The FR-F800 series

The frequency inverter FR-F800-E is optimized for applications with fans and pumps and is equipped with an integrated PLC as well as an integrated Ethernet interface with 100 MBit/s. This interface enables simple integration into an existing network and offers communication via Modbus® TCP/IP or CC-Link IE Field Basic

networks as standard. Up to 3 different protocols can communicate in parallel via the built-in Ethernet interface. This also enables inverter-to-inverter communication without a master. Due to the standard Ethernet interface, the FR-F800-E frequency inverter is supplied only with one serial interface.

The FR-F842 series frequency inverters are operated with a separate converter unit (FR-CC2).

FR-F846-E

The FR-F846 series covers the wide range of features of the FR-F800, but offers additional features in comparison:

● IP55 protective structure

● Integrated C3 EMC filter

● Integrated DC choke for harmonic suppression

● High-capacity DC Bus to avoid problems with fluctuating power supply

● Integrated multilingual display for output in plain text including English, German, French, Spanish, Italian, Russian, Turkish, Polish and Japanese

● Meets the requirements according to EN 61800-3

FR-F842-E

The F842 is separated into control and power unit. FR-CC2 (converter unit) and FR-F842 (frequency inverter).

This concept enables simple installation and commissioning of cost-effective DC bus systems.
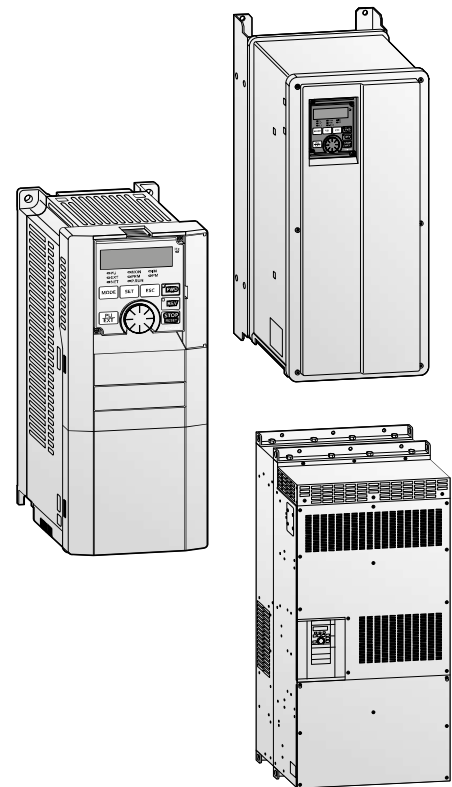
FR-F840/842-E-SCM

The SCM Kit-DRIVES offers a ready-made integrated condition monitoring solution. The combination of the three powerful individual components frequency inverter, operating display and a vibration sensor makes this possible. The system can be extended with up to two sensors. Commissioning can be carried out simply by means of an operating display, even without expert knowledge in the field of condition monitoring.

Power range:
FR-F820-E: 0,75– 110 kW, 200–240 V AC

FR-F840-E: 0,75–315 kW, 380–500 V AC

FR-F846-E: 0,75–160 kW, 380–500 V AC
(IP55 compatible model)

FR-F842-E: 355–560 kW, 380–500 V AC
(Separated converter type)

Converter unit FR-CC2-□

The converter units FR-CC2-H are diode rectifiers and enable the connection via a twelve-pulse rectifier, resulting in low harmonic content. They are used together with the FR-F842 frequency inverter. The separation of the units allows the flexible design of different systems such as parallel drives and common bus systems. This saves costs and minimizes the space required for installation.

Technical details FR-F846-00023 to -03610

Product line				FR-F846-□-E2-60L2																			
				00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	01800	02160	02600	03250	03610
Output	Rated motor capacity ① kW	150 % overload capacity (LD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160
		200 % overload capacity (ND)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132
	Rated current A	150 % overload capacity (LD)	I rated	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106	144	180	216	260	325
			I max. 60 s	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42.0	51.6	68.4	84.0	102.0	127.2	173	216	260	312	390
			I max. 3 s	3.2	5.3	7.2	11.4	17.3	24.0	34.5	43.5	52.5	64.5	85.5	105.0	127.5	159.0	216	270	324	390	488
		200 % overload capacity (ND)	I rated	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86	110	144	180	216	260
			I max. 60 s	2.3	3.8	6.0	9.0	13.5	18.0	25.5	34.5	46.5	57.0	66.0	85.5	106.5	129.0	165	216	270	324	390
			I max. 3 s	3.0	5.0	8.0	12.0	18.0	24.0	34.0	46.0	62.0	76.0	88.0	114.0	142.0	172.0	220	288	360	432	520
	Overload capacity ②	LD		120 % of rated motor capacity for 60 s; 150 % for 3 s (max. ambient temperature 50 °C)																			
		ND		150 % of rated motor capacity for 60 s; 200 % for 3 s (max. ambient temperature 50 °C)																			
	Voltage ③			3-phase AC, 380–500 V to power supply voltage																			
	Frequency range Hz			0.2–590 Hz																			
	Control method			U/f; advanced magnetic flux vector, real sensorless vector (RSV), closed loop vector, PM sensorless vector control																			
	Maximum brake torque Regenerative			10 % torque/100 % ED																			
Input	Power supply voltage			3-phase, 380–500 V AC, -15 %/+10 %																			
	Voltage range			323–550 V AC at 50/60 Hz (Undervoltage level is selectable by parameter)																			
	Power supply frequency			50/60 Hz ±5 %																			
	Rated input current ④ A	LD		2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106	144	180	216	260	325
		ND		1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86	110	144	180	216	260
	Power supply capacity ⑤ kVA	LD		1.6	2.7	3.7	5.8	9	12	18	22	27	33	43	53	65	81	110	137	165	198	248
		ND		1.1	1.9	3	4.6	6.9	9	13	18	24	29	34	43	54	66	102	110	137	165	198
Others	Cooling			Self cooling						Fan cooling													
	Protective structure ⑥			Dust- and water-proof type (IP55)																			
	Max. heat dissipation ⑦ kW	LD		50	70	80	120	160	230	325	370	440	530	700	840	1060	1260	1750	2210	2700	2900	3700
		ND		40	55	70	100	130	170	230	295	400	460	545	705	880	1060	1300	1800	1150	2400	2900
	Weight kg			15	15	15	15	16	17	26	26	27	27	59	60	63	64	147	150	153	189	193
	Dimensions (WxHxD) mm			238x520x271				238x650x285				345x790x357				420x1360x456.6		420x1510x456.6			

Order information ⑧	Art. no.	318057	318058	318059	318060	318061	318062	318063	318064	318065	318066	318067	318068	318069	318070	318071	318072	318073	318074	318075

Remarks:
① The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor. The 200 % overload capacity (ND) is the factory default setting.
② The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load. The waiting periods can be calculated using the r.m.s. current method (I^2xt), which requires knowledge of the duty.
③ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about √2 that of the power supply.
④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input choke).
⑤ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input choke).
⑥ FR-DU08: IP40 (except for the PU connector)
⑦ The values displays the maximum possible heat dissipation. Please consider this values during setup of the cabinet.
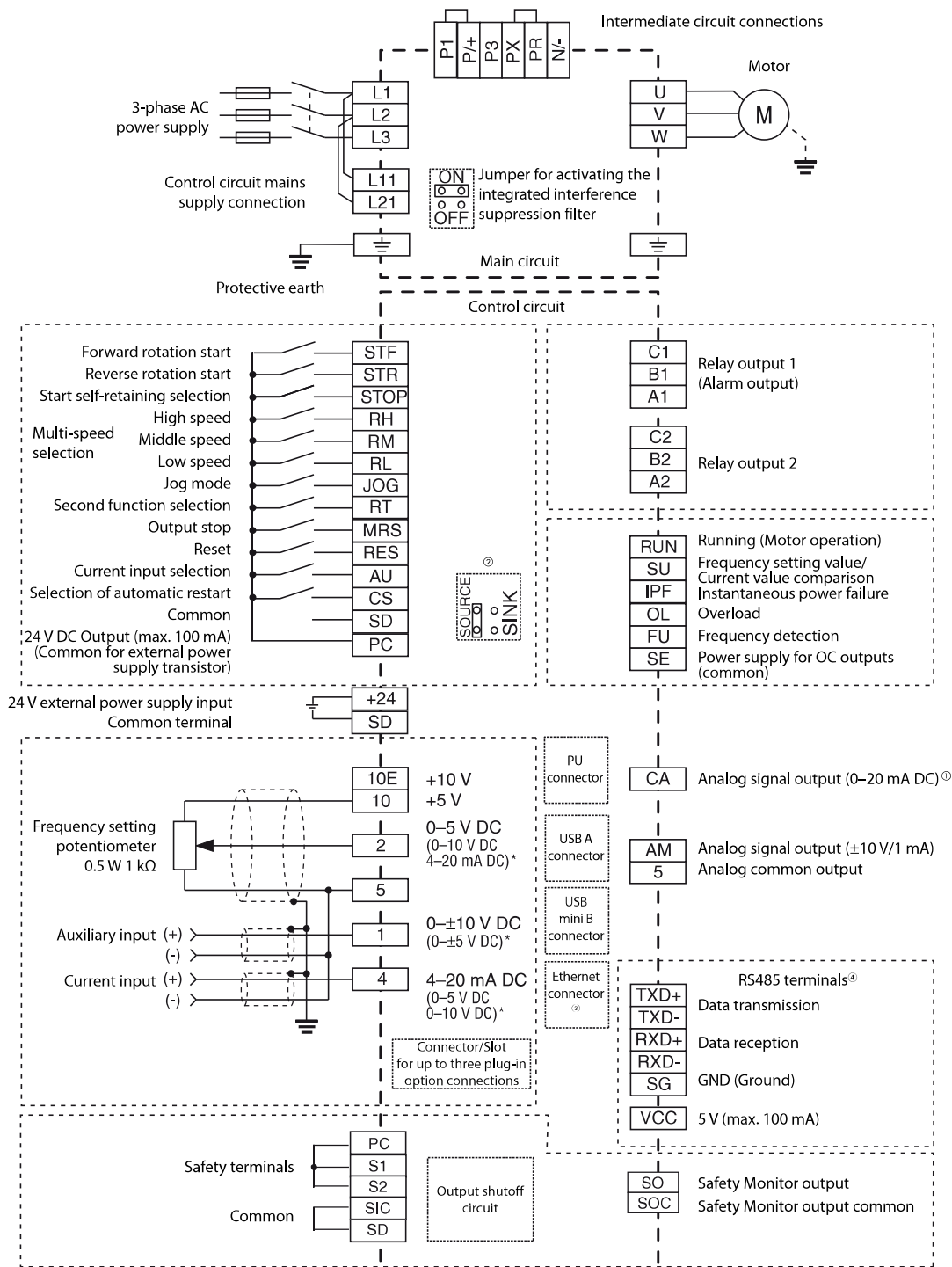⑧ All inverters with circuit board coating (IEC60721-3-3 3C2/3S2)

2

Specifications

Common specifications FR-F800

FR-A840			Description
Control specifi-cations	Frequency setting resolution	Analog input	0.015 Hz/0–50 Hz (terminal 2, 4: 0–10 V/12 bit) 0.03 Hz/0–50 Hz (terminal 2, 4: 0–5 V/11 bit, 0–20 mA/11 bit, terminal 1: -10–+10 V/12 bit) 0.06 Hz/0–50 Hz (terminal 1: 0–±5 V/11 bit)
		Digital input	0.01 Hz
	Frequency accuracy		0.2 % of the maximum output frequency (temperature range 25 °C ±10 °C) via analog input; ±0.01 % of the set output frequency (via digital input)
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 590 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		120 % (3 Hz) when set to simple magnetic flux vector control and slip compensation
	Torque boost		Manual torque boost
	Acceleration/deceleration time		0–3600 s (can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration can be selected.
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention operation level		Operation current level can be set (0–150 % adjustable), whether to use the function or not can be selected
	Motor protection		Electronic motor protection relay (rated current user adjustable)
	Torque limit level		Torque limit value can be set (0–400 % variable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–±5 V DC, 0–±10 V DC
		Digital input	Input using the setting dial of the parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A8AX)
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals	Common	Low-speed operation command, middle-speed operation command, high-speed operation command, second function selection, terminal 4 input selection, JOG operation selection, output stop, start self-holding selection, forward rotation command, reverse rotation command, inverter reset The input signal can be changed using Pr. 178 to Pr. 189 (input terminal function selection).
		Pulse train input	100 kpps
		Operating status	Maximum and minimum frequency settings, multi-speed operation, acceleration/deceleration pattern, thermal protection, DC injection brake, starting frequency, JOG operation, output stop (MRS), stall prevention, regeneration avoidance, increased magnetic excitation deceleration, DC feeding [1], frequency jump, rotation display, automatic restart after instantaneous power failure, electronic bypass sequence, remote setting, retry function, carrier frequency selection, fast-response current limit, forward/reverse rotation prevention, operation mode selection, slip compensation, speed smoothing control, traverse, auto tuning, applied motor selection, RS485 communication, PID control, PID pre-charge function, cooling fan operation selection, stop selection (deceleration stop/coasting), power-failure deceleration stop function, PLC function, life diagnosis, maintenance timer, current average monitor, multiple rating, test run, 24 V power supply input for control circuit, safety stop function, self power management, BACnet communication, PID gain tuning, cleaning, load characteristics storage, emergency drive
	Output signal	Open collector output (five terminals) Relay output (two terminals)	Inverter running, up to frequency, instantaneous power failure/undervoltage [1], overload warning, output frequency detection, fault Fault codes of the inverter can be output (4 bits) from the open collector.
Indication	For meter	Current output	Max. 20 mA DC: one terminal (output current) The monitored item can be changed using Pr. 54 FM/CA terminal function selection.
		Voltage output	Max. ±10 V DC: one terminal (output voltage) The monitored item can be changed using Pr. 158 AM terminal function selection.
	Operation panel (FR-DU08)	Operating status	Output frequency, output current, output voltage, frequency setting value The monitored item can be changed using Pr. 52 Operation panel main monitor selection.
		Fault record	Fault record is displayed when a fault occurs. Past 8 fault records and the conditions immediately before the fault (output voltage/current/frequency/cumulative energization time/year/month/date/time) are saved.
Protection	Protective functions		Overcurrent trip during acceleration, overcurrent trip during constant speed, overcurrent trip during deceleration or stop, regenerative overvoltage trip during acceleration, regenerative overvoltage trip during constant speed, regenerative overvoltage trip during deceleration or stop, inverter overload trip (electronic thermal relay function), motor overload trip (electronic thermal relay function), heatsink overheat, instantaneous power failure [1], undervoltage [1], input phase loss [1][2], stall prevention stop, loss of synchronism detection [2], upper limit fault detection, lower limit fault detection, Output side earth (ground) fault overcurrent, output short circuit, output phase loss, external thermal relay operation [2], PTC thermistor operation [2], option fault, communication option fault, parameter storage device fault, PU disconnection, retry count excess [2], CPU fault, operation panel power supply short circuit/RS485 terminals power supply short circuit, 24 V DC power fault, abnormal output current detection [2], inrush current limit circuit fault [1], communication fault (inverter), analog input fault, USB communication fault, safety circuit fault, overspeed occurrence [2], 4 mA input fault [2], pre-charge fault [2], PID signal fault [2], internal circuit fault, user definition error in the PLC function
	Warning function		Fan alarm, stall prevention (overcurrent), stall prevention (overvoltage), electronic thermal relay function pre-alarm, PU stop, parameter copy, safety stop, maintenance timer 1 to 3 [2], USB host error, operation panel lock [2], password locked [2], parameter write error, copy operation error, 24 V external power supply operation
Others	Surrounding air temperature		-10 °C to +50 °C
	Storage temperature [3]		-20 °C to +65 °C

Remarks:
[1] Available only for the standard model.
[2] This protective function is not available in the initial status.
[3] Temperature applicable for a short time, e. g. in transit.

Block diagram FR-F800

Intermediate circuit connections

P1 | P/+ | P3 | PX | PR | N/–

Motor

3-phase AC power supply

L1
L2
L3

Control circuit mains supply connection

L11
L21

ON OFF — Jumper for activating the integrated interference suppression filter

U
V
W — M

Main circuit

Protective earth

Control circuit

Forward rotation start — STF
Reverse rotation start — STR
Start self-retaining selection — STOP
High speed — RH
Multi-speed selection — Middle speed — RM
Low speed — RL
Jog mode — JOG
Second function selection — RT
Output stop — MRS
Reset — RES
Current input selection — AU
Selection of automatic restart — CS
Common — SD
24 V DC Output (max. 100 mA) (Common for external power supply transistor) — PC

SOURCE ② SINK

C1
B1 — Relay output 1 (Alarm output)
A1

C2
B2 — Relay output 2
A2

RUN — Running (Motor operation)
SU — Frequency setting value/Current value comparison
IPF — Instantaneous power failure
OL — Overload
FU — Frequency detection
SE — Power supply for OC outputs (common)

24 V external power supply input — +24
Common terminal — SD

10E — +10 V
10 — +5 V

Frequency setting potentiometer 0.5 W 1 kΩ

2 — 0–5 V DC (0–10 V DC 4–20 mA DC)*
5

Auxiliary input (+) (−) — 1 — 0–±10 V DC (0–±5 V DC)*

Current input (+) (−) — 4 — 4–20 mA DC (0–5 V DC 0–10 V DC)*

Connector/Slot for up to three plug-in option connections

PU connector

USB A connector

USB mini B connector

Ethernet connector ③

CA — Analog signal output (0–20 mA DC) ①

AM — Analog signal output (±10 V/1 mA)
5 — Analog common output

TXD+ — RS485 terminals ④
TXD− — Data transmission
RXD+ — Data reception
RXD−
SG — GND (Ground)
VCC — 5 V (max. 100 mA)

Safety terminals — PC
S1
S2
Common — SIC
SD

Output shutoff circuit

SO — Safety Monitor output
SOC — Safety Monitor output common

* Input area can be set via parameters.

① Common terminal is 5
② Initial setting is source logic.
③ Only for FR-F800-E
④ Not for FR-F800-E
If RS485 terminals are needed, install the interface card FR-A8ERS

Assignment of main circuit terminals

Function	Terminal	Designation	Description
Main circuit connection	L1, L2, L3	Mains supply connection	Mains power supply of the inverters (FR-F820: 200–240 V AC, 50/60 Hz); (FR-F840: 380–500 V AC, 50/60 Hz)
	P/+, N/–	Brake unit connection	Connect the brake unit (FR-BU, BU), power regeneration common converter (FR-CV), Harmonic Converter (FR-HC and MT-HC) or power regeneration converter (MTRC).
	P/+, P1	DC choke connection	An optional DC choke can be connected to the terminals P1 and P/+. The jumper on terminals P1 and P/+ must be removed when this optional choke is used on frequency inverter models FR-F820-03160 or lower and FR-F840-01800 or lower. When using a motor with 75 kW or higher, always connect a mandatory DC choke. The DC choke must be installed on frequency inverter models FR-F820-03800 or higher and FR-F840-02160 or higher.
	PR, PX	Built-in brake circuit connection	When the jumper is connected across terminals PR and PX (initial status), the built-in brake resistor circuit is valid.
	U, V, W	Motor connection	Voltage output of the inverter (3-phase, 0 V up to power supply voltage, 0.2–590 Hz)
	L11, L21	Power supply for control circuit	To use external power for the control circuit connect the mains power to L11/L21 (and remove jumpers L1 and L2).
	⏚	PE	Protective earth connection of inverter

Assignment of signal terminals

Function	Terminal	Designation	Description
Control connection (programmable)	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF.
	STR	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR.
	STOP	Start self-retaining selection	The start signals are self-retaining, if a signal is applied to terminal STOP.
	RH, RM, RL	Multi-speed selection	Preset of 15 different output frequencies according to the combination of the RH, RM and RL signals.
	JOG	Jog mode selection	The JOG mode is selected, if a signal is applied to this terminal (factory setting). The start signals STF and STR determine the rotation direction.
		Pulse train input	The JOG terminal can be used as pulse train input terminal (parameter 291 setting needs to be changed)
	RT	Second parameter settings	A second set of parameter settings is selected, if a signal is applied to terminal RT.
	MRS	Output stop	The inverter lock stops the output frequency without regard to the delay time.
	RES	RESET input	An activated protective circuit is reset, if a signal is applied to the terminal RES (t >0.1 s).
	AU	Current input selection	The 0/4–20 mA signal on terminal 4 is enabled by a signal on the AU terminal.
		PTC input	If you connect a PTC temperature sensor you must assign the PTC signal to the AU terminal and set the slide switch on the control circuit board to the PTC position.
	CS	No function	Use Pr.186 CS terminal function selection for function assignment.
Common	SD	Reference potential (0 V) for the PC terminal (24 V)	Common terminal for contact input terminal (sink logic); Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current. Common terminal for the 24 V DC power supply (terminal PC, terminal +24) Isolated from terminals 5 and SE.
	PC	24 V DC output	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable current. Common terminal for contact input terminal (source logic). Can be used as a 24 V DC 0.1 A power supply.
	+24	24 V external power supply input	For connecting a 24 V external power supply. If a 24 V external power supply is connected, power is supplied to the control circuit while the main power circuit is OFF.
Setting value specification	10 E	Voltage output for potentiometer	Output voltage 10 V DC. Max. output current 10 mA. Recommended potentiometer: 1 kΩ, 2 W linear
	10		Output voltage 5 V DC. Max. output current 10 mA. Recommended potentiometer: 1 kΩ, 2 W linear
	2	Input for frequency setting value signal	The setting value 0–5 V DC (or 0–10 V, 0/4–20 mA) is applied to this terminal. You can switch between voltage and current setpoint values with parameter 73. The input resistance is 10 kΩ.
	5	Frequency setting common and analog outputs	Terminal 5 provides the common reference potential (0 V) for all analog set point values and for the analog output signals CA (current) and AM (voltage). The terminal is isolated from the digital circuit's reference potential (SD). This terminal should not be grounded.
	1	Auxiliary input for frequency setting value signal 0–±5 (10) V DC	An additional voltage setting value signal of 0–±5 (10) V DC can be applied to terminal 1. The voltage range is preset to 0–±10 V DC. The input resistance is 10 kΩ.
	4	Input for setting value signal	The setting value 0/4–20 mA or 0–10 V is applied to this terminal. You can switch between voltage and current setpoint values with parameter 267. The input resistance is 250 Ω. The current setting value is enabled via terminal function AU.
Signal output (programmable)	A1, B1, C1	Potential free relay output 1 (Alarm)	The alarm is output via relay contacts. The block diagram shows the normal operation and voltage free status. If the protective function is activated, the relay picks up. The maximum contact load is 200 V AC/0.3 A or 30 V DC/0.3 A.
	A2, B2, C2	Potential free relay output 2	Any of the available 42 output signals can be used as the output driver. The maximum contact load is 230 V AC/0.3 A or 30 V DC/0.3 A.
	RUN	Signal output for motor operation	The output is switched low, if the inverter output frequency is equal to or higher than the starting frequency. The output is switched high, if no frequency is output or the DC brake is in operation.
	SU	Signal output for frequency setting value/current value comparison	The SU output supports a monitoring of frequency setting value and frequency current value. The output is switched low, once the frequency current value (output frequency of the inverter) approaches the frequency setting value (determined by the setting value signal) within a preset range of tolerance.
	IPF	Signal output for instantaneous power failure	The output is switched low for a temporary power failure within a range of 15 ms ≤tIPF ≤100 ms or for under voltage.
	OL	Signal output for overload alarm	The OL is switched low, if the output current of the inverter exceeds the current limit preset in parameter 22 and the stall prevention is activated. If the output current of the inverter falls below the current limit preset in parameter 22, the signal at the OL output is switched high.
	FU	Signal output for monitoring output frequency	The output is switched low once the output frequency exceeds a value preset in parameter 42 (or 43). Otherwise the FU output is switched high.
	SE	Reference potential for signal outputs	The potential that is switched via open collector outputs RUN, SU, OL, IPF and FU is connected to this terminal.
	CA	Analog current output	One of 18 monitoring functions can be selected, e. g. external frequency output. CA- and AM output can be used simultaneously. The functions are determined by parameters. Output item: output frequency (initial setting), Load impedance: 200 Ω–450 Ω, output signal: 0–20 mA
	AM	Analog signal output 0–10 V DC (1 mA)	Output item: output frequency (initial setting), output signal 0–10 V DC, permissible load current 1 mA (load impedance ≥10 kΩ), resolution 8 bit
Interface	—	PU connector	A parameter unit can be connected. Communications via RS485 I/O standard: RS485, multi drop operation: max 1152 baud (overall length: 500 m)
	—	RS485 terminal (via RS485 terminal)	Communications via RS485; I/O standard: RS485, multi drop operation: max 1152 baud (overall length: 500 m)
	—	2 USB connectors (Conforms to USB1.1/USB2.0)	USB A connector: a USB memory device enables parameter copy, PLC code download and trace function. USB mini B connector: connected to a personal computer via USB to enable operations of the inverter by FR Configurator2.
Safety connection	S1, S2	Safety inputs	When the safety functions are not used, the existing jumpers between the terminals S1-PC, S2-PC and SIC-SD must not be removed, otherwise an operation of the frequency inverter is not possible.
	SIC	Reference potential for safety inputs	
	SO	Safety monitor output	
	SOC	Safety monitor output common	