Rexroth Frequency Converter

VFC 3210

Record of Revision

Edition	Release Date	Notes
DOK-RCON04-VFC3210****-QU01-EN-P	2018.06	First release
DOK-RCON04-VFC3210****-QU02-EN-P	2019.04	Added new functions
DOK-RCON04-VFC3210****-QU03-EN-P	2020.08	Software functions extension
DOK-RCON04-VFC3210****-QU04-EN-P	2021.12	Contents update

Introduction of this Documentation

This **Quick Start Guide** is derived from the **Operating Instructions** which includes the product data in details.

⚠️ **WARNING**   **Personal injury and property damage caused by incorrect application, installation or operation!**

Never work with or control the product before reading through

● **Safety Instructions** in the standard delivery

● Safety descriptions in the **Operating Instructions**

Reference

For documentations available in other type or language, please consult your local sales partner or check www.boschrexroth.com.

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Table of Contents

Page

1 Mechanical Installation

1.1 Visual Check

After unpacking the frequency converter, perform a thorough visual check.

Check the following:

- **The right device has been supplied**
- **The device has no damage**
- **No transport damage such as scratches, cracks or dents**

If you find any deviation from one of the above points, please contact your **Bosch Rexroth** sales partner.

1.2 Ambient Conditions

If it is to function perfectly, the frequency converter must be installed in an environment matching the data provided below.

Rated ambient temperature	-10...40 °C
Derating / ambient temperature	1.5 % / 1 °C (40...50 °C)
Rated altitude	≤ 1,000 m
Derating / altitude	1 % / 100 m (1,000...2,000 m)
Relative humidity	≤ 90 % (No condensation)
Degrees of protection	IP 20 (Control cabinet mounting)
Degrees of pollution	2 (EN 50178)

Tab. 1-1: Ambient conditions

1.3 Installation Conditions

To avoid overheating, the device must be ventilated. The recommended minimum top and bottom distance between frequency converter and adjacent items (may prevent air flow)are shown as figure below:
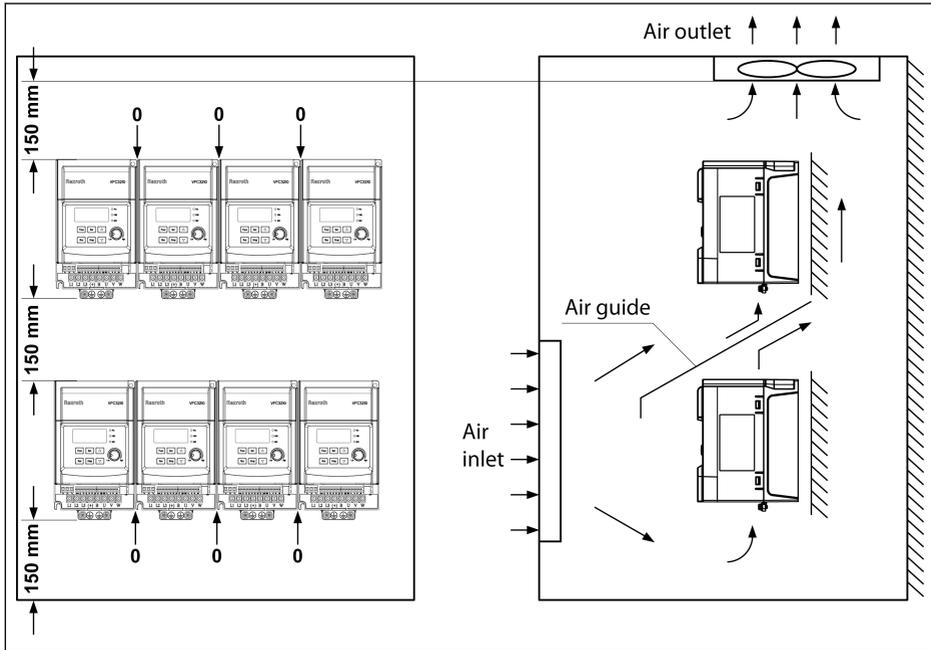
Fig. 1-1: Frequency converter mounting

☞
- VFC 3210 must be vertically installed on the metal wall.
- Without heat dissipation holes on both sides of the housing, VFC 3210 can be installed side by side.
- If one frequency converter is arranged above another, make sure the air temperature into the inlet can not exceed 40℃.
- An air guide is recommended between the frequency converters to prevent the rising hot air being drawn into the upper frequency converter if the upper limit of air temperature is exceeded.

1.4 Figures and Dimensions

1.4.1 Figures
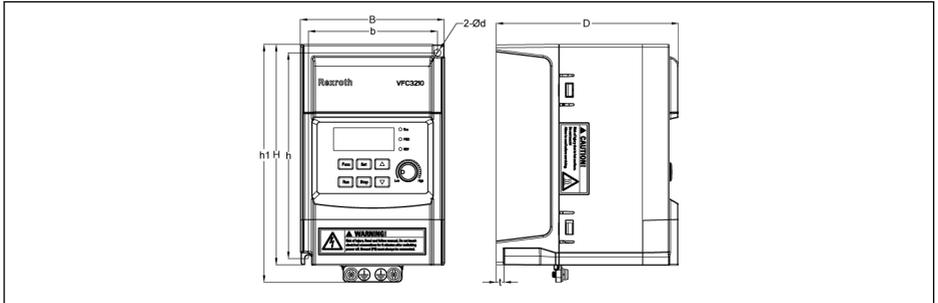
Fig. 1-2: VFC 3210 0K40...1K50 dimensions figure
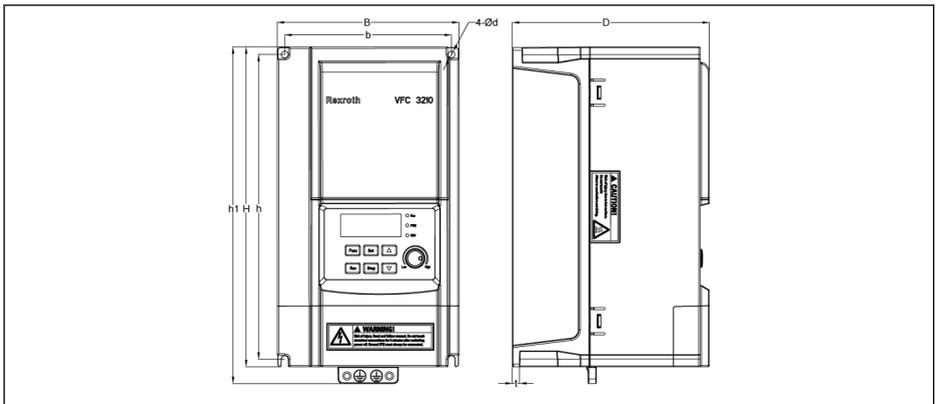
Fig. 1-3: VFC 3210 2K20...4K00 dimensions figure

1.4.2 Dimensions

Frame	VFC 3210 Model ①	Dimensions [mm]								Screw size	Net weight [kg]
		B	b	H	h	h1	Ød	D	t		
A	0K40	90	80	135	125	146	4.5	105	5	2xM4	0.90
B	0K75	95	85	145	135	156	4.5	120	5	2xM4	1.14
C	1K50	95	85	185	175	196	4.5	125	5	2xM4	1.46
D	2K20	120	110	210	200	221	4.5	130	5	4xM4	2.18

Tab. 1-2: VFC 3210 1P 200 VAC dimensions

Frame	VFC 3210 Model ①	Dimensions [mm]								Screw size	Net weight [kg]
		B	b	H	h	h1	Ød	D	t		
B	0K40-3P4	95	85	145	135	156	4.5	120	5	2xM4	1.10
	0K75-3P4										1.12
C	1K50-3P4	95	85	185	175	196	4.5	125	5	2xM4	1.38
D	2K20-3P4	120	110	210	200	221	4.5	130	5	4xM4	2.06
	4K00-3P4										2.18

Tab. 1-3: VFC 3210 3P 380 VAC dimensions

☞   ①: The complete type code for frequency converter is:

VFC3210-xKxx-xPx-MNA-7P-NNNNN-NNNN, see "Appendix II: Type Coding" in **Operating Instructions**.

2 Electric Installation

2.1 Overview of Electric Connections

Fig. 2-1: Wiring diagram

☞
- For cable size, fuse, screw torque, see **chapter 2.2**.
- For terminals, see **chapter 2.3**.
- For VFC 3210, the excessive energy produced in the process of braking can not be eliminated.

2.2 Cable Specifications

2.2.1 Power Connection

Cable specification for international without USA / Canada
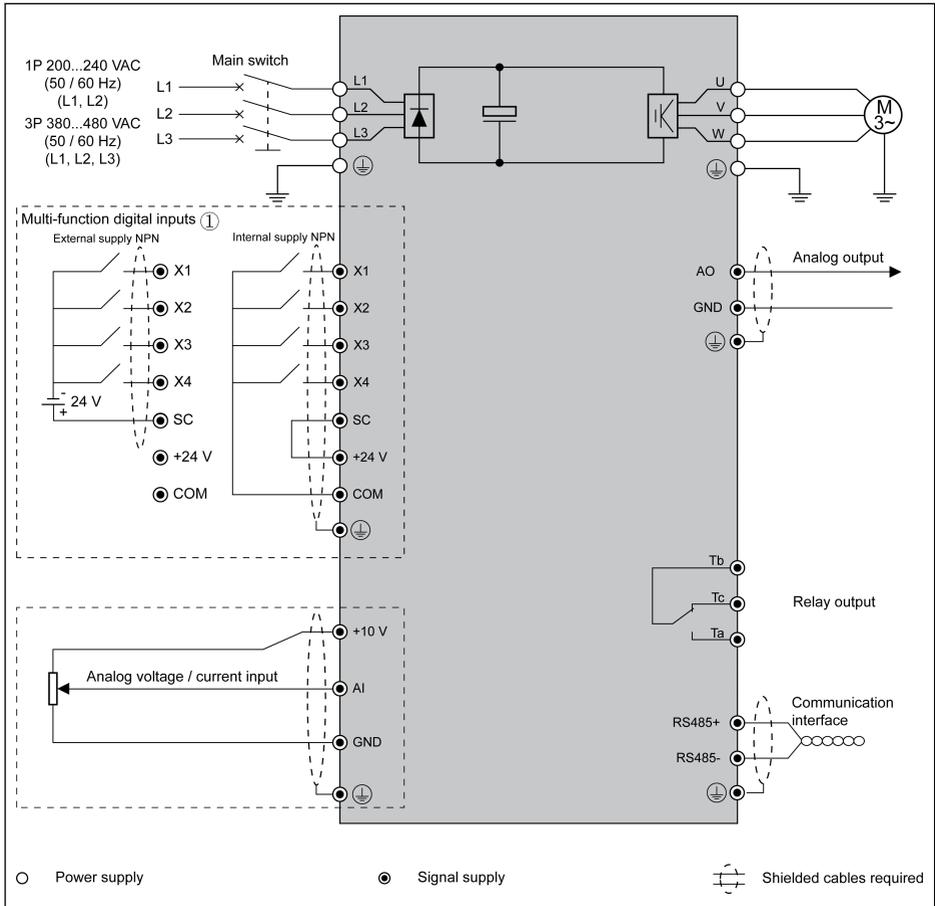
☞
- **ONLY USE** copper wires of 90 ℃ or above with XLPE or EPR insulation according to IEC60364-5-52.
- It is recommended to use shielded cables to connect the motor.

VFC 3210 Model	Fuse (gG)	Power cables installation mode			PE Cable	Torque / Screw
		B1	B2	E		
	[A]	[mm^2]	[mm^2]	[mm^2]	[mm^2]	[N·m / lbf·in] (Mx)
0K40	10.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
0K75	16.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
1K50	25.0	4.0	4.0	2.5	10.0	0.8 / 7 (M3)
2K20	32.0	6.0	6.0	4.0	10.0	0.8 / 7 (M3)

Tab. 2-1: 1P 200 VAC fuse and cable dimensions for international without USA / Canada

VFC 3210 Model	Fuse (gG)	Power cables installation mode			PE Cable	Torque / Screw
		B1	B2	E		
	[A]	[mm^2]	[mm^2]	[mm^2]	[mm^2]	[N·m / lbf·in] (Mx)
0K40	6.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
0K75	10.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
1K50	10.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
2K20	16.0	2.5	2.5	2.5	10.0	0.8 / 7 (M3)
4K00	20.0	4.0	4.0	2.5	10.0	0.8 / 7 (M3)

Tab. 2-2: 3P 380 VAC fuse and cable dimensions for international without USA / Canada

Cable specification for USA / Canada

☞
- The data listed in the table below are only used to select fuse and cable dimensions for USA / Canada.
- **ONLY USE** copper wires of 75 ℃ or above according to UL 508C.
- It is recommended to use shielded cables to connect the motor.

VFC 3210 Model	Fuse (Class J) [A]	Power cables [AWG]	PE Cable [AWG]	Torque / Screw [N·m / lbf·in] (Mx)
0K40	10.0	14	8	0.8 / 7 (M3)
0K75	15.0	14	8	0.8 / 7 (M3)
1K50	25.0	10	8	0.8 / 7 (M3)
2K20	30.0	10	8	0.8 / 7 (M3)

Tab. 2-3: 1P 200 VAC fuse and cable dimensions for USA / Canada

VFC 3210 Model	Fuse (Class J) [A]	Power cables [AWG]	PE Cable [AWG]	Torque / Screw [N·m / lbf·in] (Mx)
0K40	6.0	14	8	0.8 / 7 (M3)
0K75	10.0	14	8	0.8 / 7 (M3)
1K50	10.0	14	8	0.8 / 7 (M3)
2K20	15.0	14	8	0.8 / 7 (M3)
4K00	20.0	12	8	0.8 / 7 (M3)

Tab. 2-4: 3P 380 VAC fuse and cable dimensions for USA / Canada

2.2.2 Control Signal Connection

The following requirements are applicable to signal connection:

- Flexible cables with wire end sleeves
- Cable cross-section: 0.5...1.0 mm^2
- Cable cross-section for connectors with insulation sleeves: 0.75 mm^2
- Analog inputs AI, +10 V and GND: use shielded cables
- Digital inputs X1...X4, SC, +24 V and COM: use shielded cables
- Analog outputs AO and GND: use shielded cables
- RS485 communication: use shielded twisted pair cables

Recommendations on cable insulation stripping:

Please strip the insulation of control cables according to the dimensions given below. Too long stripping may cause short circuit of adjacent cables; too short stripping may lead to cables becoming loose.

6 mm ± 1 mm
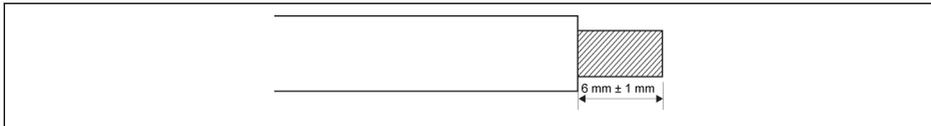
Fig. 2-2:   Cable insulation stripping length

☞   Please follow the steps below for wiring of control terminals.

Step 1: Switch off the frequency converter before performing wiring.

Step 2: Deactivate the control signals in the wiring process.

Step 3: Switch on the frequency converter.

Step 4: Set respective parameters.

Step 5: Activate respective control signals.

2.3 Terminals

2.3.1 Power Terminals

Power Terminals Figure
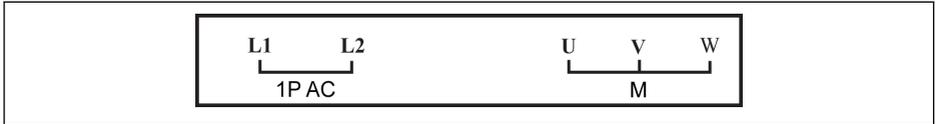
Fig. 2-3: Power terminals (1P 200 VAC)
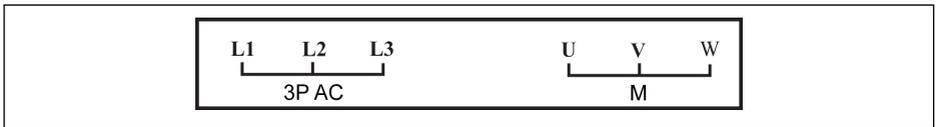
Fig. 2-4: Power terminals (3P 380 VAC)

Terminal	Description
L1, L2	Mains supply input terminals
U, V, W	Converter output terminals (connect to motor)
⏚	Input PE terminals (at the bottom left of heat sink)
⏚	Grounding terminals (at the bottom right of heat sink)

Tab. 2-5: 1P 200 VAC power terminals description

Terminal	Description
L1, L2, L3	Mains supply input terminals
U, V, W	Converter output terminals (connect to motor)
⏚	Input PE terminals (at the bottom left of heat sink)
⏚	Grounding terminals (at the bottom right of heat sink)

Tab. 2-6: 3P 380 VAC power terminals description

2.3.2 Main Circuit Wiring Step

Step 1:
Remove the terminal cover plate

Step 2:
Loosen the terminal screws

Step 3:
Thread the prepared cables through the holes at the bottom of the converter to achieve a stable connection with terminals

Step 4:
Tighten the screws and install terminal cover plate
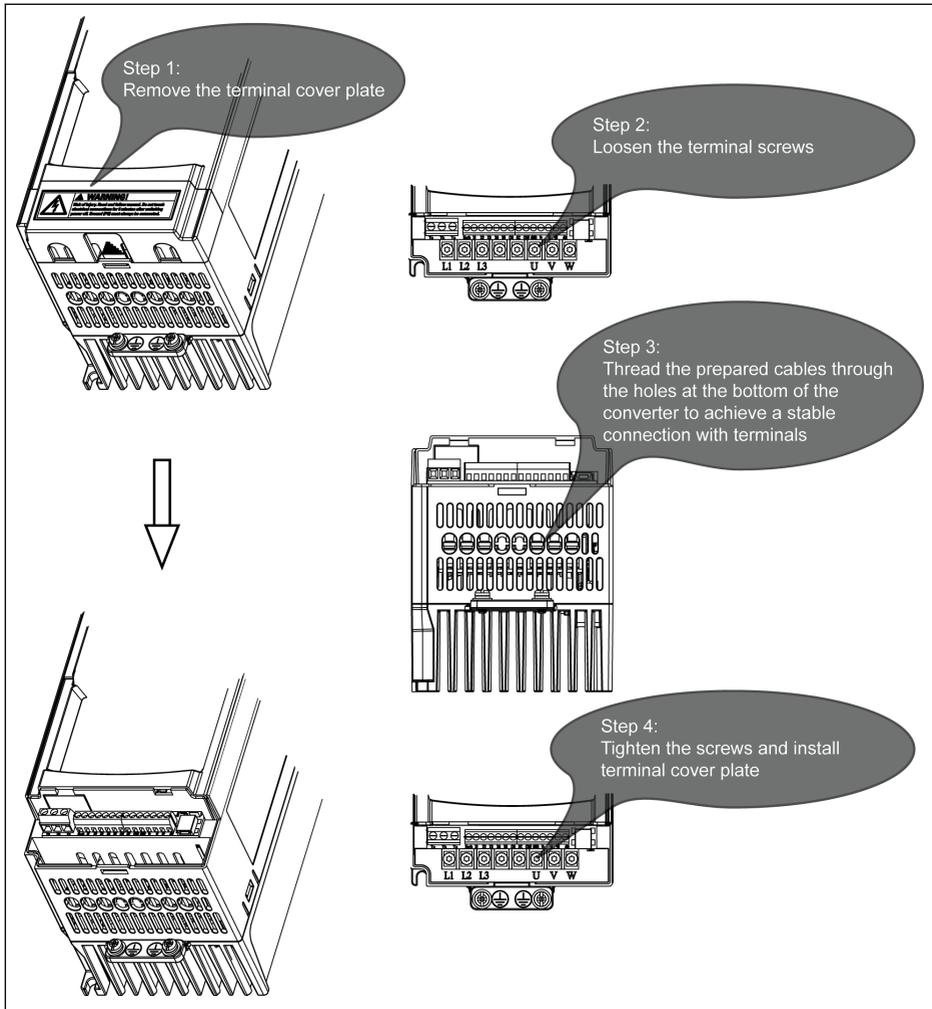
Fig. 2-5: Main circuit wiring step

☞ As the brake resistor is not supported for VFC 3210 to connect, the excessive energy produced in the process of braking can not be eliminated. The outside plastic housing is not allowed to remove.

2.3.3 Control Terminals

Control terminals figure

| Ta | Tb | Tc |

| X1 | X2 | X3 | X4 | SC | +24V | COM | +10V | GND | AI | AO | 485+ | 485- | EARTH |
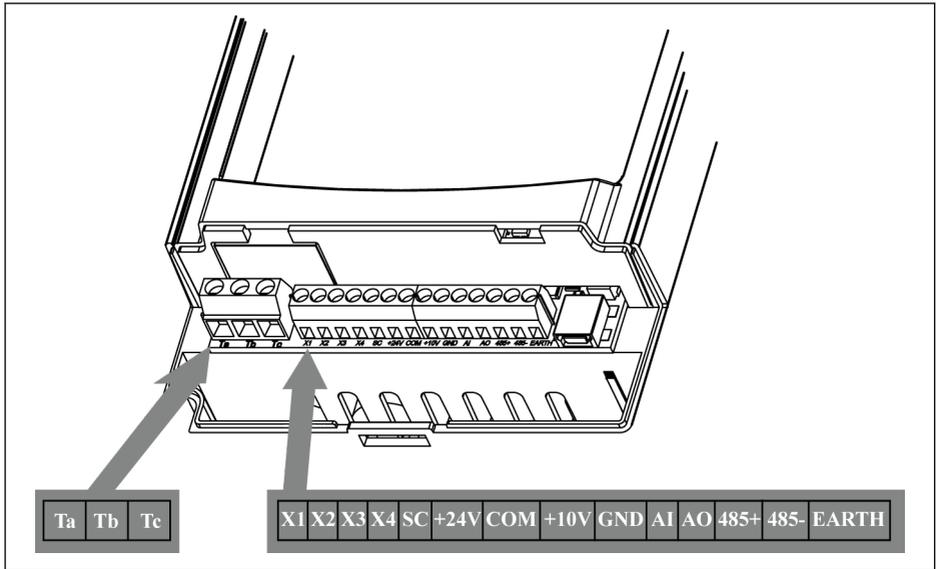
Fig. 2-6: Control circuit terminals

> ⚠️ **CAUTION**　　　　　**The frequency converter might be damaged!**
>
> Please make sure that the power supply of the frequency converter has been switched off before plugging or unplugging the connector.

☞　　Control terminals and the order are shown as the figure above. The terminal block is **ONLY** for wiring convenience, which **CANNOT** be used for fixing the cables. Additional measures need to be taken by users for cable fixing purpose.

Control terminals description

Digital inputs

Terminal	Signal function	Description	Signal requirement
X1...X4	Multi-function digital inputs	See Group E1	Inputs via opto-electric couplers: 24 VDC, 8 mA / 12 VDC, 4 mA
SC	Shared connection	Shared connection for isolation opto-electric couplers	ONLY positive of power supply can be connected
+24 V	Power supply for digital inputs	COM is reference	50 mA, +15%...-10%
COM		Isolated from GND	

Analog inputs

Terminal	Signal function	Description	Signal requirement
+10 V	Power supply for analog inputs	GND is reference	Max. output current: 30 mA
AI	Analog voltage input / Analog current input	Analog voltage / current inputs are used as external frequency setting channels To switch between voltage and current or to set the input related functions, see Group E1	Voltage input range: 0 / 2...10 V Input impedance: 40 kΩ Resolution: 1/1,000 Current input range: 0 / 4...20 mA Input impedance: 500 Ω Resolution: 1/1,000
GND	Shared connection	Isolated from COM	–
⏚	Shielding connection	Connected with grounding terminals on heatsink internally	–

Digital outputs

Terminal	Signal function	Description	Signal requirement
Ta	Relay changeover contacts	See Group E2	Rated capacity: 250 VAC, 3 A; 30 VDC, 3 A
Tc			
Tb	Relay shared contact		

Analog outputs

Terminal	Signal function	Description	Signal requirement
AO	Analog output	See Group E2	Voltage output: 0…10 V Maximum load current for voltage output: 5 mA
GND	Shared connection	Isolated from COM	–

Modbus communication

Terminal	Signal function	Description	Signal requirement
485+	Positive differential signal	GND is reference	–
485-	Negative differential signal		

Digital input NPN wiring

①   ②

X1...X4
SC
+24 V
COM

X1...X4
SC
+24 V
COM
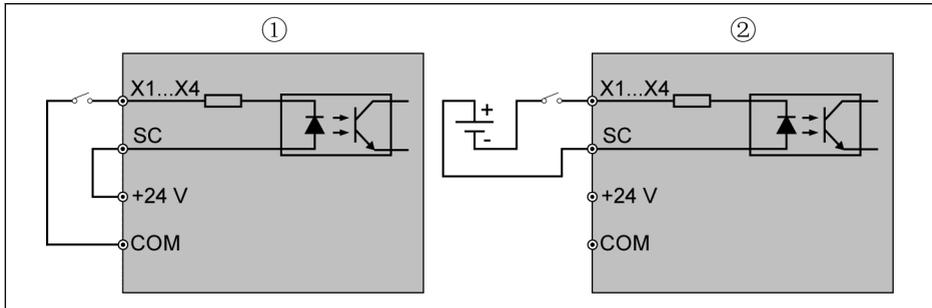
①   NPN wiring with internal power supply
②   NPN wiring with external power supply

Fig. 2-7:   Digital input NPN wiring

Analog input terminals (AI, +10 V, Earth and GND)

Potentiometer VR (≥ 1 kΩ)

Shielded cable   Frequency converter
+10 V
AI
GND

Running through 2-3 windings for the same phase   Frequency converter
AI
GND
Ferrite magnetic ring
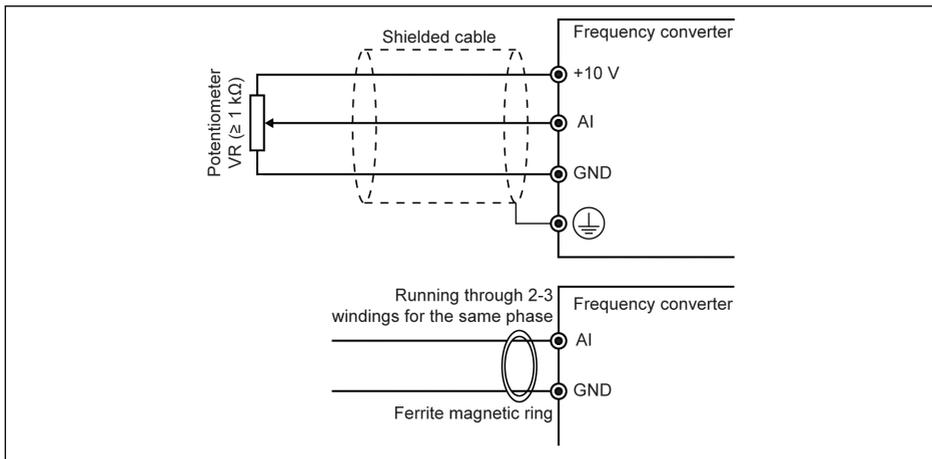
Fig. 2-8:   Analog input terminals

☞   Incorrect operation may occur due to interference on the analog signal. In such cases, connect a ferrite magnetic ring at the input side of the analog signal, as shown above.

Relay output terminals

When relay output terminals are connected with inductive loads (relays, contactors, solenoid valves, motors, etc.), following noise suppression circuits need to be applied at the coils of the inductive loads, as close as possible to the inductive loads, in order to reduce the electromagnetic interference generated from inductive load action.
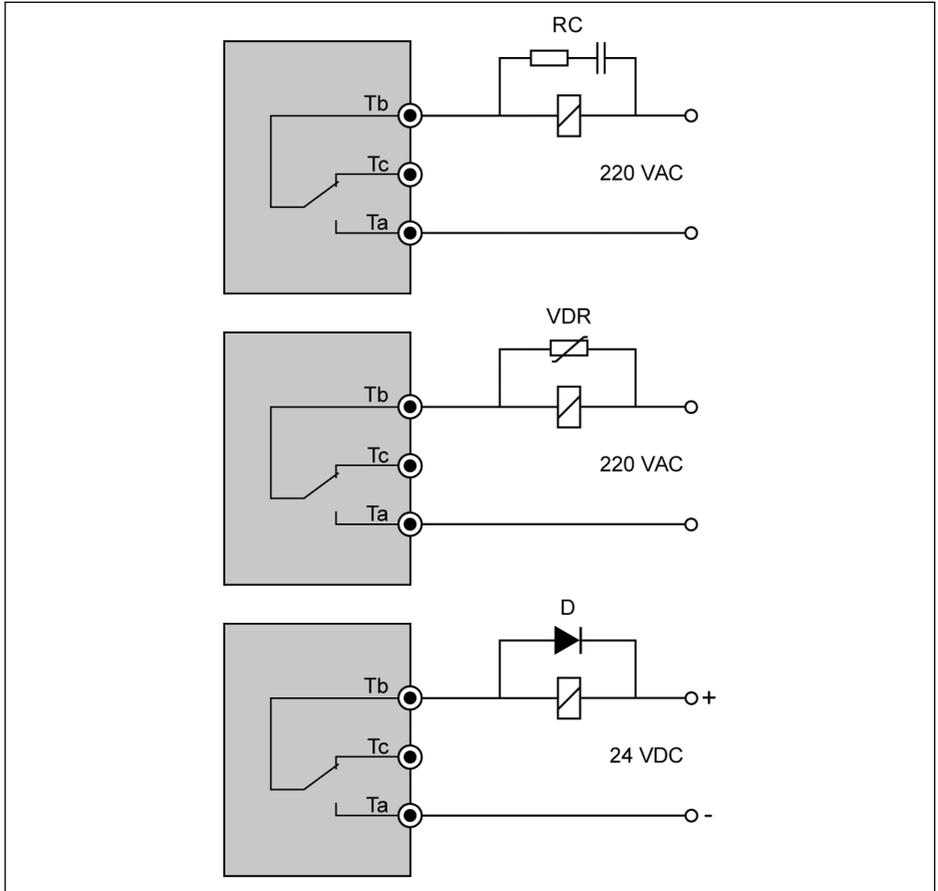
Tb	Shared terminal		**RC**	RC filtering
Tc	Normally closed contact		**VDR**	Varistor
Ta	Normally open contact		**D**	Diode

Fig. 2-9: Noise suppression circuits for relay output terminals

Control terminals wiring step
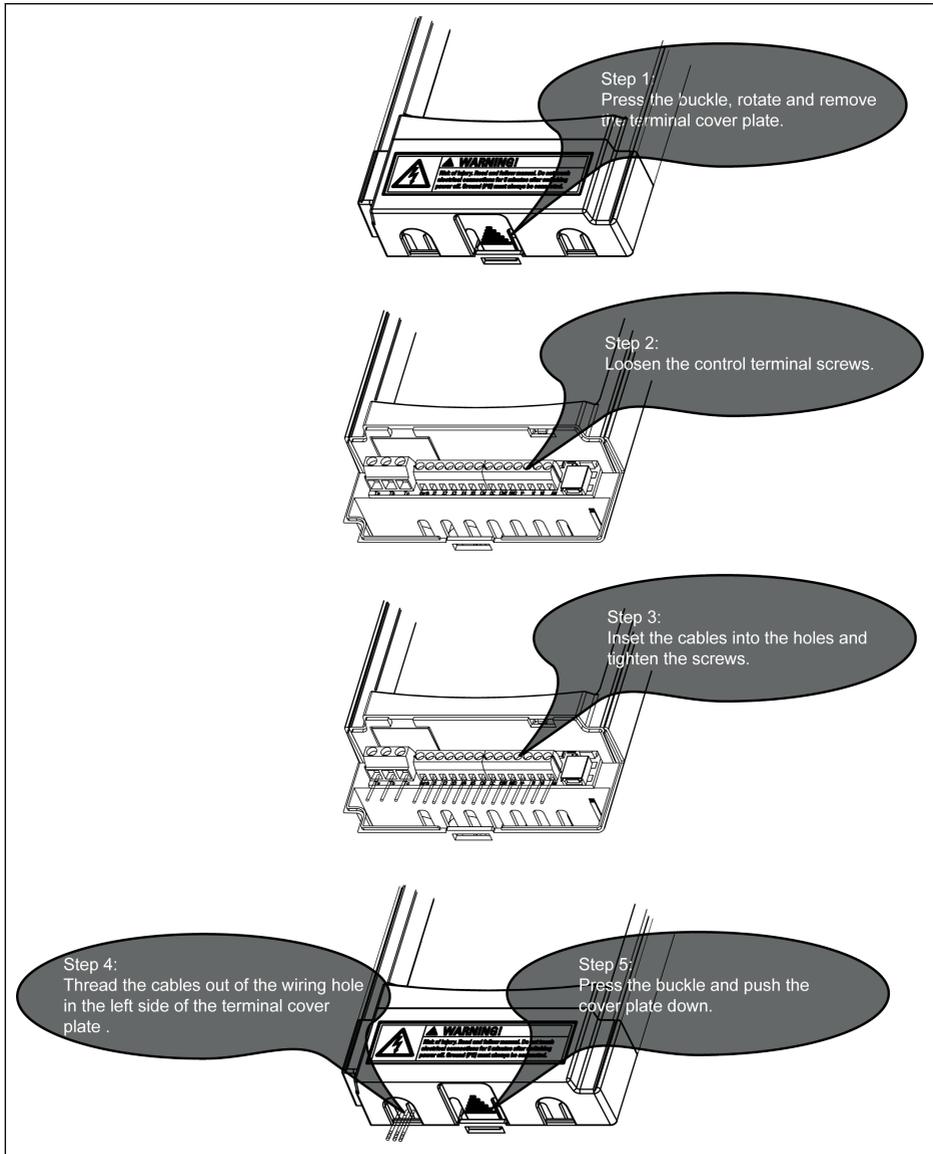
Fig. 2-10: Control terminals wiring step

3 Start-up

3.1 LED Panel

3.1.1 LED Panel

Display
Display value of monitored parameters in monitoring mode
Display function groups/function codes and parameter value in editing mode
Display error codes in error mode

Set
Enter into sub-menu
Confirm set parameters

Function
Switch function code groups
Switch between menu
and monitoring display
Return to upper level menu

Run
Run the converter

Stop
Stop the converter
and reset errors

Run / FWD / REV indicator

Increase button
Increase function group number/
function code number/
parameter value

Decrease button
Decrease function group number/function
code number/parameter value

Potentiometer
Set running frequency

Fig. 3-1:   LED panel

3.1.2 LED Display
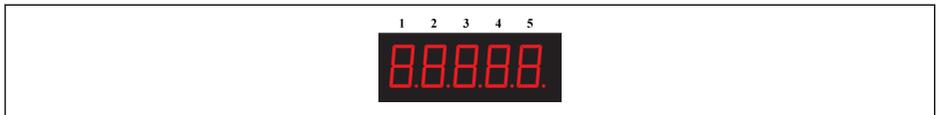
Fig. 3-2:   LED display

3.1.3 LED Indicator

Mode	Run	FWD	REV
Power off	Off	Off	Off
Ready	Off	Green / Off	Off / Green
Run (FWD)	Green	Green	Off
Run (REV)	Green	Off	Green
Run pending DC-braking at start Direction change dead time	Blinks in green (Short green long dark)	Green / Off	Off / Green
Deceleration stop phase DC-braking at stop	Blinks in green (Short dark long green)	Green / Off	Off / Green
Warning with FWD	Green	Green	Off
Warning with REV	Green	Off	Green
Warning at stop	Off	Green / Off	Off / Green
Error	Off	Green / Off	Off / Green

Tab. 3-1: LED indicator status

☞ The frequency converter stops if FWD and REV commands are active at the same time.

3.1.4 Operating Descriptions
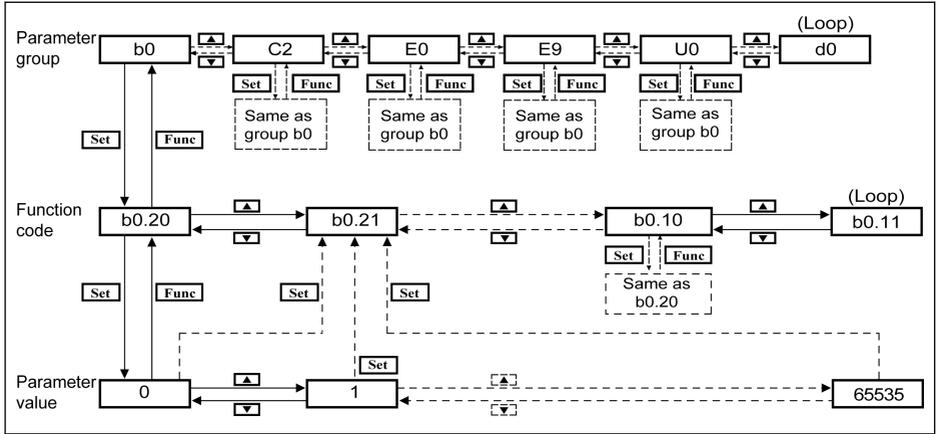
Fig. 3-3: Operating mode
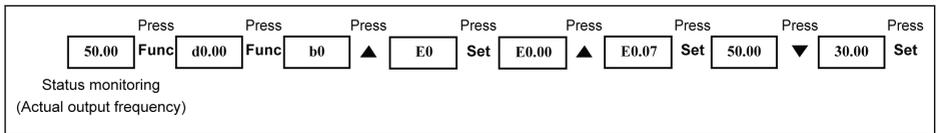
Fig. 3-4: Operating example

☞ **Digit Shifting Function** is provided for fast parameter selection and modification. Please refer to the **Operating Instructions** for details.

3.2 Start-up Procedure

3.2.1 Checking before Power-on

Ambient conditions	See chapter 1.2 "Ambient Conditions" on page 1
Installation conditions	See chapter 1.3 "Installation Conditions" on page 2
Wiring	See chapter 2 "Electric Installation" on page 5 EMC requirements must be observed , see details in **Operating Instructions** All switches must be switched off All loads must be disconnected

Tab. 3-2: Checking before Power-on

3.2.2 Checking after Power-on

LED panel	**0.00** is displayed

Tab. 3-3: Checking after Power-on

3.2.3 Checking Start-up Parameters

Set [b0.00] = '3: Start-up parameters', and then check all start-up parameters. For terminology and abbreviation in the above table, see chapter 3.3.1 "Terminology and Abbreviation in Parameter List" on page 23.

Code	Name	Setting range	Default	Min.	Attri.
C0.05	Carrier frequency	DOM	DOM	1	Run
C1.05	Motor rated power	0.1...1,000.0 kW	DOM	0.1	Stop
C1.06	Motor rated voltage	0...480 V	DOM	1	Stop
C1.07	Motor rated current	0.01...655.00 A	DOM	0.01	Stop
C1.08	Motor rated frequency	5.00...400.00 Hz	50.00	0.01	Stop
C1.09	Motor rated speed	1...30,000 rpm	DOM	1	Stop
C2.00	V/f curve mode	0: Linear 1: Square 2: User-defined	0	–	Stop
E0.00	First frequency setting source	0...21	0	–	Stop
E0.01	First run command source	0...2	0	–	Stop
E0.07	Digital setting frequency	0.00...[E0.09] Hz	50.00	0.01	Run
E0.08	Maximum output frequency	50.00...400.00 Hz	50.00	0.01	Stop
E0.09	Output frequency high limit	[E0.10]...[E0.08] Hz	50.00	0.01	Run
E0.10	Output frequency low limit	0.00...[E0.09] Hz	0.00	0.01	Run
E0.17	Direction control	0: Forward/Reverse 1: Forward only 2: Reverse only 3: Swap default direction	0	–	Stop
E0.25	Acceleration / Deceleration curve mode	0: Linear mode 1: S-curve	0	–	Stop
E0.26	Acceleration time	0.1...6,000.0 s	DOM	0.1	Run
E0.27	Deceleration time	0.1...6,000.0 s	DOM	0.1	Run
E0.35	Start mode	0: Start directly 1: DC-braking before start 2: Start with speed tracing 3: Automatic start / stop according to setting frequency	0	–	Stop
E0.50	Stop mode	0: Decelerating stop 1: Freewheeling stop 1 2: Freewheeling stop 2	0	–	Stop

Tab. 3-4: Start-up parameters

3.2.4 Control the Motor

Step	Operation	Description
1	Rotate the potentiometer counterclockwise (leftwards) to the greatest extent	Output frequency setting is 0.00
2	Press **\<Run>** button	Control command active, 0.00 is displayed
3	Rotate the potentiometer clockwise (rightwards) slowly and till 5.00 is displayed	The motor starts to run
	Observe the running status:	**Recommended operation:**
	If the motor runs in the correct direction	Stop the motor immediately by switching off the power if any abnormality occurs
	If the motor runs steadily	Restart commissioning only after error causes have been removed
	If there is any abnormal noise or problem	
4	Rotate the potentiometer clockwise	The motor accelerates
5	Rotate the potentiometer counterclockwise	The motor decelerates
6	Press **\<Stop>** button	Stop command active, the motor stops
7	Check parameters without load	Settings according to actual applications
8	Check parameters with load	Settings according to actual applications

Tab. 3-5: Motor controlling procedure

- VFC 3210 has no internal contactor, and will be energized once the power supply is connected. When the **Run** button is pressed down (or 'Control by terminals' is activated), the frequency converter will generate output.
- By default, VFC 3210 is set as:
  - The frequency converter is started or stopped by the operating panel control.
  - The output frequency is set by the potentiometer on the operating panel.
- After powering on, please confirm:
  - The setting frequency is displayed (no error display).
  - The monitoring parameter is consistent with the actual situation.
- By default, the frequency converter displays **Output frequency** in run status and **Setting frequency** in stop status as the monitoring parameters. You may change them to other parameters as described in parameters U1.00 and U1.10. The factory defaults are based on standard applications with standard motors.

3.3 Parameter List

3.3.1 Terminology and Abbreviation in Parameter List

- **Code:** Function / parameter code, written in bx.xx, Cx.xx, Ex.xx, Ux.xx, dx.xx
- **Name:** Parameter name
- **Default:** Factory default
- **Min.:** Minimum setting step
- **Attri.:** Parameter attribute
    - **Run:** Parameter setting can be modified when the converter is in run or stop status.
    - **Stop:** Parameter setting can only be modified when the converter is in stop status.
    - **Read:** Parameter setting is read-only and cannot be modified.
- **DOM:** Depends on model
- **[bx.xx], [Cx.xx], [Ex.xx], [Ux.xx], [dx.xx]:** Function / parameter values

3.3.2 Group b: System Parameters

b0: Basic system parameters

Code	Name	Setting range	Default	Min.	Attri.
b0.00	Access authority setting	0: Basic parameters 1: Standard parameters 2: Advanced parameters 3: Start-up parameters 4: Modified parameters	0	–	Run
b0.10	Parameter initialization	0: Inactive 1: Restore to default settings 2: Clear error and warning record	0	–	Stop
b0.12	Parameter set selection	0: Parameter set 1 active 1: Parameter set 2 active	0	–	Stop
b0.20	User password	0...65,535	0	1	Run
b0.21	Manufacturer password	0...65,535	0	1	Run

3.3.3 Group C: Power Parameters

C0: Power control parameters

Code	Name	Setting range	Default	Min.	Attri.
C0.05	Carrier frequency	2...12 kHz	4	1	Run
C0.06	Carrier frequency automatic adjustment	0: Inactive 1: Active 2: Fixed carrier frequency	1	–	Stop
C0.07	PWM mode	0: SVPWM 1: SVPWM with overmodulation 2: DPWM 3: DPWM with overmodulation	DOM	–	Run
C0.08	DPWM switchover frequency upper limit	8.00...400.00 Hz	12.00	0.01	Run
C0.10	Automatic voltage stabilization	0: Always active 1: Always inactive 2: Inactive only during deceleration	0	1	Stop
C0.11	Automatic voltage stabilization reference voltage	1P 200 VAC: 180...264 V	220	1	Stop
		3P 380 VAC: 323...528 V	380		
C0.23	Overvoltage suppression adjustment gain	0.00...10.00	1.00	0.01	Run
C0.24	Stall overvoltage hysteresis voltage	0...100 V	1P: 30	1	Stop
			3P: 50		
C0.25	Overvoltage prevention mode	0, 1, 4	1	–	Stop
C0.26	Stall overvoltage prevention level	1P 200 VAC: 300...390 V	385	1	Stop
		3P 380 VAC: 600...785 V	770		
C0.27	Stall overcurrent prevention level[①]	20.0 %...[C2.42]	150.0	0.1	Stop
C0.28	Phase loss protection mode	0...3	3	–	Run
C0.29	Converter overload pre-warning level	20.0...200.0 %	110.0	0.1	Stop
C0.30	Converter overload pre-warning delay	0.0...20.0 s	2.0	0.1	Stop

Code	Name	Setting range	Default	Min.	Attri.
C0.40	Power loss ride-through mode	0: Inactive 1: Output disabled 2: Regain kinetic energy 3: Regain kinetic energy, decelerate to stop	0	–	Stop
C0.41	Power loss ride-through recovery delay	0.10...30.00 s	0.50	0.01	Stop
C0.42	Power loss ride-through action voltage	1P 200 VAC: 216...366 V	240	1	Stop
		3P 380 VAC: 406...739 V	440		
C0.43	Power loss ride-through recover voltage	1P 200 VAC: 223...373 V	250	1	Stop
		3P 380 VAC: 413...746 V	450		
C0.44	Power loss ride-through decelerating to stop time	0.1...6,000.0 s	5.0	0.1	Stop
C0.45	Power loss ride-through control voltage	1P 200V 226...373	250	1	Stop
		3P 200V 226...373	250		
		3P 400V 416···746	450		
C0.46	Power loss ride-through Limit voltage	1P 200V 233...373	280	1	Stop
		3P 200V 233...373	280		
		3P 400V 423···746	500		
C0.47	Power loss ride-through switch frequency	1P 200V 0.00...400.00	5.00	0.01	Stop
		3P 200V 0.00...400.00			
		3P 400V 0.00···400.00			
C0.48	Power loss ride-through frequency deceleration rate	1P 200V 0......100	10	1	Stop
		3P 200V 0......100			
		3P 400V 0.......100			
C0.51	Fan total running time	0...65,535 h	0	1	Read
C0.52	Fan maintenance time	0...65,535 h (0: Inactive)	0	1	Stop
C0.53	Fan total running time reset	0: Inactive 1: Active Reset to '0' after action is executed	0	–	Run

①: percentage of frequency converter rated current.

Setting range of C0.25:

0: Stall overvoltage protection disabled

1: Stall overvoltage protection is enabled, adjust protection level via [C0.26]

4: Reciprocating load mode, used when the drive controls rotating machinery where part of the machine's cycle creates a cyclic regenerative (over-hauling) load, adjust overvoltage suppression adjustment gain via [C0.23].

Setting range of C0.28:

0: Both input and output phase loss protection active

1: Only input phase loss protection active

2: Only output phase loss protection active

3: Both input and output phase loss protection inactive

C1: Motor and system parameters

Code	Name	Setting range	Default	Min.	Attri.
C1.01	Motor parameter tuning	0: Inactive 1: Static auto-tuning	0	–	Stop
C1.02	Expert mode	0: Standard mode 1: Expert mode	0	–	Stop
C1.05	Motor rated power	0.1...1,000.0 kW	DOM	0.1	Stop
C1.06	Motor rated voltage	0...480 V	DOM	1	Stop
C1.07	Motor rated current	0.01...655.00 A	DOM	0.01	Stop
C1.08	Motor rated frequency	5.00...400.00 Hz	50.00	0.01	Stop
C1.09	Motor rated speed	1...60,000 rpm	DOM	1	Stop
C1.10	Motor rated power factor	0.00: Automatically identi-fied 0.01...0.99: Power factor setting	0.00	0.01	Stop
C1.11	Motor poles	2...256	4	1	Stop
C1.12	Motor rated slip frequency	0.00...60.00 Hz	DOM	0.01	Stop
C1.17	Motor rated torque	0.0...6553.5 N.m	DOM	0.1	Read
C1.20	Motor no-load current	0.00...[C1.07] A	DOM	0.01	Stop
C1.21	Stator resistance	0.00...200.00 Ω	DOM	0.01	Stop
C1.22	Rotor resistance	0.00...200.00 Ω	DOM	0.01	Stop
C1.23	Leakage inductance	0.00...600.00 mH	DOM	0.01	Stop
C1.24	Mutual inductance	0.0...6,000.0 mH	DOM	0.1	Stop
C1.25	Rotor leakage inductance	0.00...600.00	DOM	0.01	Stop
C1.69	Motor thermal model protection setting	0: Inactive 1: Active	0	–	Stop
C1.70	Motor overload pre-warning level	100.0...250.0 %	100.0	0.1	Run
C1.71	Motor overload pre-warning delay	0.0...20.0 s	2.0	0.1	Run
C1.72	Motor thermal sensor type	0: PTC, KTY84/130 2: PT100; 3: PT1000	0	–	Stop
C1.73	Motor thermal sensor protection level	0.0...10.0	2.0	0.1	Stop
C1.74	Motor thermal model protection time constant	0.0...400.0 min	DOM	0.1	Stop
C1.75	Low speed derating frequency	0.10...300.00 Hz	25.00	0.01	Run
C1.76	Zero speed load	25.0...100.0 %	25.0	0.1	Run

C2: V/f control parameters

Code	Name	Setting range	Default	Min.	Attri.
C2.00	V/f curve mode	0: Linear 1: Square 2: User-defined	0	–	Stop
C2.01	V/f frequency 1	0.00...[C2.03] Hz	0.00	0.01	Stop
C2.02	V/f voltage 1[1]	0.0...120.0 %	0.0	0.1	Stop
C2.03	V/f frequency 2	[C2.01]...[C2.05] Hz	0.00	0.01	Stop
C2.04	V/f voltage 2[1]	0.0...120.0 %	0.0	0.1	Stop
C2.05	V/f frequency 3	[C2.03]...[E0.08] Hz	50.00	0.01	Stop
C2.06	V/f voltage 3[1]	0.0...120.0 %	100.0	0.1	Stop
C2.07	Slip compensation factor	0...200 %	0	1	Run
C2.20	0 Hz output mode	0: No output 1: Standard	1	1	Stop
C2.21	Torque boost setting	0.0 %: Automatic boost 0.1...20.0 %: Manual boost	DOM	0.1	Run
C2.22	Automatic torque boost factor	0...320 %	50	1	Run
C2.23	Heavy load stabilization setting	0: Inactive 1: Active	1	–	Run
C2.24	Light load oscillation damping factor	0...5,000 %	300	1	Run
C2.25	Light load oscillation damping filter factor	10...2,000 %	30	1	Run
C2.40	Current limitation mode	0: Always inactive 1: Inactive at constant speed 2: Active at constant speed	2	–	Stop
C2.42	Current limitation level[2]	[C0.27]...250 %	150	1	Stop
C2.43	Current limitation proportional gain	0.000...10.000	DOM	0.001	Stop
C2.44	Current limitation integral time	0.001...10.000	DOM	0.001	Stop

[1]: percentage of motor rated voltage [C1.06].

[2]: percentage of frequency converter rated current.

3.3.4 Group E: Function Control Parameters

E0: Set point and control parameters

Code	Name	Setting range	Default	Min.	Attri.
E0.00	First frequency setting source	0...21	0	–	Stop
E0.01	First run command source	0...2	0	–	Stop
E0.02	Second frequency setting source	0...21	2	–	Stop
E0.03	Second run command source	0...2	1	–	Stop
E0.04	Frequency setting source combination	0...6	0	–	Stop
E0.06	Digital setting frequency saving mode	0...4	0	–	Stop
E0.07	Digital setting frequency	0.00...[E0.09] Hz	50.00	0.01	Run
E0.08	Maximum output frequency	50.00...400.00 Hz	50.00	0.01	Stop
E0.09	Output frequency high limit	[E0.10]...[E0.08] Hz	50.00	0.01	Run
E0.10	Output frequency low limit	0.00...[E0.09] Hz	0.00	0.01	Run
E0.11	Reverse running frequency	0.00...[E0.09] Hz	0.00	0.01	Stop
E0.15	Low speed running setting	0: Run with 0.00 Hz 1: Run with low limit frequency	0	–	Stop
E0.16	Low speed frequency hysteresis	0.00...[E0.10] Hz	0.00	0.01	Stop
E0.17	Direction control	0: Forward / Reverse 1: Forward only 2: Reverse only 3: Swap default direction	0	–	Stop
E0.18	Direction change dead time	0.0...60.0 s	1.0	0.1	Stop
E0.25	Acceleration / deceleration curve mode	0: Linear mode 1: S-curve	0	–	Stop
E0.26	Acceleration time	0.1...6,000.0 s	DOM	0.1	Run
E0.27	Deceleration time	0.1...6,000.0 s	DOM	0.1	Run
E0.28	S-curve starting phase factor	0.0...40.0 %	20.0	0.1	Stop
E0.29	S-curve stopping phase factor	0.0...40.0 %	20.0	0.1	Stop
E0.35	Start mode	0: Start directly 1: DC-braking before start 2: Start with speed capture 3: Automatic start / stop according to setting frequency	0	–	Stop

Code	Name	Setting range	Default	Min.	Attri.
E0.36	Start frequency	0.00...50.00 Hz	0.05	0.01	Stop
E0.37	Start frequency holding time	0.0...20.0 s	0.0	0.1	Stop
E0.38	Start DC-braking time	0.0...20.0 s (0.0: Inactive)	0.0	0.1	Stop
E0.39	Start DC-braking current[1]	0.0...150.0 %	0.0	0.1	Stop
E0.41	Automatic start / stop frequency threshold	0.01...[E0.09] Hz	16.00	0.01	Stop
E0.42	Speed tracing voltage recovery ratio	0...20	10	1	Stop
E0.43	Speed tracing deceleration time	0.5...20.0 s	2.0	0.1	Stop
E0.45	Power loss restart mode	0: Inactive 1: Active for panel control 2: Active for digital input control	0	–	Stop
E0.46	Power loss restart delay	0.0...10.0 s	1.0	0.1	Stop
E0.47	Run command priority	0: High priority 1: Low priority	0	-	Stop
E0.50	Stop mode	0: Decelerating stop 1: Freewheeling stop 1 2: Freewheeling stop 2	0	–	Stop
E0.52	Stop DC-braking initial frequency	0.00...50.00 Hz	0.00	0.01	Stop
E0.53	Stop DC-braking time	0.0...20.0 s (0.0: Inactive)	0.0	0.1	Stop
E0.54	Stop DC-braking current[1]	0.0...150.0 %	0.0	0.1	Stop
E0.55	Overexcitation braking factor	1.00...2.00	1.10	0.01	Run
E0.56	Emergency stop action	0: Freewheeling stop 1: Decelerating stop	0	–	Stop
E0.57	Emergency stop deceleration time	0.1...6,000.0	5.0	0.1	Run
E0.60	Jog frequency	0.00...[E0.08] Hz	5.00	0.01	Run
E0.61	Jog acceleration time	0.1...6,000.0 s	5.0	0.1	Run
E0.62	Jog deceleration time	0.1...6,000.0 s	5.0	0.1	Run
E0.70	Skip frequency 1	0.00...[E0.09] Hz	0.00	0.01	Stop
E0.71	Skip frequency 2	0.00...[E0.09] Hz	0.00	0.01	Stop
E0.72	Skip frequency 3	0.00...[E0.09] Hz	0.00	0.01	Stop

Code	Name	Setting range	Default	Min.	Attri.
E0.73	Skip frequency range	0.00...30.00 Hz	0.00	0.01	Stop
E0.74	Skip window acceleration factor	1...100	1	1	Stop

①: percentage of frequency converter rated current.

Setting range of E0.00, E0.02:

0: Panel potentiometer

1: Panel button setting

2: AI analog input

11: Digital input Up / Down command

20: Communication

21: Multi-speed settings

Setting range of E0.01, E0.03:

0: Panel

1: Multi-function digital input

2: Communication

Setting range of E0.04:

0: No combination

1: First frequency setting + second frequency setting

2: First frequency setting - second frequency setting

3: First frequency setting x second frequency setting

4: Bigger one of 2 sources

5: Smaller one of 2 sources

6: Valid which channel is non-zero

Setting range of E0.06:

0: Not saved when powered off or stopped

1: Not saved when powered off; saved when stopped

2: Saved when powered off; not saved when stopped

3: Saved when powered off or stopped

4: Memorized automatically when stopped

E1: Input terminal parameters

Code	Name	Setting range	Default	Min.	Attri.
E1.00	X1 input		35	–	Stop
E1.01	X2 input	0...52	36	–	Stop
E1.02	X3 input		0	–	Stop
E1.03	X4 input		0	–	Stop
E1.15	2-wire / 3-wire control mode	0...4	0	–	Stop
E1.16	Digital input Up / Down change rate	0.10...100.00 Hz/s	1.00	0.01	Run
E1.17	Digital input Up / Down initial frequency	0.00...[E0.09] Hz	0.00	0.01	Run
E1.35	AI input mode	0: 0...20 mA 1: 4...20 mA 2: 0...10 V 3: 0...5 V 4: 2...10 V	2	–	Run
E1.38	AI gain	0.00...10.00	1.00	0.01	Run
E1.60	Motor temperature sensor channel	0: Inactive 1: AI analog input	0	–	Stop
E1.61	Broken wire protection	0: Inactive 1: Warning 2: Error	0	–	Stop
E1.62	Broken threshold for motor temperature sensor	0.0...10.0	2.0	0.1	Stop
E1.69	Analog input filter time	0.000...2.000 s	0.100	0.001	Run
E1.70	Input curve 1 minimum	0.0 %...[E1.72]	0.0	0.1	Run
E1.71	Input curve 1 minimum frequency	0.00...[E0.09] Hz	0.00	0.01	Run
E1.72	Input curve 1 maximum	[E1.70]...100.0 %	100.0	0.1	Run
E1.73	Input curve 1 maximum frequency	0.00...[E0.09] Hz	50.00	0.01	Run

Setting range of E1.00...E1.03:

0: Inactive

1: Multi-speed control input 1

2: Multi-speed control input 2

3: Multi-speed control input 3

10: Acceleration / deceleration time 1 activation

11: Acceleration / deceleration time 2 activation

12: Acceleration / deceleration time 3 activation

15: Freewheeling stop activation

16: Stop DC-braking activation

20: Frequency Up command

21: Frequency Down command

22: Up / Down command reset

25: 3-wire control

26: Simple PLC stop

27: Simple PLC pause

30: Second frequency setting source activation

31: Second run command source activation

32: Error signal N.O. contact input

33: Error signal N.C. contact input

34: Error reset

35: Forward running (FWD)

36: Reverse running (REV)

37: Forward jog

38: Reverse jog

39: Counter input

40: Counter reset

41: PID deactivation

46: User parameter set selection

48: Motor overheating error N.O. contact input

49: Motor overheating error N.C. contact input

50: Motor overheating warning N.O. contact input

51: Motor overheating warning N.C. contact input

52: Jog with run command direction

Setting range of E1.15:

0: 2-wire forward / stop, reverse / stop

1: 2-wire forward / reverse, run / stop

2: 3-wire control mode 1

3: 3-wire control mode 2

4: 1-wire control

E2: Output terminal parameters

Code	Name	Setting range	Default	Min.	Attri.
E2.15	Relay 1 output selection	0...25	1	–	Stop
E2.20	DO1/relay1 output values from extension card fieldbus communication	Bit8: 0 (Tb_Ta is opened) 1 (Tb_Ta is closed)	0	–	Run
E2.26	AO output setting	0: Output frequency 1: Setting frequency 2: Output current 4: Output voltage 5: Output power 6: AI analog input 12: Parameter setting from communication[2]	0	–	Run
E2.27	AO gain	0.00...10.00	1.00	0.01	Run
E2.28	AO value in percentage from extension card fieldbus communication	0.00...100.00 %	0.00	0.01	Run
E2.40	Rated voltage	1P 200...240 VAC	220	1	Stop
		3P 380...480 VAC	380		
E2.50	Output curve 1 minimum	0.0 %...[E2.52]	0.0	0.1	Run
E2.51	Output curve 1 minimum value	0.00...100.00 %	0.00	0.01	Run
E2.52	Output curve 1 maximum	[E2.50]...100.0 %	100.0	0.1	Run
E2.53	Output curve 1 maximum value	0.00...100.00 %	100.00	0.01	Run
E2.70	Frequency detection width	0.00...400.00 Hz	2.50	0.01	Run
E2.71	Frequency detection level FDT1	0.01...400.00 Hz	50.00	0.01	Run
E2.72	Frequency detection level FDT1 width	0.01...[E2.71] Hz	1.00	0.01	Run
E2.73	Frequency detection level FDT2	0.01...400.00 Hz	25.00	0.01	Run
E2.74	Frequency detection level FDT2 width	0.01...[E2.73] Hz	1.00	0.01	Run
E2.80	Counter middle value	0...[E2.81]	0	1	Run
E2.81	Counter target value	[E2.80]...9,999	0	1	Run

Setting range of E2.15:

0: Converter ready

1: Converter running

2: Converter DC-braking

3: Converter running at zero speed

4: Speed arrival

5: Frequency level detection signal (FDT1)

6: Frequency level detection signal (FDT2)

7: Simple PLC stage complete

8: Simple PLC cycle complete

10: Converter undervoltage

11: Converter overload pre-warning

12: Motor overload pre-warning

13: Converter stop by external error

14: Converter error

15: Converter OK

16: Counter target value arrival

17: Counter middle value arrival

18: PID reference engineering value arrival

21: Parameter setting from communication[1]

25: Converter error or warning

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[1]:

- For parameter E2.15, the relationship between the output of '21: Parameter setting from communication' and the communication mode is as follow:

  – For modbus mode, when bit8 of register 0x7F08 is '0', Tb_Ta is opened; when bit8 is '1', Tb_Ta is closed.

  – For other fieldbus mode, the output is defined by bit8 of parameter E2.20.

[2]:

- For parameter E2.26, the relationship between the output of '12: Parameter setting from communication' and the communication mode is as follow:

  – For modbus mode, the output is defined by register 0x7F06. The value range of register is 0.00 %...100.00 % (It means percentage of maximum analog output value).

  – For other fieldbus mode, the output is defined by parameter E2.28.

E3: Multi-speed and simple PLC parameters

Code	Name	Setting range	Default	Min.	Attri.
E3.00	Simple PLC running mode	0: Inactive 1: Stop after selected cycle 2: Continuously cycling 3: Run last stage after selected cycle 4: Continuous cycling without decelerating to 0.00 Hz	0	–	Stop
E3.01	Simple PLC time multiplier	1...60	1	1	Stop
E3.02	Simple PLC cycle number	1...1,000	1	1	Stop
E3.10	Acceleration time 2	0.1...6,000.0 s	10.0	0.1	Run
E3.11	Deceleration time 2	0.1...6,000.0 s	10.0	0.1	Run
E3.12	Acceleration time 3	0.1...6,000.0 s	10.0	0.1	Run
E3.13	Deceleration time 3	0.1...6,000.0 s	10.0	0.1	Run
E3.14	Acceleration time 4	0.1...6,000.0 s	10.0	0.1	Run
E3.15	Deceleration time 4	0.1...6,000.0 s	10.0	0.1	Run
E3.16	Acceleration time 5	0.1...6,000.0 s	10.0	0.1	Run
E3.17	Deceleration time 5	0.1...6,000.0 s	10.0	0.1	Run
E3.18	Acceleration time 6	0.1...6,000.0 s	10.0	0.1	Run
E3.19	Deceleration time 6	0.1...6,000.0 s	10.0	0.1	Run
E3.20	Acceleration time 7	0.1...6,000.0 s	10.0	0.1	Run
E3.21	Deceleration time 7	0.1...6,000.0 s	10.0	0.1	Run
E3.22	Acceleration time 8	0.1...6,000.0 s	10.0	0.1	Run
E3.23	Deceleration time 8	0.1...6,000.0 s	10.0	0.1	Run
E3.40	Multi-speed frequency 1	0.00...[E0.09] Hz	0.00	0.01	Run
E3.41	Multi-speed frequency 2	0.00...[E0.09] Hz	0.00	0.01	Run
E3.42	Multi-speed frequency 3	0.00...[E0.09] Hz	0.00	0.01	Run
E3.43	Multi-speed frequency 4	0.00...[E0.09] Hz	0.00	0.01	Run
E3.44	Multi-speed frequency 5	0.00...[E0.09] Hz	0.00	0.01	Run
E3.45	Multi-speed frequency 6	0.00...[E0.09] Hz	0.00	0.01	Run
E3.46	Multi-speed frequency 7	0.00...[E0.09] Hz	0.00	0.01	Run
E3.59	Stage 0 frequency source	0: Digital setting frequency 1: AI analog input 5: Communication 6: Panel potentiometer 7: Digital input up/down command	0	–	Stop

Code	Name	Setting range	Default	Min.	Attri.
E3.60	Stage 0 action	011, 012, 013, 014, 015, 016 ,017, 018, 021, 022, 023, 024, 025, 026, 027, 028, 031, 032, 033, 034, 035, 036, 037, 038, 041, 042, 043, 044, 045, 046, 047, 048, 051, 052, 053, 054, 055, 056, 057, 058, 061, 062, 063, 064, 065, 066, 067, 068, 071, 072, 073, 074, 075, 076, 077, 078, 081, 082, 083, 084, 085, 086, 087,	011	–	Stop
E3.62	Stage 1 action		011	–	Stop
E3.64	Stage 2 action		011	–	Stop
E3.66	Stage 3 action		011	–	Stop
E3.68	Stage 4 action		011	–	Stop
E3.70	Stage 5 action		011	–	Stop
E3.72	Stage 6 action		011	–	Stop
E3.74	Stage 7 action	088, 111, 112, 113, 114, 115, 116, 117, 118, 121, 122, 123, 124, 125, 126, 127, 128, 131, 132, 133, 134, 135, 136, 137, 138, 141, 142, 143, 144, 145, 146, 147, 148, 151, 152, 153, 154, 155, 156, 157, 158, 161, 162, 163, 164, 165, 166, 167, 168, 171, 172, 173, 174, 175, 176, 177, 178, 181, 182, 183, 184, 185, 186, 187, 188	011	–	Stop
E3.61	Stage 0 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.63	Stage 1 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.65	Stage 2 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.67	Stage 3 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.69	Stage 4 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.71	Stage 5 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.73	Stage 6 running time	0.0...6,000.0 s	20.0	0.1	Stop
E3.75	Stage 7 running time	0.0...6,000.0 s	20.0	0.1	Stop

E4: PID control parameters

Code	Name	Setting range	Default	Min.	Attri.
E4.00	PID reference channel	0...9	0	–	Stop
E4.01	PID feedback channel	0: AI analog input	0	–	Stop
E4.02	PID reference / feedback factor	0.01...100.00	1.00	0.01	Run
E4.03	PID engineering analog reference	0.00...10.00	0.00	0.01	Run
E4.04	PID engineering speed reference	0...30,000 rpm	0	1	Run
E4.05	PID feedback polarity	0: Positive 1: Negative	0	–	Stop
E4.15	Proportional gain - P	0.000...60.000	1.500	0.001	Run
E4.16	Integral time - Ti	0.00...100.00 s (0.00: no integral)	1.50	0.01	Run
E4.17	Derivative time - Td	0.00...100.00 s (0.00: no derivative)	0.00	0.01	Run
E4.18	Sampling period - T	0.01...100.00 s	0.50	0.01	Run
E4.19	PID feed forward dynamic limit	0.00...100.00 %	10.00	0.01	Run
E4.20	PID feed forward limit offset	0.00...100.00 %	0.00	0.01	Run
E4.30	PID deadband	0.0...20.0 %	2.0	0.1	Run
E4.31	PID regulation mode	0, 1	0	–	Run
E4.32	PID engineering value detection width	0.01...100.00	1.00	0.01	Run
E4.33	PID feedforward settings	0: Inactive 1: Active	0	–	Stop

Setting range of E4.00:

0: Inactive; 1: Panel potentiometer; 2: Panel button

3: AI analog input; 7: Communication

8: Analog reference E4.03; 9: Speed reference E4.04

Setting range of E4.31:

0: Stop integral regulation when frequency arrives at upper / lower limit

1: Continue integral regulation when frequency arrives at upper / lower limit

E5: Extended function parameters

Code	Name	Setting range	Default	Min.	Attri.
E5.01	High resolution output current filter time	5...500 ms	40	1	Run
E5.02	User-defined speed scaling factor	0.01...100.00	1.00	0.01	Run
E5.05	Pump dry protection ratio	0.0 %... [E5.08]	30.0	0.1	Run
E5.06	Pump dry protection delay	0.0...300.0 s (0.0: Inactive)	0.0	0.1	Run
E5.07	Pump dry protection delay at start-up	0.0...300.0 s	30.0	0.1	Run
E5.08	Pump leakage protection threshold	0.0...100.0 %	50.0	0.1	Run
E5.09	Pump leakage protection delay	0.0...600.0 s (0.0: Inactive)	0.0	0.1	Run
E5.10	Pump leakage protection delay at start-up	0.0...600.0 s	60.0	0.1	Run
E5.15	Sleep level	0.00...[E0.09] Hz	0.00	0.01	Run
E5.16	Sleep delay	0.0...3,600.0 s	60.0	0.1	Run
E5.17	Sleep boost time	0.0...3,600.0 s	0.0	0.1	Run
E5.18	Sleep boost amplitude	0.0...100.0 %	0.0	0.1	Run
E5.19	Wake up level	0.0...100.0 %	0.0	0.1	Run
E5.20	Wake up delay	0.0...60.0 s	0.5	0.1	Run

E8: Standard communication parameters

Code	Name	Setting range	Default	Min.	Attri.
E8.01	Communication error detection time	0.0...60.0 s (0.0: Inactive)	0.0	0.1	Stop
E8.02	Communication error protection mode	0: Freewheeling stop 1: Keep running 2: Emergency stop	1	–	Stop
E8.03	Communication process data loss behavior	0: Decelerating stop 1: Freewheeling stop 2: Keep running	0	–	Stop
E8.10	Modbus baud rate	0: 1,200 bps; 1: 2,400 bps 2: 4,800 bps; 3: 9,600 bps 4: 19,200 bps; 5: 38,400 bps	3	–	Stop
E8.11	Modbus data format	0...3	0	–	Stop
E8.12	Modbus local address	1...247	1	1	Stop
E8.13	Modbus level / edge sensitivity selection	0: Level sensitive 1: Edge sensitive	1	–	Stop
E8.14	Modbus transmission mode selection	0: RTU transmission mode 1: ASCII transmission mode	0	–	Stop
E8.15	Modbus ASCII inter-character timeout	1.0...5.0	1.0	0.1	Stop

Setting range of E8.11:

0: N, 8, 1 (1 start bit, 8 data bits, 1 stop bit, no parity)

1: E, 8, 1 (1 start bit, 8 data bits, 1 stop bit, even parity)

2: O, 8, 1 (1 start bit, 8 data bits, 1 stop bit, odd parity)

3: N, 8, 2 (1 start bit, 8 data bits, 2 stop bits, no parity)

E9: Protection and error parameters

Code	Name	Setting range	Default	Min.	Attri.
E9.00	Automatic error reset attempts	0...3 (0: Inactive)	0	–	Stop
E9.01	Automatic error reset interval	0.1...60.0 s	10.0	0.1	Stop
E9.02	Automatic error reset attempts restart time	0...65,535	0	1	Stop
E9.04	Diagnosis setting	0...FFFF	0	1	Stop
E9.05	Last error type	–	–	–	Read
E9.06	Second last error type	–	–	–	Read
E9.07	Third last error type	–	–	–	Read
E9.10	Output frequency at last error	–	–	0.01	Read
E9.11	Setting frequency at last error	–	–	0.01	Read
E9.12	Output current at last error	–	–	0.1	Read
E9.13	Output voltage at last error	–	–	1	Read
E9.14	DC-bus voltage at last error	–	–	1	Read
E9.15	Power module temperature at last error	–	–	1	Read
E9.50	Last warning type	–	0	–	Read
E9.51	Second last warning type	–	0	–	Read
E9.52	Third last warning type	–	0	–	Read
E9.97	Last error detail	00000...FFFFF	0	–	Read
E9.98	Second last error detail	00000...FFFFF	0	–	Read
E9.99	Third last error detail	00000...FFFFF	0	–	Read

E9.04 Diagnosis setting:

- 0000: UE-1 (by default)
- 0001: no error

Value range of E9.05...E9.07:

0: No error

1: OC-1, overcurrent at constant speed

2: OC-2, overcurrent during acceleration

3: OC-3, overcurrent during deceleration

4: OE-1, overvoltage at constant speed

5: OE-2, overvoltage during acceleration

6: OE-3, overvoltage during deceleration

8: UE-1, undervoltage during run

9: SC, surge current or short circuit

10: IPH.L, input phase loss
11: OPH.L, output phase loss
12: ESS-, soft start error
20: OL-1, converter overload
21: OH, converter over temperature
23: FF, fan failure
24: Pdr, pump dry
25: CoL-, command value lost
30: OL-2, motor overload
31: Ot, motor over temperature
32: t-Er, motor parameter tuning error
33: AdE-, synchronous motor angle detection error
34: EnCE-, encoder connection error
35: SPE-, speed control loop error
38: AibE, analog input broken wire detection
39: EPS-, DC_IN power supply error
40: dir1, forward running lock error
41: dir2, reverse running lock error
42: E-St, terminal error signal
43: FFE-, firmware version mismatch
44: rS-, Modbus communication error
45: E.Par, parameter settings invalid
46: U.Par, unknown parameter restore error
48: idA-, internal communication error
49: idP-, internal parameter error
50: idE-, converter internal error
51: OCd-, extension card internal error
52: OCc, extension card PDOs configuration error
54: PcE-, remote control communication error
55: PbrE, parameter backup / restore error
56: PrEF, parameter restore error after firmware update
60: APE-, application firmware error
61: APE1, application error 1
62: APE2, application error 2
63: APE3, application error 3
64: APE4, application error 4

65: APE5, application error 5

Value range of E9.50...E9.52:

0: No warning

6: PLE, pump leakage

7: OE-4, overvoltage during stop

31: Ot, motor over temperature

403: C-dr, communication disconnection

408: Aib-, analog input broken wire detection

409: FLE, fan maintenance period expired

410: OCi, communication data exceeds value range

411: UH-A, under Temperature warning

420: APF1, ASF customer warning 1

421: APF2, ASF customer warning 2

422: APF3, ASF customer warning 3

423: APF4, ASF customer warning 4

424: APF5, ASF customer warning 5

430: USdc, Unsupported Device Configuration

440: SLi-, speed limited by maximum Voltage

900: iSt, invalid State Transition

903: FtL, RPDO Telegram Loss

908: Fdi, option card process data invalid

3.3.5 Group U: Panel Parameters

U0: General panel parameters

Code	Name	Setting range	Default	Min.	Attri.
U0.00	Direction control by panel	0: Forward; 1: Reverse	0	–	Run
U0.01	Stop button control	0: Active only for panel control 1: Valid for all control methods	1	–	Run
U0.99	Panel firmware version	00.00...99.99	–	0.01	Read

U1: Seven-segment panel parameters

Code	Name	Setting range	Default	Min.	Attri.
U1.00	Run monitoring display	0...99	0	–	Run
U1.10	Stop monitoring display		2	–	Run

0: Output frequency; 1: Actual speed

2: Setting frequency; 3: Setting speed

4: User-defined setting speed; 5: User-defined actual speed

10: Output voltage; 11: Output current

12: Output power; 13: DC-bus voltage

14: Energy saving counter kWh; 15: Energy saving counter MWh

20: Power module temperature; 21: Actual carrier frequency

23: Power stage running time; 30: AI input

35: AO output; 40: Digital input 1; 60: Relay output

70: PID reference engineering value

71: PID feedback engineering value

98: High resolution output current; 99: Firmware version

3.3.6 Group d0: Monitoring Parameters

Code	Name	Minimum unit
d0.00	Output frequency	0.01 Hz
d0.01	Actual speed	1 rpm
d0.02	Setting frequency	0.01 Hz
d0.03	Setting speed	1 rpm
d0.04	User-defined setting speed	0.1
d0.05	User-defined output speed	0.1
d0.10	Output voltage	1 V
d0.11	Output current	0.1 A
d0.12	Output power	0.1 kW
d0.13	DC-bus voltage	1 V
d0.14	Energy saving counter kWh	0.1 kWh
d0.15	Energy saving counter MWh	1 MWh
d0.20	Power module temperature	1 °C
d0.21	Actual carrier frequency	1 kHz
d0.23	Power stage running time	1 h
d0.30	AI input	0.01 V / 0.01 mA
d0.35	AO output	0.01 V
d0.40	Digital input 1	–
d0.60	Relay output	–
d0.70	PID reference engineering value	0.1
d0.71	PID feedback engineering value	0.1
d0.98	High resolution output current	0.01 A
d0.99	Firmware version	0.01

4 Diagnosis

4.1 Display of LED Characters

Character	A	b	C	d	E	F	H	I	L
Display	8	8	8	8	8	8	8	8	8
Character	n	O	o	P	r	S	t	U	–
Display	8	8	8	8	8	8	8	8	–

Tab. 4-1: Display of LED characters

4.2 Status Code

Code	Description
8.8.8.8.8.	Displayed at power on, detecting the operating panel
tUnE	Motor parameter tuning
PSLP	PID sleeping
-PF-	Modified parameters which are different from default value
-EP-	Parameters with invalid settings
PAr1	Parameter set switching from set 2 to set 1
PAr2	Parameter set switching from set 1 to set 2

4.3 Warning Code

Code	Description
P.oFF	Displayed only at power down / drop in stop state
S.Err	Parameter change blocked
C-dr	Communication disconnection
PrSE	Parameter setting contradiction
FLE	Fan maintenance period expired
noCP	No modified parameter
PLE	Pump leakage
Aib-	Analog input broken wire detection
OCi	Communication data exceeds value range
Fdi	Fieldbus process data invalid
APF1 APF2 APF3 APF4 APF5	Warning which can be thrown by the application, description in application manual

Code	Description
UH-A	Converter under temperature
SLi-	Speed limit
OE-4	Overvoltage during stop
Ot	Motor over temperature
USdc	Unsupported device configuration
iSt	Invalid state transition
FtL	RPDO telegram loss

4.4 Error Code

Nr.	Code	Name	Description
1	OC-1	Overcurrent at constant speed	Output current above limit at motor running at constant speed
2	OC-2	Overcurrent during acceleration	Output current above limit at motor accelerating
3	OC-3	Overcurrent during deceleration	Output current above limit at motor decelerating
4	OE-1	Overvoltage at constant speed	DC bus voltage above limit at motor running at constant speed
5	OE-2	Overvoltage during acceleration	DC bus voltage above limit at motor accelerating
6	OE-3	Overvoltage during deceleration	DC bus voltage above limit at motor decelerating
8	UE-1	Undervoltage during run	DC bus voltage below limit at converter running
9	SC	Surge current or short circuit	Output current sharp increase or short circuit occurs on motor cable or converter power module has internal error
10	IPH.L	Input phase loss	Mains cable disconnected or input imbalance occurs
11	OPH.L	Output phase loss	Motor cable disconnected or output imbalance occurs
12	ESS-	Soft start error	Soft start circuit is not working properly
20	OL-1	Converter overload	Converter load is above limit for too long
21	OH	Converter over temperature	Converter temperature is too high
23	FF	Fan failure	Converter fan is not working properly
24	Pdr	Pump dry	PID feedback is excessively low when converter running at output frequency high limit
25	CoL-	Command value lost	Command value from panel is lost
26	StO-r	STO request	STO function is activated correctly in running mode, after re-energized input channels and reset the device, the device goes to normal state
27	StO-E	STO error	STO function is activated incorrectly, it happens if one channel is energized but the other is deenergized
30	OL-2	Motor overload	Motor load is above limit for too long
31	Ot	Motor over temperature	Motor temperature is above limit for too long
32	t-Er	Motor parameter tuning error	Error occurs during motor parameter auto-tuning
33	AdE-	Synchronous motor angle detection error	Error occurs during synchronous motor angle detection
34	EnCE-	encoder connection error	error occures during encoder connection
35	SPE-	Speed control loop error	The speed loop difference is outside [C3.26] over a time of [C3.25]

Nr.	Code	Name	Description
38	AibE	Analog input broken wire detection	Analog input wire is disconnected
39	EPS-	DC_IN power supply error	DC_IN power supply voltage is out of range 20...28 V
40	dir1	Forward running lock error	Direction can only be forward but command is reverse
41	dir2	Reverse running lock error	Direction can only be reverse but command is forward
42	E-St	Terminal error signal	Error signal is received from digital inputs
43	FFE-	Firmware version mismatch	Firmware version of panel or extension card does not match that of control board
44	rS-	Modbus communication error	Modbus communication is not working properly
45	E.Par	Parameter settings invalid	Parameter settings are invalid after firmware update or extension card removed
46	U.Par	Unknown parameter restore error	An unknown parameter is skipped during parameter restore
48	idA-	Internal communication error	Internal error caused by communication interference or circuit connection problem
49	idP-	Internal parameter error	Internal error caused by parameter handling
50	idE-	Converter internal error	Converter has internal error, contact with service
51	OCd-	Extension card internal error	Extension card was successfully detected by the device at startup, but the communication failed afterwards
52	OCc	Extension card PDOs configuration error	Process data configuration error for field bus communication
53	Fdi-	no valid process data	No valid process data is received from remote communication server
54	PcE-	Remote control communication error	Error if communication to IndraWorks/ConverterWorks is lost during remote control
55	PbrE	Parameter backup / restore error	Error occurs during parameter backup and restore operation
56	PrEF	Parameter restore error after firmware update	Error occurs if parameter settings cannot be restored after firmware update
60	APE-	Application firmware error	Error message if the application firmware was not loaded correctly or trail use is over
61	APE1	Application error 1	Error which can be thrown by the application, description in application manual
62	APE2	Application error 2	
63	APE3	Application error 3	
64	APE4	Application error 4	
65	APE5	Application error 5	

Notes

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