure that the input voltage corresponds to the voltage recorded on the nameplate. Environmental influences such as high temperatures or high humidity should be avoided, as should dust, dirt and aggressive gases. The installation location should be a well-ventilated place not exposed to direct sunlight. Install the device on a non-combustible, vertical wall that does not transmit vibrations. Danger! Do not apply mains voltage to the output terminals U/T1, V/T2, W/T3.**

- **All frequency converters are tested for dielectric strength and insulation resistance. Insulation resistance measurements, for example as part of an inspection, may only be carried out between the power terminals and earth. Do not take insulation resistance measurements on the control terminals.**

- **Give the START/STOP operating signals via the control terminals or the control panel and not by switching the line or motor contactor. Do not install any capacitors or surge arresters in the motor supply lines. The STOP button on the built-in control panel must not be used for emergency stop purposes. The stop button can be deactivated under function b087.**
- **Before using the "Safe Standstill" (STO) function, a risk assessment of the machine or system must be carried out. It must be carefully checked whether the "STO" function can be used to meet the resulting safety requirements.**

DANGER

- **To ensure that your HITACHI frequency converter operates safely and reliably, all relevant safety regulations, e.g. B. Accident prevention regulations, trade association regulations, VDE regulations, etc. must be observed. Since these regulations are handled differently in German-speaking countries, the user must observe the requirements that apply to him. HITACHI cannot release the user from the obligation to follow the latest safety regulations.**

- **After delivery of the devices, make sure that there is no damage during transport. Check, whether the delivered goods (information on the nameplate) match the information on the delivery note and your order.**
- **The technical data and descriptions in these instructions have been created to the best of our knowledge and belief. However, product improvements are ongoing and Hitachi reserves the right to make such changes without notice. Despite careful preparation of this manual, Hitachi cannot be held liable for errors or damages resulting from the use of this manual.**

Proper use of the devices

The frequency inverters of the C1 series are not household appliances, but are intended as components exclusively for further use in commercial use. These are electrical equipment for controlling speed-controlled drives with three-phase motors and for installation in machines or assembly with other components to form a machine. Commissioning is prohibited until it has been established that the machine meets the protection requirements of the Machinery Directive 2006/42/EC (this corresponds to EN 60204) and complies with the EMC Directive 2014/30/EC. The responsibility for compliance with the EC guidelines when using the machine lies with the reuser.

The CE mark of your HITACHI frequency inverter documents compliance with the Low Voltage Directive (2014/35/EC) and the EMC Directive (2014/30/EC), provided that the appropriate radio interference suppression filter is used and the installation is carried out in accordance with the regulations. Applied standards: EN61800-5-1: 2007, EN61800-3: 2004 / A1: 2012

C1 frequency inverters are intended for use in industrial environments with their own supply network.
If the frequency converters are to be connected to the public low-voltage supply network, certain measures must be taken, which are described in chapter 2.2 CE-EMC installation.

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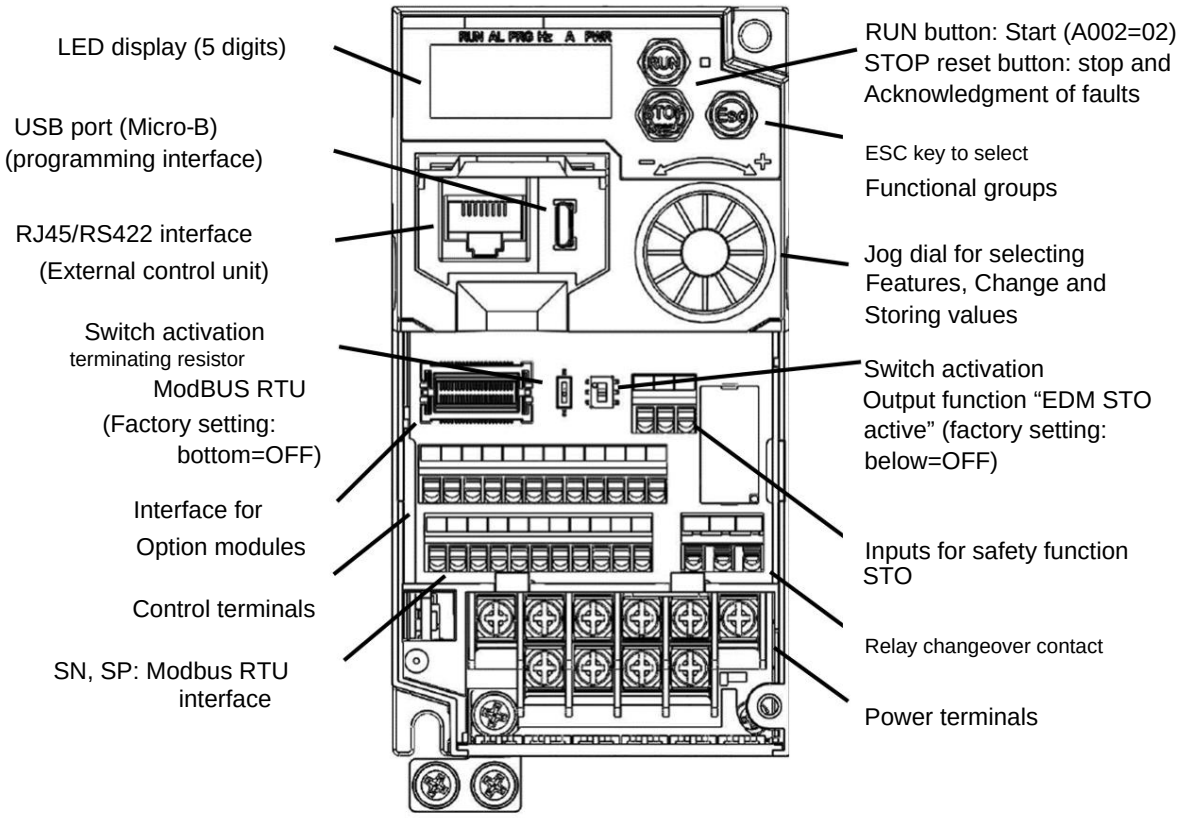
1. Project planning

1.1 Technical data

Series. WJ-C1-...SF	WJ-C1-…HF
Type 001 002 004 007 015 022 004 007 015 022 030 040 055 075 110 150	
Mains connection-1 ÿ 200...240V, -15%/+10%, 3 ÿ 380...460V, -15%/+10%, 50/60Hz (up to 480V +10% at voltage [V] 50/60Hz Overvoltage category 2)	
Load setting low duty / overload capacity 20% for 60s (see chapter 4.2, page 46)	
Rated engine power [kW] 0.25 0.37 0.75 1.5 2.2 3.0 0.75 1.5 2.2 3.0 4.0 5.5 7.5 11 15 18.5	
Rated output current [A] 1.2 1.9 3.5 6.0 9.6 12.0 2.1 4.1 5.4 6.9 8.8 11.1 17.5 23.0 31.0 38.0	
Rated input current [A] 2.2 3.8 7.3 13.8 20.2 24.0 2.1 4.3 5.9 8.1 9.4 13.3 20.0 24.0 38 44	
Load setting normal duty / overload capacity 50% for 60s (see chapter 4.2, page 46)	
Rated engine power [kW] 0.1 0.25 0.55 1.1 1.5 2.2 0.55 1.1	1.5 2.2 3.0 4.0 5.5 7.5 11 15
Rated output current [A] 1.0 1.6 3.0 5.0 8.0 11.0 1.8 3.4 4.8 5.5 7.2 9.2 14.8 18.0 24.0 31.0	
Rated input current [A] 2.0 3.0 6.3 11.5 16.8 22.0 1.8 3.6 5.2 6.5 7.7 11.0 16.9 18.8 29.4 35.9	
Line filter footprint filter FPF-9120-…-SW 10 10 10 14 24 24 5 5	Footprint filter FPF-9340-…-SW 10 10 10 14 30 30 50 50
Mass FU [kg] 1.0 1.0 1.1 1.6 1.8 1.8 1.5 1.8 1.8 1.8 2.0 2.0 3.5 3.5 4.5 4.5	
Mass filter [kg] 0.5 0.5 0.5 1.0 0.9 0.9 0.7 0.7 1.2 1.2 1.2 1.0 4.0 4.0 3.0 3.0	

Series. WJ-C1-...SF	WJ-C1-…HF
Type 001 002 004 007 015 022 004 007 015 022 030 040 055 075 110 150	
Power loss [W] Load setting Normal Duty (overload capacity 20%), clock frequency 6kHz	
Frequency converter 16 20 31 50 93 110 41 78 110 132 171 224 296 408 480 630	
Load setting High Duty (overload capacity 50%), clock frequency 6kHz	
Frequency converter 15 18 27 41 75 100 36 64 97 103 137 180 244 304 347 480	
Line filter 2 2 4 4 7216 19513 13 31 7 7	
Short term Braking torque [%] without resistance 50 50 50 50 50 20 50 50 50 20 20 20 20 20 10 10	
Brake chopper installed as standard	
Minimum ohm value for braking resistor [ÿ] at 10%ED 100 100 100 50 50 35 180 180 180 100 100 100 70 70 70 35	
Clock frequency 2.0...15kHz	
Protection class IP20	
Output voltage 3 ÿ 200...240V corresponding input voltage	3 ÿ 380...460V corresponding to input voltage
Output frequency 0…590Hz	
Working method PWM sine-coded, voltage-controlled, sensorless vector control SLV (200% at almost 0Hz), U/f Constant/reduced torque, U/f freely selectable	
Load capacity High Duty b049=01: 120% for 60s; Normal Duty b049=00: 150% for 60s	
Autotuning Automatic motor adjustment when at a standstill or in operation to make optimal use of the connected motor	
run up/down ramps 2 time ramps adjustable between 0.01 and 3600s, linear, S-curve, U-curve, inverted U-curve	
Starting torque 200% at 0.5Hz	
Fixed frequencies 16 fixed frequencies freely programmable	
DC brake duty cycle, switch-on frequency and braking torque programmable	
Speed accuracy +/-0.5% with vector control in the frequency range 5.0 ... 50Hz (up to nominal torque)	
Frequency accuracy • +/-0.2% (temperature range 25°C +/-10°C) with analog setpoint specification • +/-0.01% with digital setpoint specification	
Frequency resolution • Maximum frequency/1000 with analog setpoint specification • 0.01Hz with digital setpoint specification	
Digital inputs 7 pieces, programmable, normally open or normally closed, positive or negative logic	
Analog inputs 2 pieces, 0...10V (10kÿ), 4...20mA (100ÿ), resolution 10bit, also a thermistor input	
Pulse input 2 pieces, 24V DC, 32kHz (input 7 and 8)	
Digital outputs 2 pieces, type “Open Collector”; programmable, normally open or normally open, positive or negative Logic, switch-on and switch-off delays up to max. 100s programmable; logical connections of output signals	
Analog outputs 1 piece, 0...10V, 1mA, programmable	
Pulse output 1 piece, 10V DC, 2mA, 32kHz, programmable	
Relay output 1 piece, changeover contact, programmable	
PID controller Integrated PID controller with sleep mode for flow, pressure or temperature controls	
Motor potentiometer Integrated motor potentiometer with/without setpoint memory, setting range 0.01...3600s	
Positioning Optionally with one or two encoder tracks using pulse chain inputs, saving 8 positions, 2 different referencing, etc.	
Torque control Can be implemented in the SLV working method without an additional incremental encoder	
Interfaces USB (Mini-USB), RJ45, serial RS485 (ModBus RTU)	
Bus systems Hitachi ASCII protocol, ModBus RTU; Optionally ProfiBus, ProfiNet, EtherCat	
RoHS, CE, cULus conformity	
Protective functions overcurrent, overvoltage, undervoltage, overload, overtemperature, earth fault, thermistor monitoring, braking resistor monitoring, restart interlock, Safe Torque Off safety function, communication monitoring, incremental encoder monitoring, PLC program monitoring, etc.	
Environmental conditions Operation: -10 ... +40/50°C ambient temperature (depending on load setting, type of installation and Clock frequency), storage temperature: -20…+65°C 20...90% relative humidity (no condensation) Vibration/shock: 5.9m/s2 (0.6G) 10...55Hz Installation altitude max. 1000 above sea level	
Options External control unit, Windows-guided ProDrive programming software, braking resistor, Radio interference filters, line chokes, motor chokes, sine filters, fieldbus connection	

1.2 Device structure

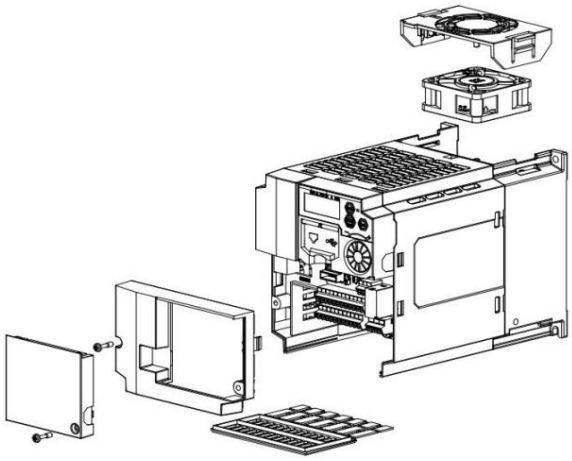


interface	Description
USB (Micro B)	Interface for parameterization and programming (ProDriveNext or ProDrive)
RS422 (RJ45)	Interface for connecting an external control unit. In this case, all buttons on the device are deactivated except for the STOP button. Network cable max. 3m
RS485 (ModBUS RTU)	The interface is connected to terminals SP and SN.
Interface option modules	Interface for connecting various communication modules (e.g. ProfiNet)
Slide switch	**Description**
DIP switch MDSW1	Slide switch to activate the terminating resistor (120ÿ) for RS485 OFF=terminating resistor deactivated (factory default) ON= terminating resistor activated
DIP switch EDM	OFF/down=no signal when “STO” is active (factory setting) ON/up=Signal EDM, if “STO” is active (see chapter **3.3.6 STO safety function)**

Structure using the example of the C1-030HF

1-Fan bracket*
2 fans*
3-Heatsink
4 housing
5 terminal cover
6 removable lids if one Option card is inserted
7-finger protection for cable entry

*The following devices have no fan:
C1-001…007SF, C1-004…007HF

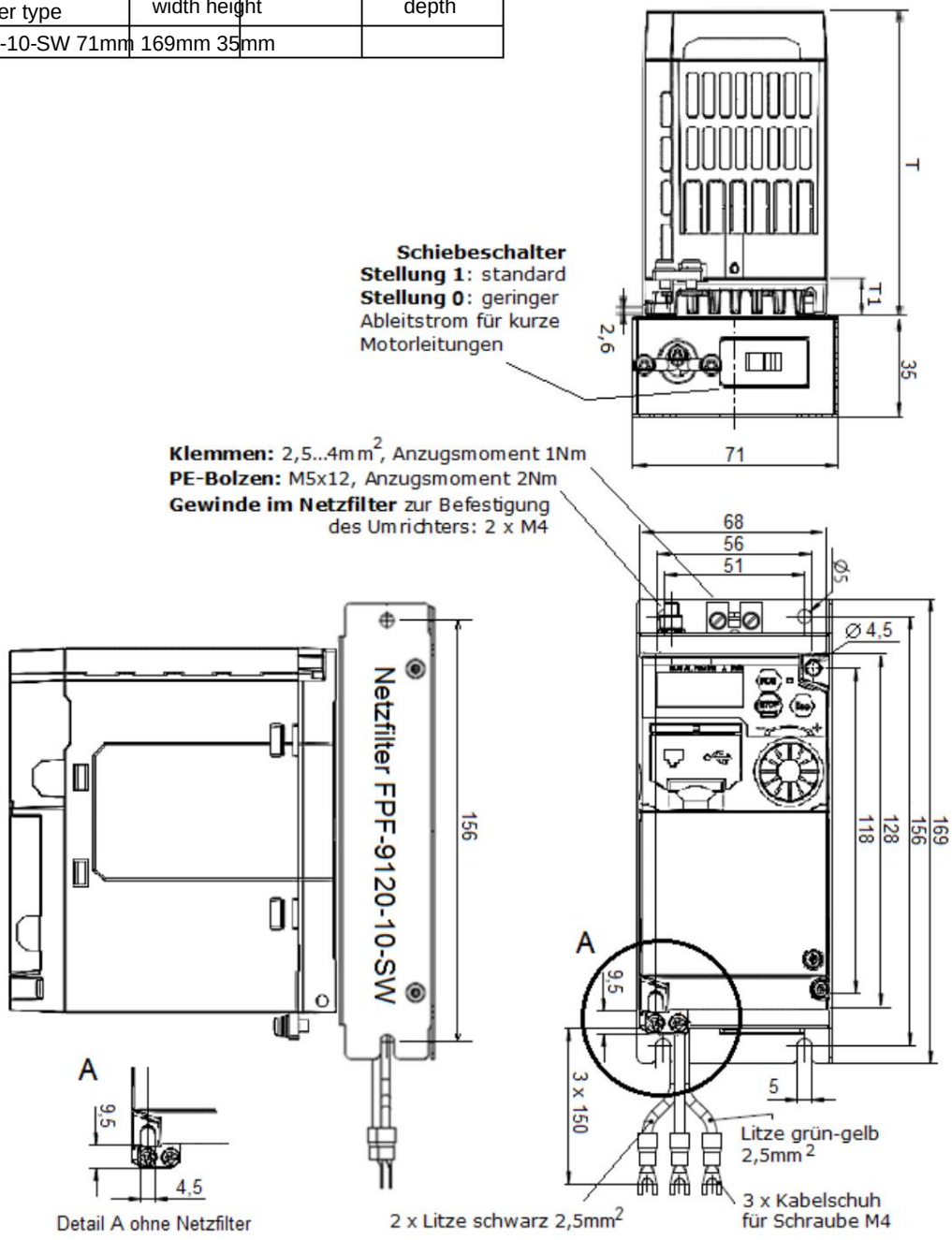


1.3 Dimensions

C1-001…004SF

FU type	Width Height Depth (T) Depth (T1)			
C1-001SF C1-002SF	68mm 128mm		109mm 13.5mm	
C1-004SF			122.5mm 27mm	

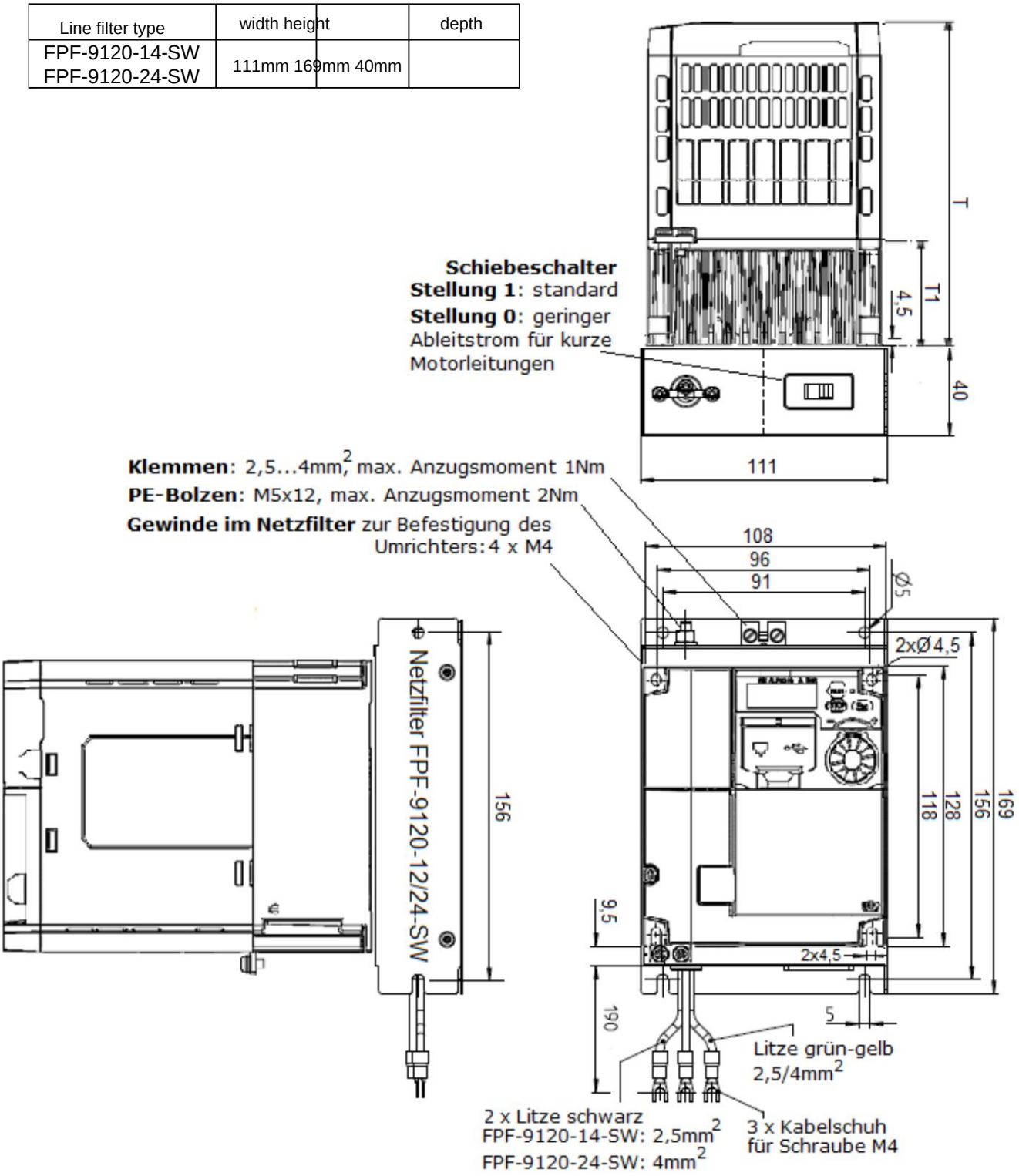
Line filter type	width height	depth
FPF-9120-10-SW 71mm 169mm 35mm		



C1-007…022SF

FU type	Width Height	Depth (T)	Depth (T1)	
C1-007SF C1-015SF C1-022SF	108mm 128mm	170.5mm	55.5mm	

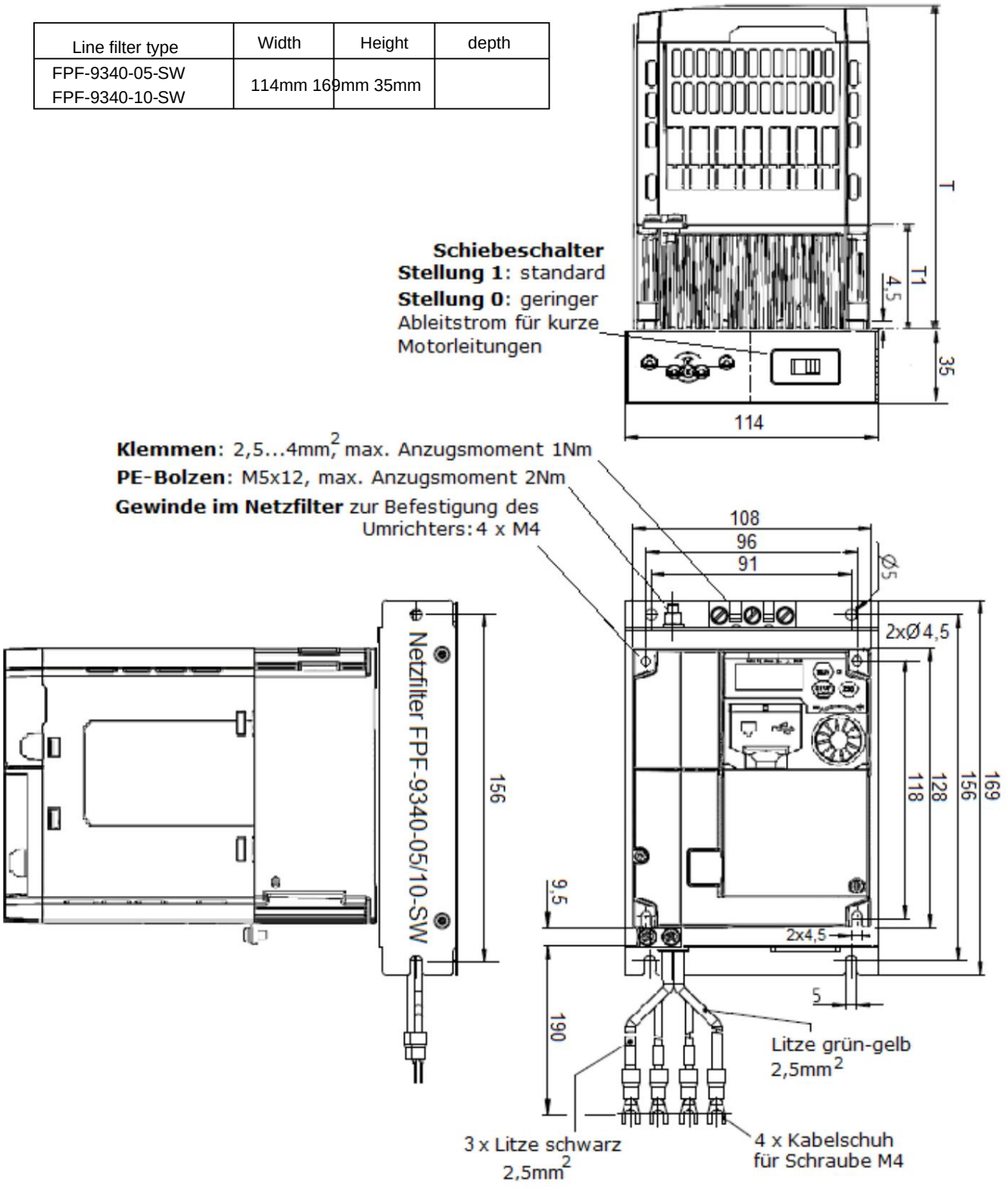
Line filter type	width height		depth
FPF-9120-14-SW FPF-9120-24-SW	111mm 169mm	40mm	



C1-004…030HF

FU type	Width	Height	Depth (T)	Depth (T1)
C1-004HF	108mm	128mm	143.5mm	28.5mm
C1-007HF C1-015HF C1-022HF C1-030HF	108mm	128mm	170.5mm	55.5mm

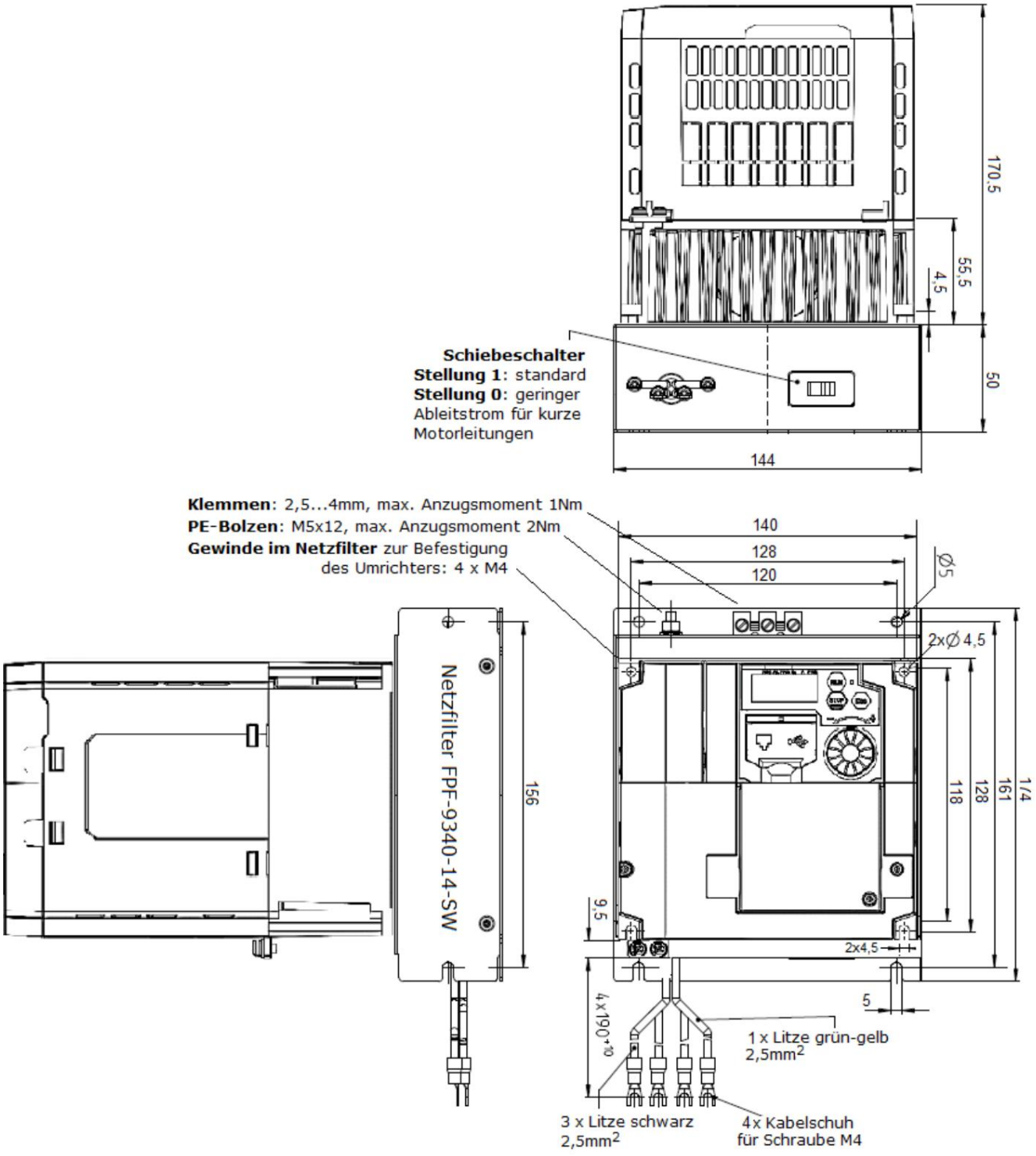
Line filter type	Width	Height	depth
FPF-9340-05-SW FPF-9340-10-SW	114mm	169mm	35mm



C1-040HF

FU type	width height	depth
C1-040HF	140mm 128mm 170.5mm	

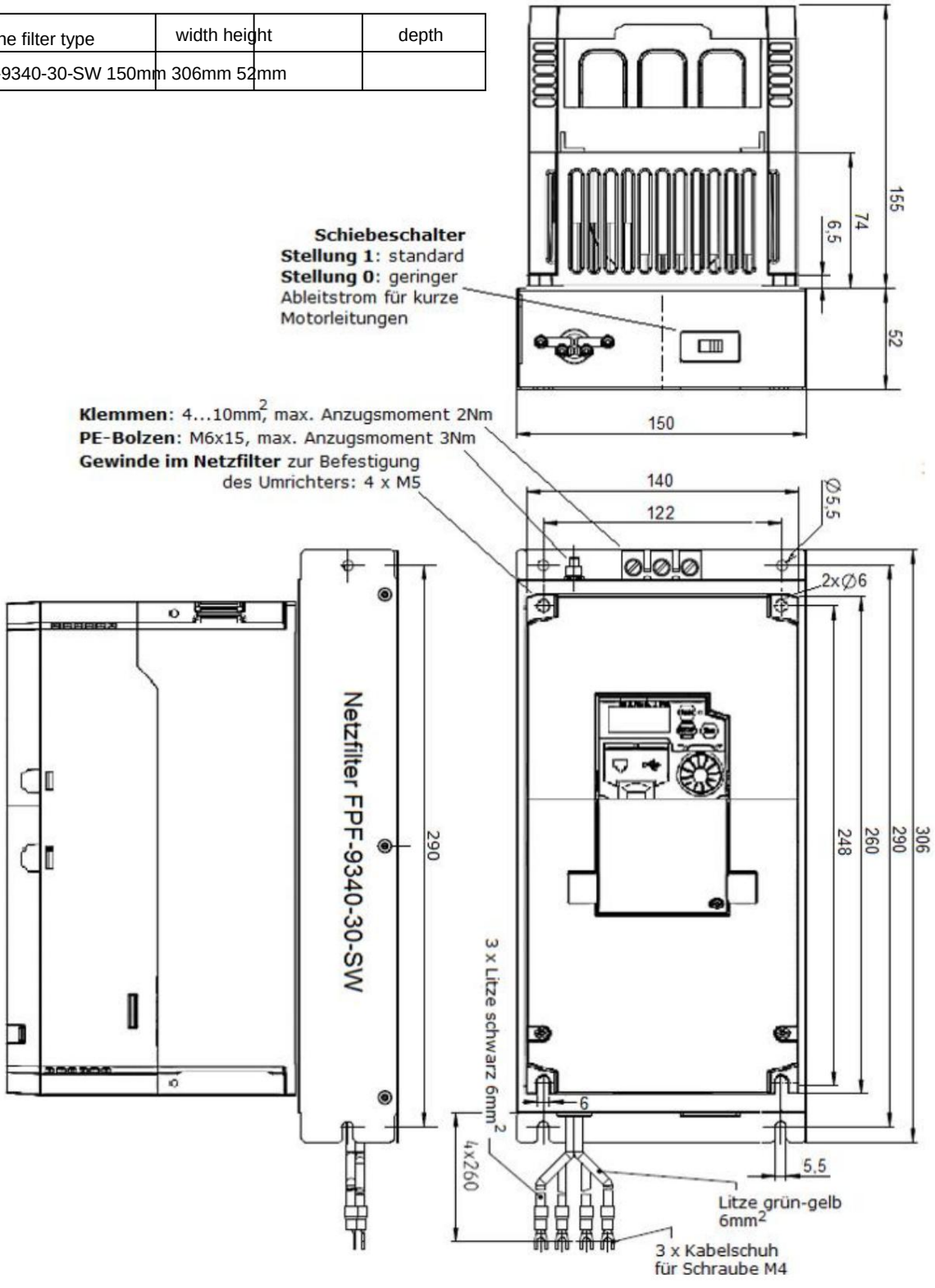
Line filter type	width height	depth
FPF-9340-14-SW 144mm 174mm 50mm		



C1-055…075HF

FU type	width height		depth
C1-055HF C1-075HF	140mm 260mm	155mm	

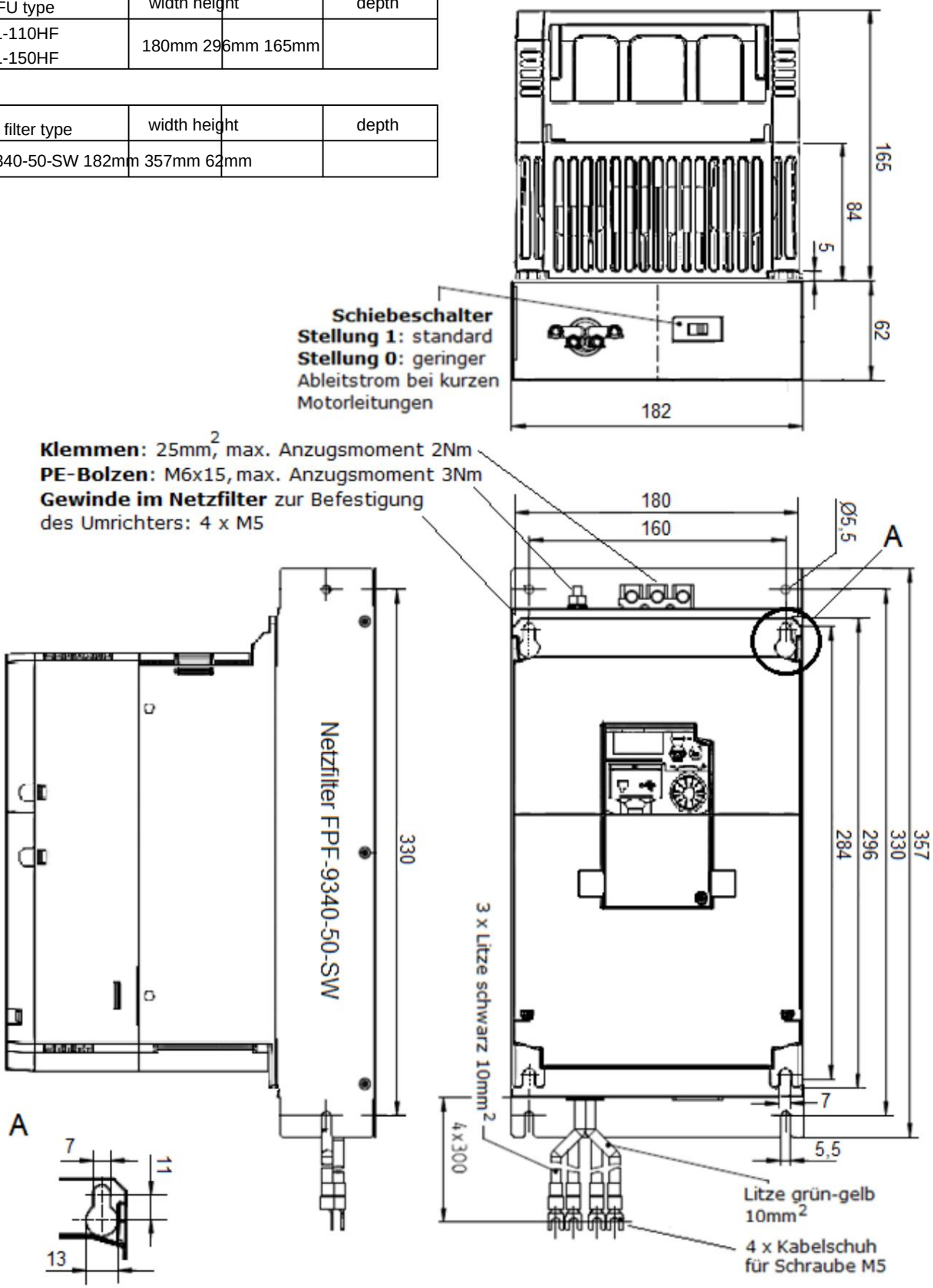
Line filter type	width height		depth
FPF-9340-30-SW	150mm 306mm	52mm	



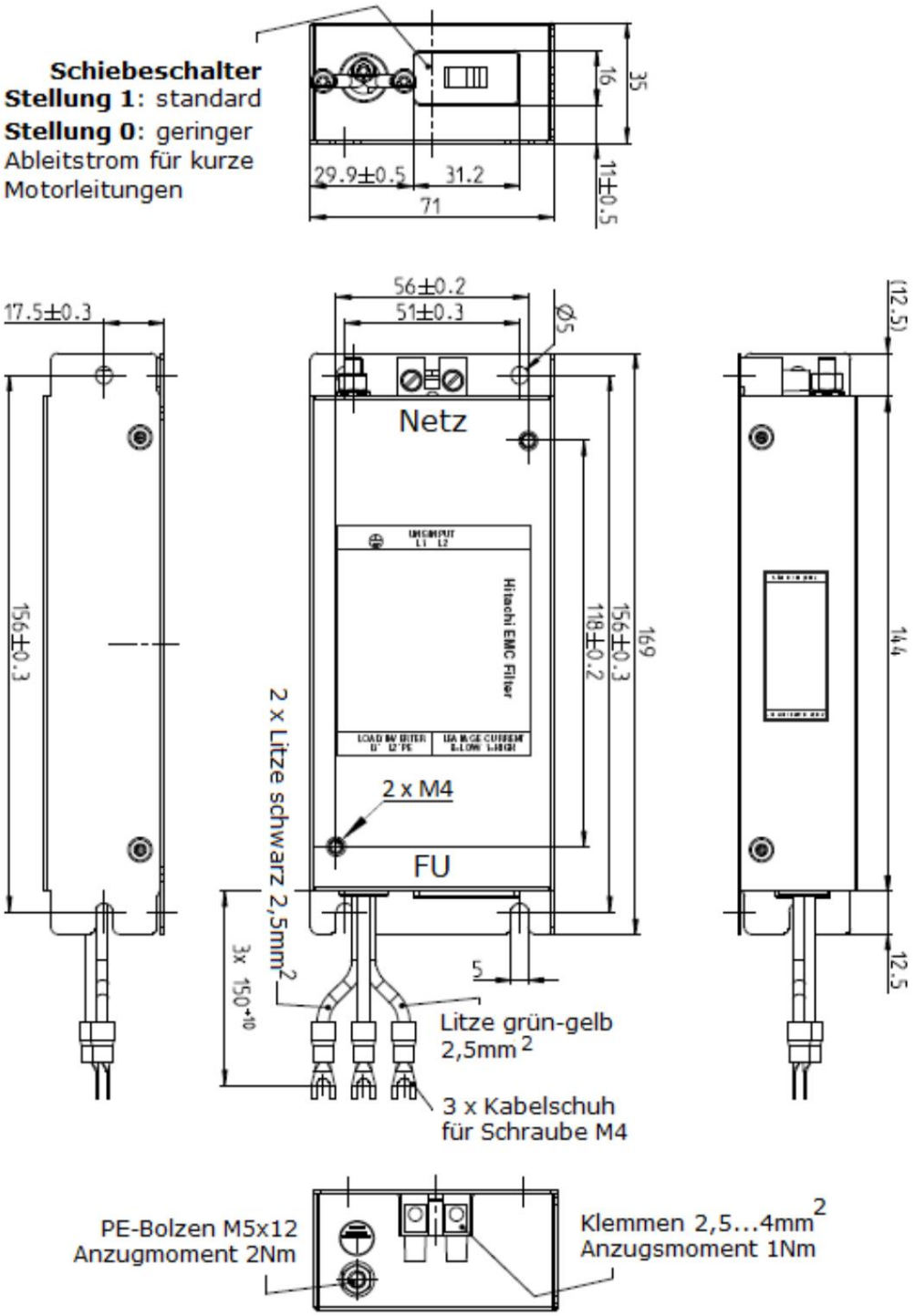
C1-110…150HF

FU type	width height		depth
C1-110HF C1-150HF	180mm 296mm	165mm	

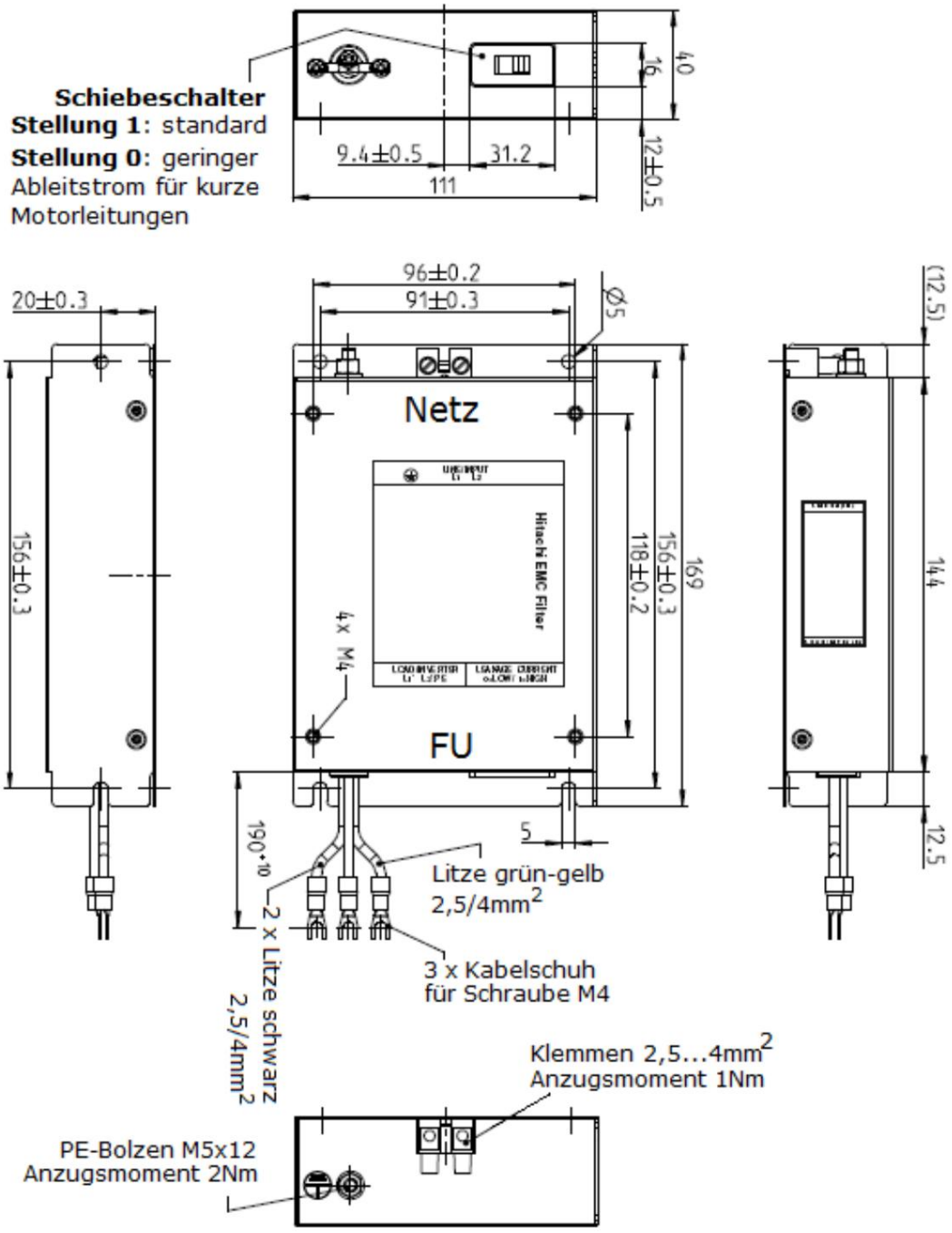
Line filter type	width height		depth
FPF-9340-50-SW	182mm 357mm	62mm	



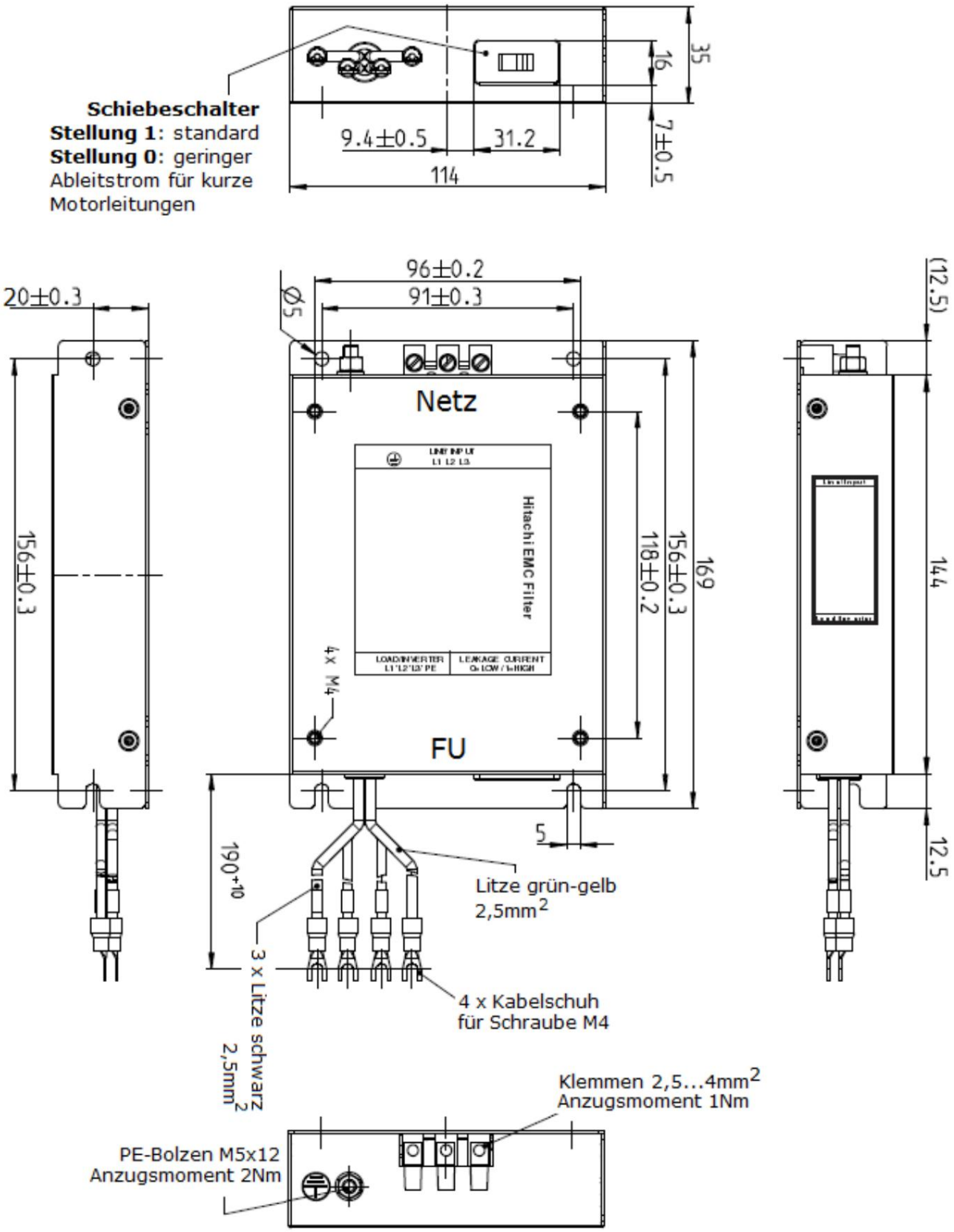
Line filter FPF-9120-10-SW



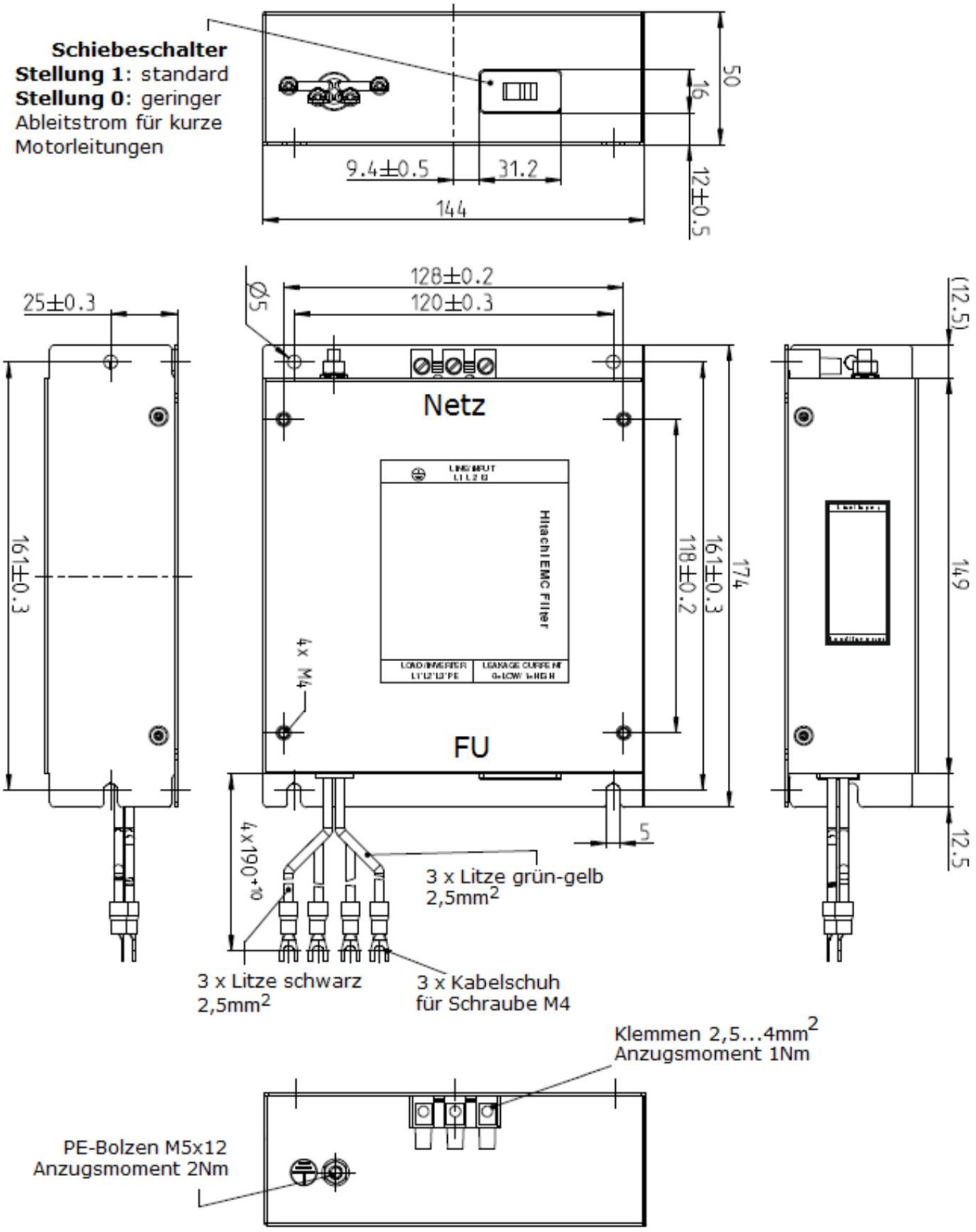
Line filter FPF-9120-14-SW, FPF-9120-24-SW



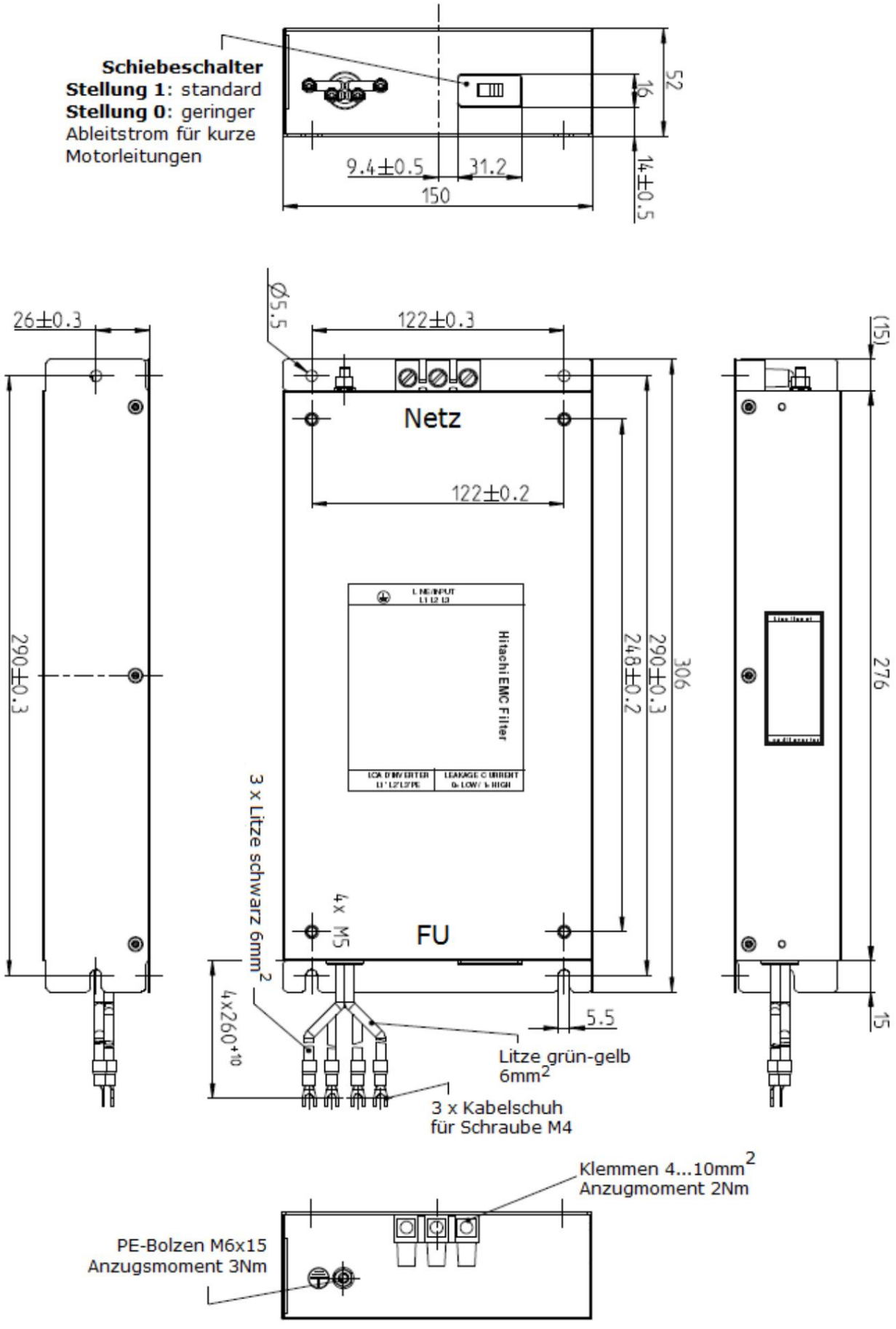
Line filter FPF-9340-05-SW, FPF-9340-10-SW



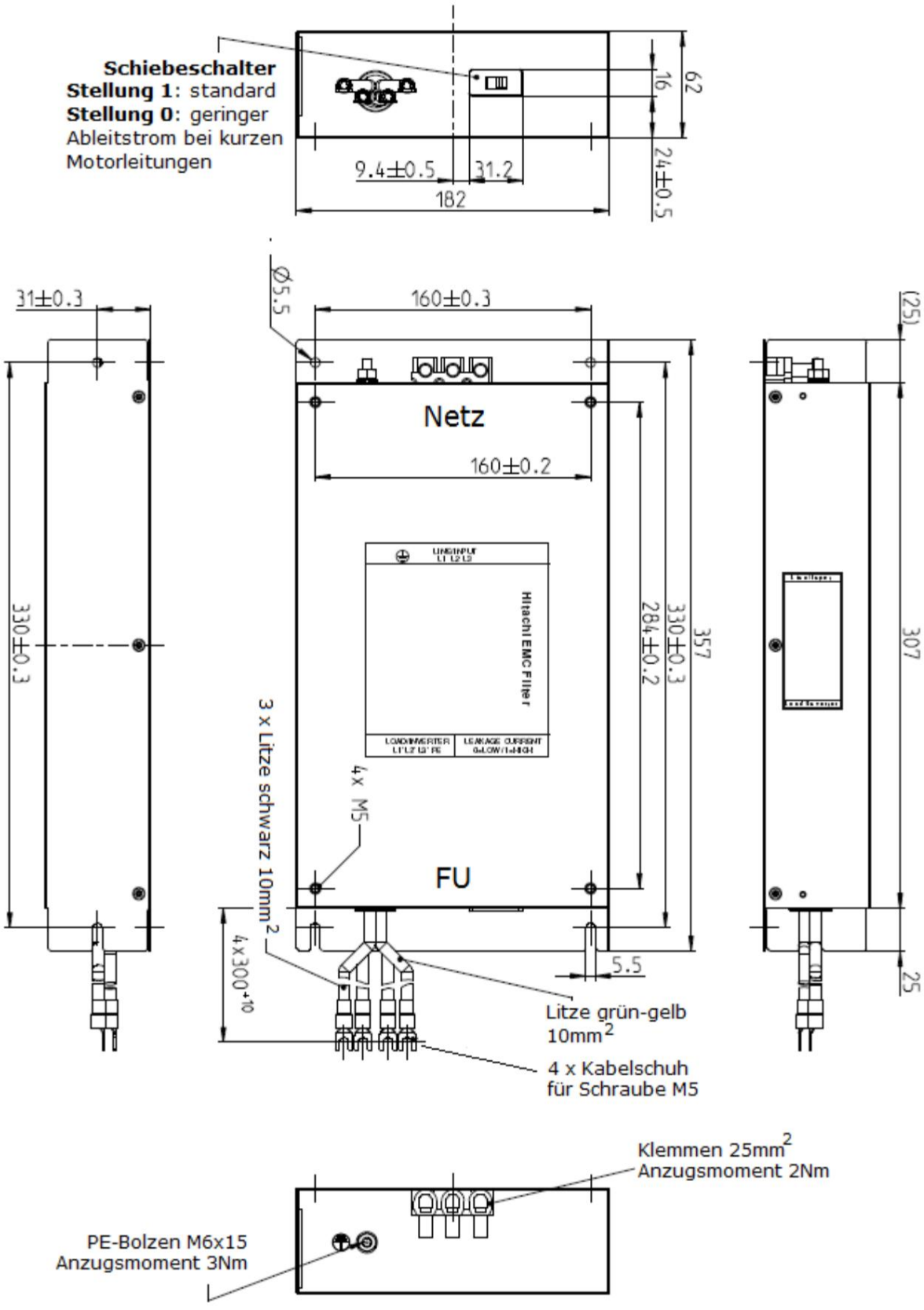
Line filter FPF-9340-14-SW



Line filter FPF-9340-30-SW



Line filter FPF-9340-50-SW



1.4 Power connections

Fuse protection / cable cross sections

For the design of the required cable cross-sections, see Chapter **3. Wiring** and observe the applicable regulations regarding current carrying capacity of cables, type of installation and ambient temperature.

Mains choke

The mains choke is installed in the mains supply line and does the following:
• Reduction of harmonic currents and thus reduction of the apparent network current
• Attenuation of current peaks caused by potential changes (e.g. through compensation systems or ground faults)
• Extension of the service life of the intermediate circuit capacitors

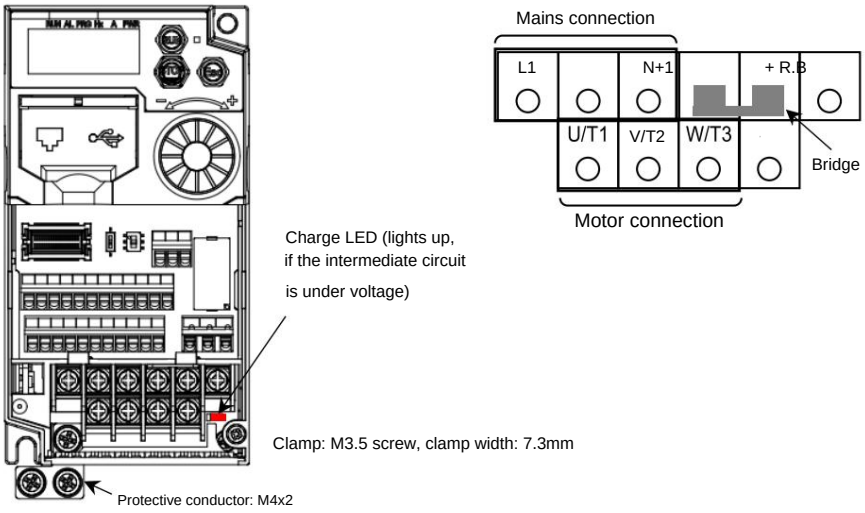
If at least one of the following conditions is met, a mains choke Uk=4% must be used:

• the power of the mains transformer is more than 10x greater than the converter power or is >500kVA
• the frequency converter is powered by a generator
• the supply voltage is >460V
• the grid asymmetry is >3%
When using a mains choke Uk=4%, there is no need to use a DC link choke.

When using a mains choke Uk=4%, there is no need to use a DC link choke.

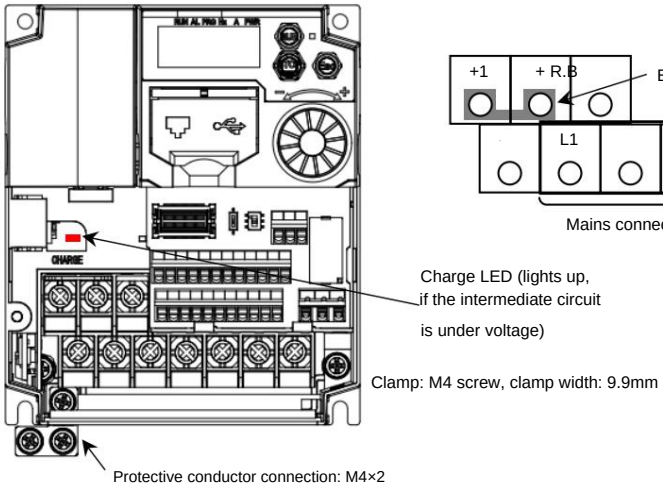
Arrangement of the power terminals

C1-001SF, C1-002SF, C1-004SF
Mains connection 1-phase 230V



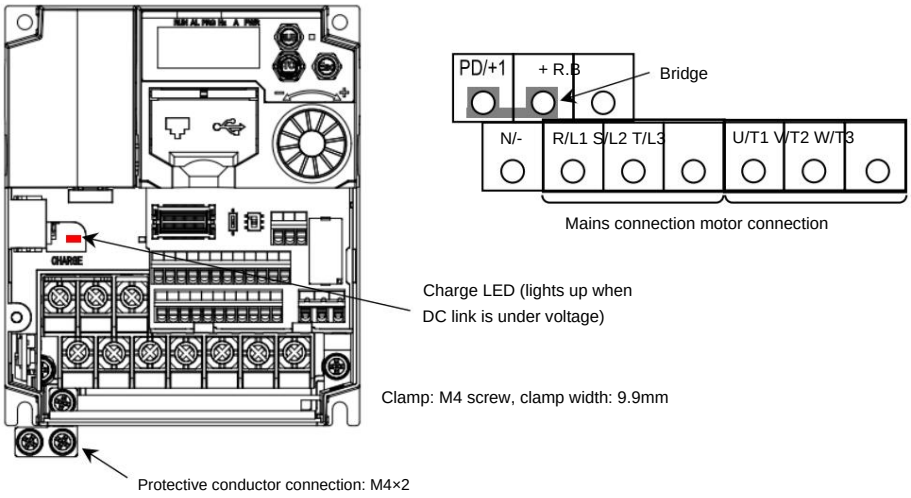
C1-007SF, C1-015SF, C1-022SF

Mains connection 1-phase 230V



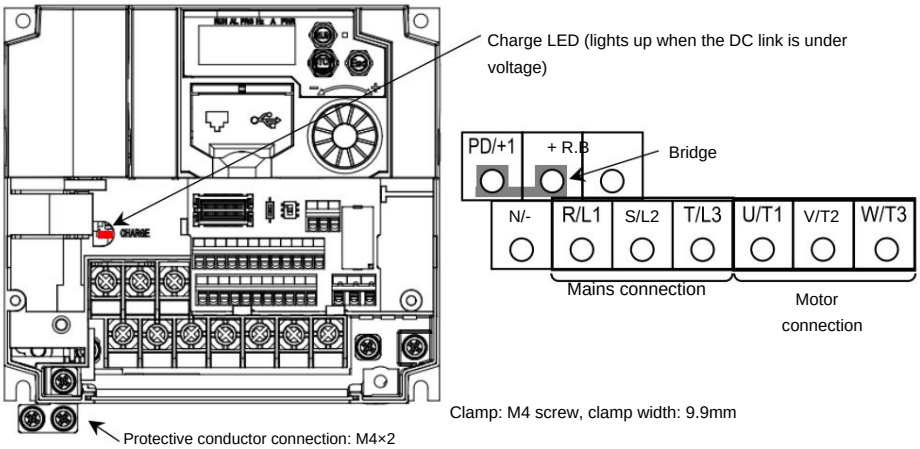
C1-004HF, C1-007HF, C1-015HF, C1-022HF, C1-030HF

Mains connection 3-phase 400V

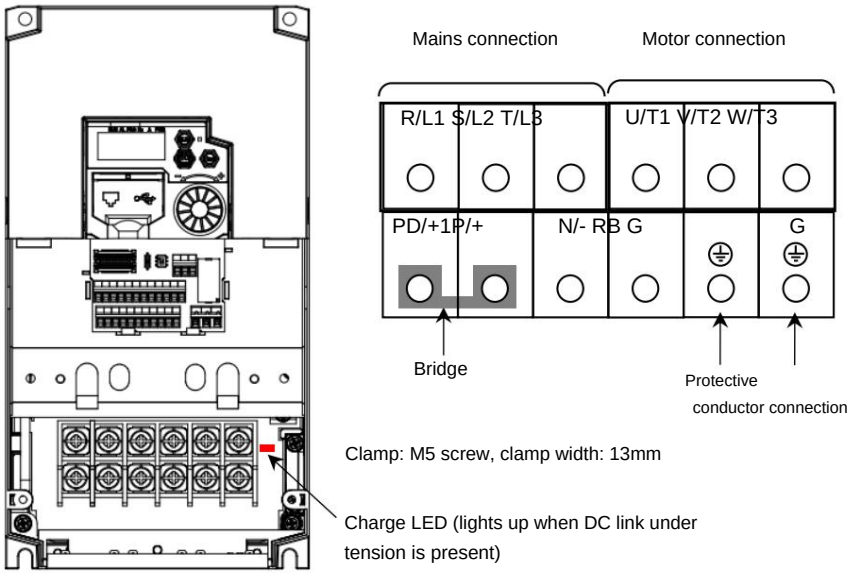


C1-040HF

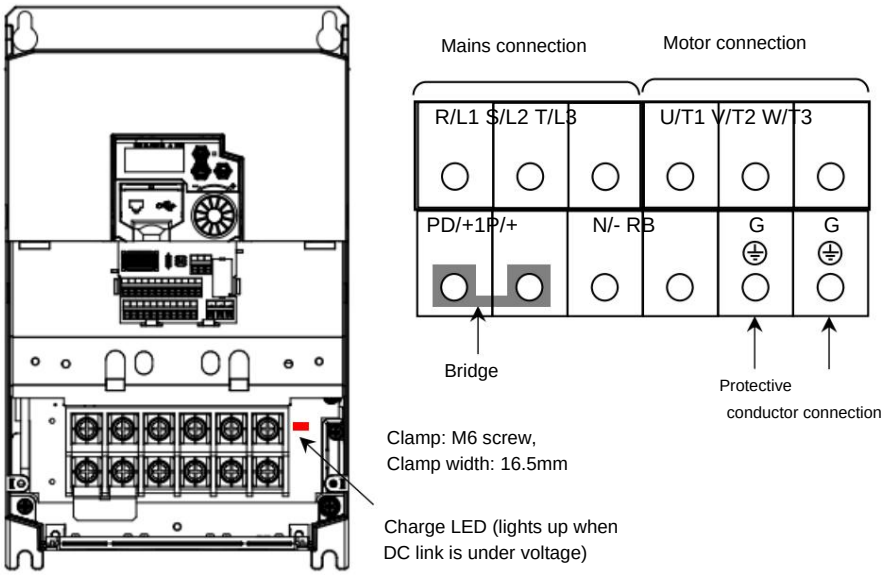
Mains connection 3-phase 400V



C1-055HF, C1-075HF
Mains connection 3-phase 400V



C1-055HF, C1-075HF
Mains connection 3-phase 400V



2. Assembly

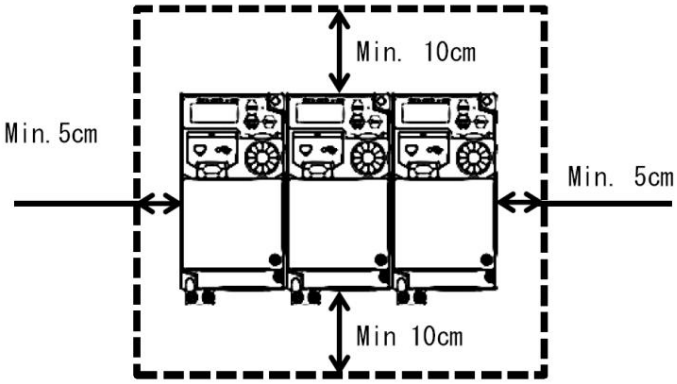
WARNING

Environmental influences such as high temperatures and high humidity should be avoided, as should dust, dirt and aggressive gases. The installation location should be a well-ventilated place not exposed to direct sunlight. Install the device on a non-combustible, vertical wall that does not transmit vibrations.

For heat convection reasons, the frequency converter must be installed vertically. Hold - especially when installing in niches - the specified minimum distances from side walls or other facilities. Objects that get inside the frequency inverter can cause damage.

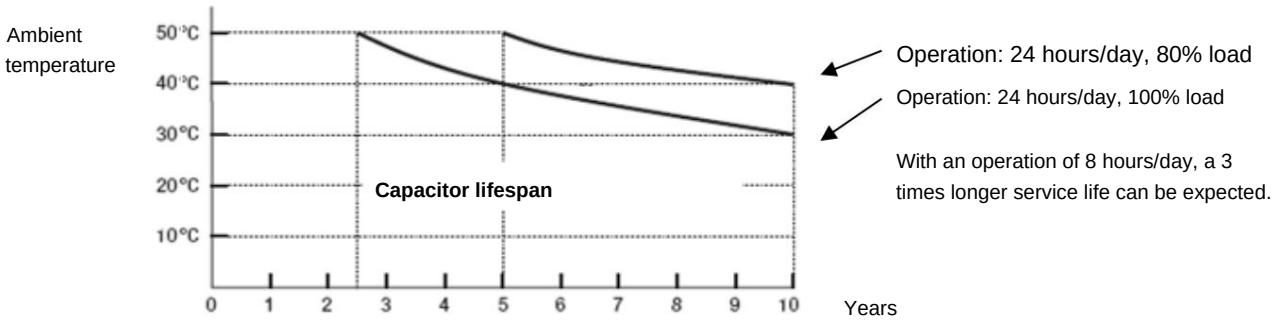
The minimum distances specified in the figure must be adhered to.

The following factors have a significant influence on the permissible load on the devices:
-Clock frequency (function b083); the higher the clock frequency, the greater the power loss
-Ambient temperature
-Installation situation (individual installation or side-by-side installation)



Side-by-side installation is only permitted up to an ambient temperature of max. 40°C!

In order to achieve the longest possible service life of the devices, the ambient temperature and power loss should be kept as low as possible.



When installing, please ensure that no objects such as: B. Cable insulation, metal shavings or dust can penetrate the housing. Avoid this by covering the frequency converter when it is de-energized.

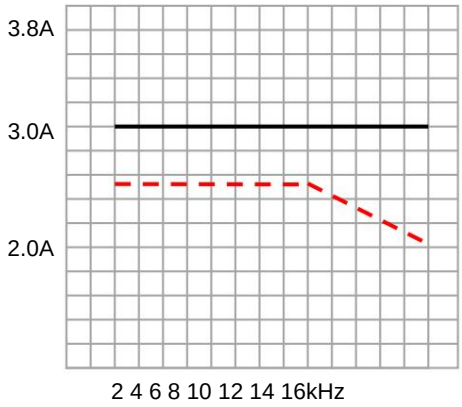
2.1 Derating (power reduction) at higher clock frequencies

For the types listed below, the permissible continuous output current must be reduced as specified at higher clock frequencies. All other types can be operated as individual devices with normal duty up to the maximum clock frequency of 15kHz or with low duty up to the maximum clock frequency of 10kHz with the specified rated current.

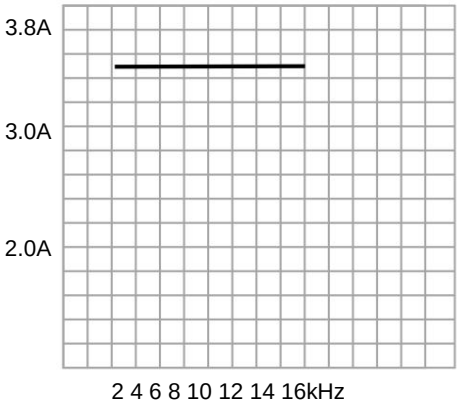
Ambient temperature 40°C: ——————
Ambient temperature 50°C: - - - - - -

C1-004SF

b049=00, normal duty
Irated=3.0A (4.5A for 60s)

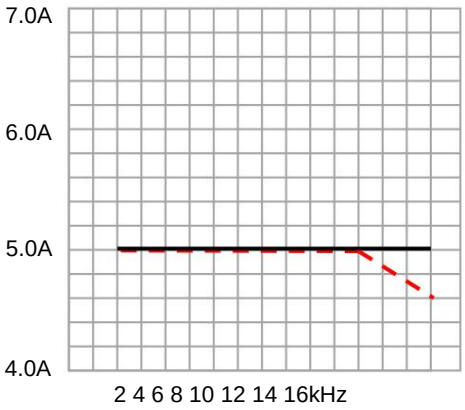


b049=01, low duty
Irated=3.5A (4.2A for 60s)

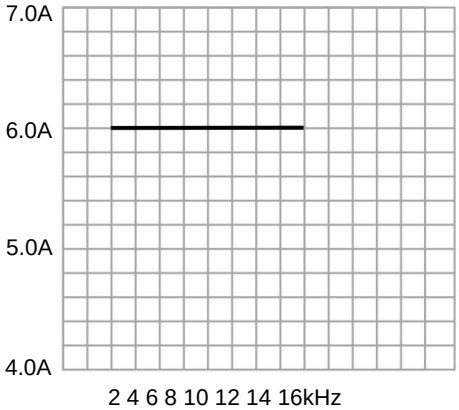


C1-007SF

b049=00, normal duty
Irated=5.0A (7.5A for 60s)

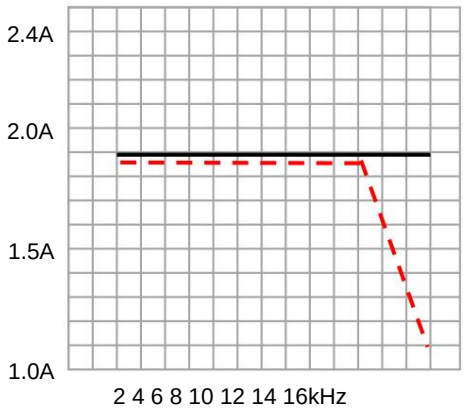


b049=01, low duty
Irated=6.0A (7.2A for 60s)

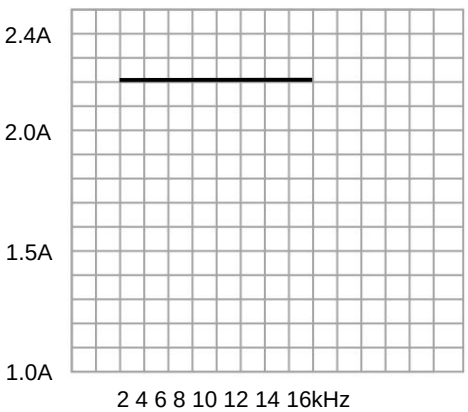


C1-004HF

b049=00, normal duty
Irated=1.8A (2.7A for 60s)

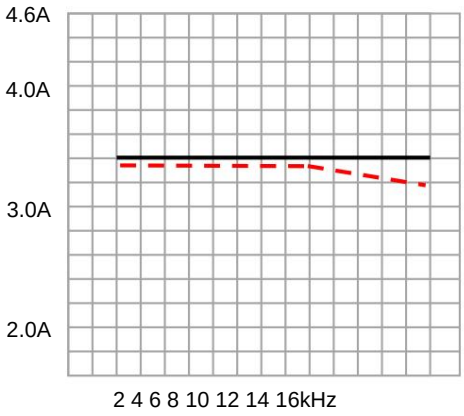


b049=01, low duty
Irated=2.1A (2.5A for 60s)

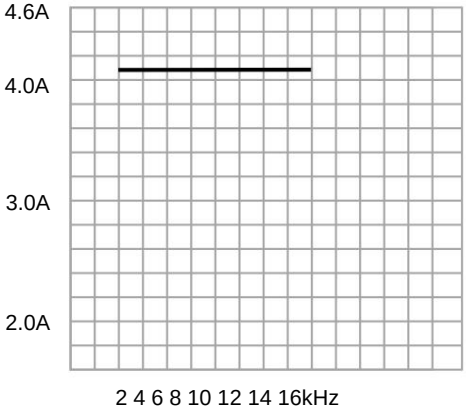


C1-007HF

b049=00, normal duty
Irated=3.4A (5.1A for 60s)

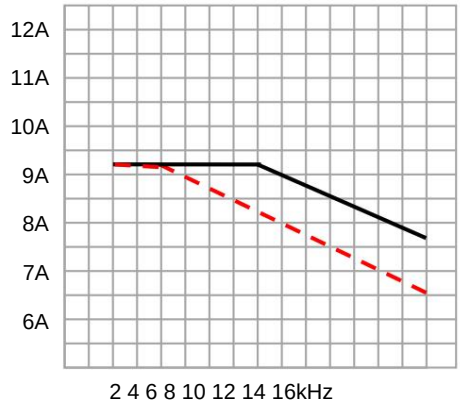


b049=01, low duty
Irated=4.1A (4.9A for 60s)

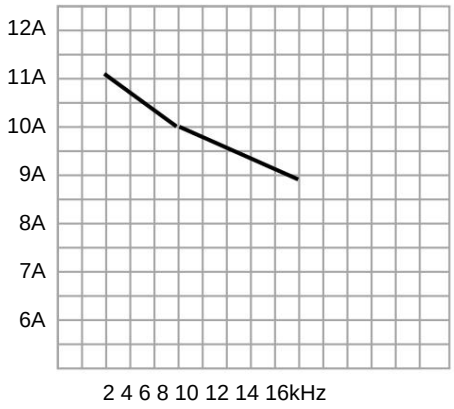


C1-040HF

b049=00, normal duty
Irated=9.2A (13.8A for 60s)

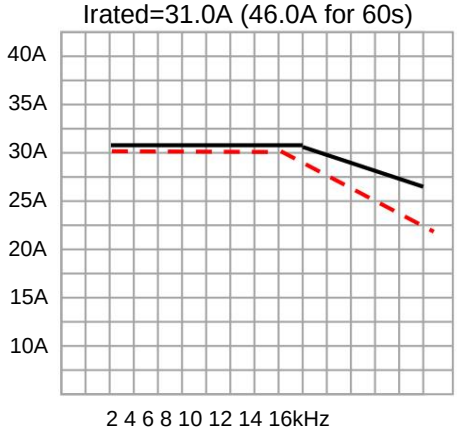


b049=01, low duty
Irated=11.1A (13.3A for 60s)

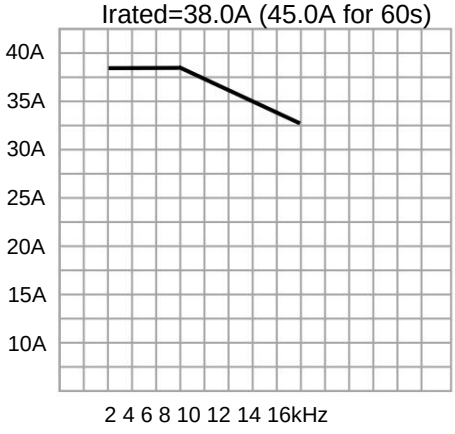


C1-150HF

b049=00, normal duty
Irated=31.0A (46.0A for 60s)



b049=01, low duty
Irated=38.0A (45.0A for 60s)



2.2 CE-EMC installation

WARNING

- **The optional line filters were developed for use in grounded networks. The stakes This filter is not permitted in unearthed networks.**
- **Capacitors between phase/phase and phase/earth as well as discharge resistors are installed in the filters. After switching off the mains voltage, you must wait at least 10 minutes before removing protective covers or touching connection terminals etc. Failure to do so poses a risk of electric shock.**
- **The protective conductor connection between the filter and the drive must be firm and permanent Connection must be carried out. Pluggable connections are not permitted.**
- **The leakage current is >3.5mA. These are the provisions of EN61800-5-1 and EN60204 Machines and systems with increased leakage current must be taken into account.**

DANGER

The frequency inverters of the C1 series are not household appliances, but are intended as components exclusively for further use in commercial use. These are electrical equipment for controlling speed-controlled drives with three-phase motors and for installation in machines or assembly with other components to form a machine. Commissioning is prohibited until it has been established that the machine complies with the EMC Directive 2014/30/EC and meets the protection requirements of the Machinery Directive 2006/42/EC (this corresponds to EN 60204). The responsibility for compliance with the EC guidelines when using the machine lies with the reuser. The CE mark of your HITACHI frequency inverter documents compliance with the Low Voltage Directive (2014/35/EC) and the EMC Directive (2014/30/EC), provided that the appropriate line filter is used and the installation is carried out in accordance with the regulations. In a residential environment - especially with motor cables >25m - the frequency inverters of the C1 series can cause high-frequency interference, which requires additional interference suppression measures.

C1 with line filter	Switch position	Max. clock frequency (Function b083)	Max. motor cable length	limit according to EN61800-3
C1-001…004SF FPF-9120-10-SW	0	9kHz	5m	C1
			10m	C2
	1	9kHz	25m	C1
			50m	C2
C1-007SF FPF-9120-14-SW	0	9kHz	5m	C1
			10m	C2
	1	9kHz	20m	C1
		10kHz	50m	C2
C1-015…022SF FPF-9120-24-SW	0	9kHz	5m	C1
			10m	C2
	1	9kHz	20m	C1
		10kHz	50m	C2
C1-004HF FPF-9340-05-SW	0	10kHz	5m	C1
			10m	C2
	1	10kHz	25m	C1
			50m	C2
C1-007…030HF FPF-9340-10-SW	0	10kHz	5m	C1
			10m	C2
	1	9kHz	10m	C1
		10kHz	50m	C2

C1 with line filter	Switch position	Max. clock frequency (Function b083)	Max. motor cable length	limit according to EN61800-3
C1-040HF FPF-9340-14-SW	0	10kHz	5m	C1*
			10m	C2
	1	10kHz	20m	C1
			50m	C2
C1-055HF FPF-9340-30-SW	0	10kHz	5m	C1*
			10m	C2
	1	10kHz	15m	C1
			50m	C2
C1-075HF FPF-9340-30-SW	0	10kHz	5m	C1*
			10m	C2
	1	10kHz	15m	C1
			50m	C2
C1-110…150HF FPF-9340-50-SW	0	10kHz	5m	C1
			10m	C2
	1	10kHz	25m	C1
			50m	C2

*Condition: A081=00 (AVR=ON)

Mains voltage requirements and installation regulations

• To comply with the specified limit values, the following minimum requirements apply to the network: Voltage tolerance -15… +10%; Unbalance between phases <3%; frequency fluctuations <4%; Total voltage distortion (THD) <10%.

• Mount the frequency inverter on the designated footprint-type line filter in a grounded metal housing on an electrically conductive and grounded mounting plate (e.g. galvanized).

• Ground the frequency converter and filter at the connections provided. grounding the engine; Electrical connection of the motor housing to the grounded machine base as large as possible; Remove any paint that may be present at the contact points.

• Shielded motor cable; Copper braid shield with coverage ÿ 85%; Ground the shield over a large area on both sides; Maximum length 50m. If the motor cable is longer, a motor choke must be used.

• Separation of the control cables from the mains and motor cables (min. 0.25m distance); intersections of If unavoidable, control and motor cables should be installed at right angles.

Frequency converters that are connected to the public low-voltage supply network must comply with limit values for harmonic currents. For devices with a current consumption ÿ16A, the limit values according to EN 61000-3-2 apply; for devices with a current consumption >16A and ÿ75A, EN 61000-3-12 applies. The following inverters only comply with the limit values with an adapted, optional DC link choke:

frequency converter	DC link choke	standard	Ssc*	Rsce
C1-001SF	GD-0.05-4.2-30	EN 61000-3-2	---	---
C1-002SF	GD-0.05-4.2-30	EN 61000-3-2	---	---
C1-004SF	GD-0.05-4.2-30	EN 61000-3-2	---	---
C1-004HF	GD-0.05-4.2-30	EN 61000-3-2	---	---
C1-007HF	GD-0.05-4.2-30	EN 61000-3-2	---	---
C1-055HF	GD-0.16-20.4-3.4	EN 61000-3-12*	1663kVA	>120
C1-075HF	GD-0.25-29.7-2.3	EN 61000-3-12*	1996kVA	>120
C1-110HF	GD-0.4-40.7-1.8	EN 61000-3-12*	3160kVA	>120
C1-150HF	GD-0.4-49.5-1.5	EN 61000-3-12*	3659kVA	>120

* The devices comply with EN 61000-3-12 provided that the short-circuit power Ssc at the connection point of the customer system to the public network is greater than or equal to the values specified above. It is the responsibility of the installer or operator of the device to ensure, if necessary after consultation with the network operator, that this device is only used on one

Connection point is connected whose Ssc value is greater than or equal to the above value. If these devices are to be connected to the public low-voltage network without an intermediate circuit choke, then a connection permit must be obtained from the network operator. The same also applies to all other types of this series not listed in the table, with or without a DC link choke.
Electrical connection of the throttle: The frequency converters are supplied with a bridge between terminal +1 and +. After removing this bridge, the choke is connected to +1 and +.

If at least one of the following conditions is met, a line choke Uk=4% must be used (if a line choke Uk=4% is used, the use of a DC link choke is unnecessary):

- the power of the mains transformer is more than 10x greater than the converter power or is >500kVA.
- the frequency converter is powered by a generator
- the supply voltage is >460V
- the grid asymmetry is >3%

Technical data line filter

Line filter FPF	Rated current at 40/50°C	Power terminals	Leakage current mains filter	
			Switch position 0 Nominal / Worst Case1	Switch position 1 Nominal / Worst Case1
FPF-9120-10-SW	8.0 / 7.3A	3.1 / 20mA	2.5…10mm2	5.1 / 362mA
FPF-9120-14-SW	14 / 12.8A	2.1 / 31mA	4…16mm2	4.1 / 552mA
FPF-9120-24-SW	24 / 22A	3.1 / 31mA	6…25mm2	6.1 / 455mA
FPF-9340-05-SW	5.0 / 4.6A	1.3 / 75mA	2.5…10mm2	3.0 / 172mA
FPF-9340-10-SW	11 / 10A	0.2 / 11mA	2.5…10mm2	2.9 / 1852mA
FPF-9340-14-SW	14 / 12.8A	1.3 / 76mA	4…16mm2	5.0 / 248mA
FPF-9340-30-SW	25 / 23A	4…10mm2	1.3 / 80mA	5.7 / 299mA
FPF-9340-50-SW	44 / 40A	1.3 / 81mA	10…25mm2	5.7 / 306mA

1 FPF-9120… series (mains connection 1~): Only phase connected, neutral conductor interrupted;
1 FPF-9340… series (mains connection 3~): Only one phase connected, 2 phases interrupted

Mains voltage	FPF-9120-…-SW series (mains connection 1~): 250V, 50/60Hz FPF-9340-…-SW series (mains connection 3~): 480V, 50/60Hz
Test voltage	Phase to earth: 2700VDC
overload capacity	1.5 x Inom for 3 minutes per hour or 2.5 x Inom for 30s per hour
Case material	Sheet steel Exception FPF-9340-05-SW and FPF-9340-10-SW: aluminum
Protection class	IP00

All radio interference suppression filters mentioned here are intended for installation in a control cabinet. The radio interference suppression filter types are designed **in a so-called footprint design** and are mounted behind the respective frequency converter - so they do not require any additional mounting space. Alternatively, the line filter can also be mounted to the left of the frequency converter.

Since the frequency converter is in most cases installed by professionals and used as a component in a machine or system, the responsibility for correct installation lies with the installer. The following information describes the EMC-compliant structure of your drive system.

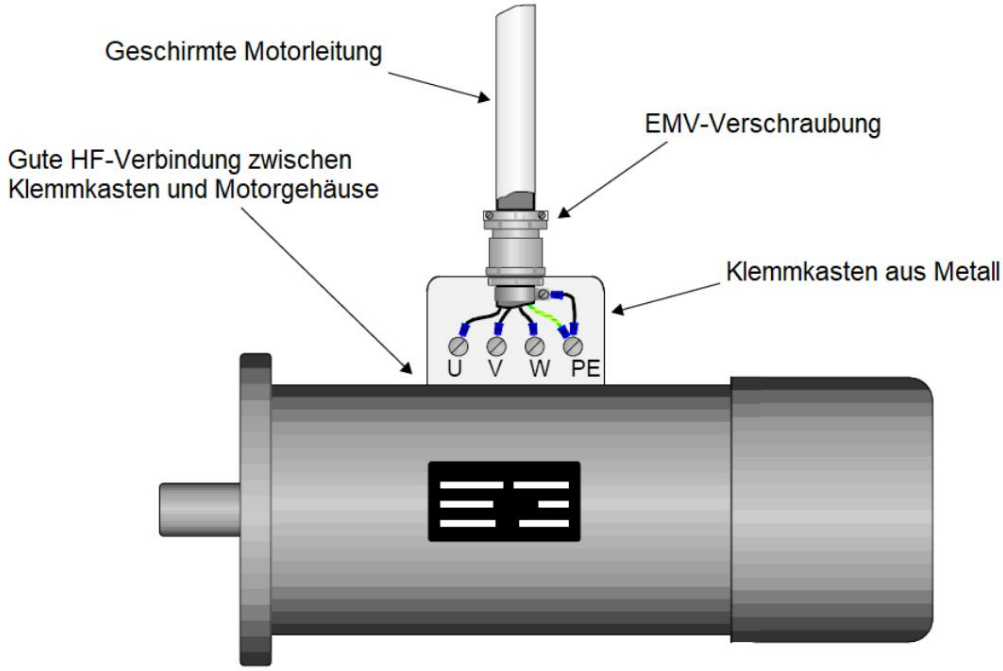
When installing, you must ensure that the RF impedance between the frequency converter, filter and ground is as small as possible. Make sure you have metallic connections that are as large as possible.

Conductor loops act like antennas. Especially if you are spatially extensive. Avoid unnecessary conductor loops and parallel cable routing of “clean” and interference-prone cables.

Lay the motor cable and all analog and digital control and regulation cables in a shielded manner

Cable crossings should be made at an angle of 90°. Lay disruptive cables separately - **minimum distance 0.25m** - from interference-sensitive cables. The effective shielding area of these cables should be left as large as possible, ie do not place the shield further than absolutely necessary.

Use an **EMC screw connection to support the shield over a large area on the motor.**



3. Wiring

WARNING

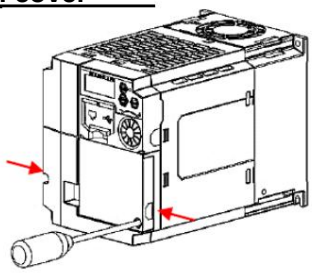
- **The inverters and line filters have intermediate circuit capacitors that carry dangerously high voltages even after the mains has been switched off. Therefore, wait at least 10 minutes after switching off the mains voltage before opening the device and working on it. It is important to ensure that no live parts are touched.**
- **Do not apply mains voltage to the output terminals U/T1, V/T2, W/T3.**
- **C1 series frequency inverters are suitable for connection to TN networks. Find out from Hitachi about the possibilities of operating on an IT network.**

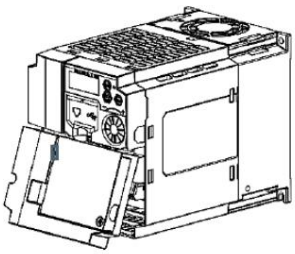
DANGER

- **The frequency converters are equipped with an electronic bimetal replica to monitor the motor current. When operating multiple motors, thermal contacts or PTC thermistor must be used for each motor to monitor the temperature.**
- **The connection of capacitive loads is not permitted.**
- **For motor cable lengths >50m and/or several motors are connected to one frequency inverter Use motor throttles.**
- **Switching motors on and off or switching the number of poles in pole-changing motors as well as reversing the direction of rotation of the motor, e.g. B. by reversing contactor during operation is not permitted.**
- **Ground the frequency converter and line filter at the appropriate connections.**

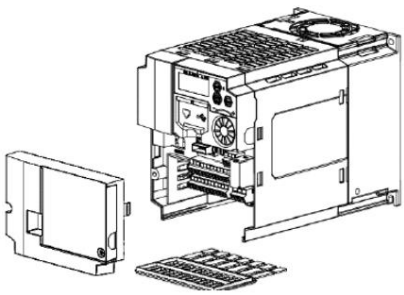
Opening the terminal cover

Loosen the two screws of the terminal cover on the bottom left and right (for C1-001…004SFonly one screw, right below)





After loosening the screws, you must press on these two points and lift the cover.



After removing the terminal cover, the finger guard can be pulled out. after in front

Residual current circuit breaker

When using residual current circuit breakers (RCD), the following must be observed:

- Type A FI circuit breakers must not be used for inverters that are supplied by a three-phase network (C1-… HF). In this case, only type B FI circuit breakers may be used.
- Line filters and long motor cables increase the leakage current. When the mains voltage is switched on and/ or off, this leakage current increases many times over in connection with three-phase frequency converters (see chapter **2.2 CE-EMC installation,** page 26).

Cable cross sections and tightening torques

The information applies to load settings Normal Duty (ND) and Low Duty (LD)

FU type	Cable cross section	Clamp	Clamp width	Cable lug -Perfomance -Protective conductor	Tightening torque -Perfomance -Protective conductor
C1-001SF	AWG16 (1.3mm2)	Screw M3.5	7.3mm	R2-3.5 / R2-4	0.9…1.9Nm (max. 1.4Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-002SF	AWG16 (1.3mm2)	Screw M3.5	7.3mm	R2-3.5 / R2-4	0.9…1.9Nm (max. 1.4Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-004SF	AWG16 (1.3mm2)	Screw M3.5	7.3mm	R2-3.5 / R2-4	0.9…1.9Nm (max. 1.4Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-007SF	AWG12 (3.3mm2)	Screw M4	9.9mm	R5.5-4 / R5.5-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-015SF	AWG10 (5.3mm2)	Screw M4	9.9mm	R5.5-4 / R5.5-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-022SF	AWG10 (5.3mm2)	Screw M4	9.9mm	R5.5-4 / R5.5-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-004HF	AWG16 (1.3mm2)	Screw M4	9.9mm	R2-4 / R2-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-007HF	AWG16 (1.3mm2)	Screw M4	9.9mm	R2-4 / R2-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-015HF	AWG16 (1.3mm2)	Screw M4	9.9mm	R2-4 / R2-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-022HF	AWG14 (2.1mm2)	Screw M4	9.9mm	R2-4 / R2-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-030HF	AWG14 (2.1mm2)	Screw M4	9.9mm	R2-4 / R2-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-040HF	AWG12 (3.3mm2)	Screw M4	9.9mm	R5.5-4 / R5.5-4	1.4Nm (max. 1.6Nm) 1.3…1.5Nm (max. 1.8Nm)
C1-055HF	AWG10 (5.3mm2)	Screw M5	13mm	R5.5-5 / R5.5-5	3.0Nm (max. 3.0Nm) 3.0Nm (max. 3.0Nm)
C1-075HF	AWG10 (5.3mm2)	Screw M5	13mm	R5.5-5 / R5.5-5	3.0Nm (max. 3.0Nm) 3.0Nm (max. 3.0Nm)
C1-110HF	AWG6 (13mm2)	Screw M6 16.5mm		R14-6 / R14-6	3.9…5.0Nm (max.5.2Nm) 3.9…5.0Nm (max. 5.2Nm)
C1-150HF	AWG6 (13mm2)	Screw M6 16.5mm		R14-6 / R14-6	3.9…5.0Nm (max.5.2Nm) 3.9…5.0Nm (max. 5.2Nm)

-The specified cable cross sections refer to heat-resistant, PVC-insulated cable (with a thermal resistance of 75°C).

-For cable lengths of >20m, a larger cross-section must be selected
-UL-certified ring cable lugs matching the cross section must be used for the power connections. Only use the crimping tool specified by the cable lug manufacturer.

Automatic shutdown in the event of an error

This product complies with IEC 60364-4-41:2005/AMD1: 2017 Part 411 “Protective measure: Automatic shutdown in the event of a fault” as it meets the requirements of IEC61800-5-1:2007+AMD:2016: Chapter 4.3.9 . Fulfills. The prerequisite for compliance is installation in accordance with the EU directive (CE) and the UL standard. Regarding IEC 61800-5-1: Section 5.2.3.6.3.3 “Short circuit between the power output terminals and protective earth”, the circuit for the compliance test is carried out as in Fig. 13: “Example of short circuit test between CDM/BDM DC link and protective earth” . A Class J 30A instantaneous fuse is used in the fault loop as an overcurrent protection device.

3.1 Compliance with UL standard

This chapter summarizes the requirements for compliance with the UL standard.

Generally

C1 inverters are open AC voltage inverters with a single or three-phase mains connection and 3-phase motor connection. C1 inverters are designed to be installed in an enclosure. They provide the connected motor with an adjustable U/f ratio for a defined speed range. 2 load settings with assigned nominal currents can be selected.

-Max. Ambient temperature: Normal-duty ND: 50°C; Low duty LD: 40°C
-Storage temperature: -20…65°C (transport temperature)
-Pollution degree 2
-Overvoltage category 3

Short-circuit current strength and overcurrent protection device

C1-001…022SF

-No semiconductor fuses: short-circuit current resistance (SCCR) 5,000A, max. 240V
-Semiconductor fuses: Short-circuit current resistance (SCCR) 100,000A, max. 240V

C1-004…075HF

-No semiconductor fuses: short-circuit current withstand capacity (SCCR) 5,000A, max. 480V

C1-110…150HF

-No semiconductor fuses: short-circuit current withstand capacity (SCCR) 5,000A, max. 480V

C1-004…150HF

-Semiconductor fuses: short-circuit current strength (SCCR) 100,000, max. 480V

Cable cross sections and tightening torques

FU type	Connection terminal	Tightening torque	Cable cross section
C1-001SF	M3.5	1.0Nm	AWG16 (1.3mm2)
C1-002SF	M3.5	1.0Nm	AWG16 (1.3mm2)
C1-004SF	M3.5	1.0Nm	AWG16 (1.3mm2)
C1-007SF	M4	1.4Nm	AWG12 (3.3mm2)
C1-015SF	M4	1.4Nm	AWG10 (5.3mm2)
C1-022SF	M4	1.4Nm	AWG10 (5.3mm2)
C1-004HF	M4	1.4Nm	AWG16 (1.3mm2)
C1-007HF	M4	1.4Nm	AWG16 (1.3mm2)
C1-015HF	M4	1.4Nm	AWG16 (1.3mm2)
C1-022HF	M4	1.4Nm	AWG14 (2.1mm2)
C1-030HF	M4	1.4Nm	AWG14 (2.1mm2)
C1-040HF	M4	1.4Nm	AWG12 (3.3mm2)
C1-055HF	M5	3.0Nm	AWG10 (5.3mm2)
C1-075HF	M5	3.0Nm	AWG10 (5.3mm2)
C1-110HF	M6	3.9…5.1Nm	AWG6 (13mm2)
C1-150HF	M6	3.9…5.1Nm	AWG6 (13mm2)

Nominal temperature of the cables:
C1-001SF, C1-002SF, C1-004SF, C1-007SF, C1-015SF, C1-004HF, C1-007HF, C1-015HF, C1-022HF, C1-030HF, C1-040HF: Max. 60°C

C1-022SF, C1-055HF, C1-075HF, C1-110HF, C1-150HF: Max. 75°C

Exclusively copper cable

FU type	No semiconductor fuse			Semiconductor fuse
	Type	Tension	Maximum current	Manufacturer Cooper Bussman LLC
C1-001SF	Class J Class CC Class G Class T	600V	3A	FWH-10A14F
C1-002SF			6A	FWH-15A14F
C1-004SF			10A	FWH-15A14F
C1-007SF			20A	FWH-60B
C1-015SF			30A	FWH-60B
C1-022SF			30A	FWH-60B
C1-004HF			6A	FWH-15A14F
C1-007HF			10A	FWH-25A14F
C1-015HF			10A	FWH-25A14F
C1-022HF			10A	FWH-25A14F
C1-030HF			15A	FWH-25A14F
C1-040HF			15A	FWH-25A14F
C1-055HF			30A	FWH-60B
C1-075HF			30A	FWH-60B
C1-110HF			50A	FWH-150B
C1-150HF			50A	FWH-150B

3.2 Connection and description of the power terminals

WARNING

• To avoid injuries and damage, do not touch any components inside the housing when mains voltage is present or the intermediate circuit capacitors are not discharged. Do not work on wiring or check signals when line voltage is present. Therefore, wait at least 10 minutes after switching off the supply voltage before opening the device.

Clamp	function	Description
L1 N	Mains connection	1 ~ 200...240V +10%, -15%, 50/60Hz +/-5% (Connection terminals for devices of type C1-…SF)
R/L1 S/L2 T/L3	Mains connection	3 ~ 380...460V +10%, -10%, 50/60Hz +/-5% (Connection terminals for devices of type C1-…HF)
U/T1 V/T2 W/T3	Motor connection	Motor according to the information on the motor nameplate Connect star or triangle
P/+ RB	Connection for Braking resistor	The C1 series has an internal brake chopper. The cable to the braking resistor must be shielded and may be a maximum of 5m (see also table below and function b090, b095, b096, b097).
+ -	DC link connection	Danger! The following voltages can be between + and – present: C1-…SF: 400VDC, C1-…HF: 800VDC
PD/+1 P/+	Connection for DC link choke	When connecting a DC link choke, the bridge must be removed. **Make sure that the bridge is installed between terminals P/+ and PD/+1 if no DC link choke is installed. Max. cable length: 5m**
G ⏚	Protective conductor connection	

The following ohm values for the braking resistor must not be fallen below:

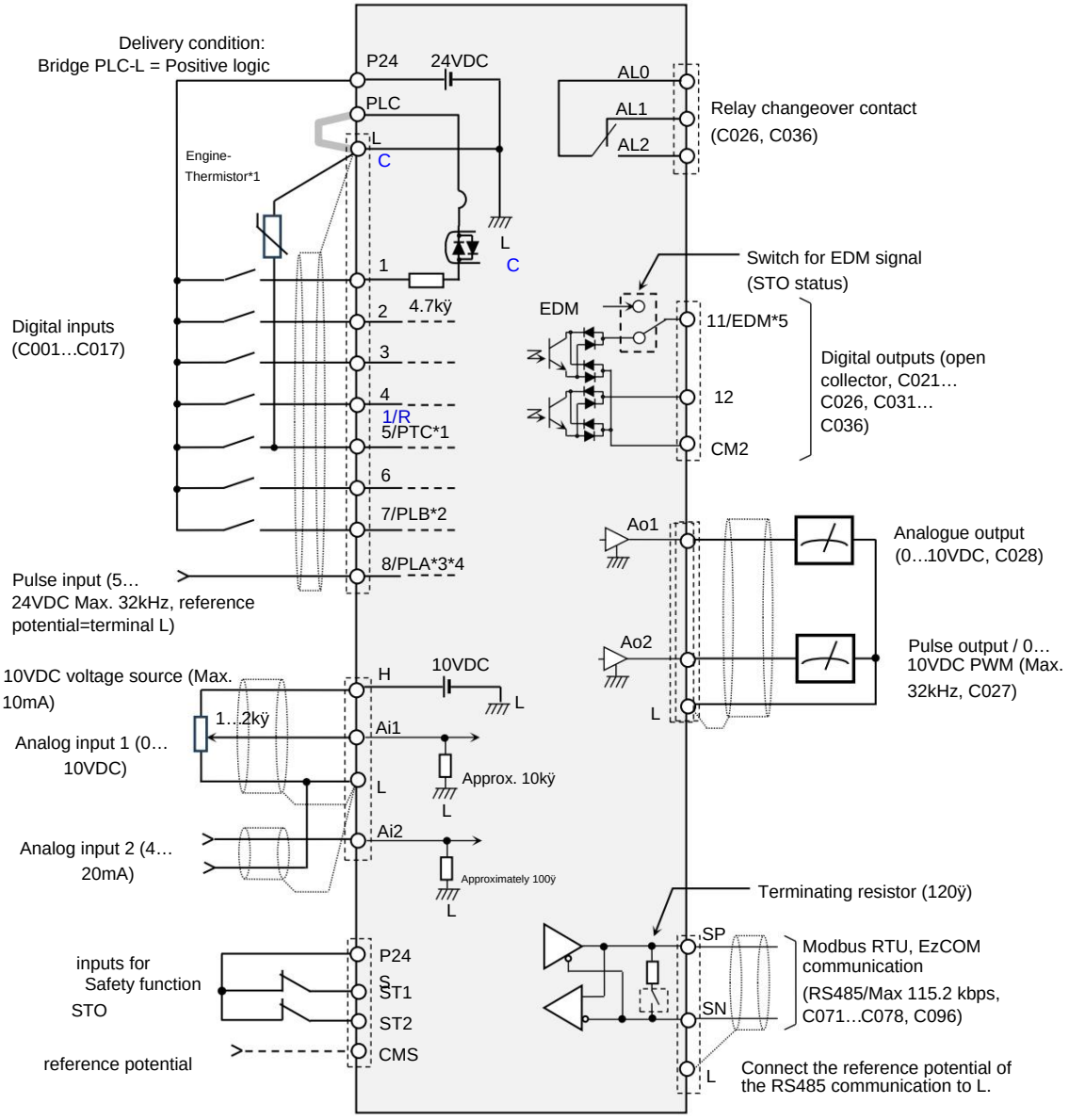
C1-	Minimum permissible ohm value		C1-	Minimum permissible ohm value	
	at ED=10% (b090=10%)	at ED=100% (b090=100%)		at ED=10% (b090=10%)	at ED=100% (b090=100%)
001SF	100ÿ	317ÿ	015HF	180ÿ	570ÿ
002SF	100ÿ	317ÿ	022HF	100ÿ	317ÿ
004SF	100ÿ	317ÿ	030HF	100ÿ	317ÿ
007SF	50ÿ	159ÿ	040HF	100ÿ	317ÿ
015SF	50ÿ	159ÿ	055HF	70ÿ	222ÿ
022SF	35ÿ	111ÿ	075HF	70ÿ	222ÿ
004HF	180ÿ	570ÿ	110HF	70ÿ	222ÿ
007HF	180ÿ	570ÿ	150HF	35ÿ	111ÿ

3.3 Connection and description of the control terminals

Do not short-circuit terminals H and L or P24 and L, H, Ai2, Ao1. The control cables must be laid separately from the mains and motor cables. They should not exceed a length of 20m and must be installed in a shielded manner. For longer cable lengths, we recommend signal amplifiers. The shield must be connected to the respective reference potential. Crossings between power or motor cables and control cables should - if unavoidable - be laid at right angles. The control terminals are designed as spring-loaded terminals. Please strip approx. 8mm of insulation.

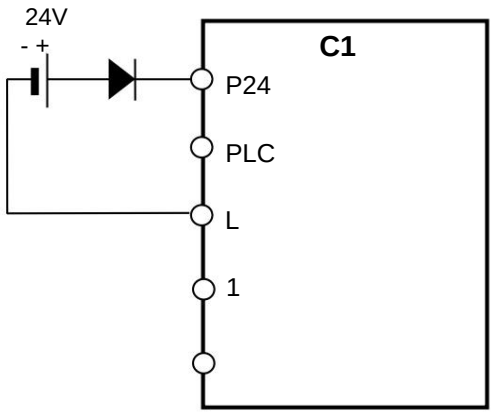
Control terminals	Solid wire (AWG)	Flexible cable (AWG)	Ferrules (AWG)
	0.2…1.5mm2 (AWG 24…16)	0.2…1.0mm2 (AWG 24…17)	0.25…0.75mm2 (AWG 24…18)

Overview of control inputs / control outputs



*1. Digital input 5 can be parameterized as a thermistor input (PTC/NTC/PTC thermistor, C005=19)
*2. Digital input 7 can be parameterized as pulse input B (C007=85).
*3. Digital input 8 is programmed under P003 (P003=00: pulse frequency input, P003=01: incremental encoder track A, program function EzSQ input X(07).
*4. Please note that the specification of pulse inputs A and B is different.
*5. Digital output 11 is switched to the “STO status EDM” function using the DIP switch EDM .

The control section can be supplied via an external 24VDC voltage source. In this case a diode must be installed as shown below.



3.3.1 Digital inputs

Clamp function			Description
P24	24V		24V control voltage for digital inputs 1, 2,...,7 Load max. 100mA.
PLC	Common connection for digital inputs 1, 2,...,7		The frequency inverters are delivered ex works with a bridge between PLC and L. In this case, the potential at the PLC terminal and therefore at the non-controlled digital inputs is 0V - for control purposes, 24V is applied to the corresponding inputs (positive logic). If PLC is set to P24, the control logic is negative. When controlling the digital inputs with an external 24VDC power supply, the bridge between PLC and L must be removed. External 0V is then placed on the PLC.
L	0V reference potential		0V reference potential for: 24V control voltage (terminal P24), setpoint inputs Ai1 / Ai2, pulse frequency input 8, Analog output AM and frequency display Ao2
1	Programmable Digital inputs	FW	FW input impedance of the digital inputs to PLC: 4.7kÿ. Max. 27VDC ON: >18VDC, OFF: <3VDC Current consumption per digital input at 24VDC: approx. 5.0mA. Inputs 1...7 are programmable. The function assignment is shown here in the factory setting. **Some functions can only be used with certain ones Digital inputs can be implemented:** -Incremental encoder track B only with input 7 (C007=85). -A PTC conductor is connected to input 5 and L (C005=19, adjustment C085). Multiple inputs cannot be assigned the same function at the same time. For a list and description of the functions, see function C001…C007 (specification of “make contact” or “break contact” is made under C011…C017).
2		RV	
3		EXT	
4		RS	
5		CF1	
6		CF2	
7		JG	

3.3.2 Analog inputs

Clamp function		Description
H	10V reference voltage for Setpoint specification Max. 10mA	**Input Ai1** -Impedance 10kÿ -Set at the factory 0…9.8VDC -Permissible range -0.3…12VDC
Ai1	Analog input Frequency setpoint 0…10V	**Input Ai2** -Impedance 100ÿ - Adjusted ex works 4…19.8mA -Permissible range 0…24mA -4mA monitoring, see digital output Ai2Dc (page 129)
Ai2	Analog input Frequency setpoint 4…20mA	
L	0V reference potential for… -24V control voltage -Analog input Ai1 -Analog input Ai2, -Pulse input 8, -Analog output Ao1 -Analog output Ao2	An adjustment of a desired setpoint range to a frequency range can be carried out using the following functions: Input Ai1: A011...A015 Input Ai2: A101...A105 Superimposed interference frequencies on the analog signals can be eliminated with a filter (function A016). Various switchovers or Links of the analog inputs can be selected.

3.3.3 Pulse inputs

Terminal function 8		Description
	Incremental encoder track A / Pulse frequency	**8: Incremental encoder track A / pulse frequency (P003)** -Voltage 5…24VDC (ON: >4VDC, OFF: <1VDC, max. 27VDC), -Impedance 10kÿ -Frequency 0.3…32kHz
7	Incremental encoder track B	
L	0V reference potential for… -24V control voltage -Analog input Ai1 -Analog input Ai2, -Pulse input 8, -Analog output Ao1 -Analog output Ao2	**7: Incremental encoder track B (C007=85)** -Voltage max. 27VDC, (ON: >18VDC, OFF: <3VDC), -Impedance 4.7kÿ -Frequency 0.3…32kHz -Current consumption approx. 5.0mA at 24VDC
PLC	Common connection for digital inputs 1, 2,...,7	

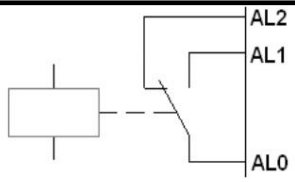
3.3.4 Analog outputs

Clamp function		Description
Ao1	Analogue output 0...10V Resolution 10 bits	Load output Ao1: max. 2mA Different output sizes can be selected under function C028. Output Ao1 is calibrated under C106, C109.
L	0V reference potential	Voltage accuracy +/-10% at 25°X +/-10°C

Terminal function		Description
Ao2	pulse output / PWM output 0...10V	Load: max. 2mA, adjustment under C105 Different output sizes can be selected using function C027: **PWM signal:** The ratio t/T changes proportionally Output size **Pulse signal for frequency measuring device** Frequency = output frequency x factor under b086, factory setting = 1), max. frequency 32kHz. The frequency of this signal changes in proportion to the output size. The duty cycle is constantly around 50%.

3.3.5 Digital outputs / relay output

Clamp function			Description
11	Programmable Digital outputs	RUN (00)	Open collector output, positive or negative logic Load: max. 50mA, max. 27VDC
12		FA1 (01)	Voltage drop when ON: <4VDC In C021, C022, different display functions can be assigned to the 2 digital outputs (also specifying normally open or normally closed contacts under C031, C032). When using the STO safety function, digital output 11 is used for diagnostics (STO active).
CM2	Common connection for digital outputs.		Positive logic (PNP) is used here as +24V Fed in with supply voltage for the digital outputs. Load: max. 100mA

Clamp function		Description
AL2	Programmable Relay changeover contact Factory setting: AL (fault message)	
AL1		
AL0		Factory setting C026=05 (AL=fault), C036=01: -AL0-AL1: Power on and no fault -AL0-AL2: Power off or fault Max. permissible contact load AL0-AL1: AL0-AL1: 2A (ohmic load), 0.2A (inductive load) AL0-AL2: 1A (resistive load), 0.2A (inductive load) Minimum contact load: 100VAC / 10mA, 5VDC / 100mA In C026 the relay can be programmed with the same functions as the digital outputs 11...12 (see function C036).

3.3.6 STO safety function

DANGER

- **The “Safe Torque Off (STO”) function described here does not mean any galvanic isolation of the motor from the power supply. It simply prevents the motor from generating torque and thus being set in rotation. For this reason, work on live parts of the motor feeder, such as: B. Motor connection terminals, motor cable and motor terminal box should not be carried out until at least 10 minutes after switching off the mains voltage (use a measuring device to check the intermediate circuit voltage between (+1/+) and (-)).**

- **The response time from switching off the two inputs ST1 and ST2 to switching off the output stages is approx. 20ms.**
- **When the “Safe Torque Off” function is triggered, the motor runs to an uncontrolled stop in accordance with EN60204-1 stop category 0. The drive is not braked.**
- **Any machine equipped with a frequency converter must comply with EN60204-1 (General requirements for the safety of machines - Electrical equipment). Make sure the machine meets these requirements.**
- **Make sure that the function described here meets the specific safety requirements meets the requirements of the present application.**
- **The slide switch for activating the output signal “EDM STO active” may only be switched in a voltage-free state!**
- **Various status display modes can be selected under b145. These are only display functions, not security functions. A safety-controlled external shutdown unit (e.g. safety relay) is required for an entire system.**
- **Please note that a start is carried out if a start command is present when the inputs ST1 and ST2 are switched on.**

C1 series frequency inverters support the Safe Torque Off (STO) function according to ISO13849-1 and Stop Category 0 according to EN60204-1 (uncontrolled motor coasting). The shutdown described here reliably prevents the motor from being subjected to a rotating field - without galvanic isolation of the power supply using switches or contactors. The signal to trigger this shutdown occurs when at least one of the inputs

ST1 or ST2=OFF. To control the inputs ST1 and ST2, the control voltage can be tapped from the inverter (terminal P24S) or an external voltage source can be used. When delivered, the two inputs are connected to P24S by bridges.

Clamp function		Description
P24S 24V		24V control voltage for safety inputs ST1 and ST2 Load max. 100mA.
CMS 0V reference potential		0V reference potential for: 24V control voltage (terminal P24S), When controlling the safety inputs with an external 24VDC voltage supply, the 0V reference potential is set to CMS.
ST1	Inputs for safety function STO	-Input impedance: 4.7kÿ. -Max. 27VDC -ON: >15VDC, OFF: <5VDC -Current consumption per input at 27VDC: approx. 5.8mA.
ST2		
11	Programmable Digital output	With the slide switch EDMSW=ON (top), output 11 can be used to diagnose “EDM STO active” (C021=62). -Open collector output -Load: max. 50mA, max. 27VDC -Voltage drop when ON: <4VDC
CM2	reference potential	

signal	State 1	State 2	State 3	State 4	Condition 5
Input ST1	OFF=STO	ON	OFF=STO	ON	ON or OFF
Input ST2	OFF=STO	OFF=STO	ON	ON	ON or OFF
Error detection no		no	no	no	Yes
EDM ON output		OFF	OFF	OFF	OFF
Power stage switched off		switched off	switched off	enabled	switched off

For PLe according to ISO 13849-1 and SIL 3 according to IEC 61800-5-2, the safety functions must be tested at least once a year. To do this, test the states 1…4 described in the aforementioned table.

With EDMSW=ON (top), a safety-related function is automatically assigned to digital output 11 - regardless of which function was previously assigned to this output. (C021=62).

After pushing the EDMSW slide switch back from ON to OFF (from top to bottom), it has
Output 11 no function (output 11: C021=no)

If the slide switch EDMSW=ON (top), then the state at the inputs ST1 and ST2 is displayed in d005 with the states of digital inputs 3 and 4 (as with WJ200).

The EDMSW slide switch may only be adjusted when the power is off!

Danger! If the start signal remains present during “STO” activation, the inverter will start again after resetting the external shutdown unit (and, if necessary, the error message E37 on the FI).

Different status display modes can be selected under b145. These are only display functions, not security functions.

b 145	**Display functions “STO” safety function No fault**	**00**
b145=00	**message**	
b145=01	**Fault E37.** Reset with input RS or power off.	
b145=02	**Display –S--** If there is an inconsistency between ST1/ST2: **E98** If there is an internal error: **E99** Reset of E98/E99 only with power off.	
b145=03	**Display –S--** In case of internal fault: **E99** Resetting E99 only with power off	
b145=04	**Display –S--** In case of internal fault: **E99** Resetting E99 only with power off	
b145=05	**Display –S--** In case of inconsistency of ST1/ST2: F01/F10/F02/F20 (reset with ST1/ST2=OFF) In the event of an internal fault: **E99** (reset only with power off) The maximum permissible time delay between switching on ST1 and ST2 with setting b145=05 is set under b146. Exceeding the set time b146 is shown on the display with –F01 or –F02.	
b145=06	**Display –S--** In case of inconsistency of ST1/ST2: F01/F10/F02/F20	

Display	Description	status
-S—	ST1 and ST2 open. No inconsistency between ST1, ST2 and EDM signal.	No interference
-F01	Inconsistency between ST1 and ST2. Delay of ST1 when switching from -S— (ST1, ST2=OFF) to normal operation (ST1, ST2=high).	No interference
-F02	Inconsistency between ST1 and ST2. Delay of ST2 when switching from -S— (ST1, ST2=OFF) to normal operation (ST1, ST2=ON).	No interference
-F10	Inconsistency between ST1 and ST2. Delay from ST1 when switching off from normal operation (ST1, ST2=ON) to -S— (ST1, ST2=OFF).	No interference
-F20	Inconsistency between ST1 and ST2. Delay of ST2 when switching off from normal operation (ST1, ST2=ON) to -S— (ST1, ST2=OFF).	No interference
E37	At least one of the two inputs ST1 and ST2 OFF. Disturbance. Reset with input RS or power off.	
E98	Status of ST1 and ST2 inconsistent (external fault).	Disturbance. Reset with power off.
E99	Status of ST1/ST2 and EDM signal inconsistent (internal fault).	Disturbance. Reset with power off.

ST1	ON	ON		ON->OFF	OFF->ON	OFF		OFF	ON	OFF	ON	OFF		
ST2	ON	ON->OFF	ON		OFF	OFF->ON	OFF	ON		ON	OFF	OFF		
EDM	OFF									ON (STO active)				
b145=00 ÿ						-								
b145=01 ÿ		E37		E37	E37	E37	E37 ÿ	E37	E37	E37				
b145=02 ÿ		E98		E98	E98	E98	E99	E99	E99	E99	-S--			
b145=03 ÿ				-		-	E99	E99	E99	E99	-S--			
b145=04 ÿ				-		-	ÿ	ÿ	ÿ	ÿ	-S--			
b145=05 ÿ		-F10		-F20	-F02	-F01	E99	E99	E99	E99	-S--			
b145=06 ÿ		-F10		-F20	-F02	-F01	ÿ	ÿ	ÿ	ÿ	-S--			

E098=Error in external circuit; E099=Error internal

The faulty states F01, F10, F02, F20 as well as all fault messages (as well as E98, E99) are signaled via the output signal FSC (page 132).

b 146	**Permissible delay for switching on ST1 and ST2** 0.00…2.00s	**0.00s**
Setting range		

Only applies to setting b145=05.

b 147	**Change from safety display to standard display.** The display does	**01**
b147=00	not change when a button is pressed. Even when you press a key, the respective display remains –S--, E98, E99, -F10, -F20, -F01, -F02 received.	
b147=01	Switch to standard display when pressing a button. After the time entered under b148 has elapsed, the system automatically switches back to the safety display.	

b 148	**Waiting time for return to safety display** 1…30s	**30s**
Setting range		

Norms	Remarks
EN ISO 13849-1:2015	CAT 3, PLe
IEC 61800-5-2:2016 EN61800-5:2017	SIL 3
UL1998	Diagnostic software class 1
IEC 60204-1:2016	Stop category 0

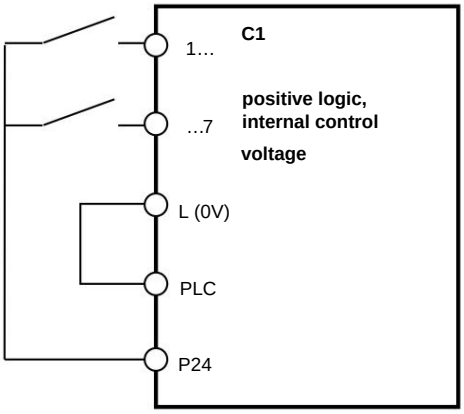
Safety characteristics according to EN ISO 13849-1:2015	
Security function	Safely switched off torque STO
PFH	3.38 x 10-10
MTTFd	100 years
CCF	75

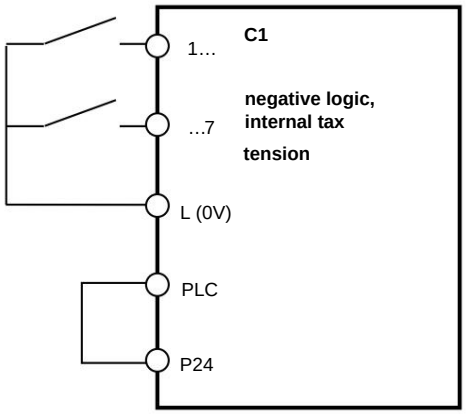
Safety characteristics according to EN / IEC 61508, part 1-7: 2010	
Security function	Safely switched off torque STO
SFF	>99%
PFH	3.38 x 10-10
HFT	1
ÿ-factor	5%
PFDavg	2.94 x 10-5

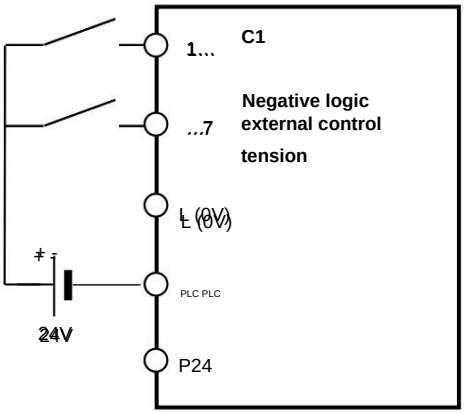
3.4 PLC control

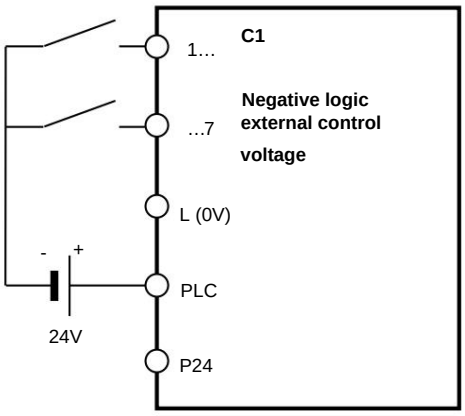
Digital inputs can be switched in both positive logic (source) and negative logic (sink). To do this, the bridge must be connected as shown in the graphic below, either between PLC and L (positive logic) or between PLC and P24 (negative logic).

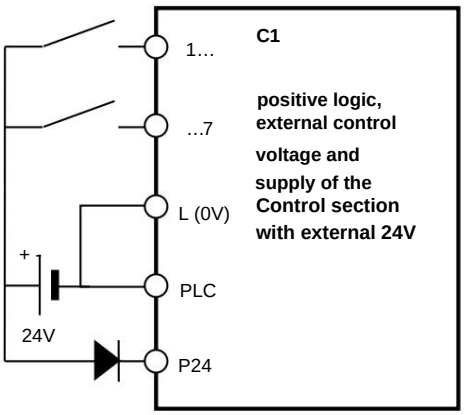
The devices are delivered from the factory with positive logic (bridge between PLC and L).



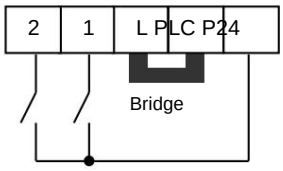




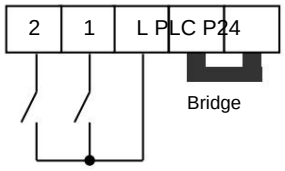




Positive logic (delivery status)

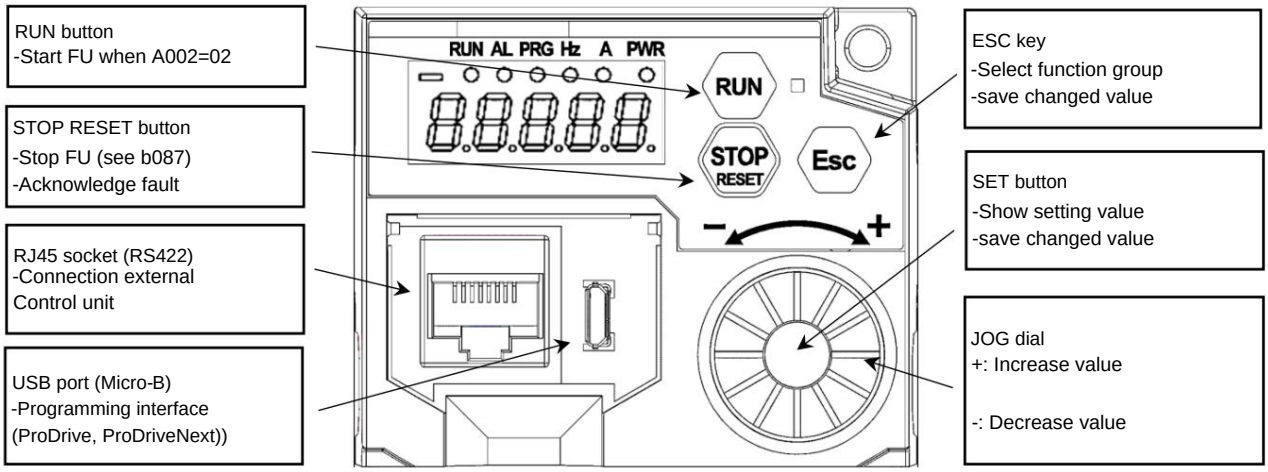


Negative logic



4. Entering parameters

4.1 Description of the control panel



ESC key: Select function group: d001ÿF001ÿA001ÿb001ÿC001ÿH001ÿP001ÿU001.
Hold down the ESC button for approx. 3s: Display of the current output frequency d001.
When using an external control unit (OPE-SR, OPE-SRmini, WOP): Switch the control point (external control unit - internal control unit) by pressing the ESC button for approx. 2s.

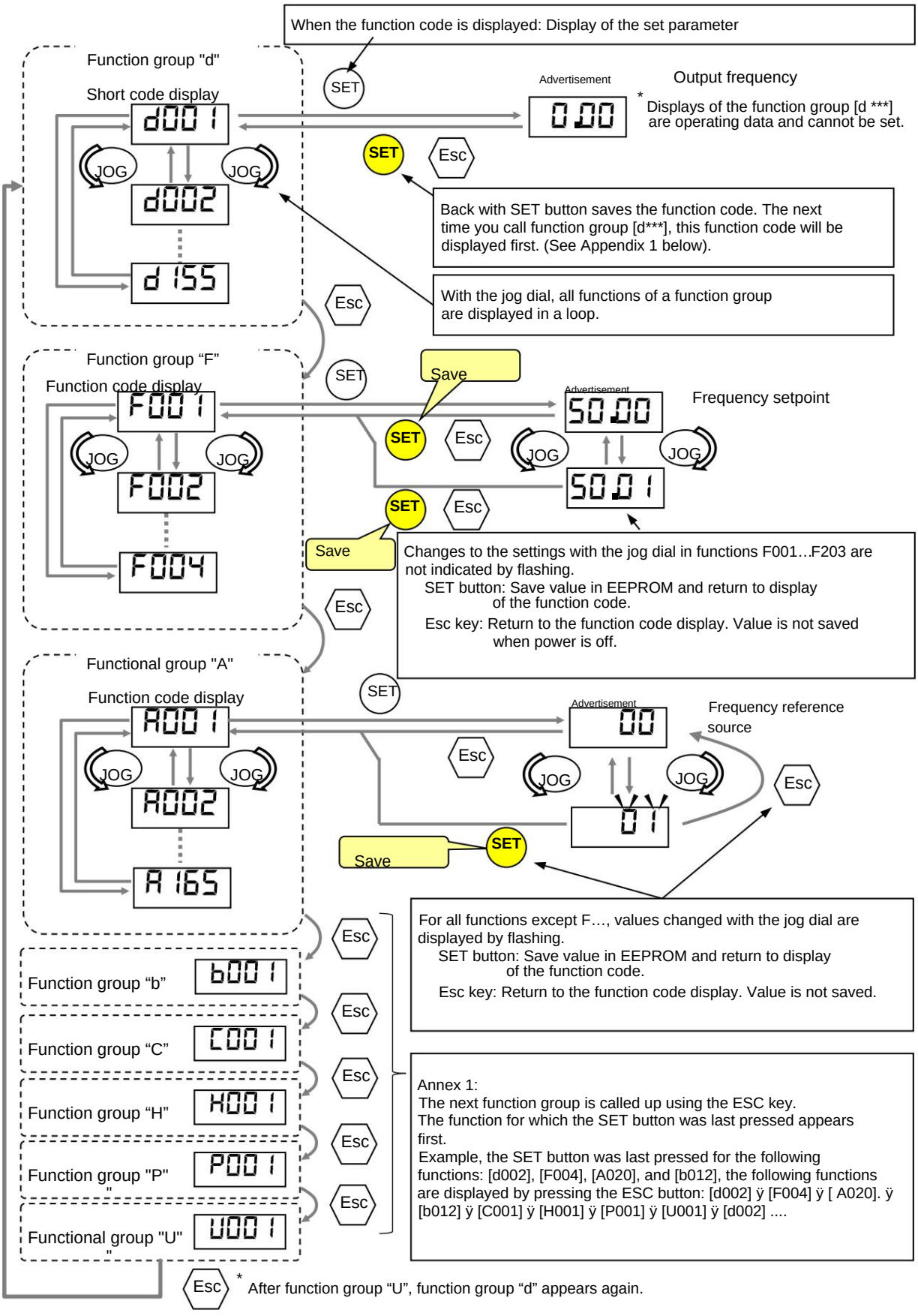
JOG dial: Select function within a function group, change setting value/parameter. The rate of change is adjustable under C117 and C118.

JOG dial button (SET button): Display set value/parameter, save set value/parameter

If the JOG dial button (SET button) is pressed for longer than 3s, the left digit of the displayed value or function code flashes. This point can now be adjusted using the JOG dial. The next digit can be selected with the JOG dial button (SET button) and adjusted with the JOG dial.
In this way, e.g. B. large values can be entered or changed quickly.

STOP/RESET button: Stop the FU and reset fault messages

RUN button: Start FU (A002=02)



ATTENTION Before switching on the supply voltage, the following points must be observed observe:

- **Check that the mains and motor cables are connected correctly.**
- **The control lines are correctly connected to the corresponding terminals.**
- **The frequency inverter is properly grounded and installed vertically on a surface non-combustible material installed.**
- **All screws and clamps are tightened.**
- **The connected machine is designed for the intended frequency range, especially for the maximum frequency.**
- **All live parts such as: B. Busbars and terminals are covered**

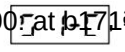
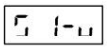
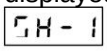
4.2 Initialization load setting “High Duty” / “Normal Duty”

Upon delivery, all C1 series frequency inverters are initialized in the “High Duty” load setting.
Switching the load setting is done as follows:

- Function b049=00: Load setting “High Duty” (overload capacity 50% for 60s)
- Function b049=01: Load setting “Normal Duty” (overload capacity 20% for 60s)

After saving the entry, the values relevant for the load setting (such as electronic motor protection b012, current limit b022, clock frequency b083) are initialized to the selected load (see description of function b049, page 107). After changing the load setting under b049, an initialization must be carried out. After initialization, the motor power must be entered separately under function H003.

Initialization **of all parameters** to the factory default setting • Function
b085=01 (01 ÿ EU-specific data). Save with the SET button
• Function b094=00: reset all parameters

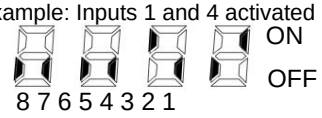
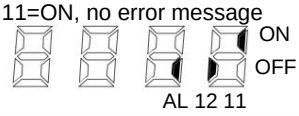
- Function b084=02. Save with the SET button.
- Function b180=01. Save with the SET button.
- After the initialization process has been triggered, the following is displayed, depending on the setting of function b049: at b049=00 at b171=02. at b049=01  or  

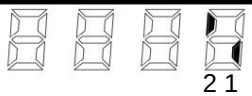
The parameters under the following functions are not initialized:
C081, C082, P100…P131, operating time d016, power on time d017

5. Features

5.1 Overview of functions

Display and diagnostic functions

functional number	Display function	Remarks
d001	Output frequency [Hz]	0.00…590.00Hz
d002	Motor current [A]	0.00…655.35A
d003	Direction of rotation	F: Clockwise rotation r: left rotation o: Stop
d004	PID actual value x display factor [%]	0.00…9999.00% Display of the PID actual value taking the Display factor A075 (only available if PID controller active)
d005	Signal status at the digital inputs 1...8	Example: Inputs 1 and 4 activated  If EDMSW=ON, then the status of the safety inputs ST1 and ST2 is displayed under d005 with the status of inputs 3 and 4.
d006	Signal status of the digital outputs 11...12 and the fault signaling relay AL0-AL2	Example: Output 11=ON, no error message 
d007	Output frequency x frequency factor 0.00…590.00 (0.00…58994.10)	Frequency factor function b086 adjustable 0.01…99.99. Factory setting=1.00
d008	Rotor rotating field frequency (only with incremental encoder)	-590.00…+590.00Hz; Display of the actual rotor rotating field frequency (P003=01, P011=encoder pulse number/revolution)
d009	Torque setpoint	-200…+200% rated motor torque
d010	Torque offset	-200…+200% rated motor torque.
d012	Engine torque	-200…+200% rated motor torque
d013	Output voltage Electrical	0.0...600.0V
d014	power consumed 0.0...100.0kW	
d015	kWh meter	0.0…999900.0kWh Under b079 this value can be evaluated with a factor of 1…1000. Clearing the kWh counter with digital input KHC or b078=01.
d016	Operating time	0… 99000 hours
d017	Power on time	0… 999000 hours
d018	Heatsink temperature	-20.0…150.0°C

functional number	Display function	Remarks
d022	Maintenance indicator for capacitors on logic and mainboard as well as cooling fans. If “Not OK” is displayed. O.”, the 2: Cooling fans (message if the speed of the corresponding components is <75% of the nominal speed; please note: some C1- it will be exchanged.	 2 1 Not i. O. i. O. 1: Capacitors on main and logic board types do not have a fan) Estimating the lifespan of the capacitors is done every 10 minutes. If the mains voltage is switched off and on frequently within 10 minutes, the service life of the capacitors cannot be determined correctly.
d023	PLC programming program line 0…1024	Displays the program line that is currently being executed
d024	PLC program number	0…9999 Displays the number of the PLC program that was last downloaded to the C1
d025	User variable 00 (Umon(00))	-2147483647…2147483647 Display of the PLC variables Umon(00)…Umon(02) (only in conjunction with EzSQ program)
d026	User variable 01 (Umon(01))	
d027	User variable 02 (Umon(02))	
d029	Target position	-268435455…268435455 pulses Display of the target position (only in conjunction with positioning **(P012=02)).** Only the 4 most significant digits of the position value are displayed.
d030	Actual position	-268435455…268435455 pulses Display of the actual position (only in conjunction with an incremental encoder **(P003=01)).** Only the 4 most significant digits of the position value are displayed.
d050	2 display values	Selection of 2 display values from the range d001-d030 which are set under b160/b161 can. You can switch between the displays using the UP/DOWN buttons.
d060	Inverter mode display	Display of the mode set under b049 / b171: i - C: Asynchronous motor, normal duty i - U: Asynchronous motor, Lowl Duty P: Permanent magnet motor
d062	Setpoint source display	00: Setpoint input under F001 (A001=02) 01…15: Fixed frequency 1…15 16: Jog frequency (input JG) 18: RS485 Modbus (A001=03) 19: Option card (A001=04) 21: Integrated potentiometer (OPE-SRmini option, A001=00) 22: Pulse frequency at EA (A001=06) 23: according to A141…A146 (A001=10) 24: Program function EzSq (A001=07) 25: Analog input Ai1 (A001=01) 26: Analog input Ai2 (A001=01) 27: Analog input Ai1 + Ai2 (A001=01)

functional number	Display function	Remarks
d063	Display start command source	1: Digital input (A001=01) 2: RUN button (A001=02) 3: RS485 Modbus (A001=03) 4: Option card (A001=04)
d080	Total number of error messages that occurred	0….65535.: Display in pieces
d081	1st fault (last fault occurred)	Display of the fault message (...) and the following operating data at the time of the fault: frequency, current, DC link voltage, operating time, power on time _ _ _ _: no fault message saved
d082	2nd fault (penultimate fault)	
d083	3.Disturbance	
d084	4.Disturbance	
d085	5.Disturbance	
d086	6.Disturbance	
d090	Warning	See Chapter 7. Warning messages, page 141
d102	message DC link voltage [V]	Display of the DC link voltage
d103	Brake chopper ED [%]	0.0…100.0% If the duty cycle set under b090 is exceeded, the inverter goes to fault with “E06”.
d104	Overload status [%]	0.0…100.0% Display of the overload status based on the settings under b012…b020. When 100% is reached, the inverter malfunctions with “E05”.
d130	Display analog input Ai1 (0…10V)	0…1023 (10 bits)
d131	Display analog input Ai2 (0…20mA)	0…1023 (10 bits)
d133	Pulse frequency at input 8	0.00…100.00% Pulse frequency after scaling under P055 and filter time constant P056
d153	Control difference [%]	-9999.00…9999.00% Control difference “setpoint minus actual value” [%] taking into account the display factor A075 (only available if PID controller active)
d155	PID controller output [%]	-100.00…100.00% PID controller output (only available if PID controller active)

Parameter functions

functional number	function	Basic value	Setting range	*	Page
F001	Display / input Frequency setpoint Display / input PID controller setpoint	0.00Hz	0.00...A004 [Hz] PID controller active (A071=01/02): 0.00…100.00% (0.00…9999.00% taking into account the display factor A075)	j	78
F002	1. Ramp-up time	10.00s	0.00...3600s	j	78
F202	***1. Ramp-up time (2nd parameter set)***	***10.00s***	***0.00…3600s***	***j***	***78***
F003	1. Rundown time	10.00s	0.00...3600s	j	78
F203	***1. Rundown time (2nd parameter set)***	***10.00s***	***0.00...3600s***	***j***	***78***
F004	Direction of rotation RUN button (only when started via built-in control panel)	00	00: right 01: left (only with A002=02)	j	---
A001	Frequency reference source	01	00: Integrated potentiometer (OPE-SR… option) 01: Analog input Ai1/Ai2 02: Entry under F001/A020 03: RS485 (Modbus RTU) 04: Option card 06: Pulse freq. at input 8 (P003=00) 07: EzSQ program function 10: according to A141…A146	n	78
A201	***Frequency reference source (2nd parameter set)***	***01***	***00: Integrated potentiometer (OPE-SR... option)*** ***01: Analog input Ai1/ Ai2*** ***02: Entry under F001/ A020*** ***03: RS485 (Modbus RTU)*** ***04: Option card*** ***06: Pulse frequency at input 8*** ***07: EzSQ program function*** ***10: according to A141...A146***	***n***	***78***
A002	Start command source	01	01: Digital input / program function 02: RUN key (see F004) 03: RS485 (Modbus RTU) 04: Option card	n	79
A202	***Start command source (2nd parameter set)***	***01***	***01: Digital input / program function*** ***02: RUN key (see F004)*** ***03: RS485 (Modbus RTU)*** ***04: Option card***	***n***	***79***
A003	Motor nominal frequency / corner frequency	50.0Hz	30.0...A004 [Hz]	n	80
A203	***Rated motor frequency (2nd parameter set)***	***50.0Hz***	***30.0...A004 [Hz]***	***n***	***80***
A004	Maximum frequency	50.0Hz	30.0...590.0Hz	n	79
A204	***Maximum frequency (2nd parameter set)***	***50.0Hz***	***30.0...590.0Hz***	***n***	***79***
A005	Switching the setpoint inputs with input AT	00	00: Ai1/Ai2 02: Ai1/integr. Poti (option OPE-SR…) 03: Ai2/integrated Poti (option OPE-SR…)	n	81
A011	Frequency at minimum setpoint at input Ai1	0.00Hz	0.00...590.00Hz	j	82
A012	Frequency at maximum setpoint at input Ai1	0.00Hz	0.00...590.00Hz	j	82

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
A013	Min. setpoint at input Ai1	0%	0...100%	j	82
A014	Max. setpoint at input Ai1	100%	0...100%	j	82
A015	Starting condition input Ai1	01	00: Min. frequency A011 01: 0Hz start	J	82
A016	Filter analog input Ai1, Ai2	8th	1...30 (x 2ms) 31 (500ms fixed +/- 0.1kHz Hyst)	j	134
A017	Program function	00	00: Program not active 01: Program active with input PRG 02: Program active with power on	j	---
A019	Retrieve the fixed frequencies	00	00: binary via CF1…CF4 (15 pieces) 01: bit via SF1…SF7 (7 pieces)	n	83
A020	Base frequency	6.00Hz	0...400Hz	j	
A220	***Base frequency (2nd parameter set)***	***6.00Hz***	***0...400Hz***	j	
A021	1.Fixed frequency	0.00Hz	0...400Hz	j	
A022	2.Fixed frequency	0.00Hz	0...400Hz	j	
A023	3.Fixed frequency	0.00Hz	0...400Hz	j	
A024	4.Fixed frequency	0.00Hz	0...400Hz	j	
A025	5.Fixed frequency	0.00Hz	0...400Hz	j	
A026	6.Fixed frequency	0.00Hz	0...400Hz	j	
A027	7.Fixed frequency	0.00Hz	0...400Hz	j	
A028	8.Fixed frequency	0.00Hz	0...400Hz	j	
A029	9.Fixed frequency	0.00Hz	0...400Hz	j	
A030	10.Fixed frequency	0.00Hz	0...400Hz	j	
A031	11.Fixed frequency	0.00Hz	0...400Hz	j	
A032	12.Fixed frequency	0.00Hz	0...400Hz	j	
A033	13.Fixed frequency	0.00Hz	0...400Hz	j	
A034	14.Fixed frequency	0.00Hz	0...400Hz	j	
A035	15.Fixed frequency	0.00Hz	0...400Hz	j	
A038	Typing frequency	6.00Hz	0.5...9.99Hz	j	84

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
A039	tipping frequency, Stop mode	04	00: Freewheel (at stop) 01: Ramp (at stop) 02: DC brake (at stop) 03: Freewheel (in operation) 04: Ramp (in operation) 05: DC brake (in operation)	j	84
A041	Boost characteristic	00	00:Manual boost (A042,A043) 01:Automatic Boost (A046,A047)	n	85
A241	***Boost characteristic (2nd parameter set)***	***00***	***00:Manual boost (A042,A043) 01:Automatic Boost (A046,A047)***	***n***	***85***
A042	Manual boost, voltage increase	1.0%	0...20%	j	85
A242	***manual boost, Voltage increase (2nd parameter set)***	***1.0%***	***0…20%***	***j***	***85***
A043	manual boost, Boost frequency	5.0%	0...50%	j	85
A243	***manual boost, Boost frequency (2nd parameter set)***	***5.0%***	***0...50%***	***j***	***85***
A044	Working procedures	00	00: U/f constant 01: U/f-square 02: U/f free according to b100-b113 03: SLV	n	87
A244	***Working procedures (2nd parameter set)***	***00***	***00: U/f constant 01: U/f-square 02: U/f free according to b100-b113 03: SLV***	***n***	***87***
A045	Output voltage	100%	20...100%	j	88
A245	***Output voltage (2nd parameter set)***	***100%***	***20...100%***	***j***	***88***
A046	Automatic boost, voltage increase	100	0...255	j	86
A246	***Automatic boost, Voltage increase (2nd parameter set)***	***100***	***0...255***	***j***	***86***
A047	Automatic boost, slip compensation	100	0...255	j	86
A247	***Automatic boost, slip compensation (2nd parameter set)***	***100***	***0...255***	***j***	***86***
A051	Automatic DC brake 00		00: inactive 01: active at stop 02: active when setpoint reduction (<A052)	j	89
A052	DC brake, Switch-on frequency	0.50Hz	0.00...60.00Hz	j	89
A053	DC brake, waiting time	0.0s	0.0...5.0s	j	89
A054	DC brake, braking torque 50%		Normal Duty: 0...100% Low duty: 0…70%	j	89
A055	DC brake, braking time	0.5s	0.0...60.0s	j	89

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
A056	DC brake, switch-on trigger	01	00: Cross 01: Level	j	90
A057	DC brake, start braking torque	0%	Normal Duty: 0...100% Low duty: 0…70%	j	
A058	DC brake, start braking time 0.0s		0.0...60.0s	j	
A059	DC brake, clock frequency 5.0kHz		Normal Duty: 2.0...15kHz Low duty: 2.0…10.0kHz	j	
A061	Max. operating frequency	0.00Hz	0.00...590.00Hz	j	90
A261	***Max. operating frequency (2nd parameter set)***	***0.00Hz***	***0.00...590.00Hz***	***j***	***90***
A062	Min. operating frequency	0.00Hz	0.00...590.00Hz	j	90
A262	***Min. operating frequency (2nd parameter set)***	***0.00Hz***	***0.00...590.00Hz***	***j***	***90***
A063	1. Frequency hopping	0.00Hz	0.00...590.00Hz	j	91
A064	1. frequency hopping, Jump distance	0.50Hz	0.50...10.00Hz	j	
A065	2. Frequency hopping	0.00Hz	0.00...590Hz	j	
A066	2. frequency hopping, Jump distance	0.50Hz	0.00...10.00Hz	j	
A067	3. Frequency hopping	0.00Hz	0.00...590.00Hz	j	
A068	3. frequency hopping, Jump distance	0.50Hz	0.00...10.00Hz	j	
A069	startup delay, frequency	0.00Hz	0.00...590.00Hz	j	
A070	startup delay, Time	0.0s	0.0...60.0s	j	91
A071	PID controller active	00	00: inactive 01: active 02: active with reversing	j	94
A072	PID controller, P component	1.00	0.00...25.00	j	94
A073	PID controller, I component	1.0s	0.0...3600.0s	j	94
A074	PID controller, D component	0.00s	0.00...100.00s	j	94
A075	PID controller, display factor 1.00		0.01...99.99	j	94
A076	PID controller, input Actual value signal	00	00: Input Ai2 (4…20mA) 01: Input Ai1 (0…10V) 02: RS485 (ModBus RTU) 03: Pulse frequency at input 8 10: according to A141…A146	j	94
A077	PID controller, inversion	00	00: default 01: inverted	j	94
A078	PID controller, control range	0.0	0.0…100.0%	j	
A079	PID controller, feedforward control	00	00: no feedforward control 01: Pre-control via input Ai1 02: Pre-control via input Ai2	j	95

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
A081	AVR function, Characteristic	02	00: active 01: inactive 02: inactive during shutdown	j	96
A281	***AVR function, Characteristic (2nd parameter set)***	***02***	***00: active 01: inactive 02: inactive during shutdown***	***j***	***96***
A082	Motor voltage / Mains voltage	230/ 400V	C1-…SF: 200/215/220/230/240 C1-…HF: 380/400/415/440/460/480	n	96
A282	***Motor voltage / Mains voltage (2nd parameter set)***	***230/ 400V***	***C1-…SF: 200/215/220/230/240V C1-…HF: 380/400/415/440/460/480V***	***n***	***96***
A083	AVR function, Time constant	0.300s	0.000...10.000s	j	96
A084	AVR function, Reinforcement downflow	100%	50...200%	j	96
A085	Energy saving operation	00	00: Normal operation 01: Energy saving mode	j	96
A086	Energy saving operation, responsiveness	50.0	0...100.0	j	96
A092	2. Ramp-up time	10.00s	0.00...3600.00s Activation, see A094	j	97
A292	***2. Ramp-up time (2nd parameter set)***	***10.00s***	***0.00...3600.00s Activation, see A094***	***j***	
A093	2. Rundown time	10.00s	0.00...3600.00s Activation, see A094	***j***	
A293	***2. Rundown time (2nd parameter set)***	***10.00s***	***0.00...3600.00s Activation, see A094***	***j***	
A094	Switching from 1st high- /down time to 2. ramp up /rundown time	00	00: via input 2CH 01: at frequency A095/A096 02: A092/A093 active when running counterclockwise	n	
A294	***Switching from 1st high- /down time to 2. Ramp up/ down time (2nd parameter set)***	***00***	***00: via input 2CH 01: at frequency A295/ A296 02: A292/ A293 active when running counterclockwise***	***n***	
A095	Switching frequency ramp-up time	0.00Hz	0.00...590.00Hz	j	
A095	***Switching frequency ramp-up time (2nd parameter set)***	***0.00Hz***	***0.00...590.00Hz***	***j***	
A096	Switching frequency downtime	0.00Hz	0.00...590.00Hz	j	
A296	***Switching frequency downtime (2nd parameter set)***	***0.00Hz***	***0.00...590.00Hz***	***j***	
A097	Startup characteristics	01	00: linear 01: S-curve	n	
A098	Run-down characteristics	01	02: U-curve 03: U-curve inverted 04: S-curve for elevators	n	
A101	Frequency at minimum setpoint input Ai2	0.00Hz	0.00...590.00Hz	j	98
A102	Frequency at max. setpoint input Ai2	0.00Hz	0.00...590.00Hz	j	98

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
A103	Min. setpoint at input Ai2	20%	0...100%	j	98
A104	Max. setpoint at input Ai2	100%	0...100%	j	98
A105	Starting condition input Ai2	00	00: Min. frequency A101 01: 0Hz start	j	98
A131	Characteristics of the curve shape (A097=01, 02, 03)	2	1...10	j	97
A132	Characteristics of the curve shape (A098=01, 02, 03)	2	1...10	j	
A141	Frequency setpoint calculated, frequency setpoint source 1	02	00: A020 01: Integrated potentiometer (OPE-SR option) 02: Input Ai1 (0…10V) 03: Input Ai2 (4…20mA) 04: RS485 (Modbus RTU) 05: Option card 07: Pulse frequency at input 8	j	---
A142	frequency setpoint calculated, Frequency setpoint source 2	03		j	
A143	frequency setpoint calculated, shortcut	00	00: A141 + A142 01: A141 – A142 **Attention! If the result is negative, the direction of rotation is reversed!** 02: A141 x A142	j	
A145	frequency setpoint calculated, offset	0.00Hz	0.00…590.00Hz	j	
A146	frequency setpoint calculated, offset, sign	00	00: +A145 01: -A145 **Attention! If negative The result is the direction of rotation turn back!**	j	
A150	Characteristic of the curve shape A097=04, startup 1	10%	0…50%	n	97
A151	Characteristic of the curve shape A097=04, ramp-up 2	10%	0…50%	n	
A152	Characteristic of the curve shape A098=04, ramp down 1	10%	0…50%	n	
A153	Characteristic of the curve shape A098=04, ramp down 2	10%	0…50%	n	
A154	ramp down delay, frequency	0.00Hz	0.00...590.00Hz	j	
A155	ramp down delay, Time	0.0s	0.0...60.0s	j	
A161	Frequency at minimum setpoint Integrated potentiometer (option)	0.00Hz	0.00...590.00Hz	j	---
A162	Frequency at maximum setpoint Integrated potentiometer (OPE-SRmini option)	0.00Hz	0.00...590.00Hz	j	
A163	Min. setpoint Integrated potentiometer (option)	0%	0...100%	j	
A164	Max. setpoint Integrated potentiometer (option)	100%	0...100%	j	
A165	Start condition 00: Min. frequency A161 Integrated potentiometer (option)	01	01: 0Hz start	j	

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
b001	restart Undervoltage / power failure	00	00: Fault message (no restart) 01: 0Hz start 02: Synchronization 1 03: Synchronization+Stop+Fault 04: Synchronization 2	j	99
b002	Permissible undervoltage / mains failure time	1.0s	0.3...25.0s	j	---
b003	Waiting time before restart after undervoltage. / Power failure	1.0s	0.3...100.0s	j	
b004	Undervoltage Mains failure during standstill	00	00: no error message 01: Fault message 02: no error message when running down and stopping	j	
b005	restart attempts Undervoltage/power failure	00	00: 16 attempts 01: unlimited	j	100
b007	Minimum frequency for Synchronization	0.00Hz	0.00…590.00Hz	j	
b008	Overvoltage/overcurrent restart mode	00	00: Fault message 01: 0Hz start 02: Synchronization 03: Synchronization+Stop+Fault 04: Active synchronization	j	
b010	restart attempts Overvoltage/overcurrent	3	1…3	j	
b011	Waiting time before restart Overvoltage/overcurrent	1.0s	0.3...100.0s	j	
b012	motor overload protection, Setting value	FU Inn [A]	0.2...1.0 x FU nominal current [A]	j	102
b212	***motor overload protection, Setting value (2nd parameter set)***	***FU Inn [A]***	***0.2...1.0 x FU nominal power [A]***	***j***	
b013	Motor overload protection, characteristics	01	00: Reduced load torque 01: Constant load torque 02: 3 support points b015…b020	j	
b213	***Motor overload protection, characteristics (2nd parameter set)***	***01***	***00: Reduced load torque 01: Constant load torque 02: 3 support points b015…b020***	***j***	
b015	Motor overload protection / frequency 1	0Hz	0...b017 [Hz]	j	
b016	Motor overload protection, trip current 1	0.00A	0...FU rated current	j	
b017	Motor overload protection, frequency 2	0Hz	b015...b019 [Hz]	j	
b018	Motor overload protection, trip current 2	0.00A	0...FU rated current	j	
b019	Motor overload protection, frequency 3	0Hz	b017...590Hz	j	
b020	Motor overload protection, trip current 3	0.00A	0...FU rated current	j	

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
b021	current limit 1, Characteristic	01	00: inactive 01: active startup/constant freq. 02: active at constant frequency 03: active startup/constant frequency, in generator operation speed increase	j	105
b221	***Current limit 1, characteristic (2nd parameter set)***	***01***	***00: inactive 01: active startup/ constant freq. 02: active at constant frequency 03: active startup/ constant frequency, in generator operation speed increase***	***j***	***---***
b022	Current limit 1, setting value	FU Inom x1.5 [A]	0.2...2.0 x FU nominal str. [A]	j	---
b222	***Current limit 1, setting value (2nd parameter set)***	***FU Inn x1.5***	***0.2...2.0 x FU nominal str. [A]***	***j***	***---***
b023	Current limit 1, ramp down time	1.0s	0.1...3000.0s	j	105
b223	***Current limit 1, ramp down time (2nd parameter set)***	***1.0s***	***0.1...3000.0s***	j	
b024	Current limit 2, characteristic	01	00: inactive 01: active startup/constant freq. 02: active at constant frequency 03: active startup/constant frequency, in generator operation speed increase	j	
b025	Current limit 2, setting value	FI nominal x 1.5 [A]	0.2...2.0 x FU rated current [A]	j	
b026	current limit 2, Rundown time	1.0s	0.1 ... 3000.0s	j	
b027	Overcurrent suppression	00	00: inactive 01: active without voltage reduction 02: active with voltage reduction	j	
b028	Starting current for speed synchronization (b088=02)	FU Inom	0.2...2.0 x FU nominal current [A]	j	108
b029	Time constant for Speed synchronization (b088=02)	0.5s	0.1…3000.0s	j	
b030	Scan start frequency for Speed synchronization (b088=02)	00	00: last frequency used 01: Max. frequency (A004) 02: current frequency setpoint	j	
b031	Parameter backup	01	00: SFT input: parameter+setpoint 01: SFT input: parameters only 02: Parameter + setpoint 03: parameters only	j	109
b033	Motor cable length	10	5...20	j	109
b034	Warning message Power on / operating time	0	0...65535 (x10) hours	j	---
b035	Lock direction of rotation	00	00: both directions released 01: Counterclockwise rotation blocked 02: Clockwise rotation blocked	n	---

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functional number	function	Basic value	Setting range	*	Page
b036	Soft start	2	0: inactive 1...255: approx. 6ms per value	j	---
b037	display mode	00	00: all functions 01: associated functions 02: selected radio. (U001...U032) 03: changed functions 05: d001-d104	j	---
b038	Display after power on	001	000: Function where SET was last pressed 001-060: d001-d060 201: F001 202: WOP Monitor B	j	---
b039	Save parameter history in U001…U032	00	00: Do not save parameter history 01: Save parameters in U001…U032	j	---
b040	Torque limitation mode	00	00: Function b041...b044 01: Digital inputs TRQ1, TRQ2 02: Analog input Ai1 (0…10V) 03: Option	j	110
b041	Torque limitation Motorized clockwise rotation	200%	0...200%, *no*	j	
b042	Torque limitation Counterclockwise rotation regenerative	200%	0...200%, *no*	j	
b043	Torque limitation Motorized left rotation	200%	0...200%, *no*	j	
b044	Torque limitation Clockwise rotation regenerative	200%	0...200%, *no*	j	
b045	Torque limitation LAD stop	00	00: inactive 01: active (possibly slow down longer)	j	
b046	Block reversing vector control	00	00: Reversing enabled 01: Reversing blocked	j	87
b049	Load setting	00	00: Normal Duty ND (50% for 60s) 01: Low Duty LD (20% for 60s)	n	107
b050	Guided shutdown in the event of an emergency stop or power failure	00	00: inactive 01: active 02: active, DC constant, none Restart after power on 03: active, DC constant, restart after power on or if DCV>b052 (b133, b134)	n	---
b051	Guided run-down, DC Starting voltage	220.0V/ 440.0V	C1-…SF: 0.0...400.0VDC UZK C1-…HF: 0.0…800.0VDC UZK	j	
b052	Guided run-down, DC Voltage for interrupting the down ramp	360.0V/ 720.0V	C1-…SF: 0.0...400.0VDC UZK C1-…HF: 0.0…800.0VDC UZK	j	
b053	Guided run down, Rundown time	1.00s	0.01…3600.00s	j	
b054	Guided run down, Frequency hopping	0.00Hz	0.00...10.00Hz	j	
b060	Analog setpoint comparator Input Ai1, maximum value	100%	0…100%	j	---
b061	Analog setpoint comparator Input Ai1, minimum value	0%	0…100%	j	
b062	Analog setpoint comparator Input Ai1, hysteresis	0%	0…10%	j	

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functional number	function	Basic value	Setting range	*	Page
b063	Analog setpoint comparator Input Ai2, maximum value	100%	0…100%	j	---
b064	Analog setpoint comparator Input Ai2, minimum value	0%	0…100%	j	
b065	Analog setpoint comparator Input Ai2, hysteresis	0%	0…10%	j	
b070	Analog setpoint comparator Input Ai1, setpoint	no	0…100%, no	j	
b071	Analog setpoint comparator Input Ai2, setpoint	no	0…100%, no	j	
b075	Enter ambient temperature (for d022)	40°C	-10…50°C	j	---
b078	Resetting the kWh counter d015	00	00: kWh counter running (d015) 01: Clear the kWh counter	j	---
b079	Factor display value d015 (kWh)	1	1…1000	j	---
b082	Starting frequency	0.50Hz	0.01...10.00Hz	j	109
b083	Clock frequency	ND:10kHz LD: 2kHz	2...15kHz (for LD max. 10kHz (see Chapter 2 Assembly, Derating)	j	110
b084	Factory setting / initialization	00	00: Initialization inactive 01: Delete fault message register 02: Load factory settings 03: Delete fault message register + load factory settings 04: Delete fault message register + Load factory settings, EzSQ delete program	n	111
b085	Factory setting parameter 01		00: --- 01: Europe 03: ---	n	
b086	Factor for display d007 and Pulse output EO	1.00	0.01...99.99	j	---
b087	Stop button for start/stop via FW/RV inputs	00	00: Key active 01: Button inactive 02: Only reset possible	j	---
b088	Motor synchronization	00	00: 0Hz start 01: Synchronization 1 02: Synchronization 2	j	108
b089	Load/temperature-dependent clock frequency	01	00: inactive 01: active, dependent v. Output current 02: active, dependent v. Heatsink temp.	j	110
b090	brake chopper Duty cycle (ED)	0.0%	0...100% (b095, b096), max value depends on ohm value below b097	j	112
b091	Stop mode	00	00: Ramp 01: free range	j	97
b092	Fan control	01	00: permanent 01: only in operation (3 minutes after power on or after stop) 02: temperature dependent	j	---
b093	Reset fan runtime 00: Fan runtime is running d022	00	01: Clear fan runtime	j	---

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functional number	function	Basic value	Setting range	*	Page
b094	Parameter selection for Reset Factory setting	00	00: All parameters 01: except I/O and communication 02: only parameters in U001-U032 03: except U001-U032+b037	n	111
b095	Release brake chopper	00	00: not released 01: only in operation 02: released	j	112
b096	Brake chopper Switch-on voltage	360V/ 720V	C1-…SF: 330…400VDC UZK C1-…HF: 660...800VDC UZK	j	
b097	Ohm value of the connected braking resistor	Depends on the FU type	Min. permissible resistance value…600ÿ; determines maximum ED under b090	j	
b098	Ground fault monitoring Power on	00	00: Not active 01: Active	n	---
b100	A044=02 Frequency 1	0Hz	0…b102	n	---
b101	A044=02 Tension 1	0.0V	0…800.0V	n	
b102	A044=02 Frequency 2	0Hz	b100…b104	n	
b103	A044=02 Tension 2	0.0V	0…800.0V	n	
b104	A044=02 Frequency 3	0Hz	b102…b106	n	
b105	A044=02 Tension 3	0.0V	0…800.0V	n	
b106	A044=02 Frequency 4	0Hz	b104…b108	n	
b107	A044=02 Tension 4	0.0V	0…800.0V	n	
b108	A044=02 Frequency 5	0Hz	b106…b110	n	
b109	A044=02 Tension 5	0.0V	0…800.0V	n	
b110	A044=02 Frequency 6	0Hz	b108…b112	n	
b111	A044=02 Tension 6	0.0V	0…800.0V	n	
b112	A044=02 Frequency 7	0Hz	b110…590Hz	n	
b113	A044=02 Tension 7	0.0V	0…800.0V	n	
b120	Brake control	00	00: inactive 01: P012=00: active P012=02: active with DC brake when position is reached 02: P012=00: active P012=02: active without DC brake upon reaching the position	j	---
b121	Waiting time before braking Release	0.00s	0.00…5.00s	j	---
b122	Waiting time for acceleration	0.00s	0.00…5.00s	j	

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functional number	function	Basic value	Setting range	*	Page
b123	Waiting time for delay	0.00s	0.00…5.00s	j	---
b124	Waiting time for brake confirmation	0.00s	0.00…5.00s	j	
b125	brake release frequency	0.00Hz	0.00…590.00Hz	j	
b126	Brake release current	FU Inn [A]	0...2 x FU nominal current [A]	j	---
b127	Brake incidence frequency	0.00Hz	0.00…590.00Hz	j	
b130	Avoidance of overvoltage tripping in generator operation	00	00: inactive 01: active (interrupt braking ramp) 02: active (increase frequency)	j	114
b131	Limit value for intermediate circuit voltage b130=01/02	380VDC/ 760VDC	C1-…SF: 330…400VDC UZK C1-…HF: 660…800VDC UZK	j	
b132	Deceleration time at b130=02	1.00	0.10…30.00s	j	114
b133	Avoidance of overvoltage tripping at b130=01, controller P component	0.20	0.00…5.00	j	
b134	Avoiding overvoltage tripping b130=01, controller I component	1.0	0.0…150.0s	j	
b145	Display functions “STO” safety function	00	00: no display 01:E37 02: -S--/E98/E99 03: -S--/E99 04: -S— 05: -S--/F01/F10/F02/F20/E99 06: -S--/F01/F10/F02/F20	j	39
b146	Permissible time delay for switching the inputs ST1 and ST2	0.00	0.00…2.00s	j	41
b147	Change from safety display to standard display	01	00: no change 01: Switch to standard display when pressing a button	j	41
b148	Waiting time for return Safety display	30s	1…30s	j	41
b150	Display when an external control unit is connected	001	d001-d060	j	---
b160	Display value 1 at d050	001	d001-d030	j	---
b161	Display value 2 at d050	002	d001-d030	j	---
b163	Setpoint change under d001/d007 (A001=02)	00	00: not released 01: released	j	---
b164	Return to the display selected under b038	00	00: inactive 01: active	j	---
b165	Communication monitoring ng external control unit	02	00: Fault message 01: Run down + fault message 02: no monitoring 03: free range 04: Run down + stop	j	---

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functional number	function	Basic value	Setting range	*	Page
b166	Authorization data Read/Write with WOP	00	00: Read/Write allowed 01: Read/Write disabled	j	---
b171	Operating mode	00	00: no function 01: Asynchronous motor up to 400Hz 02: Asynchronous motor up to 580Hz 03: Permanent magnet motor	n	---
b180	Start factory setting/ initialization	00	00: no function 01: Start initialization	n	111
b190	Set password (b037)	0000	0000: Password not active 0001-FFFF: Password active	n	---
b191	Enter password (b037	0000	0001-FFFF: corresponding to b190	n	---
b192	Set password (b031)	0000	0000: Password not active 0001-FFFF: Password active	n	---
b193	Enter password (b031)	0000	0001-FFFF: corresponding to b192	n	---
b910	motor overload protection, Characteristics Thermal subtraction	03	00: not active 01: linear subtraction 100%/10min. 02: linear subtraction 100%/b911 03: Subtraction according to filter 1st order b912	j	---
b911	Motor overload protection, thermal. Subtraction time (b910=02)	600.0s	600.00…100,000.00s, values <600s are not allowed!	j	---
b912	Motor overload protection, thermal. Subtraction, time const. (b910=03)	120.0s	120.00…100,000.00s, values <120s are not allowed!	j	---
b913	Motor overload protection, overload factor	100%	100.0…200.0%, values <100% are not allowed!	j	---
b914	Motor overload protection, save overload status when power off	01	00: Do not save when power off 01: Save when power off	j	---

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functional number	function	Basic value	Setting range	*	Page
C001	Digital input 1	00 (FW)	00: FW=Start clockwise rotation 01: RV=Start counterclockwise rotation 02: CF1=Fixed frequencies BCD, bit 1 (A019=00, page 116) 03: CF2=Fixed frequencies BCD, bit 2 (A019=00, page 116) 04: CF3=Fixed frequencies BCD, bit 3 (A019=00, page 116) 05: CF4=Fixed frequencies BCD, bit 4 (A019=00, page 116) 06: JG=Jog mode A038, A039 (page 116) 07: DB=DC brake A054 08: SET=2. Parameter set (page 117) 09: 2CH=2. Time ramp A092, A093 11: FRS=controller inhibit (freewheeling) 12: EXT=external fault (fault E12) 13: USP=restart interlock (fault E13, page 117) 15: SFT=parameter backup (b031, page 118) 16: AT=setpoint switching (A005, page 118) 18: RS=Reset (C102, C103) 19: Thermistor monitoring (only input 5-L, page 118) 20: STA=impulse start (page 119) 21: STP=impulse stop (opener, page 119) 22: F/R=Pulse control/direction of rotation (page 119) 23: PID=PID Off (if A071=01, page 119) 24: PIDC=PID Delete I component (page 118) 27: FUP=Freq. increase (A001=02 / fixed frequency, page 120) 28: FDN=Freq. reduce. (A001=02 / fixed frequency, page 120) 29: UDC=frequency reset (page 120) 31: OPE=Control via control panel (page 120) 32: SF1=Fixed frequency 1, A021 (A019=01, page 120) 33: SF2=Fixed frequency 2, A022 (A019=01, page 120) 34: SF3=Fixed frequency 3, A023 (A019=01, page 120) 35: SF4=Fixed frequency 4, A024 (A019=01, page 120) 36: SF5=Fixed frequency 5, A025 (A019=01, page 120) 37: SF6=Fixed frequency 6, A026 (A019=01, page 120) 38: SF7=Fixed frequency 7, A027 (A019=01, page 120) 39: OLR=current limit 2 active, b024…b026 40: TL=torque limitation active (b040…b045) 41: TRQ1=Torque limit binary, Bit1 (page 121) 42: TRQ2=Torque limit binary, Bit2 (page 121) 46: LAC=time ramps inactive (page 122) 47: PCLR=Delete actual position d030 (page 122) 50: ADD=add frequency (A145, A146, page 122) 51: F-TM=control via terminals (page 122) 52: ATR=torque control (P033…P041; page 122) 53: KHC=kWh counter d015 reset (page 122) 56: X(00)=EzSQ program input 1 57: X(01)=EzSQ program input 2 58: X(02)=EzSQ program input 3 59: Input 4 60: X(04)=EzSQ program input 5 61: X(05)=EzSQ program input 6 62:) 66: CP1=positions Bit1 (P060…P067, page 124) 67: CP2=positions Bit2 (P060…P067, page 124) 68: CP3=positions Bit3 (P060…P067, page 124) 69: ORL=reference switch connection 70: ORG=start referencing 73: SPD=switching from position to speed control 81: ECOM=direct communication inverter EzCom 82: PRG=EzSQ program function active (A017=01) 83: HLD=hold output frequency (page 124) 84: REN=controller enable (page 124) 85: EB=incremental encoder track B (only input 7) 86: DISP=disable display (b038) 90: FIRE=Firemode active (contact Hitachi) 91: PSET=assign actual position (P083, d030) no: no function *n=not	j	116
C002	Digital input 2	01 (RV)		j	
C003	Digital input 3	12 (EXT)		j	
C004	Digital input 4	18 (RS)		j	
C005	Digital input 5	02 (CF1)		j	
C006	Digital input 6	03 (CF2)		j	
C007	Digital input 7	06 (JG)		j	

adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
C011	Digital input 1 NO/NC	00	00: Closer 01: Opener	j	---
C012	Digital input 2 NO/NC	00		j	
C013	Digital input 3 NO/NC	00		j	
C014	Digital input 4 NO/NC	00		j	
C015	Digital input 5 NO/NC	00		j	
C016	Digital input 6 NO/NC	00		j	
C017	Digital input 7 NO/NC	00		j	

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functional number	function	Basic value	Setting range	*	Page
C021	Digital output 11 00	(RUN)	00: RUN=Operation 01: FA1=Frequency setpoint reached (page 126) 02: FA2=Freq. Exceeded (C042, C043, page 126) 03: OL= current exceeded (C041, page 126) 04: OD=PID control deviation (C044, page 127) 05: AL=Fault 06: FA3=Frequency reached (C042, C043, page 127) 07: OTQ=torque exceeded (C055…C058)	j	126
C022	Digital output 12 01	(FA1)	09: UV=undervoltage (E09) 10: TRQ=torque limitation active 11: RNT=operating time exceeded (b034, page 128) 12: ONT=power on time exceeded (b034, page 128) 13: THM=Motor overloaded (C061, page 128) 19: BRK=Brake enable signal 20: BER=Brake fault 21: ZS=Speed=0 (C063, page 128)	j	
C026	Relay AL0-AL1-AL2	05 (AL)	22: DSE=Speed deviation (P027, page 128) 23: POK=target position reached (page 128) 24: FA4=Freq. exceeded 2 (C045, C046, page 129) 25: FA5=Frequency reaches 2 (C045, C046, page 129) 26: OL2=current exceeded 2 (C111, page 129) 27: Ai1Dc=Analog setpoint monitoring Ai1, page 129) 28: Ai2Dc=Analog setpoint monitoring Ai2, page 129) 31: FBV=PID actual value monitoring (C052, C053) 32: NDc=Modbus communication interruption 33: LOG1=Log. Link. 1 (C142…C144, page 130) 34: LOG2=Log. Link. 2 (C145…C147, page 130) 35: LOG3=Log. Link. 3 (C148…C150, page 130) 39: WAC=Capacitor lifetime exceeded 40: WAF=Fan lifetime exceeded 41: FR=Start command 42: OHF=Heat sink over temperature (C064) 43: LOC=current undershot (C039, page 131) 44: Y(00)=EzSQ program output 1 45: Y(01)=EzSQ program output 2 46: Y(02)=EzSQ program output 3 50: IRDY=inverter ready (page 131) 51: FWR=clockwise rotation active 52: RVR=counterclockwise rotation active 53: MJA=serious fault (page 132) 54: WCAi1=Analog setpoint comparator Ai1 55: WCAi2=Analog setpoint comparator Ai2 58: FREF=Frequency setpoint via control unit 59: REF=Start command via control unit 60: SETM=2. Parameter set active 62: EDM=STO active, only output 11, Slide switch EDMSW (page 132) 63: OPO=option module available 64: FSC=OFF with ST1/ST2 discrepancy (b145=05.06 page 132) no: No function 00:	j	
C027	PWM output Ao2	07	Actual frequency value (0...A004) 01: Motor current (0...200%) 02: Torque (0...200%, independent of direction of rotation) 03: Frequency actual value, pulse signal (0...A004), **only Ao2** 04: Output voltage (0…133%) 05: Recording power (0...200%) 06: Thermal overload (0...100%)	j	---
C028	Analogue output A01, 0...10V	07	07: LAD frequency (0...A004) 08: Motor current, pulse signal. 1.44Hz at C030, **only Ao2** 10: heat sink temperature (0…200°C) 11: Torque (0…200%), **Ao1 only** 12: EzSQ analog output YA(0), **Ao2 only** 13: EzSQ analog output YA(1), **Ao1 only** 15: Pulse frequency monitor at input 8, **Ao2 only** *n= not adjustable during	j	134

operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
C030	current reference value C027=08	FU Inn [A]	0.2...2.0 x FU rated current [A] (at this current a frequency of 1.44kHz is output to Ao2-L)	j	---
C031	Digital output 11 NO/NC	00	00: Closer 01: Opener	j	---
C032	Digital output 12 NO/NC	00		j	---
C036	Relay AL0-AL1 NO/NC	01		j	---
C038	Signal “current undershot” LOC, characteristic	01	00: always active 01: not active during ramp up/ down ramp	j	131
C039	Signal “current undershot” LOC, setting value	FU Inn [A]	0...2.0 x FU nominal current [A]	j	
C040	“Current exceeded” signal OL, characteristics	01	00: always active 01: not active during ramp up/ down ramp	j	126
C041	“Current exceeded” signal OL, setting value	FU Inn x 1.15 [A]	0...2.0 x FU nominal current [A]	j	
C241	***Signal “current exceeded” OL, setting value (2nd parameter set)***	***FU Inenn x 1.15 [A]***	***0...2.0 x FU nominal current [A]***	***j***	
C042	Signal FA2, FA3, setting value for startup	0.00Hz	0.00…590.00Hz	j	126
C043	Signal FA2, FA3, setting value for ramp down	0.00Hz	0.00…590.00Hz	j	
C044	Signal “PID control deviation” OD, setting value	3.0%	0.0…100.0%	j	127
C045	Signal FA4, FA5, setting value for startup	0.00Hz	0.00…590.00Hz	j	126
C046	Signal FA4, FA5, setting value for ramp down	0.00Hz	0.00…590.00Hz	j	
C047	Evaluation of pulse signal at C027=15	1.00	0.01...99.99	j	---
C052	Signal “PID-FBV”, “Off threshold”	100.0%	0.0…100.0%	j	---
C053	Signal “PID-FBV”, One-threshold	0.0%	0.0…100.0%	j	---
C054	Signal “torque exceeded/ undershot” OTQ, selection (only at SLV)	00	00: Torque exceeded 01: Torque not reached	j	---
C055	“Torque exceeded” signal OTQ, setting value for motor-driven clockwise rotation	100%	0…200%	j	---
C056	“Torque exceeded” signal OTQ, setting value for counterclockwise rotation, regenerative	100%	0…200%	j	---
C057	“Torque exceeded” signal OTQ, setting value for motorized anti-clockwise rotation	100%	0…200%	j	---

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functional number	function	Basic value	Setting range	*	Page
C058	"Torque exceeded" signal OTQ, setting value for clockwise rotation regenerative	100% 0…200%		j	---
C059	"Torque exceeded" signal OTQ, Characteristic	01	00: always active 01: not active during ramp up/down ramp	j	---
C061	"Motor overloaded" signal THM, setting value	90% 0…100%		j	---
C063	Signal "Speed=0" ZS, Setting value	0.00Hz 0.00...100.00Hz		j	---
C064	"Heat sink overtemperature" signal OHF, Setting value	100°C 0…110°C		j	---
C071	RS485 baud rate	05	03: 2400bps 04: 4800bps 05: 9600bps 06: 19200bps 07: 38400bps 08: 57600bps 09: 76800bps 10: 115200bps	j	---
C072	RS485 address	1	1...247	j	
C074	RS485 parity	00	00: no parity 01: even parity 02: odd parity	j	
C075	RS485 stop bits	1	1 or 2 stop bits	j	
C076	RS485 behavior Communication disorder	02	00: Fault message E60/E69 01: Stop, fault message E60/E69 02: Ignore disturbances 03: free range 04: Stop	j	
C077	RS485 permitted timeout 0.00s 0…99.99s			j	
C078	RS485 waiting time	0ms	0...1000ms	j	
C081	Calibration of analog input Ai1 (0...10V)	100.0% 0.0...200.0%		j	134
C082	Adjustment of analog input Ai2 (4...20mA)	100.0% 0.0...200.0%		j	
C085	Trigger value thermistor input	100.0 0.0...200.0%		j	113
C091	debug mode	00	Don `t change!!!	j	--
C096	communication	00	00: ModBus RTU 01: EzCOM 02: EzCOM Administrator	j	---
C098	EzCOM start address Master 1		01…08	n	
C099	EzCOM end address Master 1		01…08	n	
C100	EzCOM startup trigger	00	00: Digital input ECOM 01: Power on	n	

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functional number	function	Basic value	Setting range	*	Page
C101	Frequency setpoint specification via inputs FUP/FDN, Save setpoint	00	00: do not save 01: save	j	135
C102	Reset signal	00	00: on rising edge 01: on falling edge 02: on rising edge, active only in the event of a fault 03: on rising edge, active only in the event of a fault, do not reset register	j	135
C103	Restart after reset	00	00: Start at 0Hz 01: Synchronization 1 02: Synchronization 2	j	135
C104	Frequency setpoint specification via inputs FUP/FDN, Setpoint from EEPROM	00	00: 0Hz 01: Setpoint from EEPROM	j	135
C105	Adjust output EO	100%	50…200%	j	---
C106	Adjustment of analog output Ao1 (0...10V)	100%	50…200%	j	134
C109	Offset analog output Ao1 (0...10V)	0%	0…100%	j	134
C111	Signal “Current exceeded 2” OL2, setting value	FU Inn x 1.15 [A]	0...2.0 x FU nominal current [A]	j	
C117	JOG dial change rate	1	1…24 The larger the value, the lower the rate of change (change in value/revolution)	n	---
C118	JOG dial sensitivity	20	1…100	n	---
C130	Switch-on delay Exit 11	0.0s	0.0…100.0s	j	---
C131	Switch-off delay Exit 11	0.0s	0.0…100.0s	j	---
C132	Switch-on delay Exit 12	0.0s	0.0…100.0s	j	---
C133	Switch-off delay Exit 12	0.0s	0.0…100.0s	j	---
C140	Switch-on delay relay AL0-AL1-Al2	0.0s	0.0…100.0s	j	---
C141	Switch-off delay relay AL0-AL1-AL2	0.0s	0.0…100.0s	j	---
C142	Logical link 1, Signal function 1	00	Settings under C021…C022 (except LOG1…LOG3, OPO, no)	j	130
C143	Logical link 1, Signal function 2	00	Settings under C021…C022 (except LOG1…LOG3, OPO, no)	j	
C144	Logical link 1, shortcut	00	00: AND 01: OR 02: XOR	j	
C145	Logical link 2, settings under C021…C022	00	Signal function 1 (except LOG1…LOG3, OPO, no)	j	
C146	Logical link 2, settings under C021…C022	00	Signal function 2 (except LOG1…LOG3, OPO, no)	j	

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
C147	Logical link 2, shortcut	00	00: AND 01: OR 02: XOR	j	130
C148	Logical link 3, Signal function 1	00	Settings under C021…C022 (except LOG1…LOG3, OPO, no)	j	
C149	Logical link 3, Signal function 2	00	Settings under C021…C022 (except LOG1…LOG3, OPO, no)	j	
C150	Logical link 3, shortcut	00	00: AND 01: OR 02: XOR	j	
C160	Response time digital input 1	1	0…200 [x2ms]	j	125
C161	Response time digital input 2	1	0…200 [x2ms]	j	125
C162	Response time digital input 3	1	0…200 [x2ms]	j	125
C163	Response time digital input 4	1	0…200 [x2ms]	j	125
C164	Response time digital input 5	1	0…200 [x2ms]	j	125
C165	Response time digital input 6	1	0…200 [x2ms]	j	125
C166	Response time digital input 7	1	0…200 [x2ms]	j	125
C169	Determination time when selecting fixed frequencies	0	0…200 [x10ms]	j	125
C900	Condition for “inverter ready” signal IRDY	01	00: independent of ST1/ST2 01: dependent on ST1/ST2	j	131
C901	“Current exceeded” signal OL, OL2, cycle time	00	00: 40ms 01: 2ms	j	126
C902	Signal “current exceeded” OL, OL2, filter time const.	0ms	0…9999ms	j	
C903	“Current exceeded” signal OL, OL2, hysteresis	10.00%	0.00…50.00%	j	

*n=not adjustable during operation / j=adjustable during operation

functional number	function		Basic value	Setting range	*	Page
H001	Auto tuning		00	00: inactive 01: static autotuning 02: dynamic autotuning 00:	n	136
H002	Engine data		00	standard (H020…H024) 02: Autotuning (H030…H034)	n	137
H202	***Engine data (2nd parameter set)***		***00***	***00: Standard (H220…H224) 02: Autotuning (H230…H34)***	***n***	***137***
H003	Engine performance		FU power [kW]	0.1...18.5kW	n	80
H203	***Engine performance (2nd parameter set)***		***FU power [kW]***	***0.1...18.5kW***	***n***	***80***
H004	Number of motor poles		4pol	2…8 pin	n	80
H204	***Number of motor poles (2nd parameter set)***		***4pol***	***2…8 pin***	***n***	***80***
H005	Speed controller response speed		100	1...1000	j	87
H205	***Speed controller response speed (2nd parameter set)***		***100***	***1...1000***	***j***	***87***
H006	Engine stabilization constant		100	0...255	j	137
H206	***Motor stabilization constant (2nd parameter set)***		***100***	***0...255***	***j***	137
H020	Default- Motor constants H002=00	R1		0.001...65.53ÿ	n	136
H021		R2		0.001...65.53ÿ	n	136
H022		L		0.01...655.3mH	n	136
H023		I0		0.01...655.3A	n	136
H024		J		0.001...9999kgm2	n	136
H220	***Standard motor constants H202=00 (2nd parameter set)***	***R1***		***0.001...65.53*** ÿ	***n***	***136***
H221		***R2***		***0.001...65.53*** ÿ	***n***	***136***
H222		***L***		***0.01...655.3mH***	***n***	***136***
H223		***I0***		***0.01...655.3A***	***n***	***136***
H224		***J***		***0.001...9999kgm2***	***n***	***136***
H030	autotuning Motor constants H002=02	R1		0.001...65.53ÿ	n	136
H031		R2		0.001...65.53ÿ	n	136
H032		L		0.01...655.3mH	n	136
H033		I0		0.01...655.3A	n	136
H034		J		0.001...9999kg/m2	n	136

*n=not adjustable during operation / j=adjustable during operation

functional number	function		Basic value	Setting range	*	Page
H230		***R1***		***0.001...65.53*** ÿ	***n***	136
H231		***R2***		***0.001...65.53*** ÿ	***n***	136
H232	***Standard motor constants H202=02***	***L***		***0.01...655.3mH***	***n***	136
H233	***(2nd parameter set)***	***I0***		***0.01...655.3A***	***n***	136
H234		***J***		***0.001...9999kg/ m2***	***n***	136
H050	Slip compensation at U/f	P-Portion	0.20	0.00...10.00	j	---
H051	(A044=00) with Donor feedback	I share 2		0...1000s	j	---
H102	PM engine, engine data		00	00: Standard data 01: Autotuning data	n	---
H103	PM engine, engine power		FU Power [kW]	0.1...18.5kW	n	
H104	PM motor, number of motor poles		4pol	2, 4, 6, 8, 10, 12, 14, 16, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48pin	n	
H105	PM motor, rated motor current			0…100% drive rated current	n	
H106	PM engine constants H102=00	R		0.001...65.535ÿ	n	
H107		Ld		0.01...655.35mH	n	
H108		Lq		0.01...655.35mH	n	
H109		Ke		0.0001…6.5535V/(rad/s)	n	
H110		J		0.001…9999.000kgm2	n	
H111	PM engine constants H102=01 (auto tuning)	R		0.001...65.535ÿ	n	
H112		Ld		0.01...655.35mH	n	
H113		Lq		0.01...655.35mH	n	
H116	PM motor, speed controller Response speed		100	1…1000%	j	
H117	PM motor, starting current		70	20…100%	n	
H118	PM motor, start-up time		1.00	0.01…60.00s	n	
H119	PM motor, motor stabilization constant		100	0…120%	j	
H121	PM motor, minimum frequency		8.0	0…25.5%	j	
H122	PM motor, idle current		10.00	0…100%	j	
H123	PM motor, start-up procedure		00	00: inactive 01: active	n	
H131	PM motor, initial magnet Position Estimation 0V Wait Times		10	0…255	n	

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
H132	PM motor, initial magnet Position Estimation Detect Wait times	10	0…255	n	---
H133	PM motor initial magnet Position Estimation 0V Times	30	0…255	n	
H134	PM motor initial magnet Position Estimation Voltage gain	100	0…200	n	
P001	Behavior in case of disruption Connection with a connected Option card	00	00: Fault message 01: no error message	j	---
P003	Use pulse input 8 00		00: Setpoint specification pulse frequency signal (A001=06) 01: Incremental encoder feedback 02: Digital input X(07) EasySeq.	n	---
P004	Encoder feedback mode	00	00: Entrance 8: A 01: Input 8: A, Input 7: B 02: do not set! 03: Input 8: A, Input 7: Direction of rotation	n	---
P011	Incremental encoder resolution 512		32...1024 pulses/revolution	n	---
P012	Positioning activation	Impulses 00	00: not active 02: active	n	---
P014	Positioning, slow speed revolution	125% 0.0…400.0%		n	---
P015	Positioning, slow speed frequency	5.00Hz b082...10.00Hz		j	---
P017	Positioning, windows "Position reached"	50 pulses 0…10,000 pulses	(Position window: P017/4)	n	---
P026	Positioning, monitoring maximum speed	115.0% 0.0...150.0%		j	---
P027	Positioning, monitoring speed deviation	10.00H e.g	0.00...120.00Hz	j	---
P031	Default time ramp	00	00: Control panel 03: PLC programming	n	97
P033	torque control, Torque setpoint source	00	00: Analog input Ai1 (0…10V) 01: Analog input Ai2 (4…20mA) 03: Control panel P034 06: Option card	n	139
P034	torque control, torque setpoint, Setting value	0%	0…200% P033=03	j	139
P036	torque control, Torque offset, default	00	00: no offset 01: Control panel P037 05: Option card	n	139
P037	torque control, torque offset, Setting value	0%	-200…+200% P037=01	j	139
P038	torque control, Sign torque offset	00	00: corresponding to signal polarity 01: dependent on direction of rotation	n	139
P039	Torque control, max. Frequency clockwise rotation	0.00Hz 0.00…120.00Hz		j	139

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
P040	Torque control, max. Frequency counterclockwise rotation	0.00Hz	0.00…120.00Hz	n	139
P041	Speed/torque control switching time	0ms	0…1000ms	n	139
P044	Option ProfiBus, Profi-Net, EtherCAT, watchdog timer	1.00s	0.00…99.99s	n	---
P045	Option ProfiBus, Profi-Net, EtherCAT, behavior at Communication disorder	00	00: Fault E60/E69 01: Stop with ramp, fault. E60/E69 02: Ignore disturbances 03: Stop with free run 04: Stop with ramp down	n	---
P046	Option DeviceNet assembly instance number	01	0…20	n	---
P048	DeviceNet option Idle mode action selection	00	00: Fault message E60/E69 01: Stop, fault message E60/E69 02: Ignore disturbances 03: free range 04: Stop, ramp down	n	---
P049	Number of motor poles for specifying the speed via bus	0	0, 2, 4, 6, 8…48 poles	n	---
P055	pulse frequency signal, Scaling	1.5kHz	1.0…32.0kHz	j	138
P056	Pulse frequency signal, filter time constant	0.10s	0.01…2.00s	j	138
P057	Pulse frequency signal, frequency offset	0%	-100…+100%	j	138
P058	Pulse frequency signal, max. Frequency limit	100%	0…100%	j	138
P059	Pulse frequency signal, min. Frequency limit	1.00%	0.01…20.00%	j	138
P060	Positioning, position 0	0	P073…P072	j	---
P061	Positioning, position 1	0	P073…P072	j	---
P062	Positioning, position 2	0	P073…P072	j	---
P063	Positioning, position 3	0	P073…P072	j	---
P064	Positioning, position 4	0	P073…P072	j	---
P065	Positioning, position 5	0	P073…P072	j	---
P066	Positioning, position 6	0	P073…P072	j	---
P067	Positioning, position 7	0	P073…P072	j	---
P068	Positioning, Homing mode	00	00: Low Speed (P070) 01: High Speed (P071, P070)	j	---
P069	positioning, referencing Direction of rotation	01	00: Clockwise rotation 01: Left rotation	j	---
P070	positioning, referencing Frequency low speed	5.00Hz	0.00…10.00Hz	j	---
P071	positioning, referencing Frequency high speed	5.00Hz	0.00…A004 [Hz]	j	---

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functional number	function	Basic value	Setting range	*	Page
P072	Positioning, Maximum position clockwise rotation	2 28 -1	0…268435455 (228 -1)	j	---
P073	Positioning, Maximum position left rotation	-2 28+1	0…-268435455(-2 28+1)	j	---
P075	Positioning, travel path (Rotary table applications)	00	00: According to position value 01: Shortest path, (P004=00/01, P060=Impulse rotary table revolution)	n	---
P077	Positioning, encoder signals, monitoring time	1.0s	0.0…10.0s, in case of fault: E80 0.0: Monitoring inactive	j	---
P080	Positioning, position correction window	0 pulses.	0…10,000 pulses (Position window: P080/4)	n	---
P081	Saving the actual position when power is off	00	00: Do not save actual position 01: Save actual position (P082)	j	---
P082	Storage location of the actual position. at power off (d030x4)	0	P072…P073	j	---
P083	Pre-set actual position (input PSET-91)	0	P072…P073 Assign this value as actual position with input PSET (91).	j	---
P100	Program function Variable U(00)	0	0…65535	j	---
P101	Program function Variable U(01)	0	0…65535	j	---
P102	Program function Variable U(02)	0	0…65535	j	---
P103	Program function Variable U(03)	0	0…65535	j	---
P104	Program function Variable U(04)	0	0…65535	j	---
P105	Program function Variable U(05)	0	0…65535	j	---
P106	Program function Variable U(06)	0	0…65535	j	---
P107	Program function Variable U(07)	0	0…65535	j	---
P108	Program function Variable U(08)	0	0…65535	j	---
P109	Program function Variable U(09)	0	0…65535	j	---
P110	Program function Variable U(10)	0	0…65535	j	---
P111	Program function Variable U(11)	0	0…65535	j	---
P112	Program function Variable U(12)	0	0…65535	j	---
P113	Program function Variable U(13)	0	0…65535	j	---
P114	Program function Variable U(14)	0	0…65535	j	---
P115	Program function Variable U(15)	0	0…65535	j	---
P116	Program function Variable U(16)	0	0…65535	j	---
P117	Program function Variable U(17)	0	0…65535	j	---

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
P118	Program function variable U(18)	0	0…65535	j	---
P119	Program function variable U(19)	0	0…65535	j	---
P120	Program function variable U(20)	0	0…65535	j	---
P121	Program function variable U(21)	0	0…65535	j	---
P122	Program function variable U(22)	0	0…65535	j	---
P123	Program function variable U(23)	0	0…65535	j	---
P124	Program function variable U(24)	0	0…65535	j	---
P125	Program function variable U(25)	0	0…65535	j	---
P126	Program function variable U(26)	0	0…65535	j	---
P127	Program function variable U(27)	0	0…65535	j	---
P128	Program function variable U(28)	0	0…65535	j	---
P129	Program function variable U(29)	0	0…65535	j	---
P130	Program function variable U(30)	0	0…65535	j	---
P131	Program function variable U(31)	0	0…65535	j	---
P140	EzCOM records in total	05	01...05	n	---
P141	EzCOM data set 1 Destination address	1	1...247	j	
P142	EzCOM data set 1 Target holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P143	EzCOM data set 1 Source holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P144	EzCOM Dataset 2 Destination address	2	1...247	j	
P145	EzCOM Dataset 2 Target holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P146	EzCOM Dataset 2 Source holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P147	EzCOM Dataset 3 Destination address	3	1...247	j	
P148	EzCOM Dataset 3 Target holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P149	EzCOM Dataset 3 Source holding register	0000	0000….FFFF (value according to Holding register table -1)	j	
P150	EzCOM Dataset 4 Destination address	4	1...247	j	
P151	EzCOM Dataset 4 Target holding register	0000	0000….FFFF (value according to Holding register table -1)	j	

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
P152	EzCOM Dataset 4 Source holding register	0000 0000	….FFFF (value according to Holding register table -1)	j	---
P153	EzCOM Dataset 5 Destination address	5	1...247	j	
P154	EzCOM Dataset 5 Target holding register	0000 0000	….FFFF (value according to Holding register table -1)	j	
P155	EzCOM Dataset 5 Source holding register	0000 0000	….FFFF (value according to Holding register table -1)	j	
P160	PZD1	0000 0000	...FFFF		---
P161	PZD2	0000 0000	...FFFF	yy	
P162	PZD3	0000 0000	...FFFF	j	
P163	PZD4	0000 0000	...FFFF	j	
P164	PZD5	0000 0000	...FFFF	j	
P165	PZD6	0000 0000	...FFFF	j	
P166	PZD7	0000 0000	...FFFF	j	
P167	PZD8	0000 0000	...FFFF	j	
P168	PZD9	0000 0000	...FFFF	j	
P169	PZD10	0000 0000	...FFFF	j	
P170	PZD1	0000 0000	...FFFF	j	
P171	PZD2	0000 0000	...FFFF	j	
P172	PZD3	0000 0000	...FFFF	j	
P173	PZD4	0000 0000	...FFFF	j	
P174	PZD5	0000 0000	...FFFF	j	
P175	PZD6	0000 0000	...FFFF	j	
P176	PZD7	0000 0000	...FFFF	j	
P177	PZD8	0000 0000	...FFFF	j	
P178	PZD9	0000 0000	...FFFF	j	
P179	PZD10	0000 0000	...FFFF	j	---
P180	Profibus option, Node address	0	0...125	n	
P181	Profibus option, Behavior in the event of a bus fault or CLEAR mode	00	00: Delete output data and Stop drive 01: Do not delete output data and drive continues to run	n	
P182	Profibus option, Transmission protocol	00	00: PPO 01: conventional 02: flexible	n	---

*n=not adjustable during operation / j=adjustable during operation

functional number	function	Basic value	Setting range	*	Page
P185	CANopen option, Node address	0	0...127	n	---
P186	CANopen option, Baud rate	06	00: automatic 01: 10kbps 02: 20kbps 03: 50 kbps 04: 125 kbps 05: 250 kbps 06: 500 kbps 07: 800 kbps 08: 1Mbps	n	
P190	CompoNet option, Node address	0	0…63	n	---
P192	DeviceNet option, MAC ID 63		0…63	n	---
P195	Option ML2, Frame Length 00		00: 32 bytes 01: 17 bytes	n	---
P196	Option ML2, node address	21	21…3E hex	n	---
P200	Modbus mapping	00	00: not active 01: active	j	---
P201... P210	Modbus mapping, external registers	0000h	0000….FFFFh 0000h: no register selected	j	---
P211... P220	Modbus mapping, External register format	00	00: 16bit unsigned 01: 16bit with sign	j	---
P221... P230	Modbus mapping, Scaling factor	1.000	0.001…65.535	j	---
P301... P310	Modbus mapping, internal registers	0000h	0000….FFFFh 0000h: no register selected	j	---
P400	Endian selection	00	00: Big endian 01: Little endian 02: Special endian	j	---
P900	Speed control with encoder feedback at EA-L at A044=00, measuring cycle	00	00: Pulse cycle/2 01: Pulse cycle	j	---
U001... U032	Custom selection of max. 32 functions	no	d001…P186, no	j	See b037

*n=not adjustable during operation / j=adjustable during operation

5.2 Basic functions

F001	Display/enter frequency setpoint	0.00Hz
Setting range	0.00…590.00Hz	

- Display of the frequency setpoint. With activated PID controller (A071=01): Display of the PID Controller setpoint [%].
- Enter the frequency setpoint if A001=02 (or enter the PID controller setpoint [%] if additionally A071=01).
- Entering/changing fixed frequencies (when selecting the fixed frequencies via the corresponding ones digital inputs)

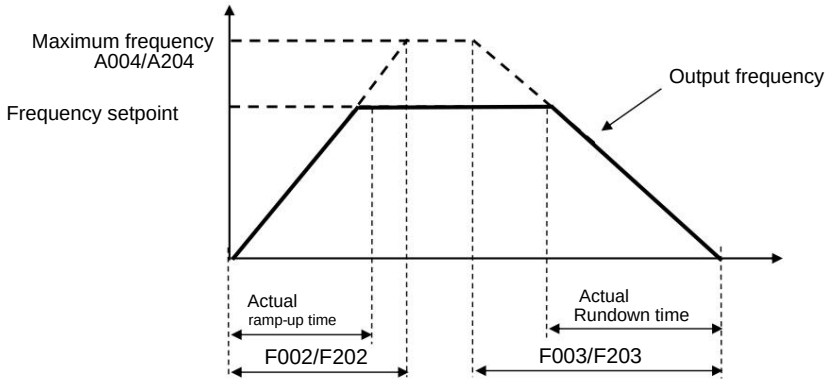
F002,F202	1. Ramp-up time	10.00s

F003,F203	1. Rundown time	10.00s
Setting range	0.00…3600.00s	

The ramp-up or ramp-down time refers to the set end frequency (function A004). There is also a 2nd ramp-up or ramp-down time that can be activated in various ways (see **time ramps,** function A092...A098; digital input 2CH). The minimum possible ramp-up or ramp-down time for a specific drive essentially depends on the mass moment of inertia of the mechanical system to be driven. If these times are not reached, a fault message is triggered (E01...E03 “Overcurrent” or E07 “Overvoltage in the DC link”).

When the digital input LAC is activated, the time ramp is inactive and the inverter follows the frequency setpoint directly.

Function P031 determines how the time ramp is specified:
P031=00: via control panel (as described here)
P031=03: via “Easy Sequence” program function



b091=01: When stopping, the brakes are not braked according to the deceleration time, but rather the output stages are switched off and the drive runs down uncontrolled.

A001,A201	Frequency setpoint	01
(00)	**specification** Integrated potentiometer (only with an optional OPE-SRmini control panel)	
01	Analogue inputs Ai1 - L (0…10V) or Ai2 - L (4…20mA)	
02	Entry under function F001	
03	RS485 (ModBus RTU)	
04	Option card (e.g. ProfiBus/ProfiNet option, EtherCAT option)	
06	Pulse frequency at input 8	
07	EzSQ program function	
10	A141…A146	

There are also the following options:
- Retrieval of fixed frequencies via inputs SF1…SF7 or CF1…CF4 (A021...A035). Fixed frequencies have priority over other setpoint sources. Only jogging has even higher priority (A038, input JG).
- Setpoint specification via inputs FUP (increase frequency) and FDN (reduce frequency) (A001=02).

Fixed frequencies can be programmed in two ways:
- Enter the frequencies under function A021...A035.
- Select the corresponding digital input CF1...CF4 and enter the desired frequency under Function F001. The value entered must be saved using the STR key.

Digital input F-TM=ON: Start/stop and setpoint specification take place via control terminals - regardless of the setting under A001 / A002.

Digital input OPE=ON: Start/stop and setpoint specification take place via the built-in control panel – regardless of the programming under functions A001 and A002. If this happens during operation, the drive is first stopped.

In each of the above cases, the setpoint is displayed under function F001.

b163	**Setpoint change in d001/d007 using the arrow keys…** …not	**00**
00	released	
01	…released (A001=02)	

WARNING

For frequencies >60Hz, ensure that the motor and machine are suitable for these speeds.

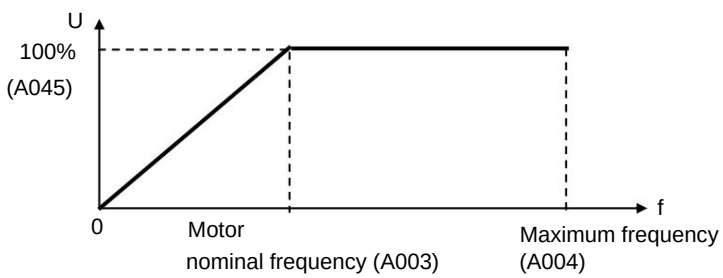
A002, A202	**Start/Stop command**	**01**
01	Digital inputs with the FW and RV functions	
02	RUN and STOP buttons on the control panel	
03	RS485 (ModBus RTU)	
04	Option card	

Digital input F-TM=ON: Start/stop and setpoint specification take place via control terminals - regardless of the setting under A001 / A002.

Digital input OPE=ON: Start/stop and setpoint specification take place via the built-in control panel - regardless of the input in A001 and A002. If this happens during operation, the drive is first stopped.

A004, A204	**Maximum frequency**	**50.0Hz**
Setting range	30.0…590.0Hz	

The maximum frequency is output when the maximum setpoint is reached. **Danger! If A004 is reduced to values < A003, then A003 is reduced to the same value.**



5.3 Engine data

An optimal adaptation of the frequency inverter to the connected motor can be carried out using autotuning (see functions H001 and H002). If the motor data are known, they can also be entered directly into the functions H020...H224.

The following data must always be entered:

A003, A203	**Motor nominal frequency / corner**	**50.0Hz**
Setting range	**frequency** 30.0…590.0Hz	

This function is used to enter the output frequency at which the output voltage reaches its maximum value. As a rule, this is the nominal frequency of the connected motor (see figure under function A004).

H003, H203	**Motor power**	**----kW**
Setting range	0.1…18.5kW	

The power can be found on the nameplate of the connected motor.

H004, H204	**Number of motor**	**4 pin**
Setting range	**poles** 2…8 pin	

The number of poles can be derived from the rated speed and rated frequency stated on the motor nameplate.

It must also be checked whether the nominal motor voltage corresponds to the value entered under A082 (see function A081, A082, factory setting=230/400V).

5.4 Linking the analog inputs

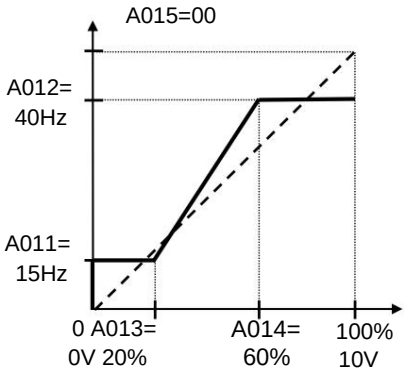
A005	Switching the setpoint inputs with input AT	00
00	Switching between input Ai1 and Ai2 with digital input AT. AT Off: Input Ai1 active AT On: Input Ai2 active	
02	Only in conjunction with an optional OPE-SRmini control unit. Switching between input Ai1 and integrated potentiometer with digital input AT. AT Off: Input Ai1 active AT On: Integrated potentiometer active	
03	Only in conjunction with an optional OPE-SRmini control unit. Switching between input Ai2 and integrated potentiometer with digital input AT. AT Off: Input Ai2 active AT On: Integrated potentiometer active	

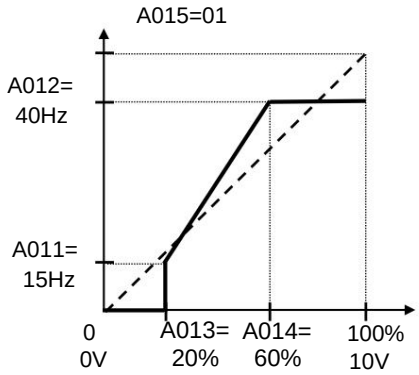
AT input available?	A005	AT entrance	Main frequency reference input
Yes	00	OUT OF	Ai1
		A	Ai2
	02	OUT OF	Ai1
		A	Integrated potentiometer (option)
	03	OUT OF	Ai2
		A	Integrated potentiometer (option)
No	--	--	Add Ai1 + Ai2

5.5 Scaling analog input Ai1 (0...10V)

Example:

A011 15Hz
A012 40Hz
A013 20% (2V)
A014 60% (6V)





Setpoint inversion

In special applications it may be necessary to drive the maximum frequency with the minimum setpoint (e.g. 0V) or the minimum frequency with the maximum setpoint (e.g. 10V). To do this, enter the maximum frequency under A011 and the minimum frequency under A012. **Danger! Under these circumstances there is no protection against wire breakage! (see A015).**

A011	**Frequency at minimum setpoint at input Ai1**	**0.00Hz**
Setting range	0.00…590.00Hz	

With activated PID controller (A071=01): **Setting range: 0...100%**

A012	**Frequency at max. setpoint at input Ai1** 0.00…	**0.00Hz**
Setting range	590.00Hz	

With activated PID controller (A071=01): **Setting range: 0...100%**

A013	**Min. setpoint at input Ai1** 0…	**0%**
Setting range	100%	

The value entered refers to the maximum possible setpoint of 10V.

A014	**Max. setpoint at input Ai1** 0…	**100%**
Setting range	100%	

The value entered refers to the maximum possible setpoint of 10V.

A015	**Starting condition input Ai1** If	**01**
00	setpoints < minimum setpoint (A013), the frequency programmed under function A011 is output.	
01	For setpoints < minimum setpoint (A013) 0Hz is output.	

PID controller

When using analog input Ai1 as an actual value input in conjunction with the integrated PID controller, A011…A014 (together with function A075) can be used to scale the signal to the measured variable (unit: %). In this case, the original input values under A011 and A012 are multiplied by the factor under A075. If A011=A012=0%, scaling takes place directly via A075.

Example:
A011=20%, A012=100%; Changing the input under A075 from 1.00 to 0.60: A011=12%, A012=60%
0…10V corresponds to 12…60% actual value under d004

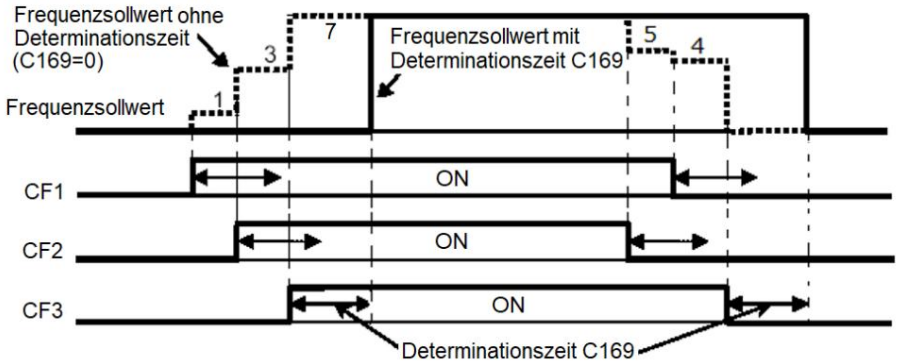
5.6 Fixed frequencies

Fixed frequencies can be accessed via digital inputs in two ways:

1. **Retrieval of up to 15 fixed frequencies (function A21...A35) BCD-coded via digital inputs CF1...CF4 (C001…C007=02…05, A019=00).**

A-corridor	Fixed frequency / function															
	A20*	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35
CF1		ON		ON		ON		ON		ON		ON		ON		ON
CF2			ON	ON			ON	ON			ON	ON			ON	ON
CF3					ON	ON	ON	ON					ON	ON	ON	ON
CF4									ON	ON	ON	ON	ON	ON	ON	ON

To avoid unwanted fixed frequencies being triggered when the binary signal is applied (e.g. due to contact bounce), a determination time can be entered under C169.



2. **Retrieval of up to 7 fixed frequencies (function A21...A27) bit by bit via the digital inputs SF1...SF7 (C001...C007=32...38, A019=01).** If 2 or more inputs are controlled at the same time, the frequency with the lower priority is used.

A-corridor	Fixed frequency / function							
	A20*	A21	A22	A23	A24	A25	A26	A27
SF1		ON						
SF2		O	ON					
SF3		OO	ON					
SF4		OOO	ON					
SF5		OOOO	ON					
SF6		OOOOO	ON					
SF7		OOOOOO	ON					

O: Signal status at the corresponding digital input has no effect.

The determination time under function C169 does not work here

*If none of the inputs CF1...CF4 or SF1...SF7 are activated, the frequency inverter moves to the base frequency (if A001=02: function A020) or to the existing frequency setpoint.
Fixed frequencies have priority over other setpoints. Only tapping has higher priority (A038, input JG).

A019	**Retrieval of fixed frequencies**	**00**
00	(BCD) 15 fixed frequencies via digital inputs CF1…CF4	
01	(Bit) 7 fixed frequencies via digital inputs SF1…SF7	

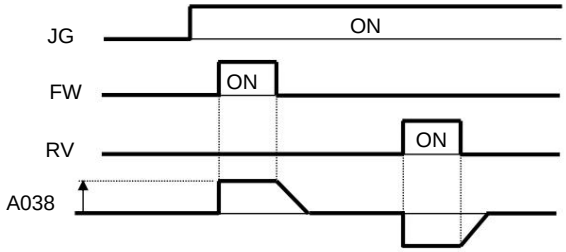
A020, A220	**Base frequency**	**6.00Hz**
Setting range	0.00…590.00Hz	
Setting range	0…100% with activated PID controller (A071=01)	

A021...A035	**1. Fixed frequency… 15. Fixed**	**0.00Hz**
Setting range	**frequency** 0.00…590.00Hz	
Setting range	0…100% with activated PID controller (A071=01)	

5.7 Jog operation

A038	Typing	6.00Hz
Setting range	**frequency** 0.00…10.00Hz	

The jogging mode is activated via input JG (C001…C007=06) and is used, for example. B. for setting up a machine in manual operation. Since the ramp-up ramp is not active in jogging mode, a fault message (overcurrent) can be triggered if the jogging frequency is selected too high.

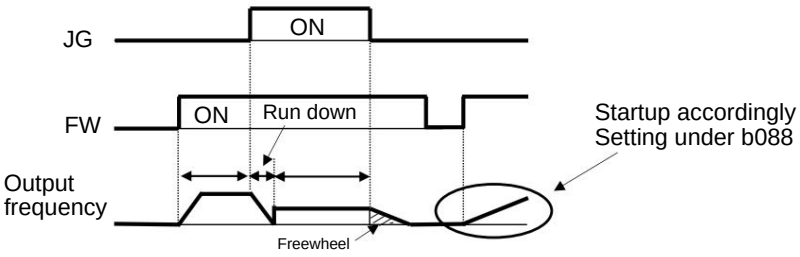


Jog operation is not possible if the set jog frequency is lower than the start frequency entered under b082.

A039	Inching mode, stop mode	04
00/03	freewheeling	
01/04	Braking the motor on the down ramp	
02/05	Braking the motor with the DC brake (A051…A055)	

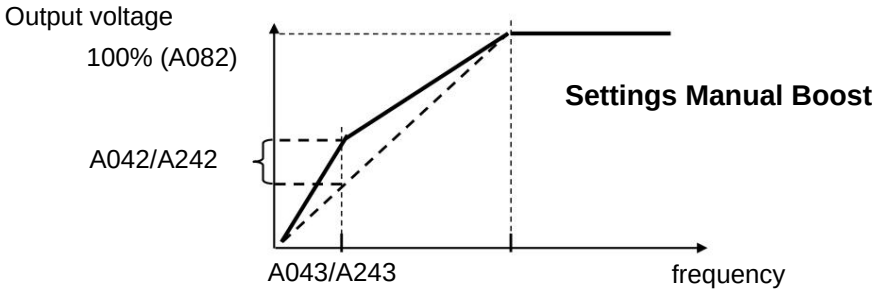
If the signal for jog operation occurs after a start command has been given, the frequency inverter does not respond to the jog command for entries 00, 01 and 02.

If the signal for jogging operation occurs after a start command has been given, the frequency converter brakes with the set time ramp to 0Hz for inputs 03, 04 and 05 and then moves to the jogging frequency without a ramp.



5.8 Boost

The boost compensates for the voltage drop in the ohmic portion of the motor's stator winding (Motor constant R1). This voltage drop leads to a reduction in torque, particularly at low frequencies or voltages. The manual boost increases the voltage in the frequency range from the starting frequency to the base frequency (factory setting 0.5…50Hz) in every operating state - regardless of the load on the motor. The reference value is the voltage in A082.
With automatic boost, the voltage and frequency are increased depending on the load (slip compensation). The degree of voltage and frequency boost is set with A046 and A047. Make sure that the motor is not overloaded. An increase in voltage can trigger a fault message from the frequency converter due to the resulting higher current. For the automatic boost, it is important to correctly enter the motor power (H003) and the number of motor poles (H004).
The boost is not active under the SLV working method (A044=03).



Symptom	Measure
Torque too low with small manual boost: Increase A042	
speeds; Motor does not turn during Automatic boost: increase A047, increase A046	
small frequencies	Reduce b083 (clock frequency).
Drop in speed when switching on load Automatic boost: Increase A047	
Speed increases when load is applied.	Auto Boost: Decrease A047
When a load is connected, the inverter goes into an “overcurrent” fault.	Auto Boost: Decrease A046, Decrease A047 Manual Boost: Decrease A042

A041, A241	**Boost characteristic**	**00**
00	Manual boost (A042, A043)	
01	Automatic Boost (A042, A046, A047)	

A042, A242	**Manual boost, voltage increase** 0.0…20.0%	**1.0%**
Setting range		

Function A042 determines the amount of voltage boost at 0Hz (based on the value under A082).

A043, A243	**Manual boost, boost frequency**	**5.0%**
Setting range	0.0…50.0%	

The value refers to the corner frequency set under A003.

A046, A246	**Automatic boost, voltage increase** 0…255	**100**
Setting range		

A047, A247	**Automatic boost, slip compensation**	**100**
Setting range	0…255	

5.9 Working procedures, U/f characteristics, SLV

A044, A244	Working procedures	00
00	U/f characteristic, U ÿ f (constant)	
01	U/f characteristic curve, U ÿ f 1.7 for e.g. B. for centrifugal pumps and fans	
02	Freely adjustable U/f characteristic according to the setting under b100...b113	
03	Sensorless Vector Control (SLV)	

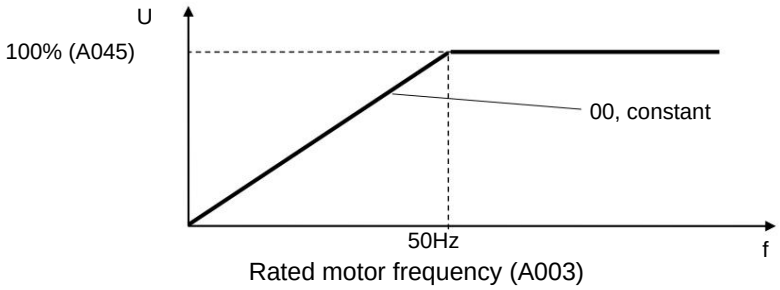
In the setting A044=03, it can happen that the frequency converter gives the motor a rotating field at very low frequencies, which is opposite to the selected direction of rotation. With
b046=01 this can be prevented.

b046	Disable reversing vector control	00
00	Reversing enabled due to vector control	
01	Reversing blocked due to vector control	

U/f characteristic, constant (A044=00)

The constant V/f characteristic can be used for most applications.

Optimization such as torque increase and slip compensation takes place under function A041, A042, A043, A046, A047.



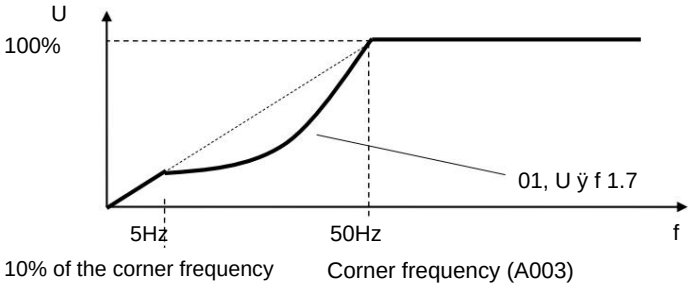
U/f characteristic, U ÿ f 1.7, (A044=01)

For applications with load moments that increase squarely, such as: B. Centrifugal pumps and fans can achieve a reduced power consumption of the motor with this U/f characteristic. The motor starting torque is low.

At U ÿ f 1.7, the U/f characteristic is made up of the following areas:

0...10% of the corner frequency:
- linear U/f ratio

10...100% corner frequency:
- U ÿ f 1.7



Freely adjustable U/f characteristic according to setting under b100…b113 (A044=02)
See Users Guide

Sensorless Vector Control SLV (A044=03)

Sensorless Vector Control (SLV) determines the speed and torque based on the output voltage, current and the motor constants H020…H024 / H030…H34. This creates a
high torque is achieved, especially at low frequencies (>0.3Hz) (for adapting the frequency inverter to the connected motor, see “Motor data”, function A003, A082; H003, H004; see “Autotuning / Motor data” function H001, H002, H020.. .H234). Optimizing the SLV control parameters under H005, H050…H251. Optimization of the drive according to the following table

Operating state behavior		Measures to	function
More motoric Operation	Slip compensation too low	increase motor constant R2 (approx. 1.2 x current value)	H021, H221, H031, H231
	Overcompensation of slippage	Reduce motor constant R2 (approx. 0.8 x current value)	H021, H221, H031, H231
More generative Operation	Low torque at low frequencies	Increase motor constant R1 (approx. 1.2 x current value)	H020, H220, H030, H230
		Increase motor constant I0 (approx. 1.2 x current value)	H023, H223, H033, H233
Start	The engine starts suddenly. Reduce engine constant J		H024, H224, H034, H234
		Reduce speed controller response speed	H005, H205
	The engine runs in the first Moment backwards	Lock reversing	b046
On the run down	The engine doesn't run smoothly	Reduce speed controller response speed	H005, H205
		Reduce motor constant J	H024, H224, H034, H234
For small ones frequencies	It swings between clockwise and engine Left rotation	Increase motor constant J	H024, H224, H034, H234
		Increase speed controller response speed	H005, H205

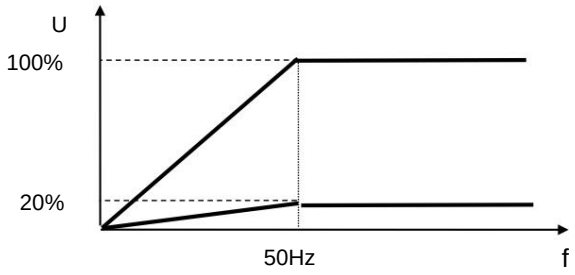
The following must be taken into account:

- The motor must match the power of the inverter and should not have more than one power level be smaller than the inverter power. Example C1-055HF, motor 4.0kW or 5.5kW.
- To avoid motor damage due to overloading when using motors with a lower power than the inverter in conjunction with vector control (A044=03), please reduce the torque limit under b041…b044 as follows:

  b041…b044=motor power/inverter power x torque limit (e.g. 200%)

A045,A245	**Output voltage** 20…100%	**100%**
Setting range		

The output voltage can be set in the range of 20...100% based on the value set under A082.



5.10 DC brake

WARNING

The DC brake causes additional heating of the connected motor. Enter the smallest possible values for the braking time and braking torque. Check whether the motor is heating up to an unacceptable level due to the use of the DC brake.

The C1 series frequency inverters have an adjustable DC brake. By connecting a clocked DC voltage to the stator winding of the motor, a braking torque is generated that counteracts the rotation of the rotor. With the help of the DC brake, high stopping accuracies can be achieved in positioning drives (without speed feedback). In addition, the DC brake can reduce the speed to a minimum before a mechanical brake is applied.

The DC brake can be switched on in two ways:

1. externally, by controlling the digital input DB (setting under A051 has no influence on this).
2. automatically internally when a programmed frequency is reached (A051=01)

A051	**DC brake, automatically active**	**00**
00	DC brake automatically inactive	
01	DC brake automatically active at start and in deceleration at stop	
02	DC brake automatically active during operation when the frequency falls below a certain frequency	

A052	**DC brake, switch-on frequency** 0.00…	**0.50Hz**
Setting range	60.00Hz	

If the frequency programmed here falls below the frequency when running down (if stop is present!), the DC brake is applied.

A053	**DC brake, waiting time** 0.0…	**0.0s**
Setting range	5.0s	

When the frequency programmed under A052 is reached, or when the digital input DB is activated, the output stages are switched off for the waiting time entered here. The engine runs freely during this time. After the time has elapsed, the DC brake is applied.

A054	**DC brake, braking torque** 0…100%	**50%**
Setting range		

100% corresponds to approx. 70% of the FU nominal current.

A055	**DC brake, braking time** 0.0…	**0.5s**
Setting range	60.0s	

The braking time starts after the waiting time has expired (A053).

A056	**DC brake, switch-on trigger** Switch	**01**
00	on the DC brake by a rising edge at digital input DB (take into account waiting time A053, braking torque A054 and braking time A056!)	
01	Switch on the DC brake using an ON signal at digital input DB (take waiting time A053 and braking torque A054 into account!)	

With functions A057 and A058 the DC brake can be activated before starting the motor.

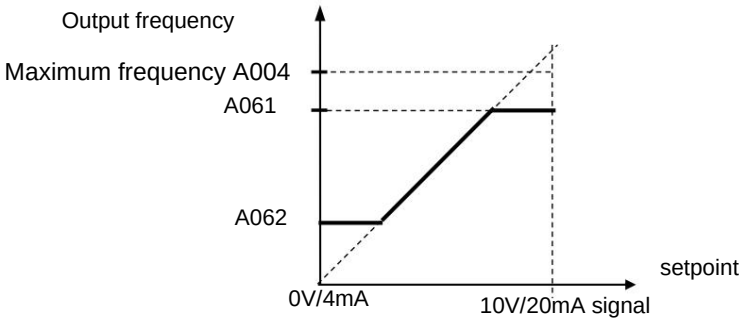
High clock frequencies result in high power losses in the output stages. Therefore, the clock frequency for the period of DC braking under A059 should be selected as low as possible.
The DC brake also causes the motor to heat up additionally.

For more information about A056…A059, see product manual.

5.11 Operating frequency range

The frequency range, which is determined by the start frequency (b082) and maximum frequency (A004), can be restricted using functions A061 and A062. As soon as the frequency inverter receives a start command, it runs to the frequency programmed under A062. If 0Hz is entered, the corresponding function is ineffective.

Setpoint specification via analog input Ai1 or Ai2



A061, A261	**Max. operating frequency**	**0.00Hz**
Setting range	0.00…590.00Hz	

If 0Hz is entered, the limit is ineffective.

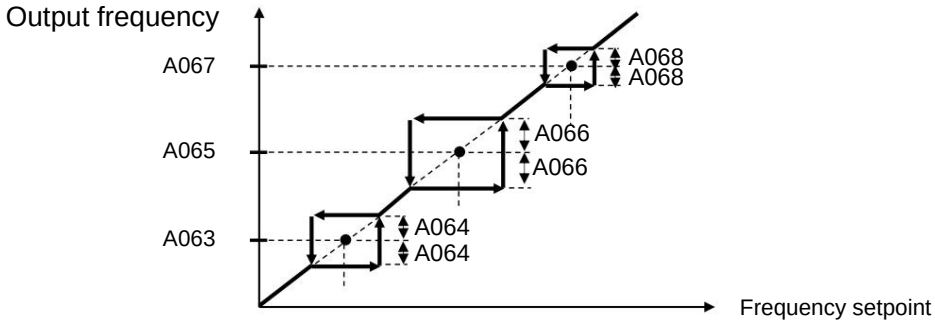
A062, A262	**Min. operating frequency**	**0.00Hz**
Setting range	0.00…590Hz	

5.12 Frequency jumps

To avoid any resonances that may occur in the drive system, it is possible to program three frequency jumps under functions A063...A068.

A063, A065, A067	**1…3. Frequency jump** 0.00…	**0.00Hz**
Setting range	590.00Hz	

A064, A066, A068	**1…3 frequency jump, jump width** 0.00…	**0.50Hz**
Setting range	10.00Hz	

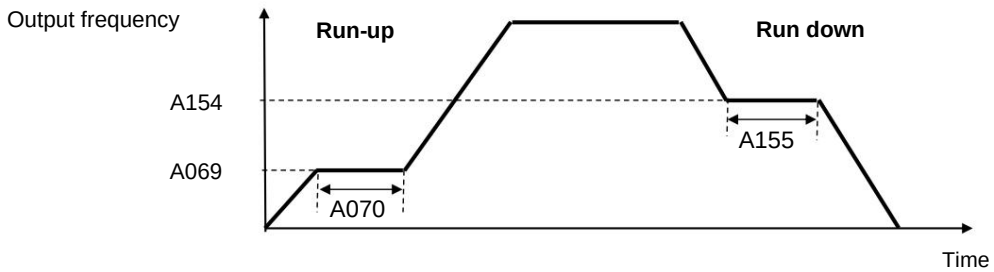


5.13 Ramp up/down delay

The acceleration/deceleration can be delayed for the time entered under function A070/A155 when the frequency programmed under A069/A154 is reached. If e.g. For example, if high currents occur when accelerating systems with large moments of inertia, it can be advantageous to “wait” for a few seconds at a low frequency until the motor slip and thus the current has reduced.

A069, A154	**Startup delay, frequency** 0.00…590.00Hz	**0.00Hz**
Setting range		

A070, A155	**Startup delay, time** 0.0…60.0s	**0.0s**
Setting range		



5.14 PID controller

Activation of the PID controller with A071=01. If one of the digital inputs is also programmed as PID (function C001...C007=23), the controller can be switched off via this input become.

The manipulated variable of the PID controller is the output frequency. The control range of the frequency inverter is limited to 0Hz (or the frequency set under A062) and up to the frequency entered under A004 (or A061).

The **actual value input is selected under function A076** (A076=00: analog input Ai1 corresponding to 0...10V or A076=01: analog input Ai2 for 4...20 mA). The setpoint source is defined under A001.

A001, A201	**Setpoint**	**01**
(00)	**source** Integrated potentiometer (only with option OPE-SRmini)	
01	Analog inputs Ai1-L (A076=00) or Ai2-L (A076=01)	
02	Entry under function F001 (input value 0…100%)	
03	ModBus RTU	
04	Option card	
06	Pulse frequency at input 8	
07	PLC program	
10	A141…A146	

The setpoint and actual values are standardized in %. The analog signals are scaled to the measured variable (setpoint or actual value) via A011…A014 (input Ai1, 0…10V), A101…A104 (input Ai2, 0…20mA) and A161…A164 (optional integrated potentiometer). All setpoint and actual value-related input values A011/ A012, A101/A102, A020…A035, F001 are multiplied by the factor entered under A075 (Factory setting A075=1).

Example: A011=20%, A012=100%, changing the input under A075 from 1.00 to 0.60, A011=12%, A012=60%, 0…10V corresponds to actual value 12…60% under d004.

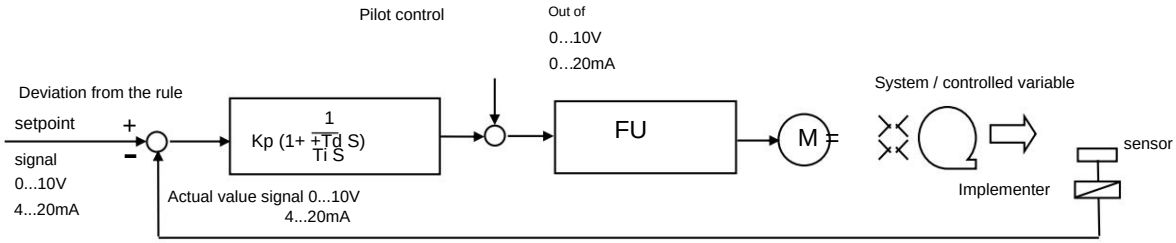
If A011=A012=0%, scaling takes place directly via A075.

For this reason, the controller must first be activated under function A071 before all other functions are set.

The I component of the PID controller can be reset via digital input PIDC (function C001...C007, input 24; only reset if the PID controller is switched off!)

F001: Display setpoint, d004: Display actual value

Block diagram



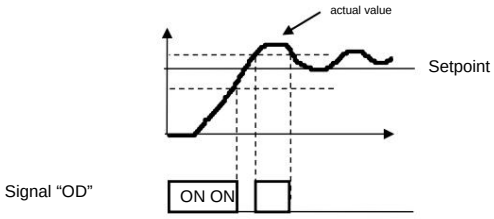
Kp: proportional coefficient, Ti: reset time, Td: differential time, s: frequency variable

Output signals

Symbol	Parameter function	
OD	**04**	**PID control deviation exceeded**

C021…C026=04

Signal if the deviation between the set setpoint and the returned actual value is greater than the value set under function C044.

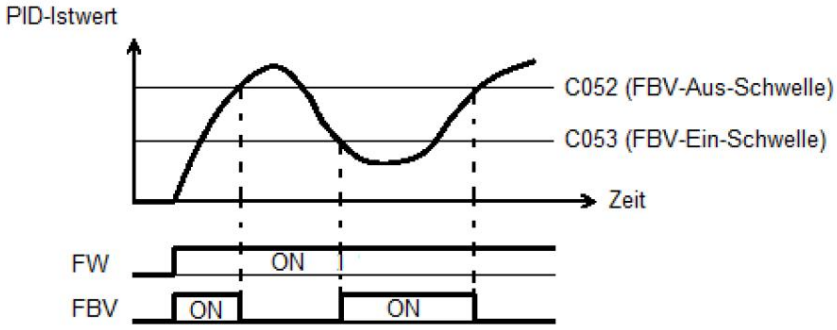


Symbol	Parameter function	
FBV	**31**	**PID actual value monitoring**

C021…C026=31

Signal change if the control deviation programmed under C052 / C053 is outside the set ranges.

FBV=OFF: PID actual value > C052
if PID actual value > C053
FBV=ON: PID actual value < C053
if PID actual value < C052



PID controller optimization

The actual value only follows the setpoint very slowly ÿ increase A072
Actual value is not stable although it follows the setpoint quickly ÿ decrease A072, increase A073
It takes too long until actual value = setpoint ÿ A073 decrease
Settlement time is too long even though gain A072 has been increased ÿ increase A074
Actual value is not stable after A072 was increased ÿ A074 decreased

Example: Actual value = analog setpoint 0…10V.
A076=01 Actual value = analog input Ai1 (0…10V)
A001=01 Setpoint = analog input Ai2 (4…20mA)

Example: Setpoint = ModBus RTU
100% corresponds to 10000 (resolution 0.01%). Write value to register address 0006h. This address can be read or written.

Example: Setpoint = pulse frequency at input 8 and actual value = analog setpoint 0…10V.
A076=01 Actual value = analog input Ai1
A001=06 Setpoint = pulse frequency at input 8

A071	**PID controller active**	**00**
00	PID controller inactive	
01	PID controller active, no reversal if the PID results are negative calculation	
02	PID controller active, reversal if the PID calculation results are negative	

A072	**PID controller, P**	**1.00**
Setting range	**component** 0…25	

A073	**PID controller, I**	**1.0s**
Setting range	**component** 0…3600s	

A074	**PID controller, D**	**0.00s**
Setting range	**component** 0…100s	

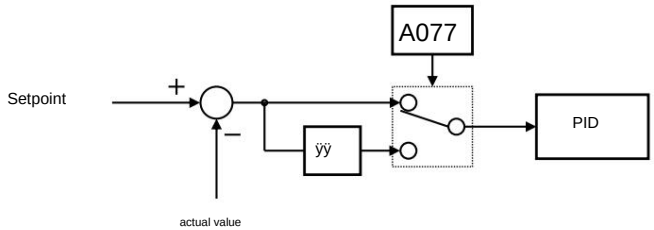
A075	**PID controller, display factor**	**1.00**
Setting range	0.01…99.99	

The display of the actual value can be multiplied by a factor so that process-correct variables are displayed instead of 0...100%.

A076	**PID controller, input actual value signal,**	**00**
00	analog input Ai2	
01	Analog input Ai1	
02	RS485	
03	Pulse frequency at input 8	
10	according to A141…A146	

The actual value signal can be selected either via analog input Ai1/Ai2, RS485 (register address 0006h),
or as a result of an arithmetic operation according to A141…A146. The unused, free analog input or the setpoint source that was selected under A001 then serves as the setpoint input.
In addition, the fixed frequencies or - according to the programming under function A001 -
The built-in potentiometer can be used to specify the setpoint.

A077	**PID controller, inversion**	**00**
00	Standard (actual value>setpoint=reduce frequency)	
01	Inversion (actual value>setpoint=increase frequency)	



A079	**PID controller, pre-control**	**00**
00	No pre-control	
01	Precontrol via analog input Ai1-L (0…10V)	
02	Pre-control via analog input Ai2-L (0…20mA)	

The analog input selected under this function to supply the precontrol can also be selected to specify the setpoint or actual value.

5.15 Automatic voltage regulation AVR

The AVR function (Automatic Voltage Regulation) stabilizes the motor voltage when the DC link voltage fluctuates (e.g. due to an unstable network or because of DC link voltage dips or increases due to short ramp-up or ramp-down times) in order to achieve such a high torque - in particular during startup - to be maintained.

The generator engine operation (without AVR function) causes in the deceleration phase - e.g. B. with very short ramp down times - an increase in the intermediate circuit voltage, which in turn results in a corresponding increase in the motor voltage. This higher motor voltage causes higher losses in the motor and an increase in braking torque. For this reason, e.g. B under function A081 the AVR function for the run-down phase can be deactivated (A081=02).

The corresponding voltage is set under function A082 (motor voltage / mains voltage).

A081, A281	**AVR function, characteristics**	**02**
00	AVR function active throughout operation	
01	AVR function not active	
02	AVR function not active when running down (higher braking torque may be possible)	

A082, A282	**Motor voltage / mains voltage**	**200V/400V**
Setting range	C1-…SF: 200V / 215V / 220V / 230V / 240V	
Setting range	C1-…HF: 380V / 400V / 415V / 440V / 460V / 480V	

The rated voltage of the motor can be found on the nameplate of the connected motor. **Make sure the motor is wired correctly in the terminal box! If the mains voltage is higher than the rated motor voltage, enter the mains voltage here and reduce the output voltage to the rated motor voltage under A045.**
Example: Mains voltage = 440V, rated motor voltage = 400V.
Enter the mains voltage (440V) in A082 and reduce the output voltage in A045 to 400V/440V x 100% = 91%.
To increase the braking torque, use shorter ramp down times and suppress the fault message “Overvoltage E07”, either the AVR function can be deactivated during ramp down (A081=02) or adjusted with functions A083 and A084.

5.16 Energy saving mode

Energy saving mode (A085=01) is only possible in the “U/f characteristic curve” working method (A044=00/01/02). It is suitable for pump and fan applications with reduced torque characteristics. The output voltage is automatically adjusted to the load on the motor. The response time of the control can be influenced with function A086. **Danger!** When energy saving mode is activated and a sudden load is applied, the motor can “tip over” and the frequency converter can trigger an “overcurrent” fault. The ramp up or down ramp can vary depending on the application.

A085	**Energy saving mode**	**00**
00	Normal operation	
01	**Energy saving operation.**	

When specifying the frequency setpoint via analog input Ai1 or Ai2, the analog filter must be set to 500ms (A016=31).

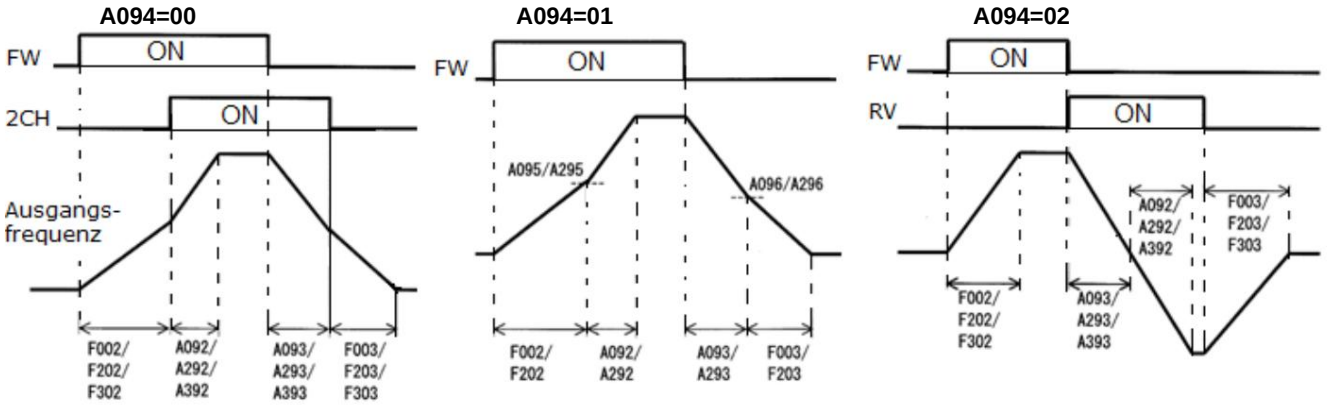
A086	**Energy saving mode, response behavior**	**50.0**
Setting range	0…100	

Set value: 0.....100
Response behavior: slow fast
Accuracy: High Low

5.17 Time Ramps

During operation, you can switch from the time ramps set under function F002 or F003 to the time ramps programmed under A092 and A093. This can either be done at any time using an external signal on digital input 2CH (A094=00, left picture), or when certain, fixed frequencies are reached (A094=01, A095, A096, middle picture).

Input LAC=ON: Ignore the time ramps. The output frequency immediately follows the frequency setpoint.



P031	**Default time ramps**	**00**
00	Control panel	
03	Easy Sequence program function	

A094, A294	**Switching from 1st time ramp to 2nd time ramp**	**00**
00	Switching via external signal at digital input 2CH (left example)	
01	Switching when A095 or A096 is reached (middle example)	
02	2. Time ramp only active when running counterclockwise (right example)	

A097	**Startup characteristics**	**01**
00	linear	
01	S-curve	
02	U-curve	
03	U-curve inverted	
04	S-curve for elevators	

A098	**Run-down characteristics**	**01**
00	linear	
01	S-curve	
02	U-curve	
03	U-curve inverted	
04	S-curve for elevators	

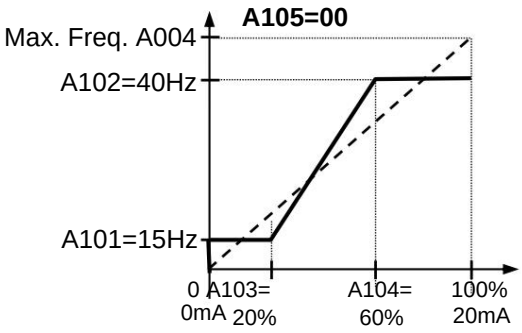
Further information on this and on curve characteristics (function A131, A132, A150…A155) can be found in the product manual.

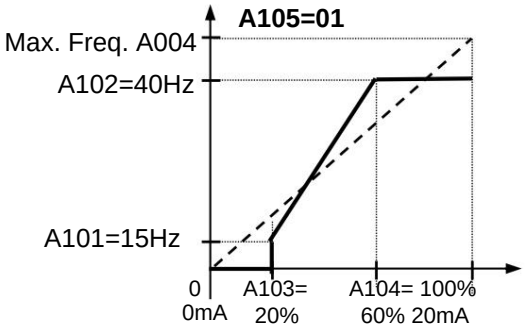
b091	**Stop mode** in	**00**
00	the event of a stop command, the drive is switched to the currently active Down ramp braked.	
01	In the event of a stop command, the drive coasts freely	

5.18 Scaling analog input Ai2 (4...20mA)

Example:

A101 15Hz
A102 40Hz
A103 20% (4mA)
A104 60% (12mA)





Setpoint inversion

In special applications it may be necessary to drive the maximum frequency at the minimum setpoint (e.g. 4mA) or the minimum frequency at the maximum setpoint (e.g. 20mA). To do this, enter the maximum frequency under A101 and the minimum frequency under A102. **Danger! Under these circumstances there is no protection against wire breakage! (see A105).**

A101	**Frequency at minimum setpoint at input Ai2**	**0.00Hz**
Setting range	0.00…590.00Hz	

With activated PID controller (A071=01): **Setting range: 0...100%**

A102	**Frequency at max. setpoint at input Ai2** 0.00…	**0.00Hz**
Setting range	590.00Hz	

With activated PID controller (A071=01): **Setting range: 0...100%**

A103	**Min. setpoint at input Ai2** 0…	**20%**
Setting range	100%	

The value entered refers to the maximum possible setpoint of 20mA (20% corresponds to 4mA).

A104	**Max. setpoint at input Ai2** 0…	**100%**
Setting range	100%	

The value entered refers to the maximum possible setpoint of 20mA.

A105	**Starting condition input Ai2** If	**00**
00	setpoints < minimum setpoint (A103), the frequency programmed under function A101 is operated.	
01	For setpoints < minimum setpoint (A103), 0Hz is output.	

5.19 Automatic restart after fault

WARNING

This function causes the frequency inverter to restart automatically in the event of a fault after the set waiting time has elapsed - if a start command is still pending. It must be ensured that no persons are endangered in the event of a restart.

In the factory setting, any malfunction triggers an error message. An automatic restart is possible after the following error messages occur:

Overcurrent (E01...E04, max. 3 restart attempts in 10 minutes, then fault message; see b008).
Overvoltage (07, max. 3 restart attempts in 10 minutes, then fault message; see b008).
Undervoltage, brief power failure (E09, max. 16 restart attempts in 10 minutes, then fault message; see b001).

Display when automatic restart is active: 0000

b001	**Restart mode in the event of undervoltage/power failure**	**00**

Behavior of the frequency inverter in the event of a brief power failure or undervoltage:

00	The frequency converter gives a fault for each of the above-mentioned faults
01	A restart with the starting frequency takes place after the time set in b003
02	After the time set under b003, the frequency inverter synchronizes itself to the rotating motor and accelerates it to the setpoint according to the ramp-up time entered. Since this synchronization method works on the principle of detecting the induction voltage, the motor must only have been voltage-free for a few seconds and the motor speed must not have fallen further than half of the rated motor speed (Example 1) . Otherwise there will be a 0Hz start.
03	After the time set under b003, the frequency inverter synchronizes itself to the rotating motor, stops it according to the set down time and shows the fault message on the display. Since this synchronization method works on the principle of detecting the induction voltage, the motor must only have been voltage-free for a few seconds and the motor speed must not have fallen further than half of the motor's rated speed.
04	After the time set under b003, the frequency inverter synchronizes itself to the rotating motor **by actively detecting the motor speed** and accelerates it to the setpoint according to the ramp-up time entered (see function b028, b029, b030).

Even if synchronization is desired (b001=02, 03), it can still occur under the following conditions
0Hz start:

- the engine speed is less than half the rated engine speed
- The voltage induced by the motor is too low

b002	**Permissible mains failure**	**1.0s**
Setting range	**time** 0.3…25.0s	

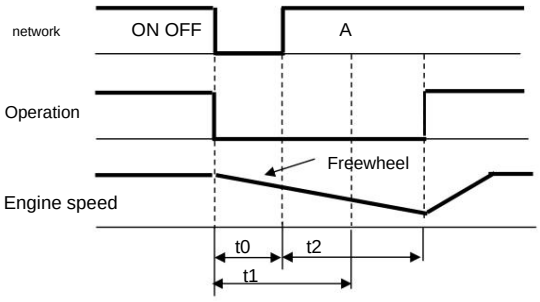
Permissible mains failure time without triggering the undervoltage fault message E09 **(Example** 1). If the mains failure time is longer than the time entered here, the frequency inverter malfunctions **(example** 2).

Example 1, b001=02

t0: Mains failure time

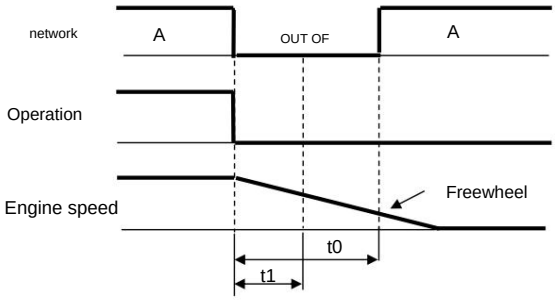
t1: Permissible mains failure time (b002)

t2: Waiting time before restart (b003)



The power failure time is shorter than the time programmed under b002. After t2 has elapsed, synchronization to the engine speed and acceleration to the engine speed

Example 2



The power failure time is longer than the time programmed under b002. The frequency converter malfunctions

b003	**Waiting time before restart after power failure**	**1.0s**
Setting range	0.3…100.0s	

Waiting time after an undervoltage fault / short-term power failure before the automatic restart is activated.

It is recommended to set the waiting time before restart using function b003 longer than the duration of the undervoltage or power failure.

b004	**Short-term power failure/undervoltage** when the frequency	**00**
00	converter is at a standstill does **not** cause a fault	
01	The frequency inverter malfunctions in the event of a brief power failure or undervoltage when at a standstill	
02	The frequency inverter does **not** malfunction in the event of a brief power failure or undervoltage while running down or at a standstill	

The digital outputs or the relay are programmed under function C021…C022.

b005	**Restart attempts in the event of undervoltage/power failure**	**00**
00	16 restart attempts in the event of undervoltage / brief power failure	
01	the number of restart attempts in the event of undervoltage / short-term Power outages are unlimited	

b007	**Minimum frequency for synchronization**	**0.00Hz**
Setting range	0.00…590.00Hz	

The following applies to synchronization:

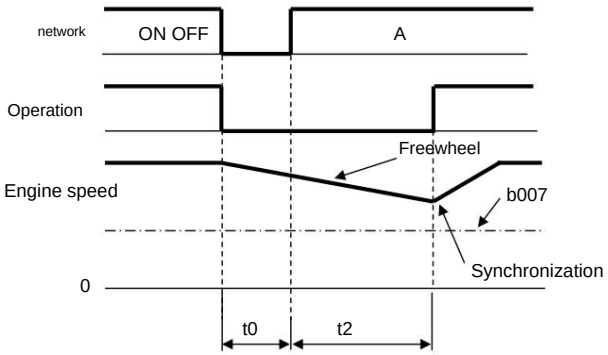
If the motor's rotating field frequency is higher than the frequency programmed under b007, then
The frequency inverter synchronizes to the motor speed and accelerates to the setpoint (b001=02, **example** 3).

If the motor's rotating field frequency is lower than the frequency programmed under b007, then the frequency inverter starts at 0Hz **(example** 4).

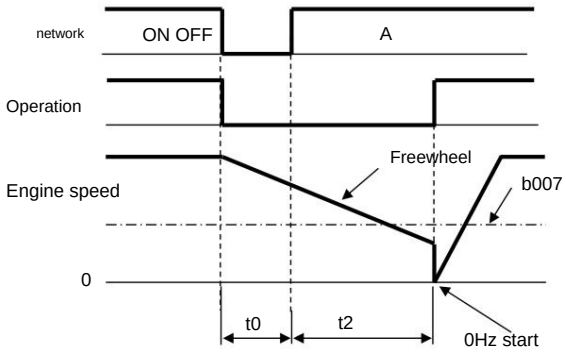
t0: Mains failure time

t2: Waiting time before restart (b003)

Example 3



Example 4



b008	**Overvoltage/overcurrent restart mode**	**00**

Behavior of the frequency inverter in the event of overvoltage or overcurrent:

00	The frequency inverter malfunctions in the event of any of the above-mentioned faults
01	A restart with the starting frequency takes place after the time set under b003
02	After the time set under b011, the frequency inverter synchronizes with the rotating motor and accelerates it to the setpoint according to the ramp-up time entered. Since this synchronization method works on the principle of detecting the induction voltage, the motor must only have been voltage-free for a few seconds and the motor speed must not have fallen further than half of the motor's rated speed. Otherwise there will be a 0Hz start.
03	After the time set under b011, the frequency inverter synchronizes itself to the rotating motor, stops it according to the set down time and shows the fault message on the display. Since this synchronization method works on the principle of detecting the induction voltage, the motor must only have been voltage-free for a few seconds and the motor speed must not have fallen further than half of the motor's rated speed.
04	After the time set under b011, the frequency inverter synchronizes itself to the rotating motor **by actively detecting the motor speed** and accelerates it to the setpoint according to the ramp-up time entered (see function b028, b029, b030).

b010	**Restart attempts in the event of overvoltage/overcurrent**	**3**
Setting range	1…3	

b011	**Waiting time before restart in the event of overcurrent/**	**1.0s**
Setting range	**voltage** 0.3…100.0s	

Waiting time after an overcurrent/overvoltage fault before activating the automatic restart.

5.20 Electronic engine protection

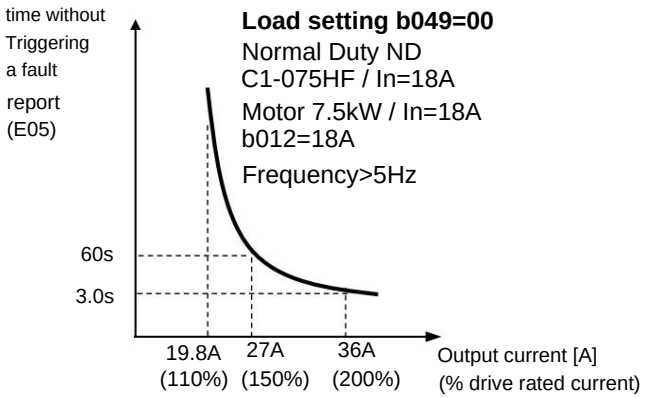
The C1 series frequency inverters can monitor the connected motor for overload using an electronic bimetal simulation. The electronic motor protection is activated via function b012
matched to the rated current of the motor. If input values > rated motor current, the motor cannot be monitored using this function. In this case, use PTC thermistors or thermal contacts in the motor windings. When the electronic motor protection is triggered, the message E05 or E38
displayed.

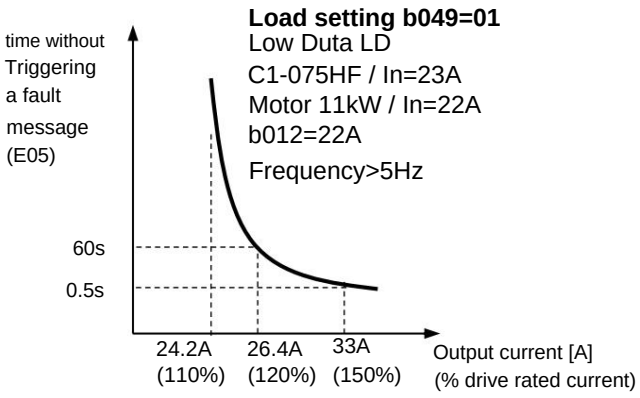
An overload threshold value at which a correspondingly programmed digital output is switched can be set under function C061 (C021/C022/C026=13).

b012, b212	**Electronic motor protection, setting value**	**FU-Inenn [A]**
Setting range	0.2...1.0 x drive rated current [A]	

The tripping characteristic of the motor protection depends on the load setting in b049.

Triggering characteristic b013=01





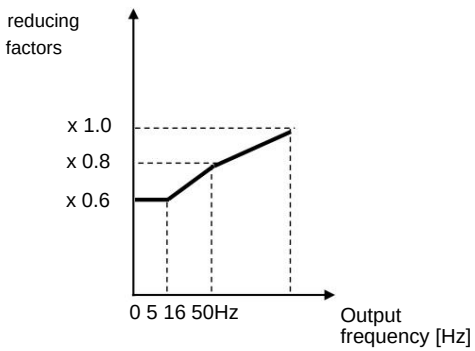
Danger! The output current must not be permanently above the rated frequency inverter current, otherwise the service life of the intermediate circuit capacitors and output stages will be reduced.

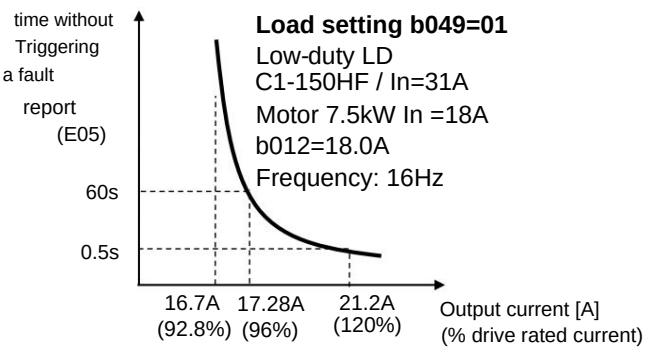
b013, b213	**Electronic motor protection, tripping characteristics**	**01**

The tripping characteristics of the motor protection can be adapted to the torque characteristics of the driven machine.

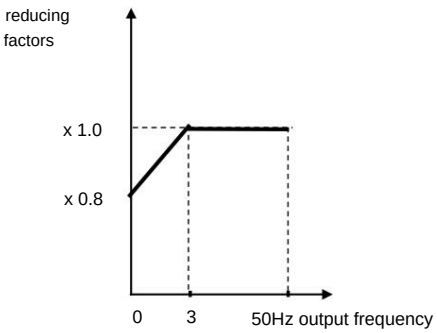
00	Triggering characteristics for reduced load torque
01	Triggering characteristics for constant load torque
02	3 support points b015...b020

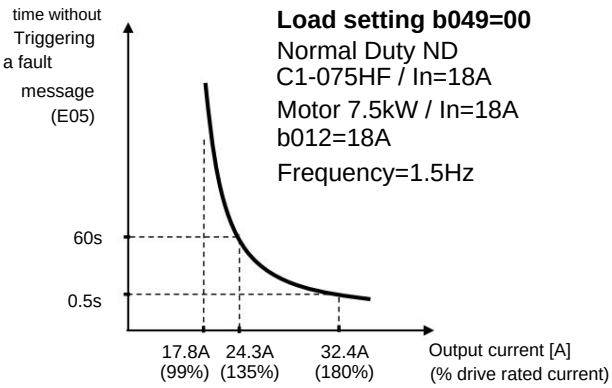
Reduced load moment (b013=00)



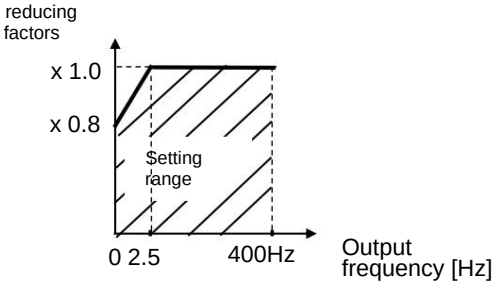


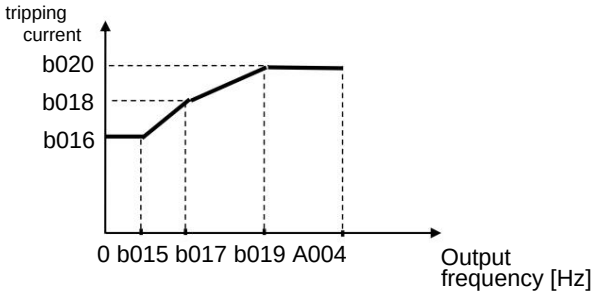
Constant load moment (b013=01)





Triggering characteristic with 3 base points (b013=02)





b015	**Electronic motor protection, frequency 1** 0…b017	**0Hz**
Setting range	[Hz]	

b016	**Electronic motor protection, tripping current 1** 0.00…FU	**0.00A**
Setting range	rated current	

b017	**Electronic motor protection, frequency 2** b015…b019	**0Hz**
Setting range	[Hz]	

b018	**Electronic motor protection, trip current 2** 0.00…FU rated	**0.00A**
Setting range	current	

b019	**Electronic motor protection, frequency 3** b017…	**0Hz**
Setting range	590Hz	

b020	**Electronic motor protection, tripping current 3** 0.00…FU	**0.00A**
Setting range	rated current	

With b910=01…03, the electronic overload monitoring of the frequency inverter and that of the motor are carried out separately. The following applies to overload monitoring of the frequency inverter:

- The characteristic values for overload monitoring of the frequency converter are permanently stored (identical with b012=FU rated current, b013=01)
- The characteristic is independent of the settings under b012…b020 (only applies to the motor protection)
- Fault message when the frequency inverter overload monitoring is triggered is E38 (E05: motor overload protection). The fault message can be reset after 10s. • Thermal subtraction not possible for

drive overload protection. If b910=00, motor overload protection and frequency converter overload protection are identical.

Characteristics of the frequency converter overload monitoring

	Setting under b910			
	00	01 02		03
Characteristic	Like motor overload monitoring	Characteristic of the frequency inverter overload monitoring is fixed (b012, b013=01)		
b012…b020	valid	invalid		
Therm. Subtraction	Not available			
fault message	E05	E38 (Frequency converter overload monitoring)		

Characteristics of motor overload monitoring

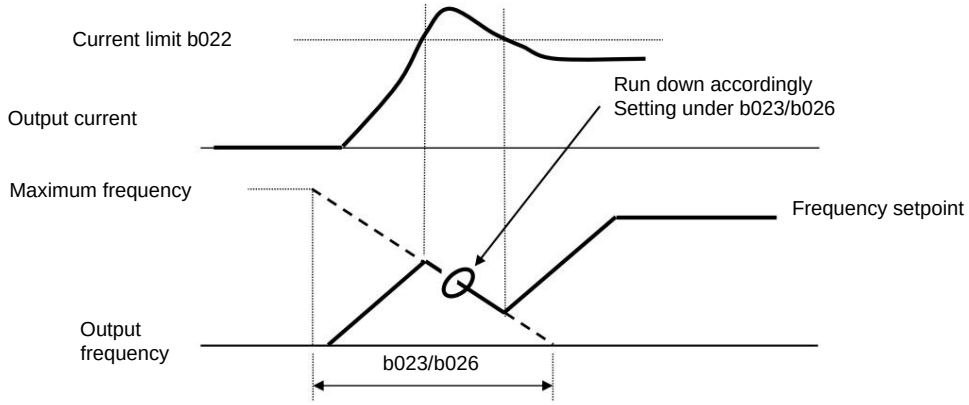
	Setting under b910			
	00	01 02		03
Characteristic	Like FU overload monitoring	Not identical to drive overload monitoring when therm. Subtraction is active		
b012…b020	valid	valid (only for engine)		
Therm. subtraction	Not available	Subtraction from Max. to 0 in 10 Min.	Subtraction from Max. to 0 according to b911	Subtraction from Max. to 0 according to b912
Fault message	E05			

The behavior of the thermal load status when it falls below the motor protection threshold after previously exceeding it is set with the functions b910…b912.

b914	**Electron. Motor protection, overload protection save** 0.00…FU rated	**01**
Setting range	current when power is off	

5.21 Current limit

The current limit limits the motor current, e.g. B. when accelerating large masses such as fans or centrifuges. As soon as the motor current reaches the set current limit, the frequency inverter stops ramping or reduces the output frequency in static operation to reduce the load current (time constant for control: b023 or b026). As soon as the output current falls below the set current limit, the frequency is increased again and moved to the set target value. The current limit can be deactivated for the acceleration phase, so that larger currents are permitted for a short time for acceleration (see function b021 or b024). Please note that with b021=03 in the SLV working method (A044=03) the frequency increases during ramp down when the current limit is reached. A 2nd current limit b024...b026 can be called up via digital input OLR. The current limit can trigger a fault message, e.g. B. due to a short circuit, cannot be prevented.



b021, b212	**Current limit 1,** current limit	**01**
00	characteristic not active	
01	Current limit active in every operating state	
02	Current limit to achieve higher starting currents not active during startup	
03	Current limit active in the startup phase and during constant operation; When the current limit is reached during ramp down, the frequency is increased.	

b022, b222	**Current limit 1, setting value**	**FU nominal x 1.5 [A]**
Setting range	0.2...2.0 x drive nominal current [A]	

When the current limit set here is reached, the frequency is reduced.

b023, b223	**Current limit 1, ramp down time**	**1.0s**
Setting range	0.1…3000.0s	

The ramp down time refers to the ramp down from the maximum frequency until reaching 0Hz. If this value is chosen too small, a fault E07 (overvoltage in the intermediate circuit) can be triggered when the current limit is reached and the frequency is reduced according to the time entered here.

b027	**Overcurrent suppression**	**00**
00	Overcurrent suppression not active	
01	active without voltage reduction	
02	active with voltage reduction	

With b027=02, the triggering of fault messages due to overcurrent is prevented. This occurs at approximately 150% of the inverter rated current. Since the torque is reduced when overcurrent suppression is active, we do not recommend using this function in conjunction with linear actuators.

5.22 Load setting (dual rating)

The C1 series frequency inverters can be set to 2 different load characteristics:

b049=00: Normal Duty ND (overload capacity 50% for 60s) for dynamic applications in mechanical engineering, such as B. Lift drives and positioning.
b049=01: Low Duty LD (overload capacity 20% for 60s) for applications without high overload requirements, such as: B. Fans and centrifugal pumps. **When changing the load setting**
The nominal output current and other performance-dependent parameters are automatically adjusted.

Example: C1-015SF, rated power 1.5kW, output current 8.0A

Normal Duty ND (b049=00)		**Low Duty LD (b049=01)**	
Use:	Increased torque	Use:	Normal torque
Application:	Elevators, cranes, extruders	Application:	Fans, pumps
Overload capacity: 50% for 60 seconds		Overload capacity:	20% for 60 seconds
Output current:	8.0A	Output current:	9.6A

Some parameters differ in the setting range or in the factory setting depending on the load setting. These parameters are listed in the table below.

functional number	function	Setting range	Core value	Value according to Switch to ND
A044*1	Working procedures	00: U/f constant 01: U/f-square 02: U/f free b100-b113 03: SLV	00	No change
A054	DC brake, Braking torque	0...100%	50%	No change
A057	DC brake, start braking torque	0...100%	0%	No change
b012*1	Motor overload protection	0.20…1.00 x FU nominal ND [A]	FU-Inenn ND [A]	Converted value
b016 b018 b020	Motor overload protection, 3 support points Tripping current 1…3	0.00…1.00 x FU nominal ND [A]	0.00A	Converted value
b022*1	Current limit 1, Setting value	0.2…2.0 x FU nominal ND [A]	FU nominal ND x 1.5 [A]	Converted value
b025	current limit 2, Setting value	0.2…2.0 x FU nominal ND [A]	FU nominal ND x 1.5 [A]	Converted value
b028	Starting current for speed synchronization (b088=02)	0.2…2.0 x FU nominal ND [A]	FU-Inenn ND [A]	Converted value
b083	Clock frequency	2...15kHz	10.0kHz	No change
C030	Current reference value at C027=08	0.2…2.0 x FU-Inom ND [A]	FU-Inenn ND [A]	Converted value
C039	Signal “current undershot” LOC, setting value	0.2…2.0 x FU nominal ND [A]	FU-Inenn ND [A]	Converted value
C041*1	Signal “Current exceeded“ OL, setting value	0.00: Function not active 0.01…2.00 x FU-Inominal ND [A]	FU Inom ND x 1.15 [A]	Converted value
C111	Signal “Current exceeded 2" OL2, setting value	0.00: Function not active 0.01...2.00 x FU-Inominal ND [A]	FU Inom ND x 1.15 [A]	Converted value
H003*1	Motor power	0.1…18.5kW	Drive rated power ND	No change

*1: Also affects the corresponding functions of the 2nd parameter set

functional number	function	Setting range	Core value	Value according to Switch to LD
A044*1	Working procedures	00: U/f constant 01: U/f-square 02: U/f free b100-b113	00	00
A054	DC brake, Braking torque	0...70%	50%	50%
A057	DC brake, start braking torque	0...70%	0%	0%
b012*1	engine Overload protection	0.20…1.00 x FU Inom LD [A]	FU-Inenn LD [A]	Converted value
b016 b018 b020	Motor overload protection, 3 support points Tripping current 1…3	0.00…1.00 x FU Inom LD [A]	0.00A	Converted value
b022*1	Current limit 1, Setting value	0.2…1.5 x FU Inom LD [A]	FU Inom LD x 1.2 [A]	Converted value
b025	current limit 2, Setting value	0.2…1.5 x FU Inom LD [A]	FU Inom LD x 1.2 [A]	Converted value
b028	Starting current for speed synchronization (b088=02)	0.2…1.5 x FU Inom LD [A]	FU Inom LD [A]	Converted value
b083	Clock frequency	2...10kHz	10.0kHz 0.2…2.0 x FU-Inom	2.0kHz
C030	current reference value at C027=08	LD [A]	FU-Inom LD [A]	Converted value
C039	Signal “current undershot” LOC, setting value	0.2…2.0 x FU Inom LD [A]	FU Inom LD [A]	Converted value
C041*1	Signal “Current exceeded” OL, setting value	0.00: Function not active 0.01…2.00 x FU-Inominal LD [A]	FU nominal LD x 1.15 [A]	Converted value
C111	Signal “Current exceeded 2" setting value	0.00: Function not active 0.01...2.00 x FU-Inominal LD [A]	FU nominal LD x 1.15 [A]	Converted value
H003*1	Motor power 0.1…18.5kW	*1: Also affects	Drive rated power LD	No change

the corresponding functions of the 2nd parameter set

Example for conversion from ND to LD:
C1-007SF: FU Inom ND=5A, FU Inom ND=6A
Setting value at ND=4A, conversion: 6/5 x 4A = 4.8A at LD

After switching under function b049, it is recommended to check the settings listed above, as not all parameters are adopted for setting 00 (high overload).

b049	**Load setting** High	**00**
00	Duty (overload 50% for 60s, 1 x in 10 minutes)	
01	Normal Duty (overload 20% for 60s, 1 x in 10 min.)	

With Normal Duty (b049=01) the following parameters cannot be selected or set:
d009, d010, d012, b040, b041, b042, b043, b044, b045, b046, C054, C055, C056, C057, C058, C059, H001, H002, H005, H020, H021, H022, H023, H024, H030, H031, H032, H033, H034, P033, P034, P036, P037, P038, P039, P040

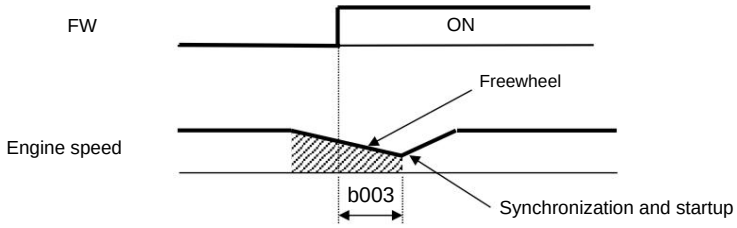
In addition, the following functions are not available for the digital inputs and outputs
Inputs: Activate torque limitation (TL-40), torque limit BCD bit 1 (TRQ1-41),
Torque limit BCD bit 2 (TRQ2-42), enable torque control (ATR-52)
Outputs: Torque exceeded (OTQ-07), torque limitation active (TRQ-10)

5.23 Synchronization to the engine speed

The C1 offers two different methods under function b088 to synchronize to the speed of a motor that is rotating without voltage.

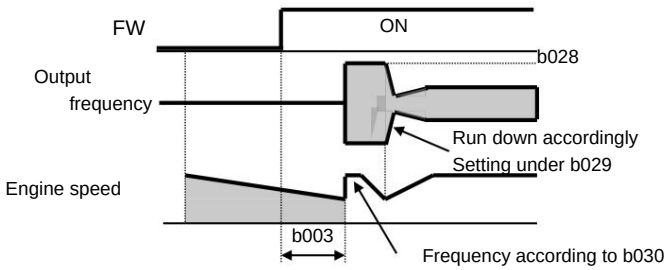
b088	**Motor synchronization**	**00**
00	No synchronization (0Hz start)	
01	Synchronize to the motor speed by detecting the motor induction voltage (the motor must only have been voltage-free for a few seconds and the motor speed must not be reduced to more than half of that nominal speed has dropped)	
02	Synchronize by actively detecting the engine speed	

b088=01: Synchronize to the motor speed after the waiting time programmed under function b003 has expired. The FU recognizes the rotation frequency of the rotor and only starts when the frequency entered under function b007 is reached. If the motor rotation frequency is lower than the synchronization frequency programmed under b007, the frequency converter starts at 0Hz. Since this procedure is based on detecting the motor induction voltage, the motor must only have been voltage-free for a few seconds and the motor speed must not have fallen further than half of the nominal speed, e.g. E.g., during an automatic restart after a short power failure (function b001…b007).



b088=02: Synchronization to the engine speed after the waiting time programmed under function b003 has expired by actively detecting the engine speed. Since this method works independently of the motor induction voltage, it can also be used if the motor has been voltage-free for a very long time and does not generate a measurable induction voltage.

We recommend the following setting:
b028=Motor rated current
b029=0.5…1.0s
b030=01
b091=01 (free stop)



b028	**Starting current for speed synchronization** 0.20…	**FU Inn**
Setting range	2.00 x drive rated current [A]	

b029	**Time constant for speed synchronization** 0.1…	**0.5s**
Setting range	3000.0s	

b030	**Scan start frequency for speed synchronization**	**00**
00	Most recently driven frequency	
01	Maximum frequency (A004)	
02	Current frequency setpoint	

5.24 Parameter backup

The parameter backup protects entered parameters from being lost due to overwriting. If parameter backup is activated, no parameters can be changed (see function b031).

b031	**Parameter backup**	**01**
00	Parameter backup via digital input SFT; With the exception of b031, all other functions are blocked.	
01	Parameter backup via digital input SFT; All functions are blocked except for the following functions: b031, F001, A020 (A220), A021...A035, A038.	
02	parameter backup; With the exception of b031, all functions are blocked	
03	parameter backup; All functions are blocked except for the following functions: b031, F001, A020 (A220), A021...A035, A038.	

In addition, the parameters b031 (parameter backup) and b037 (display mode) can be used with a 4-
can be protected against alteration with a one-digit password. Parameter b190/b191 is intended as protection for parameter b037 and parameter b192/193 is intended as protection for parameter b031.

Description of the password functions b190…b193, see Users Guide.

5.25 Motor cable length

To achieve better motor running characteristics, the C1 has a parameter for adjusting the motor cable length. Normally this parameter does not need to be changed. In cases where the motor cables are very long or with shielded cables with a high cable capacity to ground, better motor running properties can be achieved. This parameter is merely indicative; the longer the motor cables, the larger the value set here must be. The settings must always be adapted to the conditions on site or the system. For types C1-110HF and C2-150HF, a setting under b033 is not necessary.

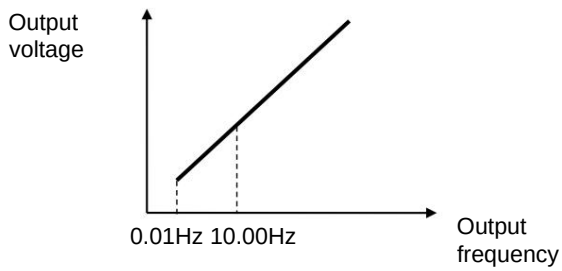
b033	**Motor cable length** 5…	**10**
Setting range	20	

5.26 Starting frequency

b082	**Starting**	**0.50Hz**
Setting range	**frequency** 0.01…10.00Hz	

As soon as the frequency converter receives a start signal and a setpoint that is equal to or greater than the set start frequency, the motor is started at the start frequency.

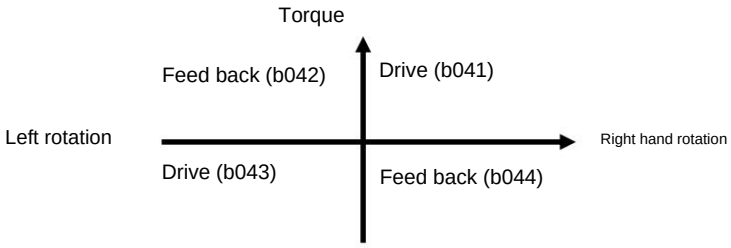
Increasing the starting frequency can e.g. B. may be necessary to overcome high static friction of the drive or the connected machine. At high starting frequencies, an error message (E02) may be triggered.



5.27 Torque limitation

b040	**Torque limitation mode** Individual	**00**

00 limitation of the torque in each of the 4 quadrants (functions b041 ...b044, 0...200%)



01 Selection of the 4 torque limits b041…b044 binary via the digital inputs TRQ1 and TRQ2.

	Entrances	
	TRQ1	TRQ2
b041	OFF	OFF
b042	ON	OFF
b043	OFF	ON
b044	ON	ON

02 Specification of the torque limit via an analog signal 0...10V at analog input Ai1 (factory setting 0...10V corresponding to 0...200%)

The torque limitation is active in the Sensorless Vector Control SLV working method (A044=03).

If a digital input was programmed as TL under function C001...C007, the torque limitation is only active when the input is activated. If the digital input is not activated, the frequency inverter runs to a maximum of 200% nominal current. If none of the digital inputs is programmed as TL, the torque limitation occurs according to the setting under b040. If one of the digital outputs is programmed to OTQ (exceeding the set torque, function C021...C022), the output is switched as long as the set torque is exceeded. If one of the digital outputs is programmed to TRQ (torque limit active), the output is switched as long as the torque is limited.

The torque limits specified under the “Torque limitation” function refer to the torque that is achieved at maximum output current. This torque is assumed to be “200%”.

5.28 clock frequency

b083	**Clock**	**10.0kHz**
Setting range	**frequency** 2.0…15.0kHz	

High clock frequencies cause lower motor noise and lower losses in the motor - but higher losses in the power stages and greater interference on the power and motor cables. In addition, higher clock frequencies can increase the leakage current on the motor cables. The maximum allowed
Output current is limited by the clock frequency and the ambient temperature. You can find more information in chapters **2.1 Derating (power reduction) at higher clock frequencies,** page 24 and **2.2 CE-EMC installation,** page 26.

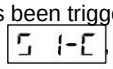
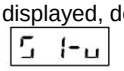
In the factory setting, higher clock frequencies are reduced to a minimum of 3kHz depending on the output current (see function b089).

5.29 Initialization

b084	Factory setting / initialization	00
00	Initialization inactive	
01	Delete fault message register	
02	Load factory settings	
03	Delete fault message register + load factory settings	
04	Delete fault message register + load factory settings, delete EzSQ program	

When delivered, all C1 series frequency inverters are initialized, ie they are programmed with the parameters of the factory default setting.

Load factory settings:

- b085=01: During initialization the data for Europe is loaded.
- b084=02 / 03 / 04
- In b094 select which parameters should be initialized (b094=00: all parameters).
- b180=01: The initialization is started with the SET key.
- After the initialization process has been triggered, the following is displayed, depending on the setting of function b049: at b049=00: ND at b049=01   LD.

- The end of initialization is displayed as 0.00.

The parameters under the following functions are not initialized:
C081, C082, C085, P100…P131

b085	Factory setting parameters	01
00	---	
01	**Europe**	
03	---	

b094	Parameter selection Reset factory setting	00
00	All parameters	
01	Except input/output configuration + communication parameters	
02	U001-U032 only	
03	Except U001-U032 + b037	

This parameter can be used to select which values should be reset

b180	Start factory setting / initialization	00
00	No function	
01	Start initialization	

5.30 brake chopper

C1 frequency converters have an integrated brake chopper. A brake chopper is used to reduce the regenerative power (braking power) of a drive.

Braking power always occurs when the rotating field frequency imposed by the frequency converter is smaller than the rotor rotating field frequency of the motor. This is the case with braking processes such as:
B. with lifting drives in lowering operation, or when quickly braking large moments of inertia (e.g. centrifuges).

The braking energy that occurs is fed back into the frequency converter and leads to an increase in the intermediate circuit voltage. If this DC voltage reaches the value programmed under function b096, then the voltage is clocked to the connected braking resistor using a braking transistor (brake chopper).

The brake chopper must be enabled under function b095.

The duty cycle of the built-in brake chopper, based on 100s, can be set under function b090 in the range from 0.1% to 100% (if 0.0% is entered, the brake chopper is not active).
This function is essentially used to monitor the overload of the built-in transistor and the connected braking resistor. If the duty cycle for the braking process is selected to be too low, the braking chopper will be switched off and the frequency converter will malfunction (fault message E06). If the duty cycle for the connected braking resistor or chopper transistor is chosen to be too high, this can lead to its destruction.

The following ohm values for the braking resistor must not be fallen below:

FU	Min. permissible ohm value at		FU	Minimum permissible ohm value	
	ED=10% (b090=10%)	at ED=100% (b090=100%)		at ED=10% (b090=10%)	at ED=100% (b090=100%)
C1-001SF	100ÿ 317ÿ		C1-015HF	180ÿ 570ÿ	
C1-002SF	100ÿ	317ÿ	C1-022HF	100ÿ	317ÿ
C1-004SF	100ÿ	317ÿ	C1-030HF	100ÿ	317ÿ
C1-007SF	50ÿ	159ÿ	C1-040HF	100ÿ	317ÿ
C1-015SF	50ÿ	159ÿ	C1-055HF	70ÿ	222ÿ
C1-022SF	35ÿ	111ÿ	C1-075HF	70ÿ	222ÿ
C1-004HF	180ÿ	570ÿ	C1-110HF	70ÿ	222ÿ
C1-007HF	180ÿ	570ÿ	C1-150HF	35ÿ	111ÿ

The braking power is calculated as follows: P = U2 / R
U: Brake chopper switch-on voltage (function b096; factory setting 360V (SF)/720V (HF)
R: braking resistor

Example: The maximum possible continuous braking power (b090=100%) of the C1-150HF with an intermediate circuit voltage of 750VDC is: P = 750 2V2 /111ÿ = 5067W

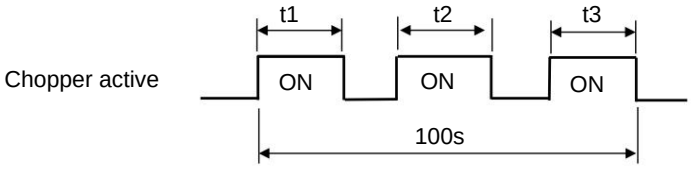
In most cases, the expected braking performance is only available for a short period of time, which may repeat itself cyclically. In these cases, the nominal power of the resistor does not have to correspond to the braking power, but can be lower depending on the expected duty cycle (ED) (see the manufacturer's specifications for the braking resistor).

Select the resistance value and power of the braking resistor according to the expected braking power and duty cycle.

The smaller the resistance value of the connected braking resistor, the greater the possible braking power. If the resistance value is too small or the duty cycle is too long, the brake chopper can be overloaded and thus destroyed.

b090	**Brake chopper duty cycle (ED)** 0.0…100.0%	**0.0%**
Setting range		

Function b090 is essentially used to monitor the overload of the connected braking resistor and the built-in chopper transistor. If 0% is entered, the brake chopper is not ready for operation.
The maximum possible switch-on time under function b090 depends on the ohm value of the resistor set under b097.



$$ED\,[\%] = \frac{t1+t2+t3}{100s} \times 100$$

b095	**Release brake chopper** not	**00**
00	released	
01	only released during operation	
02	always released	

b096	**Brake chopper switch-on voltage** C1-…SF:	**360V/720V**
Setting range	330…400VDC	
	C1-…HF: 660…800VDC	

b097	**Braking resistor setting value**	**Depends on the FU**
Setting range	Min. permissible resistance value…600.0ÿ	

Ohm value of the connected braking resistor. This must not fall below the minimum permissible resistance value. The ohm value entered here determines the maximum permissible ED under b090.

5.31 PTC thermistor input

Under function C005, configure input 5 as the PTC input (C005=19) and connect the PTC to input 5 and L. The maximum cable length of the PTC conductors must not exceed 20m and must be laid separately from the motor cable to avoid interference.

The trip value can be set under C085. If the ohm value is exceeded, the drive is switched off and fault E35 is displayed.

C005	**Digital input 5**	**19**

19: PTC thermistor input (input 5 only)

C085	**Trigger value thermistor input**	**100.0%**
Setting range	0.0...200.0%	

In the factory setting (C085=100%), a fault is triggered when approx. 3000 ÿ is reached.

C085 is calculated according to the following formula:

$$C085\,[\%] = \frac{3000ÿ \times 100\%}{\text{Trigger value [ÿ]}}$$

Example: A fault should occur at 1800 ÿ:

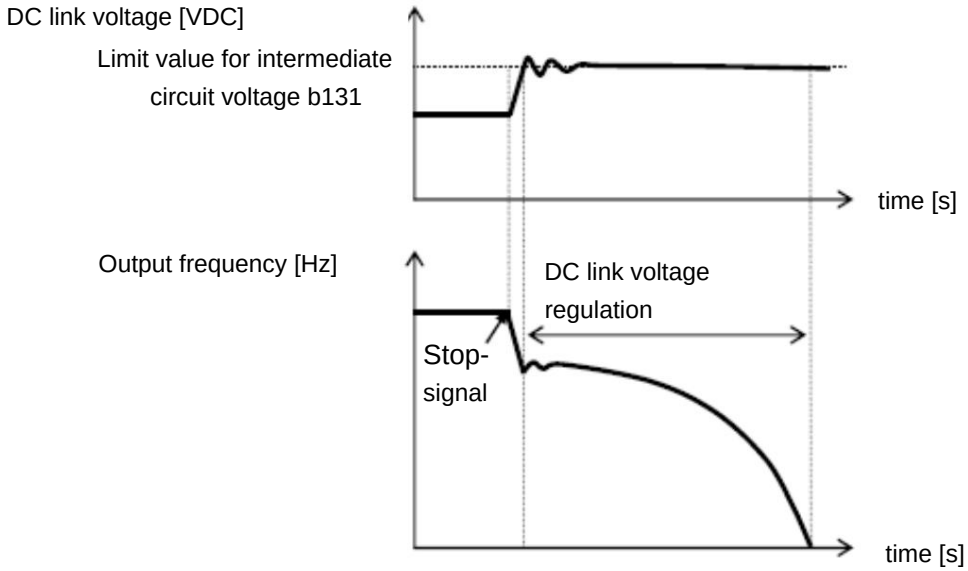
$$C085\,[\%] = \frac{3000ÿ \times 100\%}{1800ÿ} = 167\%$$

5.32 Avoiding overvoltage tripping in generator operation

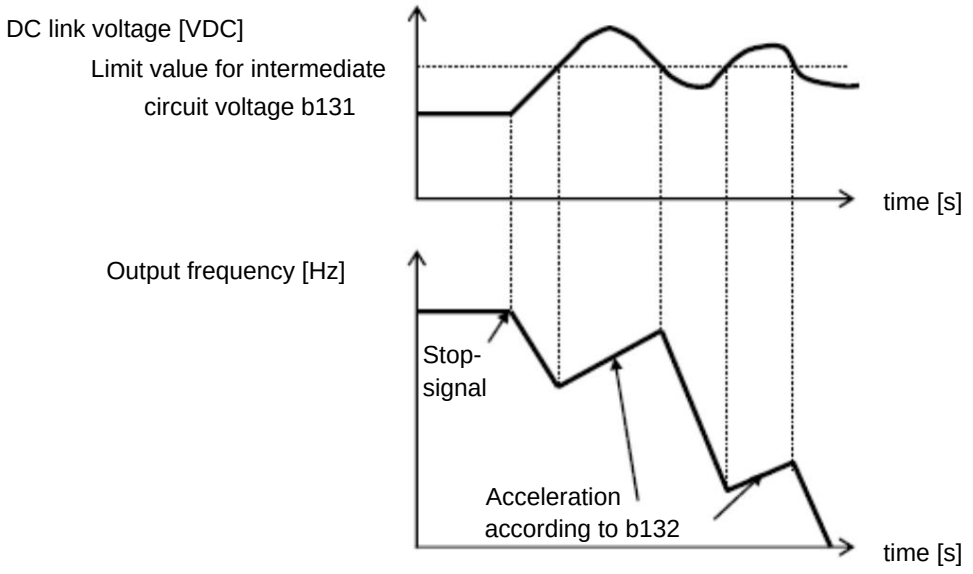
b 130	**Avoiding overvoltage tripping E07** Avoiding overvoltage	**00**
00	tripping E07 not active	
01	Avoid overvoltage fault E07 by extending the shutdown time.	
02	Avoid overvoltage fault E07 by increasing the frequency	

b130=01: The drive is braked with the set deceleration time. If the voltage increases to values > b131, the ramp down time is extended, with the intermediate circuit voltage being regulated to the value set in b131 using a PI controller. The P component and I component of the PI controller are set under b133 and b134. Reduction in reaction time is achieved by increasing b133 and decreasing b134
achieved.

Danger! Values for gain b133 that are too high or values for integration time b134 that are too low can trigger a fault.



b130=02: If the DC link voltage set in b131 is exceeded, the frequency is adjusted accordingly
Acceleration time increased in b132. If the intermediate circuit voltage falls below the value of b131 again, the drive is decelerated again.



b131	**Limit value for intermediate circuit**	**380V/760V DC**
Setting range	**voltage** C1-…SF: 330…400VDC	
	C1-…HF: 660…800VDC	

This value must be greater than the DC link voltage of the frequency inverter in the unloaded state (UDC=input voltage x ÿ2; with an input voltage of 240V the DC link voltage is 339VDC and with an input voltage of 400V the DC link voltage is 566VDC).

b132	**Ramp-up time at b132=02**	**1.00s**
Setting range	0.10…30.00s	

This value must always be set in relation to the mass moment of inertia of the load. Small values for b132 can trigger an “overcurrent” fault.

b133	**Avoiding overvoltage tripping, P component** 0.00…5.00	**0.20**
Setting range		

P component of the PI controller at b130=01.

b134	**Avoiding overvoltage tripping, I component** 0…150s	**1.0s**
Setting range		

I component of the PI controller at b130=01.

5.33 Digital inputs 1...7

The digital inputs 1...7 can be assigned various functions under function C001...C007.
Each input can be assigned any function (exception: thermistor: only input 5, incremental encoder track B only input 7). A function cannot be programmed twice - on two control inputs at the same time. The inputs can be programmed as normally open or normally closed in function C011...C017 (factory setting: normally open).

Overview of the functions of the programmable digital inputs

symbol	Parameter function	
FW	**00**	**Start clockwise rotation**

symbol	Parameter function	
RV	**01**	**Start left rotation**

A002=01: Start via digital inputs
If both digital inputs are activated at the same time, a stop is executed.

symbol	Parameter function	
CF1	**02**	**Retrieve fixed frequencies (BCD, bit 1)**

symbol	Parameter function	
CF2	**03**	**Retrieve fixed frequencies (BCD, bit 2)**

symbol	Parameter function	
CF3	**04**	**Retrieve fixed frequencies (BCD, bit 3)**

symbol	Parameter function	
CF4	**05**	**Retrieve fixed frequencies (BCD, bit 4)**

See chapter **5.6 Fixed frequencies,** page 83.

symbol	Parameter function	
JG	**06**	**Tip operation**

See chapter **5.7 Jog mode,** page 84.

symbol	Parameter function	
DB	**07**	**DC brake**

With the help of the direct current brake (DC brake), high stopping accuracies can be achieved. The DC brake can be activated both via this input and automatically when running down when a certain frequency is reached (see function A051). Braking torque and waiting time are set under functions A053 and A054 (see A051 ... A059).

symbol	Parameter function	
SET	**08**	**2. Parameter set**

The SET input switches the frequency inverter to the parameters for operating a second motor.
Switching only occurs at standstill when 0Hz is reached and there is no start command. The parameter set switching does not work if the command is issued at the same time as the start command. SET must be done beforehand. The 2nd parameter set ***(F2xx, A2xx, b2xx, C2xx, H2xx)*** includes all of the functions listed below.

F202 - 1st ramp-up time,	***A296*** - switching frequency downtime, ***b212***
F203 - 1st ramp-down	- motor overload protection/setting value,
time, ***A201*** - frequency setpoint	***b213*** - motor overload protection/characteristics,
specification, ***A202*** - start/	***b221*** - current limit 1, characteristic,
stop command, ***A203*** - motor nominal	***b222*** - current limit 1, setting value,
frequency/base frequency,	***b223*** - current limit 1, time constant,
A204 - maximum	***C241*** - Signal “current exceeded” OL, setting value
frequency, ***A220*** - base	***H202*** - engine data,
frequency, ***A241*** - boost	***H203*** - engine power,
characteristic, ***A242*** - % manual boost,	***H204*** - number of motor poles,
A243 - Max. boost at % base frequency, ***A244***	***H205*** - speed controller constant,
- Working method, U/f	***H206*** - engine stabilization constant,
characteristic, ***A245*** - Output voltage, ***A246*** -	***H220*** - motor constant R1,
Voltage boost for auto boost, ***A247*** - Frequency	***H221*** - motor constant R2,
boost for auto boost, ***A261*** - Max.	***H222*** - motor constant L,
operating frequency, ***A262*** - Min.	***H223*** - motor constant I0,
operating frequency , ***A281*** - AVR	***H224*** - motor constant J,
function, characteristics, ***A282*** - motor	***H230*** - autotuning engine constant R1,
voltage / mains voltage,	***H231*** - autotuning engine constant R2,
A292 - 2nd acceleration	***H232*** - autotuning engine constant L,
time, ***A293*** - 2nd deceleration time, ***A294*** -	***H233*** - autotuning engine constant I0,
switching from 1st to 2nd time ramp, ***A295*** - switching frequency acceleration time	***H234*** - autotuning engine constant J,

symbol	Parameter function	
2CH	**09**	**2. Time ramp**

Activation of the 2nd ramp up/down time (function A092, A093).

symbol	Parameter function	
FRS	**11**	**Controller lock**

The power stage is switched off - the motor runs freely.

symbol	Parameter function	
EXT	**12**	**External fault**

When this input is activated, a fault message is triggered (E12, e.g. to be used as an input for thermal contacts). The fault message is acknowledged with a reset.

Danger! After a reset, the system restarts immediately if a start command (FW or RV) is present.

symbol	Parameter function	
USP	**13**	**Protection against accidental starting when power is switched on**

If there is a start command when the power is on, fault E13 is triggered.
Reset the fault with reset or cancellation of the start command.

symbol	Parameter function	
SFT	**15**	**Parameter backup**

The parameter backup protects entered parameters from being lost due to overwriting.

b031=00 SFT=ON Only b031 can be changed
b031=01 SFT=ON b031, F001, A020, A220, A021…A035, A038 can be changed

symbol	Parameter function	
AT	**16**	**Setpoint switching**

A005=00	AT=OFF Analog input Ai1 (0…10V) active
	AT=ON Analog input Ai2 (4…20mA) active
A005=02	AT=OFF Analog input Ai1 (0…10V) active
	AT=ON Potentiometer of the external operating unit OPE-SR… active
A005=03	AT=OFF Analog input Ai2 (4…20mA) active
	AT=ON Potentiometer of the external operating unit OPE-SR… active

If no digital input is programmed as AT, then the setpoints at Ai1 and Ai2 are added
(factory setting).

symbol	Parameter function	
RS	**18**	**Reset (resetting fault messages)**

Acknowledging a fault message and resetting the fault signaling relay. If a reset is given during operation in the factory default setting (C102=00), the power stages are switched off and the motor runs freely. (see function b003, b007, C102, C103).

C102=00	Error acknowledgment on rising edge at RS. If RS occurs during operation, the output stages are switched off for the time that RS is present (factory setting). Restart according to setting under C103.
C102=01	Error acknowledgment on falling edge at RS. If RS occurs during operation, the output stages are switched off for the time that RS is present (factory setting). Restart according to setting under C103.
C102=02/03	Error acknowledgment on rising edge at RS. The output stages are **not** switched off if RS occurs during operation - motor operation is not interrupted

C103=00	**0 Hz start** (as with controller inhibit FRS, b088=00)
C103=01	**Synchronize to motor speed** by detecting the **motor induction voltage** (as with controller inhibit FRS, b088=01)
C102=02	**Synchronization to engine speed by actively detecting the engine speed** (as with controller lock FRS, b088=02)

Reset cannot be defined as opener.

symbol	Parameter function	
PTC	**19**	**PTC thermistor input (digital input 5 only)**

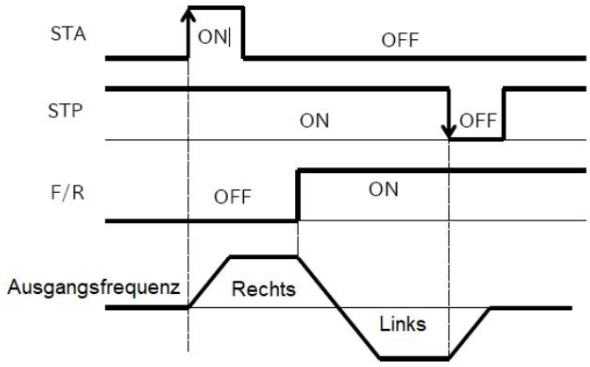
Digital input 5 can be configured as a PTC thermistor input under function C005. In this case, the reference potential is terminal L. If the PTC resistance exceeds 3000ÿ, the motor is switched off and an error message E35 is triggered. To set the trigger value, see function C085.

symbol	Parameter function
STA	**20** **Impulse start**

symbol	Parameter function
STP	**21** **Impulse stop**

symbol	Parameter function
F/R	**22** **Pulse control / direction of rotation**

The frequency inverter can be started or stopped using pulses using the STA and STP inputs.



-If STP is programmed as a normally closed contact, the stop can also be triggered using an ON pulse.
-The FW and RV inputs are not active if one of the inputs is programmed as STP.
-If the input STA=ON when power is on, then a start is carried out.

symbol	Parameter function
PID	**23** **PID controller off**

PID=ON: PID controller switched off
PID=OFF: PID controller switched on when A071=01/02

(see function A071…A079, C044, C052, C053)

symbol	Parameter function
PIDC	**24** **Reset PID controller I component**

PIDC=ON: Sets the result of the integral calculation to 0
PIDC=OFF: No influence on the control

The result of the integral calculation may only be set to 0 when stationary!

symbol	Parameter function
FUP	**27** **Increase frequency**

symbol	Parameter function
FDN	**28** **Reduce frequency**

symbol	Parameter function
UDC	**29** **Reset frequency**

FUP=ON: Increase the frequency when setting A001=02 or recall a fixed frequency.
FDN=ON: Decrease the frequency when setting A001=02 or get a fixed frequency.

When the frequency setpoint is specified via an analog signal (A001=01), the function is only possible in conjunction with the “Hold analogue frequency setpoint” function AHD or with a fixed frequency. The time ramp corresponds to the currently selected acceleration/deceleration time.

Under function C101 you can select whether the last frequency value should be saved when the power is turned off or whether the frequency should be set to 0Hz (or minimum operating frequency A061).

The frequency is reset via input UDC.

symbol	Parameter function
OPE	**31** **Control via control panel**

Activation of start command source=RUN button on control panel (corresponding to A002=02) and frequency setpoint source=entry under F001 (corresponding to A001=02) – independent setting in A001 and A002.
If this happens during operation, the drive is first stopped and the start command must be given again.

symbol	Parameter function
SF1	**32** **Fixed frequency 1 (A021)**

symbol	Parameter function
SF2	**33** **Fixed frequency 2 (A022)**

symbol	Parameter function
SF3	**34** **Fixed frequency 3 (A023)**

symbol	Parameter function
SF4	**35** **Fixed frequency 4 (A024)**

symbol	Parameter function
SF5	**36** **Fixed frequency 5 (A025)**

symbol	Parameter function
SF6	**37** **Fixed frequency 6 (A026)**

symbol	Parameter function
SF7	**38** **Fixed frequency 7 (A027)**

See chapter **5.6 Fixed frequencies,** page 83

symbol	Parameter function
OLR	**39** **Current limit 2**

Activation of current limit 2 (b024…b026).

symbol	Parameter function
TL	**40** **Torque limit**

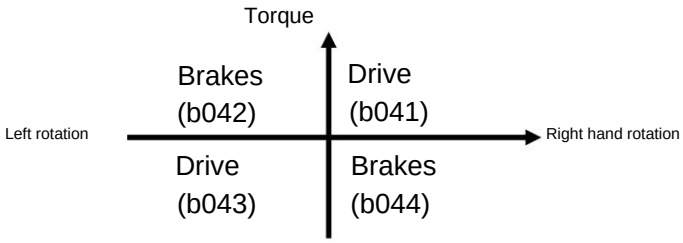
Activation of the torque limit (b040…b045).

symbol	Parameter function
TRQ1	**41** **Torque limit (BCD, bit 1)**

symbol	Parameter function
TRQ2	**42** **Torque limit (BCD, bit 2)**

Torque limitation is possible in the Sensorless Vector Control SLV working method (A044=03). Three options can be selected under function b040:

• **b040=00:** individual limitation of the torque in each of the 4 quadrants (functions b041...b044, 0...200%).



• **b040=01:** Selection of the 4 torque limits b041…b044 binary via digital inputs TRQ1, TRQ2

	Entrances	
	TRQ1	**TRQ2**
b041		
b042	ON	
b043		ON
b044	ON	ON

• **b040=02:** Specification of the torque limit via an analog signal 0...10V at analog input Ai1. The torque limit applies to all operating states.

If a digital input was programmed as TL under function C001...C007 (C001…C007=40), then
The torque limitation is only active when the input is activated. When not activated
Digital input drives the frequency inverter to a maximum of 200% nominal current. If no digital input is programmed as TL, the torque limitation occurs according to the setting under b040.

If one of the digital outputs is programmed to OTQ (exceeding the set torque, function C021/C022/C026=07), then OTQ=ON when the set torque is exceeded.

If one of the digital outputs is programmed to TRQ (torque limit active, function C021/C022/C026=10), then TRQ=ON when the torque is limited.

The torque limits refer to the torque achieved at maximum output current. This torque is assumed to be “200%”.

symbol	Parameter function
BOK	**44** **Brake release confirmation**

For more information, see Users Guide.

symbol	Parameter function
LAC	**46** **Ramp up/down ramp inactive**

LAC=ON: Ignoring the set time ramps. The output frequency immediately follows the setpoint.

symbol	Parameter function
PCLR	**47** **Delete position**

PCLR=ON: Reset the actual position to 0 (d030=0)

This function is only available for positioning (P003=01, P012=02).
For more information, see Users Guide.

symbol	Parameter function
ADD	**50** **Add frequency**

Addition or subtraction (according to setting under A146) of the frequency programmed under A145.

symbol	Parameter function
F-TM	**51** **Control via terminals**

Activation of start command source=digital inputs (corresponding to A002=01) and frequency setpoint source=analog input Ai1/Ai2 (corresponding to A001=01) – regardless of the setting in A001 and A002.
If this happens during operation, the drive is first stopped and the start command must be given again.

symbol	Parameter function
ATR	**52** **Torque control**

Torque control is only possible in conjunction with the SLV working method (A044=03). You can e.g.
Can be used, for example, in winding drives (see function P033…P041).

ATR=ON: Torque control active

See chapter **5.42 Torque control,** page 139.

symbol	Parameter function
KHC	**53** **Reset kWh counter**

Reset kWh counter d015 (see function b078, b079).

symbol	Parameter function
X(00)	**56** **EzSQ program digital input 1**

symbol	Parameter function
X(01)	**57** **EzSQ program digital input 2**

symbol	Parameter function
X(02)	**58** **EzSQ program digital input 3**

symbol	Parameter function
X(03)	**59** **EzSQ program digital input 4**

symbol	Parameter function
X(04)	**60** **EzSQ program digital input 5**

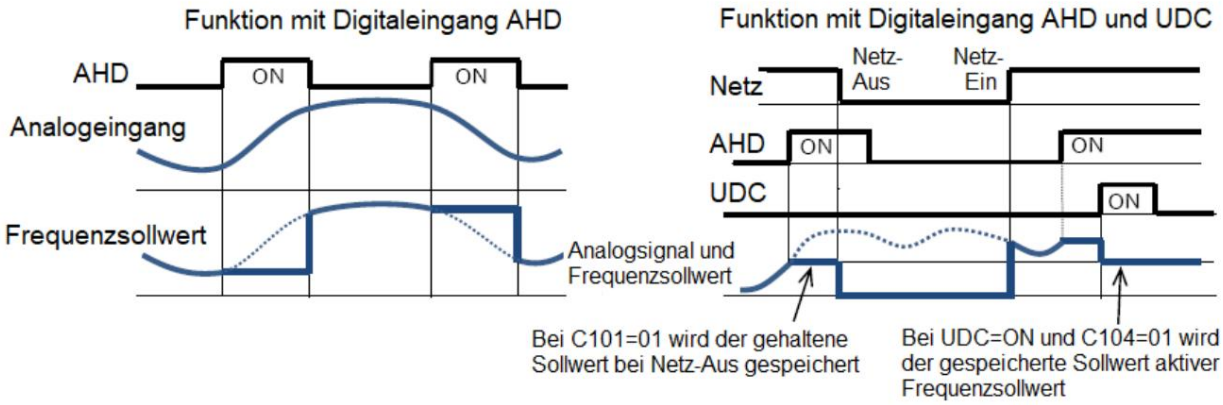
symbol	Parameter function
X(05)	**61** **EzSQ program digital input 6**

symbol	Parameter function
X(06)	**62** **EzSQ program digital input 7**

Digital inputs X(00)…X(06) for EasySequence program function

symbol	Parameter function
AHD	**65** **Hold analog setpoint**

Input AHD holds the active analog setpoint. The held analog setpoint can be changed with input FUP or FDN. With C101=01, the held analog setpoint is saved when the power is off. If the mains voltage is switched on when AHD is present or the reset signal drops, then the analog setpoint is held at which the AHD input was last set - before the mains voltage was switched off or before the reset.



With AHD=ON, the setpoint is maintained even when the power is turned off/on or when the parameter set is switched with the digital input SET. **Danger!** Frequent use of this function may destroy the EEPROM.

symbol	Parameter function	
CP1	**66**	**Selection of positions (BCD, Bit1)**

symbol	Parameter function	
CP2	**67**	**Selection of positions (BCD, Bit2)**

symbol	Parameter function	
CP3	**68**	**Selection of positions (BCD, Bit3)**

These functions are only available for positioning (P003=01, P012=02).
For more information, see Users Guide.

symbol	Parameter function	
SPD	**73**	**Switching from position control to speed control**

This function is only available for positioning (P003=01, P012=02). With SPD=ON the actual position d030 reset to 0.

For more information, see Users Guide.

symbol	Parameter function	
ECOM	**81**	**Direct communication EzCOM**

Control via EzCom communication (direct communication between frequency inverters)

ECOM=ON: Control via EzCom communication

For more information, see Users Guide.

symbol	Parameter function	
PRG	**82**	**Run EzSQ program**

Execution of the EzSQ program loaded into the inverter.

symbol	Parameter function	
HLD	**83**	**Record output frequency**

HLD=ON: The current output frequency is recorded

Danger!
If the input signal is active, the inverter does not respond to any stop command, neither by removing the start command nor by pressing the stop button.

symbol	Parameter function	
REN	**84**	**Controller release**

REN can be used as an additional condition for start.
If REN=OFF occurs during operation, the FI runs down the ramp to 0Hz.

symbol	Parameter function	
PLB	**85**	**Track B for incremental encoder connection (digital input 7 only)**

This function is only available for positioning (P003=01, P012=02).
For more information, see Users Guide.

symbol	Parameter function	
DISP	**86**	**Advertisement**

With this function, only the value selected under b038 is displayed.
(Factory setting: d001).

symbol	Parameter function	
PSET	**91**	**Assign actual position**

Assigning the value entered under P083 as actual position d130 with input PSET (91).

The function is only available for positioning (P003=01, P012=02, P075=00).
For more information, see Users Guide.

symbol	Parameter function	
NO	**no**	**No function**

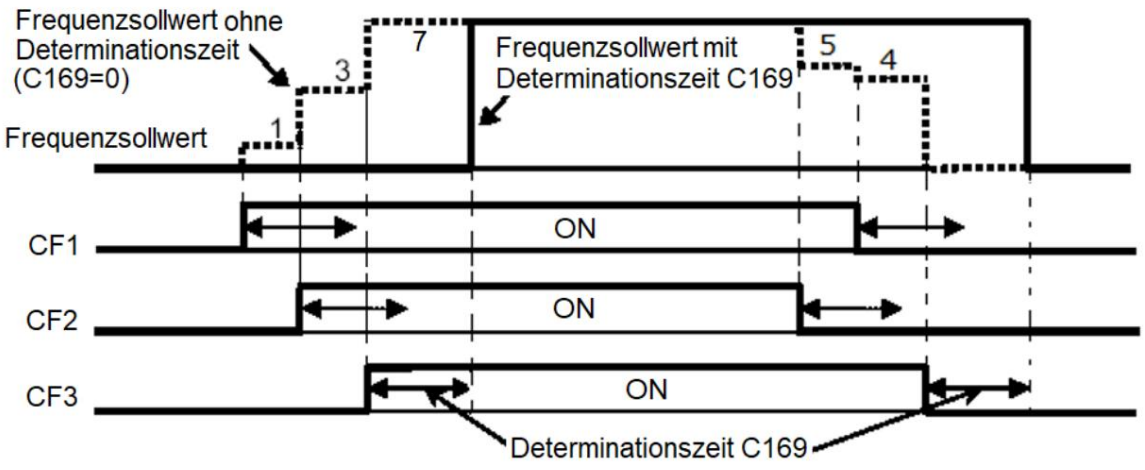
5.34 Response time of the digital inputs

The response time can be set in the range of 2…400ms for each of the digital inputs 1…7.
The function is used to prevent unwanted triggering of digital inputs, e.g. B. to prevent interference or contact bounce.

C160...C166	**Response time digital input 1…7**	**1**
Setting range	0…200 [x2ms]	

C169	**Determination time**	**0**
Setting range	0…200 [x10ms]	

To avoid unwanted triggered fixed frequencies or positions when the signal is applied (e.g.
B. due to contact bounce) a determination time can be entered under C169.



5.35 Digital outputs 11...12, relay output AL

The digital outputs 11...12 and the relay output can be programmed with various signal functions:

Overview of the functions of the digital outputs and the relay

The digital outputs are programmed with function C021...C022 (corresponding to output 11...12, programming of the relay AL under C026; programming "opener" or "closer" with function C031...C032).

symbol	Parameter function	
RUN	**00**	**Operation**

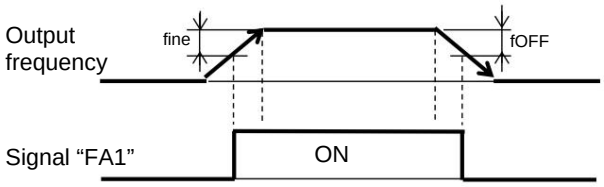
Output frequency > 0Hz

symbol	Parameter function	
FA1	**01**	**Frequency setpoint reached**

Set frequency setpoint reached

fine: 1% of maximum frequency (A004)
fOFF: 2% of maximum frequency (A004)

Example: Setpoint=40Hz, maximum frequency (A004)=50Hz
fine: 50Hz x 0.01=0.5Hz, fOFF: 50Hz x 0.02=1.0Hz
Signal FA1 ON at 49.5Hz, signal FA1 OFF at 49Hz

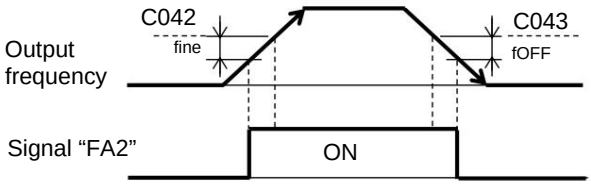


symbol	Parameter function	
FA2	**02**	**Frequency exceeded 1**

Output frequency ÿ C042 / C043.

fine: 1% of maximum frequency (A004)
fOFF: 2% of maximum frequency (A004)

Example: C042=30Hz, C043=35Hz, Maximum frequency (A004)=50Hz
fine: 50Hz x 0.01=0.5Hz, fOFF: 50Hz x 0.02=1.0Hz
Signal FA2 ON at 29.5Hz, signal FA2 OFF at 34Hz

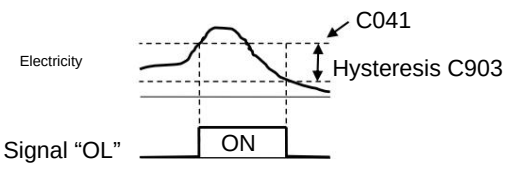


This signal can be used to control a motor brake.

symbol	Parameter function	
OIL	**03**	**Current exceeded 1**

Motor current > C041.

C040=00: Function always active
C040=01: Function only active in
static operation (not active during run-up and run-down)



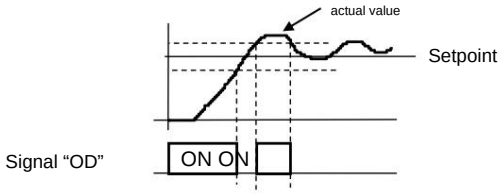
The response time for this function is set using functions C901 and C902. The switching hysteresis is set under function C903.

When specifying the frequency setpoint via analog input (A001=01), it can happen that constant operation is not recognized if there are disturbances in the setpoint signal. In this case we recommend C040=00 or increasing the filter time under A016.

symbol	Parameter function
O.D	**04** **PID control deviation exceeded**

PID control deviation > C044

The deviation between the set setpoint and the feedback actual value is greater than the value set under function C044. Only available
if PID controller active (A071=01/02). Actual value display in d004.



symbol	Parameter function
AL	**05** **Disturbance**

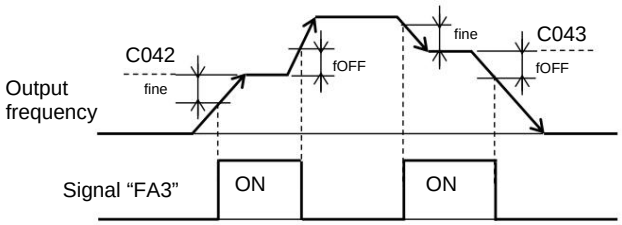
Disturbance

symbol	Parameter function
FA3	**06** **Frequency reaches 1**

Output frequency=C042/C043.

fine: 1% of maximum frequency (A004)
fOFF: 2% of maximum frequency (A004)

Example: C042=30Hz, C043=35Hz,
Maximum frequency A004=50Hz
fine: 50Hz x 0.01=0.5Hz
fOFF: 50Hz x 0.02=1.0Hz



Startup: Signal FA3=ON at 29.5Hz, signal FA3=OFF at 31Hz
Downflow: Signal FA3=ON at 35.5Hz, Signal FA3=OFF at 34Hz

symbol	Parameter function
OTQ	**07** **Torque exceeded**

Torque > C055…C058

Only available in working method A044=03.

symbol	Parameter function
UV	**09** **undervoltage**

Mains undervoltage

symbol	Parameter function	
TRQ	10	Torque limitation active

Torque limitation active (see b040)

symbol	Parameter function	
RNT	11	Operating time exceeded

Operating time d016 has exceeded the value in b034.

symbol	Parameter function	
ONT	12	Power on time exceeded

Mains on time d017 has exceeded the value in b034.

symbol	Parameter function	
THM	13	Motor overloaded

Overload status d104 has exceeded the value in C061.

symbol	Parameter function	
BRK	19	Brake release signal

See Users Guide.

symbol	Parameter function	
BER	20	Brake malfunction

See Users Guide.

symbol	Parameter function	
ZS	21	Speed 0

Output frequency d001 < C063.

symbol	Parameter function	
DSE	22	Permissible speed deviation exceeded

d001 – d008 ÿ P027

This function is only available with positioning and incremental encoder feedback (P003=01, P012=02).

symbol	Parameter function	
POK	23	Target position reached

Deviation between target and actual position < P017/4.

This function is only available with positioning and incremental encoder feedback (P003=01, P012=02).

symbol	Parameter function	
FA4	**24**	**Frequency exceeded 2**

Output frequency ÿ **C045 / C046.**

See description of signal function FA2.

symbol	Parameter function	
FA5	**25**	**Frequency reaches 2**

Output frequency=C045/C046.

See description of signal function FA3.

symbol	Parameter function	
OL2	**26**	**Current exceeded 2**

Motor current > C111.

See description of signal function OL.

symbol	Parameter function	
Ai1Dc	**27**	**Analog setpoint monitoring input Ai1**

The value at analog input Ai1 is in the range of b061 and b060.

Example: Monitoring analog value <1V: b060=10%, b061=0%
Ai1Dc=ON in the range of 0…1V

symbol	Parameter function	
Ai2Dc	**28**	**Analog setpoint monitoring input Ai2**

The value at analog input Ai2 is in the range of b064 and b063.

Example: Monitoring analog value <4mA: b063=20%, b064=0%
Ai2Dc=ON in the range of 0…4mA

symbol	Parameter function	
FBV	**31**	**PID actual value monitoring**

See Users Guide.

symbol	Parameter function	
NDc	**32**	**ModBus communication interrupted**

See function C077.

symbol	Parameter function	
LOG1	**33**	**Result logical link 1**

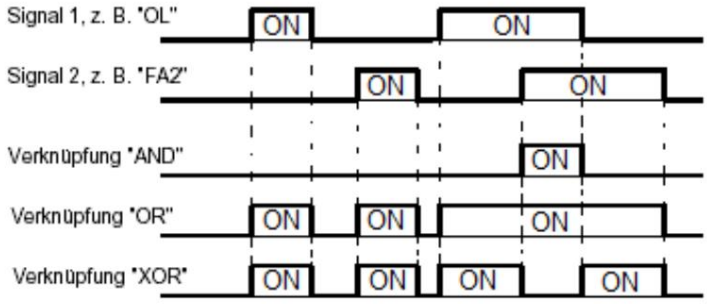
symbol	Parameter function	
LOG2	**34**	**Result logical connection 2**

symbol	Parameter function	
LOG3	**35**	**Result logical connection 3**

The result of up to 3 logical operations (“AND”, “OR”, “XOR”) of two signal functions (except LOG1…LOG3) can be applied to the outputs 11…12 and to the relay AL.

Result	Signal function 1	Signal function 2	Shortcut*
LOG1 (33)	C142	C143	C144
LOG2 (34)	C145	C146	C147
LOG3 (35)	C148	C149	C150

*: 00=AND, 01=OR, 02=XOR



symbol	Parameter function	
WAC	**39**	**Capacitor service life exceeded**

The condition of the capacitors on the circuit boards is determined based on the internal device temperature and the power-on time. The status of the capacitors is displayed in d022. If WAC=ON, the frequency converter or, if possible, the “main board” and “logic board” should be replaced with new boards.

symbol	Parameter function	
WAF	**40**	**Fan lifespan exceeded**

The fan lifespan is based on the temperature information under b075 and the fan operating time determined. After replacing the fans, the fan running time should be reset with b093=01. The fan status is displayed in d022.

symbol	Parameter function	
FR	**41**	**begin**

A start command is pending.

symbol	Parameter function	
OHF	**42**	**Heat sink over temperature**

Heat sink temperature > C064.

symbol	Parameter function	
LOC	**43**	**Current falls below**

Output current < C039.

C038=00: Monitoring throughout the entire operation
C038=01: Monitoring only in static operation (not in startup and shutdown)

When specifying the frequency setpoint via analog input (A001=01), it can happen that constant operation is not recognized if there are disturbances in the setpoint signal. In this case we recommend C038=00 or increasing the filter time under A016.

symbol	Parameter function	
Y(00)	**44**	**EzSQ program output 1**

symbol	Parameter function	
Y(01)	**45**	**EzSQ program output 2**

symbol	Parameter function	
Y(02)	**46**	**EzSQ program output 3**

Digital outputs Y(00)…Y(02) for EasySequence program function.

symbol	Parameter function	
IRDY	**50**	**Inverter ready**

Inverter is ready to execute a start command.

Please check the following conditions if the signal is not present: -Is the mains
voltage present?
-Is a digital input parameterized with the controller enable (REN) function?
-Is the controller lock (input FRS) active?
-Is there a problem?
-Is STO active?

symbol	Parameter function	
FWR	**51**	**Right hand rotation**

symbol	Parameter function	
RVR	**52**	**Left rotation**

FWR=ON: Motor is subjected to a clockwise rotating field.
RVR=ON: Motor is subjected to a counterclockwise rotating field.

symbol	Parameter function
MJA	**53** **Serious disorder**

There is one of the following problems:
-E08: Memory error
-E11: CPU error
-E14: Earth fault
-E30: IGBT malfunction

symbol	Parameter function
WCAi1	**54** **Analog setpoint comparator input Ai1**

symbol	Parameter function
WCAi2	**55** **Analog setpoint comparator input Ai2**

See Users Guide.

symbol	Parameter function
FREF	**58** **Frequency setpoint source = control panel F001**

Frequency setpoint source = control panel F001 (A001=02)

symbol	Parameter function
REF	**59** **Start command source = control panel RUN button**

Start command source = control panel RUN button (A002=02)

symbol	Parameter function
SETM	**60** **2. Parameter set active**

2 Parameter set active (input SET=ON)

symbol	Parameter function
EDM	**62** **STO active (only digital output 11)**

Activation with DIP switch EDMSW=ON (top)

Signal when both safety inputs ST1 and ST2 are switched off (OFF) and STO is active. If only one of the two is switched, the digital output is not switched, but the inverter still stops.

See chapter **3.3.6 STO safety function,** page 39.

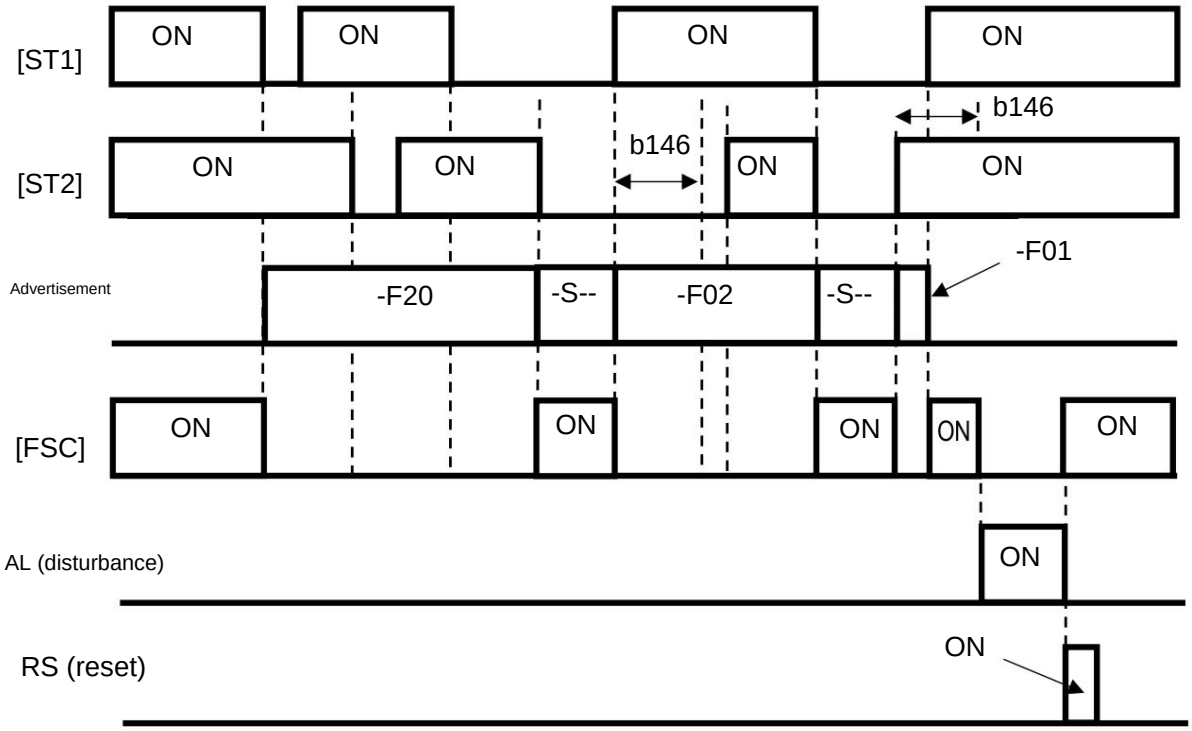
symbol	Parameter function
FSC	**64** **ST1/ST2 discrepancy**

FSC=OFF with ST1/ST2 discrepancy (b145=05.06)

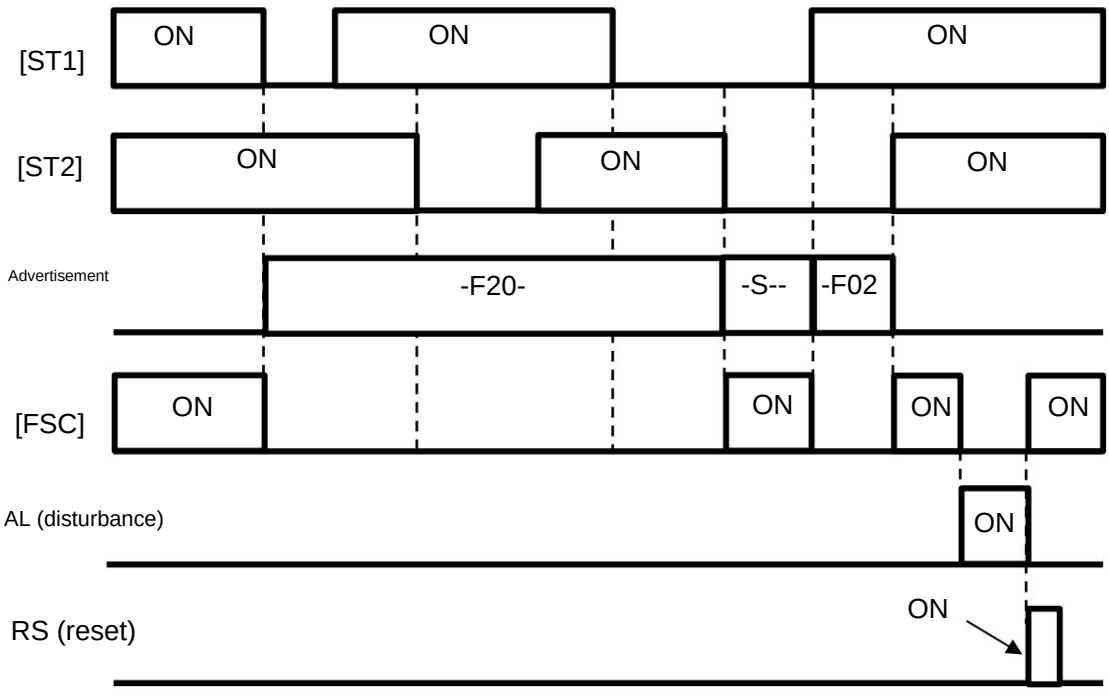
The FSC signal drops out if there is a fault or a delay occurs between the switching of the safety inputs ST1 and ST2. Requirement: b145=05 or 06.

See chapter **3.3.6 STO safety function,** page 39.

b145=05



b145=06



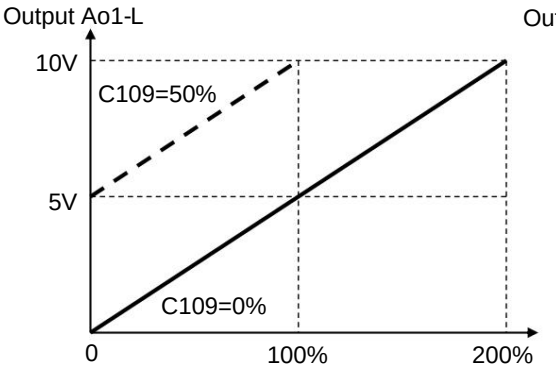
symbol	Parameter function
no	**no**	**No function**

5.36 Analogue output Ao1, adjustment/offset

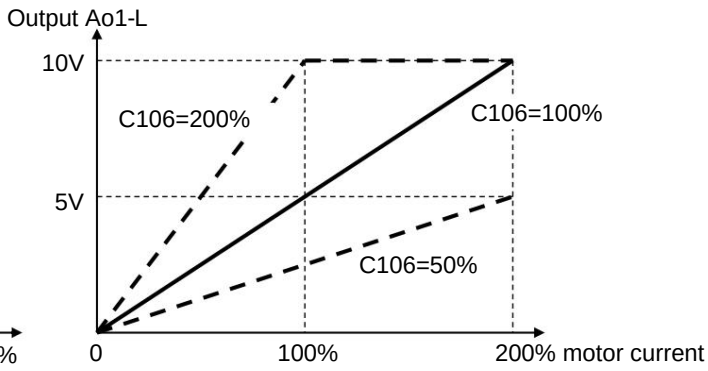
C106	**Adjustment output Ao1**	**100%**
Setting range	50…200%	

C109	**Offset output Ao1**	**0%**
Setting range	0…100%	

Example: Offset analog output Ao1
C028=01 (motor current), C106=100%



Example: Adjustment of analog output Ao1
C028=01 (motor current), C109=0% (no offset)



5.37 Analogue inputs, adjustment/filters

A016	**Filter analog input Ai1, Ai2** 0…	8th
Setting range	30, 31	

The larger the value entered here, the greater the filter effect compared to superimposed interference frequencies - but the longer the response time to setpoint changes.

Filter constant = 1…30 x 2ms; A016=31: Filter constant=500ms, hysteresis +/-0.1Hz (factory setting)

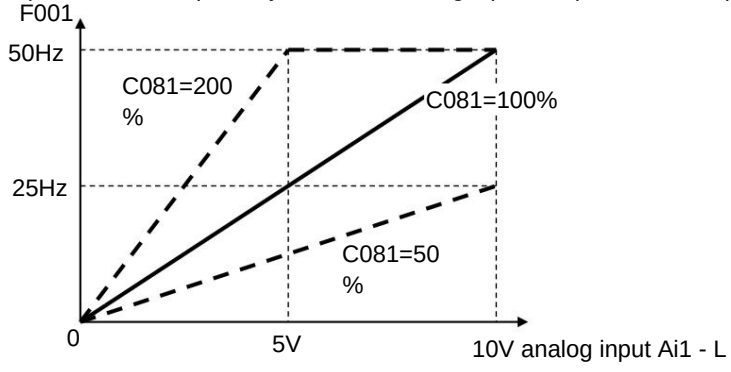
Set value	**01 ..... 30**
Filter effect against interference frequencies	low ..... high
reaction time	Fast Slow

C081	**Adjustment of analog input**	**100%**
Setting range	**Ai1** 0…200%	

C082	**Adjustment of analog input**	**100%**
Setting range	**Ai2** 0…200%	

Frequency setpoint F001

Example: Adjustment of analog input Ai1 (maximum frequency A004=50Hz)



5.38 Reset signal, error acknowledgment

C102	Reset signal	00
00	error acknowledgment on rising edge at RS. The output stages are switched off if RS occurs during operation (factory setting)	
01	Error acknowledgment on falling edge at RS. The output stages are switched off if RS occurs during operation.	
02	Error acknowledgment on rising edge at RS. The power amplifiers will **not** switched off if RS occurs during operation - motor operation is not interrupted.	
03	Error acknowledgment on rising edge at RS. The power amplifiers will **not** switched off if RS occurs during operation. Only the fault and the registers associated with it are reset. **Motor potentiometer frequency setpoint (F001) and position counter (d030) are not reset.**	

C103	Reset behavior	00
00	0 Hz start (corresponding to controller inhibit FRS, b088=00)	
01	Synchronization to motor speed by detecting the motor induction voltage (corresponding to controller lock FRS, b088=01)	
02	Synchronization to engine speed by actively detecting the engine speed (corresponding to controller lock FRS, b088=02)	

5.39 motor potentiometer

The frequency setpoint can be specified continuously via the 2 digital inputs FUP and FDN.
FUP: Increase the frequency, FDN: Decrease the frequency when setting A001=02 or get a fixed frequency.

When the frequency setpoint is specified via an analog signal (A001=01), the function is only possible in conjunction with the “Hold analogue frequency setpoint” function AHD or with a fixed frequency. The time ramp corresponds to the currently selected acceleration/deceleration time.

Under function C101 you can select whether the last frequency value should be saved (C101=01) or not saved (C101=00) when the power is switched off.

The frequency is reset via input UDC.

C101	Save motor potentiometer setpoint	00
00	Do not save the last motor potentiometer setpoint after power off	
01	Save last motor potentiometer setpoint after power off	

C104	Motor potentiometer setpoint from EEPROM	00
00	0Hz	
01	Setpoint from EEPROM	

When resetting the frequency setpoint with the “UDC” function, F001/A020 is set either to 0Hz (C104=00) or to the value stored in the EEPROM (C104=01).

The value in the EEPROM depends on the setting under C101.

If a Minimum Frequency is entered under b062, the value under function A020 must be increased to the value of the Minimum Frequency: A020>/=b062. On the other hand, a warning message W025 is displayed and the drive cannot be started.

5.40 Autotuning, engine data

WARNING

During the dynamic autotuning (H001=02), the motor is accelerated to 80% of the set base frequency (A003). Make sure that no one is injured and that the connected motor or drive is designed for this speed.

The motor must correspond to the power of the inverter and may only be one power level smaller than the inverter power. Example C1-055HF, motor 4.0kW or 5.5kW. Um – especially under the
Working method Sensorless Vector Control SLV (A044=03,) - to achieve the greatest possible utilization of the motor, the frequency converter must be optimally matched to the motor. On the one hand, it is possible to access the saved Hitachi standard motor data, to read out the data of the connected motor using autotuning or to request and enter the data from the motor manufacturer. **If the connected machine does not allow dynamic autotuning, or if it is not possible to drive the engine unloaded during dynamic autotuning,**

This allows static autotuning to be carried out. In this case the motor does not rotate.
The data determined using autotuning (static or dynamic) is entered in H030…H034 (or H230…H234 in the 2nd parameter set). Under function H002 you can choose between the standard data H020…H024 (or H220…H224 in the 2nd parameter set) and Autotunig data.

Dynamic autotuning H001=02

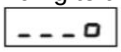
With autotuning, the motor constants of the connected motor are automatically determined and saved in H030… H034 (or H230…H234 in the 2nd parameter set).

Before autotuning can be carried out, the following must be set and observed:

- **A003=Motor nominal frequency**
- **A082=Nominal motor voltage (if necessary adjust with A045)**
- **H003=Rated motor power**
- **H004=Motor pole number**
- **A051=00 (DC brake is not active)**
- **The drive is unloaded. Any brake that may have been installed is unlocked. Is this not possible - e.g. B. with hoist drives and elevators, then the motor must be decoupled from the load and autotuning must be carried out on the unloaded motor. In this case, the mass moment of inertia of the load must be converted to the motor shaft and added to the value under H024 determined by autotuning.**

- **H001=02, dynamic autotuning**
- **H002=00, the motor data under H020…H024 is used**

Autotuning is triggered with a start corresponding to the setting under A002.

Autotuning was completed without errors: 

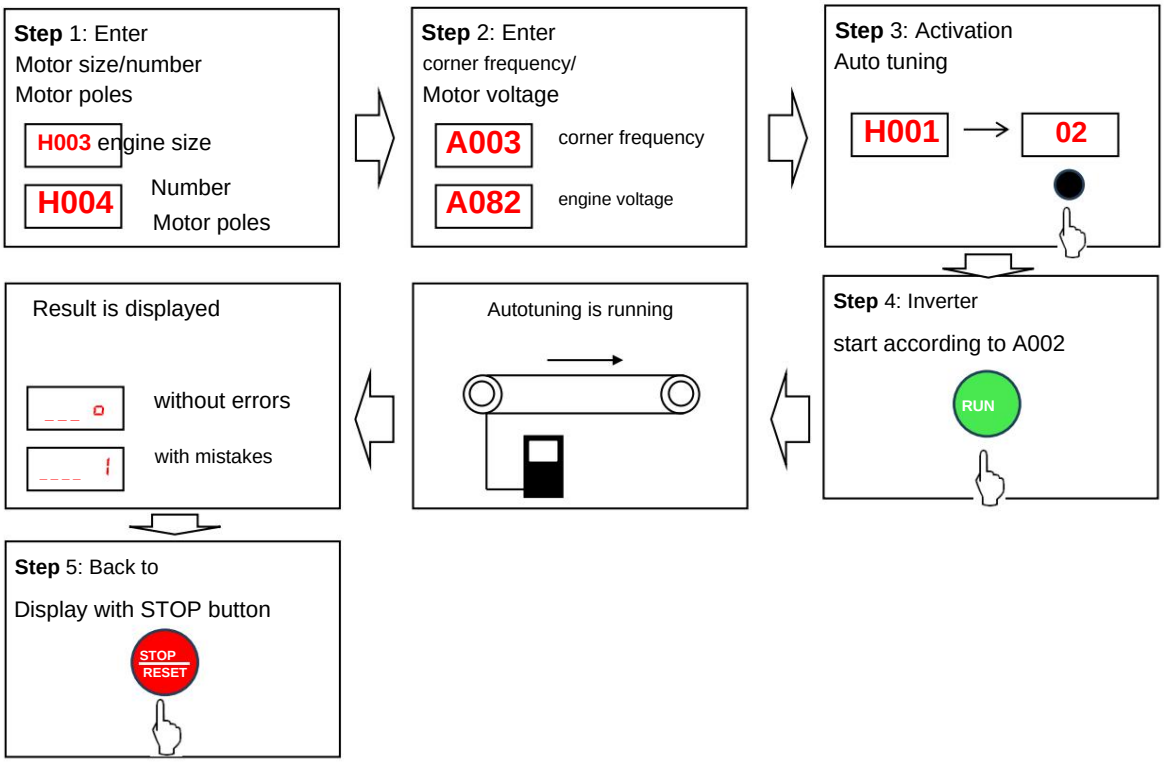
An error occurred during autotuning: 

Autotuning works as follows:
1-AC voltage (1) (motor does not rotate)
2 AC voltage (2) (motor does not rotate)
3 DC voltage (1) (motor does not rotate)
4 motor is ramped up to approx. 80% of the base frequency A003 in V/f characteristic control (A044=00); The acceleration/deceleration time depends on the mass moment of inertia
5 motor is accelerated in SLV (A044=03) up to a maximum of 40% of the base frequency* (A003).
6 DC voltage (2) (motor does not rotate)

*The frequency value depends on the ramp-up or ramp-down time T determined using Fuzzy Logic under point 4 (the larger of the two values): 0s<T<50s: x=40%; 50s<T<100s: x=20%; 100s<T: x=10%

Return to normal display with STOP/RESET button.

Dynamic autotuning procedure



As an alternative to dynamic autotuning, **static autotuning (H001=01)** can be carried out. In this case, the motor does not rotate (a slight movement of the rotor can still occur when DC voltage is applied).

• If a fault occurs such as: B. Overcurrent or overvoltage during autotuning
Fault message displayed.
• Autotuning can be canceled with a stop command. To delete the until then
Once the motor data has been read, please initialize the inverter (function b084).
• Autotuning is not possible if A044=02 (freely adjustable U/f characteristic)

H002, H202	**Engine data**	**00**
00	Standard motor data in the main memory (H020...H024)	
02	Autotuning engine data in RAM (H030...H034)	

H006, H206	**Motor stabilization constant** 0…	**100**
Setting range	255	

If the motor does not run smoothly or is unstable, please check whether the motor performance is too low Function H003 and the number of poles under function H004 are set correctly according to the information on the motor nameplate. If the values are set correctly and the motor still runs unevenly, then increase the value in H006. If problems occur under the following operating conditions (current peaks occur; the frequency inverter trips with overcurrent), then reduce H006: The rated current of the connected motor is greater than or equal to the rated current of the frequency inverter or the torque characteristic of the connected drive is square (e.g. Centrifugal pump or fan) and the current reaches values approximately equal to the FU rated current. Alternatively, the clock frequency b083 can be reduced to stabilize the motor.

5.41 Pulse frequency signal

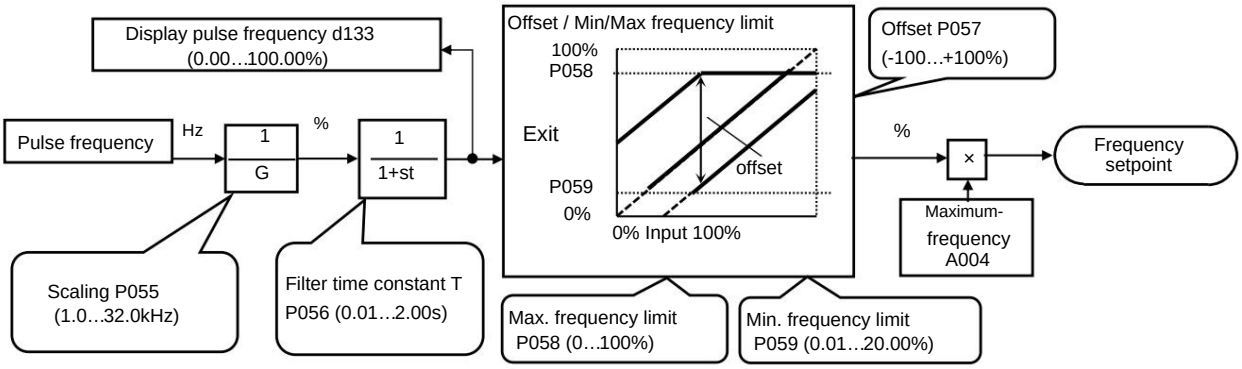
Frequency setpoint, PID controller setpoint or PID controller actual value can be specified as a pulse frequency signal at terminal 8 - L.

Frequency setpoint, PID controller setpoint: A001=06
PID controller actual value: A071=01, A076=03

Calculation of the frequency setpoint:

$$\text{Frequency setpoint} = \frac{\text{Frequency of the pulse signal [kHz]}}{\text{P055 [kHz]}} \times \text{A004 [Hz]}$$

Example: Frequency signal = 20kHz, P055=25kHz, A004=50Hz, frequency setpoint F001=40Hz



P055	**Pulse frequency signal, scaling** 1…32kHz	**1.5kHz**
Setting range		

P056	**Pulse frequency signal, filter time constant** 0.01…	**0.1s**
Setting range	2.00s	

P057	**Pulse frequency signal, frequency offset**	**0%**
Setting range	-100…+100%	

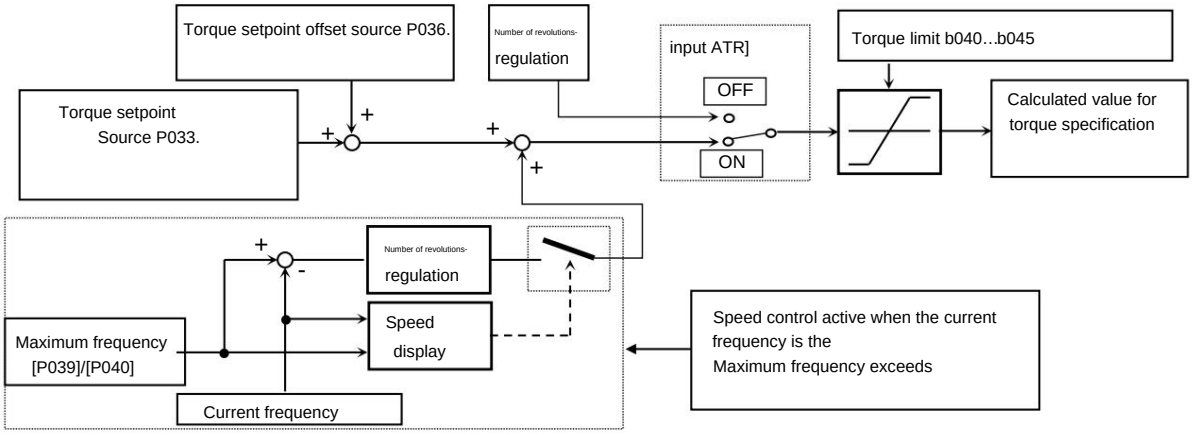
The value entered refers to the maximum frequency under A004.

P058	**Pulse frequency signal, max. frequency limit** 0…100%	**100%**
Setting range		

P059	**Pulse frequency signal, min. frequency limit** 0.01…	**1.00%**
Setting range	20%	

5.42 Torque control

Torque control is possible using the Vector Control working method (A044=03). Torque control is activated via a digital input with the ATR function (52). The torque setpoint is specified via analog inputs, control unit or option card.



P033	**Torque setpoint source** analog	**00**
00	input Ai1 (0…10V)	
01	Analogue input Ai2 (4…20mA)	
03	Control panel under function P034	
06	Option card	

P034	**Torque setpoint setting value (P033=03)** 0…200%	**0%**
Setting range		

P036	**Torque offset, default**	**00**
00	No offset	
01	Control panel under function P037	
05	Option card	

P037	**Torque offset, setting value (P036=01)** -200…+200%	**0%**
Setting range		

P038	**Torque offset, sign**	**00**
00	Torque offset values with + sign for clockwise rotation Torque offset values with sign for counterclockwise rotation	
01	Sign depends on the direction of rotation	

P039	**Torque control, maximum frequency clockwise rotation** 0…120Hz	**0.00Hz**
Setting range		

P040	**Torque control, maximum frequency counterclockwise rotation**	**0.00Hz**
Setting range	0…120Hz	

P041	**Speed/torque control, switching time** 0…1000ms	**0ms**
Setting range		

6. Commissioning

In principle, two conditions must be met for the frequency converter to operate:

1. The frequency converter must receive a **start command .** How the start command is issued is determined under function A002. In the factory default setting, the start command is sent via one of the digital inputs 1 (FW) or 2 (RV).

2. The frequency inverter requires a **frequency setpoint.** Function A001 determines how the frequency setpoint is specified. In the factory default setting, the frequency setpoint is specified via the analog inputs Ai1 or Ai2. Alternatively, the setpoint can be specified via the control unit (F001), as a fixed frequency, using digital inputs FUP and FDN or with the integrated potentiometer of an external control unit.

Be sure to enter the power and number of poles of the connected motor under function H003 or H004 a.

The factory default setting enables easy commissioning of the frequency inverter. For many applications no further parameters need to be set.

6.1 Commissioning via the integrated control panel

To start using the built-in control panel, the following functions must be set:

A001=02: Specification of the frequency setpoint under function F001

A002=02: Start with button 

; Stop with button 

A003=Motor nominal frequency (factory setting: 50Hz; please note: A003 ÿ A004

H003=Rated motor power (see motor nameplate)

H004=number of motor poles (factory setting: 4-pole)

6.2 Error acknowledgment/reset

There are three different ways to acknowledge pending fault messages:

• Reset input (see function C102, C103).

• Switch off the mains voltage

• Press the button 

.

7. Alerts

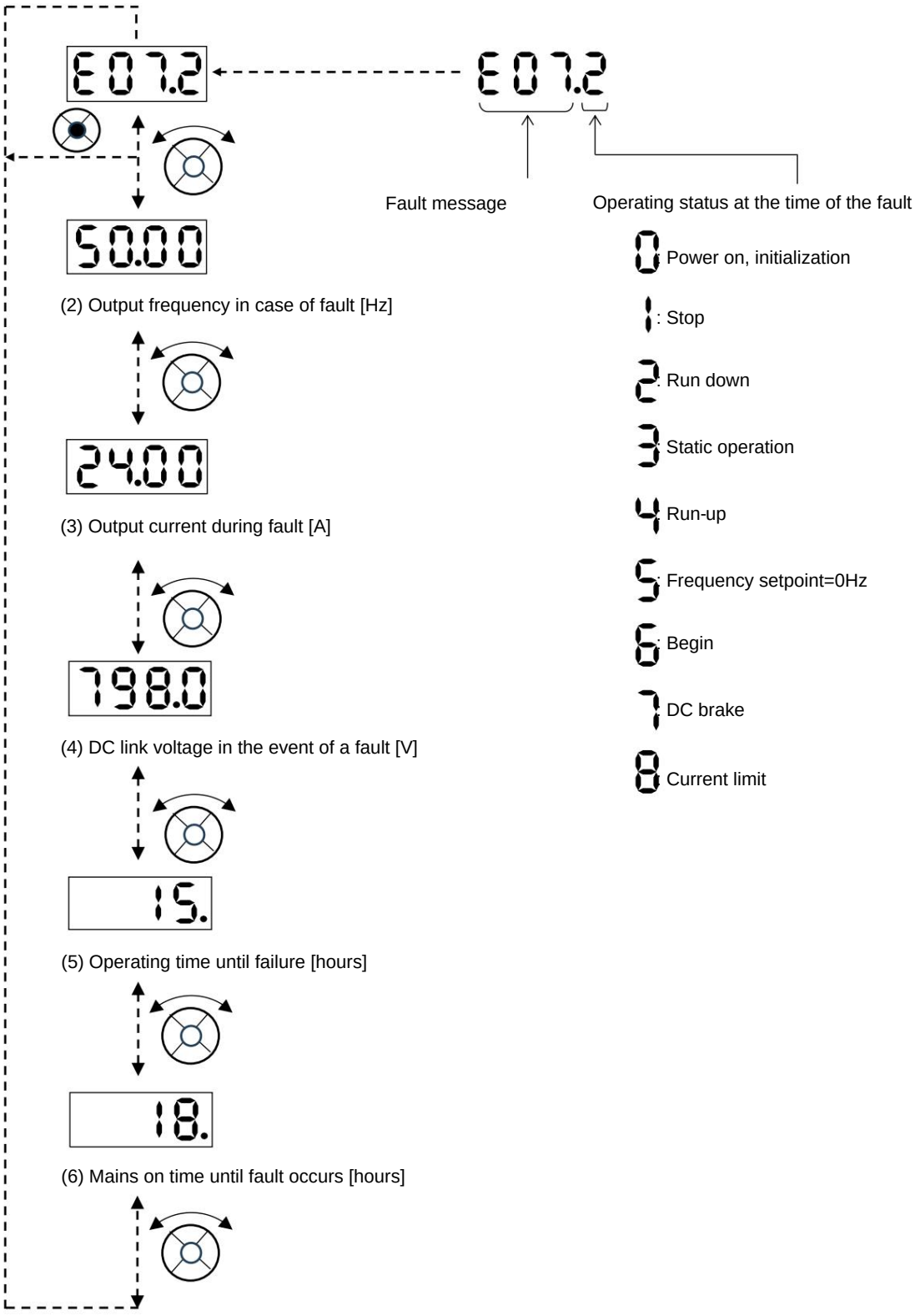
Conflicting parameter entries (e.g. Min. operating frequency A062 > Maximum frequency A004) are displayed with warning messages. The PRG LED flashes and the frequency converter cannot be started.

Display indication	Meaning		
H001 / H201	Max. operating frequency, A061 / A261 > Min.		
H002 / H202	operating frequency, A062 / A262 >		maximum frequency, A004 / A204
H005 / H205	Frequency setpoint, F001 Base frequency, A020 / A220	>	
H015 / H215	Frequency setpoint, F001 Base frequency, A020 / A220	> Max. operating frequency, A061 / A261	
H025 / H225	Frequency setpoint, F001 Base frequency, A020 / A220	< Min. operating frequency, A062 / A262	
H031 / H231	Max. operating frequency, A061 / A261 < Min.		
H032 / H232	operating frequency, A062 / A262 < Frequency		
H035 / H235	setpoint, F001 Base frequency, A020 / A220 Fixed	<	Start frequency, b082
H037	frequencies 1 ...15, A021...A027, Jog frequency, A038	<	
H085 / H285	Frequency setpoint, F001 Base frequency, A020 / A220	= Frequency jump 1...3 +/-	Jump distance, A063+/-A064 A065+/-A066, A067+/-A068 ***1**
H086	Fixed frequencies 1...15, A021...A035 = Max.		
H091 / H291	operating frequency, A061 / A261 < Min.		
H092 / H292	operating frequency, A062 / A262 > Frequency		Freely configurable U/f Characteristic curve, frequency 7, b112
H095 / H295	setpoint, F001 base frequency, A020 / A220	>	

8. Error messages

The frequency converters are equipped with protective devices such as: B. Protection against overcurrent, overvoltage and undervoltage. When one of the various protective functions is triggered, the output voltage is switched off - the motor runs freely and the device remains in the fault status until the fault message is acknowledged.

Fault messages are displayed as follows: Function d081…d086, SET key:



Fault message	Description	Possible Cause	remedy
E01	Overcurrent in the power output stage, ÿ200% FU nominal • in static operation	The motor rated current is greater than the frequency converter rated current.	Select a frequency inverter with a higher output.
		There is a sudden increase in load or the motor is blocked.	Avoid overload. Use frequency inverter and motor with higher power.
		The motor terminals U, V, W are short-circuited.	Check motor cables and motor for short circuit.
		The motor windings are incorrect wired.	Wire the motor according to the nameplate.
E02	• during the delay	The delay time is too short.	Extend delay time.
		The motor terminals U, V, W are short-circuited.	Motor cables and motor Check short circuit
		AVR function is inactive during shutdown	Activate AVR function in downshift: A081=00.
E03	• during the ramp-up	The ramp-up time is too short.	Extend startup time.
		The motor terminals U, V, W are short-circuited.	Check motor cables and motor for short circuit.
		The manual boost (function A042) is set too high.	Reduce boost under function A042.
		The engine is blocked.	Check motor load or breakaway torque.
E04	• at standstill	Ground fault on the output terminals or on the motor.	Check the output cables or the motor for a ground fault.
		The braking torque of the DC brake is set too high (A054).	Reduce braking torque A054.
E05 *1	Triggering the internal engine protection	The internal electronic motor protection has tripped due to overload of the connected motor (b012).	Use motor and inverter with higher power. Check input under function b012.
	The frequency converter is overloaded	The output current is greater than the drive rated current.	Use frequency inverters with higher performance
E06	Exceeding the braking limit Chopper duty cycle	The brake chopper duty cycle is set too low (b090).	Increase the duty cycle under function b090 (Caution! Do not overload the braking resistor!).
		The delay time is too short.	Extend delay time.
E07	Overvoltage in the intermediate circuit, C1-…SFE: ÿ400VDC C1-…HFE: ÿ800VDC	The motor was operated oversynchronously (generatively).	Extend delay time. Disable AVR function for ramp down (A081=02). Enter higher voltage in A082. Insert brake chopper and brake resistor.
E08 *2	EEPROM error	The temperature is unacceptably high or the drive is exposed to radio interference.	Check environmental conditions. **Enter the parameters again.**

*1: Error acknowledgment possible at the earliest 10s after the error message occurs

*2: Error acknowledgment only possible by switching the mains voltage off and on. If the error message always occurs when the mains voltage is switched on, then there is a fault in the memory. In this case, initialize the frequency converter (b084=02, b180=01) and enter the parameters again.

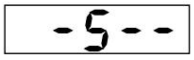
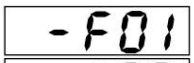
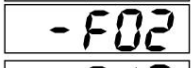
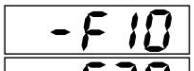
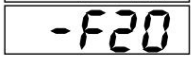
Fault message	Description	Caused	remedy
E09	Undervoltage in the intermediate circuit C1-…SFE: ÿ173VDC C1-…HFE: ÿ345VDC	The mains voltage is too low. Check mains voltage.	Activate restart (b001…b008)
E 10	Current transformer fault	Current transformer defective.	Contact Hitachi Service.
E 11 *3	Processor faulty	Strong electromagnetic fields surrounding the frequency inverter and have an effect on the external circuitry of the frequency inverter and cause faults.	(e.g. busbars).
		The frequency converter is defective.	Contact Hitachi Service.
E 12	External fault	Input EXT=ON.	Eliminate the cause of the error message in the external circuitry.
E 13	Malfunction due to triggering of the restart interlock	When the restart interlock was activated (input USP=ON), the mains voltage was switched on.	Only activate the restart lock after the mains voltage has been switched on.
E 14 *3	Ground fault at the motor connection terminals at power on. (only if b098=01, ground fault is not monitored in the factory setting)	There is a ground fault between U, V, W and ground. The fault can be triggered unintentionally if the mains is One the engine turns and one Tension generated.	Eliminate ground fault and check motor; Switch the device off from the mains without acknowledging the fault. Motor or motor cable for possible Check the ground fault and correct it before continuing to operate the device. FAILURE TO FOLLOW THIS MAY RESULT IN THE DESTRUCTION OF THE DEVICE
E 15	Grid overvoltage	The DC link voltage is too high for at least 100s at standstill. C1-…SFE: ÿ390VDC C1-…HFE: ÿ780VDC	Check mains voltage.
E 19	Disturbance in the Temperature detection	Temperature detection defective.	Contact Hitachi Service.
E21	Excess temperature in power section	Inverter overloaded.	Measure motor current.
		Ambient temperature too high.	Check ambient temperature.
		Installation distances too small (see Chapter **2. Installation,** page 23)	Check installation distances.
		Heatsink/fan dirty.	Clean heatsink/fan.
E22	CPU communication error	The drive is exposed to radio interference.	Examine the surroundings of the frequency inverter and external circuitry for causes of faults
		The frequency converter is defective.	Contact Hitachi Service.
E25 *3	Main board malfunction	Error on the main board.	Contact Hitachi Service.
		The drive is exposed to radio interference.	Examine the surroundings of the frequency inverter and external circuitry for causes of faults.
E26 *3	Error in 20mA Current loop on Ai2	20mA at Ai2 is clearly exceeded	Check analog signal.
E30 *3	IGBT error	Overcurrent in IGBT	Check motor cables and motor for short circuit. Select a frequency inverter with a higher output.

*3: Error acknowledgment only possible by switching the mains voltage off and on

Fault message	Description	Caused	remedy
E35	Response of the cold conductor tripping function (Terminal 5 – L)	The motor is overloaded.	Check the load on the engine.
		The thermistor is defective.	Replace thermistor.
		The engine's own ventilation – especially at low speeds – is not enough.	Insert external fan.
		C085 not set correctly.	Check value in C085.
E36	Brake control error	An error occurred when controlling the motor brake (function b120…b127)	Check parameters. Check brake.
E37 *3	Triggering the function "STO"	There was an emergency stop at the inputs ST1 and ST2 triggered (b145=01)	Investigate the cause of the emergency stop. See chapter **3.3.6 STO safety function,** page 39.
E38	Frequency converter overloaded	Overload at frequencies <0.2Hz or with setting b910=01…03: FI overload	Motor is blocked or overloaded. Check settings under b012…b020, b910…b913.
E40	No connection with optional control unit	Connection between frequency inverter and control unit defective.	Check the connection cable between the frequency inverter and the control unit (no fault message is triggered if b165=02).
E41	ModBus Communication disorder	The time-out programmed under C077 has been exceeded.	Set the baud rate correctly under C071. Check the length of the communication cable.
E43	Invalid command	Malfunctions in connection with the EzSQ user program. For further information see the description of the EzSQ program function.	
E44	Nesting depth too large		
E45	Execution error		
E50... E59	Custom Fault message		
E60... E69	Disturbance optional slot	Malfunction in connection with the option card inserted in the optional slot	See manual for the option card inserted in the optional slot.
E80	Fault in incremental encoder signals	Incremental encoder defective or incorrectly wired	Check wiring, replace encoder if necessary
		Incorrect pulse shape	Incremental encoder with the correct one Use pulse form
		Drive blocked	Increase time under P077. Switch off monitoring with P077=0.0. P015 lift.
E81	Positioning speed too high	Positioning cannot be carried out at the specified speed.	Increase values under A004 and P026. Switch off monitoring with P026=0.
E83	Position outside the area	Position is outside the range of P072/P073.	Set specified position within the ranges of P072/P073
E98	Error on the Security entrances ST1 and ST2	Status at ST1 and ST2 inconsistent (b145=02).	Check signals at ST1 and ST2. See chapter **3.3.6 STO safety function,** page 39
E99 *3	STO malfunction	Fault in the STO shutdown paths.	Contact Hitachi Service

*3: Error acknowledgment only possible by switching the mains voltage off and on.

Additional Reports

Advertisement	Description
	Reset Digital input with the RS function is active or the STOP/RESET button is activated Error acknowledgment was pressed
	The frequency converter is in standby mode while the input voltage has dropped.
	Inverter is supplied with 24VDC
	Waiting time before automatic restart
	The selected direction of rotation is blocked under b035
	Deleting the error memory (b084=01, b180=01)
	There are no error messages stored in the error memory (d081-d086)
 flashing	Communication fault between frequency inverter and external control unit
	Autotuning completed without errors
	An error occurred during autotuning. Autotuning was canceled.
	STO active, no fault (b145=02…06).
   	Inconsistency in the switch of the safety inputs ST1 and ST2 (b145=05/06, see 3.3.6 Safety function STO, page 39)

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