

KALEJA Elektronik GmbH

Strübelweg 14  
D-7553 Alfdorf

Phone: 07172-93711-0  
Fax: 07172-93711-90  
E-mail: info@kaleja.com  
Internet: www.kaleja.com

# QUICK GUIDE

## FRU-200

### Digital Frequency Inverter

### 0,25 – 0,7 kW

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## 2 Safety notes and environmental protection

### 2.1 General Safety Instructions

The warnings and risks below are listed in order to allow the user to enjoy maximum benefit and to point out important safety aspects.



**Attention**

- Installation, commissioning or servicing of these drives must be carried out by expert technicians completely familiar with the workings of this equipment and any related machinery. Non-compliance with this regulation may result in injuries and/ or material damage. All work on the devices must be carried out isolated from the power supply.
- Connect the drive motor to a suitable protective-conductor terminal.
- Non-compliance leads to risk of electric shock. All capacitors in the intermediate circuit carry high voltage, even after disconnection.
- Before opening the device, wait for 3 minutes to allow time for discharge. If the required safety precautions are not followed,
- FRU-200 frequency converters may constitute an electrical safety hazard involving danger to life or injury if the required safety precautions are not followed.
- Rotating and moving machine parts also pose a danger to life, risk of injury or material damage.



**Caution**

- These FRU-200 frequency converters have been factory checked before dispatch. Prior to assembly and commissioning, however, please check the devices for possible damages in transit, loose components, packaging material etc.
- Before carrying out high-voltage resistance tests on the wiring, disconnect the FRU-200 frequency converter from the circuit to be tested.

**Replacing a device**



**Attention**

- When replacing the FRU-200 frequency converter it is imperative to correctly install all user-defined parameters determining the proper operation of the drive before restarting the device.
- Disregard of this step may result in danger or risk of injury.


**Installation**



**Attention**

- This product has an IP54 rating. To ensure safe and reliable operation, please comply with any assembly regulations relevant for the respective location.
- Make sure that
  - - mechanically faultless fixings according to recommendations are used
  - - the frequency converter is supplied with sufficient cooling air according to the recommended cooling intervals
  - - cables and connection technology meet recommendations
  - - assembly and commissioning is carried out by expert technicians
  - - specified values are not exceeded


**Implementation risk**



**Attention**

- The integration of the devices into other facilities or systems lies beyond the supplier's or manufacturer's scope of responsibility. This includes applicability, effect, operational safety and other facilities or systems.
- If applicable, the user should consider the relevant aspects of the risk assessment below.


**Servicing, Repairs**



**Attention**

- Servicing must be carried out by trained expert technicians according to manufacturer's instructions (or sent off to the supplier for servicing).
- Repairs carried out by the customer, in particular when non-designated spare parts are used for this purpose may result in danger or risk of injury.
- Repair reports for repairs will only be compiled if the defective device is accompanied by a detailed fault description.

**Risk assessment**




**Attention**

- A drive that is operated under faulty conditions or conditions contrary to the intended use may:
  - - adopt incorrect speed
  - - cause high motor overspeed
  - - cause an incorrect direction of rotation for the motor
  - The motor may be live (unless suitable counter-measures are effective on the system)

**The user has to designate sufficient mechanical covers and/or has to install monitoring and safety systems according to safety regulations.**


**Intended use**



**Attention**

- Speed control of asynchronous squirrel-cage rotors or synchronous motors
- The device must be used exclusively for the use intended and according to its predefined operational data. Any incorrect use may cause a serious hazard or material damage and will result in loss of warranty.


**EMC**



**Caution**

- Please comply with the relevant EMC Regulations. The device as such is equipped with an A EMC of class A.
- The use of earth current monitoring systems in combination with FRU-200 frequency converters or similar is **not suitable for personal protection**. Personal protection will have to be provided in a different way, see EN50178/VDE0160.


**VOLTAGE INTERRUPTIONS**



**Attention**

- The performance of the FRU-200 frequency converter cannot be maintained during a voltage interruption.


**START-UP ON VOLTAGE RETURN**



**Attention**

- Automatic start-up after voltage return is possible for frequency converters FRU-200-25E/37E/75E and FRU-200-25W/37W/75W, provided:
  - - external start is pending for FRU-200-25E/37E/75E
  - - direction of rotation is predefined for FRU-200-25W/37W/75W

**PROTECTIVE INSULATION**



**Caution**

- All bare, touchable metal parts are protected by basic insulation and earth wires (PROTECTION CLASS I).
- The user will be responsible for the appropriate connection of the earth wire!

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## 2.2 Environmental Protection



Attention

- The packaging provided is flammable and may generate toxic gases if disposed of inappropriately.
- Inhalation of gases may result in damage to health.

Note on disposal



Note

- Dispose of packaging material in an appropriate way.
- Worn out devices or parts there of must be disposed of separately as electronic waste.
- Copper cables and wiring as well as all other recyclable materials must be fed into the material cycle.

## 2.3 Additional information

Support



Note

- Please contact your supplier for user support and training.

## 4.1.4 Special requirements for installation as per UL requirements

- Earth wire connectors:** ♦ Symbol  $\oplus$  (IEC publication 417, symbol 5019) is used to designate the earth wire connector.
- Motor overload protection:** ♦ External motor overload protection has to be provided.
- Overload protection:** ♦ Fuses must be wired inside the supply. Select these fuses according to the **Technical Specifications**, chapter 4.
- Short circuit behaviour of supply:** ♦ Suitable for use in supply with short circuit current not greater than 5000 A rms symmetric
- Corner frequency:** ♦ The maximally adjustable corner frequency is 60 Hz.
- Operating temperature:** ♦ See **Technical Specifications**, chapter 4, for details on ambient and operating temperature.

## 4.1.5 Type coding

FRU-200 ..... 25-x

**Motor rated power**  
(Example: 025 = 250W )

**Model**  
(0 = Standard)  
(N = with emergency shutdown)  
(E = with control socket)  
(W = with selector switch)

## 4.2 Order data

Function	Product Denomination/ Item number	Technical Data
Frequency converter For operation at 1AC 230V with integrated EMC filter class A	FRU-200-25 (standard)	0.25 kW, 1AC 220-240 V, 1.4 A
	FRU-200-37 (standard)	0.37 kW, 1AC 220-240 V, 2.3 A
	FRU-200-75 (standard)	0.75 kW, 1AC 220-240 V, 4.2 A
	FRU-200-25N (with emergency shutdown)	0.25 kW, 1AC 220-240 V, 1.4 A
	FRU-200-37N (with emergency shutdown)	0.37 kW, 1AC 220-240 V, 2.3 A
	FRU-200-75N (with emergency shutdown)	0.75 kW, 1AC 220-240 V, 4.2 A
	FRU-200-25E (control socket)	0.25 kW, 1AC 220-240 V, 1.4 A
	FRU-200-37E (control socket)	0.37 kW, 1AC 220-240 V, 2.3 A
	FRU-200-75E (control socket)	0.75 kW, 1AC 220-240 V, 4.2 A
	FRU-200-25W (selector switch)	0.25 kW, 1AC 220-240 V, 1.4 A
	FRU-200-37W (selector switch)	0.37 kW, 1AC 220-240 V, 2.3 A
	FRU-200-75W (selector switch)	0.75 kW, 1AC 220-240 V, 4.2 A

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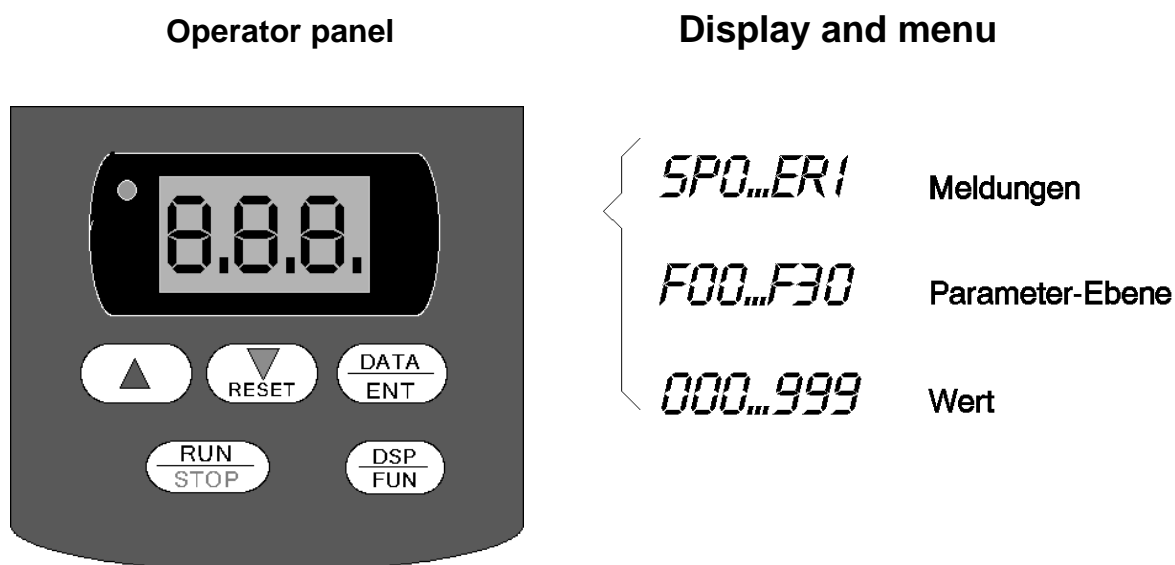
## 8 Settings and commissioning

### 8.1 Operator panel

All settings for the frequency converter are made at the control panel. This function is described below. Users who are already familiar with the control panel can continue with chapter "Settings and initial start-up (page 8.2).

#### 8.1.1 Introduction

FRU-200 frequency converters use a control panel comprising a 3-digit LED display and 5 function keys, see fig. 4.1. This allows simple diagnosis and configuration.



**Fig. 4.1: Operator panel**

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## 8.1.2 Function keys for settings of the drive

The 5 function keys enable free movement among the tree menu and the settings for the respective parameters. The individual function of these keys is as follows:



### DSP/FUN

The menu key allows you to switch between the operating mode display and the diagnosis / parameter level. The display shows the specified value in standby mode; output frequency is displayed whilst the motor is rotating. After selecting the parameter level, the most recently selected parameter will appear on the display (F00...F30).



### DATA/ENT

This key is used to access individual values from the parameter level. To return to parameter level, simply press this key again. Any changes you made will be adopted and confirmed beforehand by the message "End".



### HIGHER

This key enables you to advance within the selected menu level. If an adjustable parameter is selected, its value will increase as this function key is pressed.



### LOWER/RESET

This key enables you to return within the selected menu level. If an adjustable parameter is selected, its value will decrease as this function key is pressed. If an error message appears it can be reset by pressing this key.



### RUN/STOP

This key is used to start or stop the frequency converter in local mode.

## 8.1.3 Function keys during on-site operation (local mode)

In local mode, it is possible to control the device on-site and to send start and stop commands via the control panel.

- 1) To change local mode, set parameter F10 to 000.
- 2) Pressing the **RUN/STOP** key initiates the command boost or stop. In the process, you can select between local specified value and remote specified value by using parameter F11.
- 3) The **DSP/FUN** key is used to switch between parameter level and diagnosis level. The diagnosis level indicates the specified value during standby mode. Output frequency will be shown after the start command was given.

## 8.1.4 Resetting all parameters to default settings

This function is used to reset all setting parameters of the FRU-200 frequency converter to factory default settings.



### Caution

All previously set values will be lost. Prior to a restart be mindful of any safety notes on commissioning.

- 1) To reset parameters to default settings, invoke parameter F25.
- 2) For a 50 Hz system this parameter has to be set to 010. For a 60 Hz system this parameter has to be set to 020. Any other settings will have no effect. This function is also used to change the corner frequency from 50Hz to 60Hz or vice versa.
- 3) The parameter F25 will automatically be reset to 000 after invocation. The default settings will remain until the change of individual parameters.

### 3.3 "DUfUa YHf"Yj Y

Parameter	Function	Settings	Factory-setting
<b>F00</b>	<b>Factory adjustment</b>	<b>Do not change this value under any circumstances!</b>	000
<b>F01</b>	Ramp up	[0.1] s to [999] s	5.0
<b>F02</b>	Ramp down	[0.1] s to [999] s	5.0
<b>F03</b> <sup>1)</sup>	Operating mode	[000] Forward / Stop; Back / Stop [001] Boost / Stop; Forward / Back	000
<b>F04</b>	Direction of rotation	[000] Forward [001] Backward	000
<b>F05</b>	U/f-characteristic	[001] Linear 50Hz [004] Linear 60Hz [002] Heavy starting 50Hz [005] Heavy starting 60Hz [003] Pump/Venti.. 50Hz [006] Pump/Venti. 60Hz	001/004
<b>F06</b>	Max. rpm:	[1.0] Hz to [200] Hz	50.0/60.0
<b>F07</b>	Min. rpm:	[1.0] Hz to [200] Hz	00.0
<b>F08</b>	Fixed target value 1	[0.0] Hz to [200] Hz	10.0
<b>F09</b>	Inching-nominal value	[0.0] Hz to [200] Hz	06.0
<b>F10</b>	Enable L/F	[000] Local mode via RUN/STOP-KEY [001] Remote mode via TERMINAL 3 <sup>1)</sup>	000
<b>F11</b>	Specified value selection L/F	[000] Local specified value via control panel [001] Remote specified value via POT: 0 to 10V	001 000 <sup>1)</sup>
<b>F12</b>	Clock frequency	[001] 4kHz [005] 8kHz [009] 15kHz [002] 5kHz [006] 10kHz [010] 16kHz [003] 6kHz [007] 12kHz [004] 7,2kHz [008] 14,4kHz	005
<b>F13</b>	Boost	[0.0] % to [10.0] %	00.0
<b>F14</b>	Stop mode	[000] Ramp [001] Coast	000
<b>F15</b>	Braking time	[0.0] s to [25.5]	00.5
<b>F16</b>	Starting frequency	[1.0] Hz to [10.0] Hz	01.5
<b>F17</b>	Braking voltage	[0.0] % to [20.0] %	08.0
<b>F18</b>	Motor rated current	[0.0] % to [200]	100
<b>F19</b> <sup>1)</sup>	Multi-functions input 1	[001] Inching mode [004] Ext.supervision [002] Fixed specified 1 [005] Reset	002
<b>F20</b> <sup>1)</sup>	Multi-functions-input 2	[003] Emergency shutdown [006] Fixed specified 2	
<b>F21</b> <sup>1)</sup>	Multi-functions-output	[001] Message operation [003] Error [002] Message Specified Value has been reached	003
<b>F22</b>	Change of direction	[000] possible [001] blocked	000
<b>F23</b>	Automatic ON	[000] enabled [001] disabled	000
<b>F24</b>	Selecting an output	[0] to [5]	000
<b>F25</b>	Default setting	[010] setting 50Hz [020] setting 60Hz	
<b>F26</b>	Fixed speed 2	[0.0] Hz to [200] Hz	20.0
<b>F27</b>	Fixed speed 3	[0.0] Hz to [200] Hz	30.0
<b>F28</b> <sup>1)</sup>	Auto-Start after Netz ON (program version 2.2)	[000] activated [001] disabled	001
<b>F29</b>	CPU-program-version		
<b>F30</b>	Error messages	[X.XX] last error messages [XXX.] first error messages [XX.X] One but last error message	

<sup>1)</sup> Only FRU-200-25E / -75E

## 9 Operating and error messages

### 9.1 General

FRU-200 frequency converter offer many warning and error evaluation functions. This considerably reduces the danger of damage to frequency converter, motor and related equipment under faulty conditions. The diagnosis information on the control panel's display unit often facilitates quick error location. If you detect a fault in the FRU-200 frequency converter, return the frequency converter to the supplier; we strongly advice against repairs on-site.

### 9.2 Operation messages

message	Significance	Cause
<i>SPO</i>	<b>Zero speed</b>	Specified value frequency is smaller than 1Hz, at min. speed F07 =000
<i>SP1</i>	<b>Auto-Start impossible</b>	Release/boost command at terminal 3 is enabled when mains voltage is applied but the auto-start function disabled. Check setting of parameter F28.
<i>SP2</i>	<b>Local mode Emergency stop</b>	Frequency converter is working in remote specified value mode and <b>RUN/STOP</b> key is pressed on frequency converter. You will have to reset Release/Boost, before you can restart.
<i>E.S.</i>	<b>Remote specified value Emergency stop</b>	One of the multi-function inputs F19/F20 has been configured to Emergency Stop function and this message is pending (operating mode: local mode and remote specified value)
<i>B.B.</i>	<b>External supervision</b>	One of the multi-function inputs F19/F20 has been configured to External Supervision function and this message is pending (operating mode: local mode and remote specified value)

### 9.3 Setting error)

message	Significance	Cause	Remedy
<i>LOC</i>	<b>Change of direction of rotation blocked</b>	<ol style="list-style-type: none"> <li>F22 =001 and via input REV (terminal 4), to reverse and to change direction of rotation</li> <li>F22 and F04 are simultaneously set to 001</li> </ol>	<ul style="list-style-type: none"> <li>- Set F22 to 000</li> <li>- Set F04 to 000</li> </ul>
<i>ER1</i>	<b>Error 1</b>	<ol style="list-style-type: none"> <li>Frequency converter is working in operating mode remote specified value (F11=001) and the arrow keys <b>UP</b> or <b>DOWN/RESET</b> were pressed</li> <li>An attempt was made to change CPU program version F29</li> <li>Parameter should be changed during operation</li> </ol>	<ul style="list-style-type: none"> <li>- The arrow keys are used in local mode only to increase or decrease the output frequency</li> <li>- CPU program version is non-alterable</li> <li>- Merely parameters F01, F02, F04 and F13 can be changed during operation</li> </ul>
<i>ER2</i>	<b>Error 2</b>	<ol style="list-style-type: none"> <li>Parameter error F06, F07</li> </ol>	<ul style="list-style-type: none"> <li>- F06 &gt; F07</li> </ul>

## 9.4 Error messages

### Error messages that cannot be reset

Message	Significance	Cause	Remedy
<i>CPF</i>	Program error	External electromagnetic effect	- Connect in parallel RC absorption circuit with interfering magnetic contact
<i>EPR</i>	EEPROM error	EEPROM defect	- Check and replace memory module, as required
<i>OU</i>	Excess voltage in standby mode	1. Supply voltage too high 2. Measuring arrangement defective	- Check network voltage - Contact supplier
<i>LU</i>	Undervoltage in standby mode	1. Supply voltage too low 2. Measuring arrangement defective	- Check network voltage - Contact supplier
<i>OH</i>	Overload in standby mode	1. Ambient temperature too high 2. Insufficient cooling 3. Measuring arrangement defective	- Improve cooling - Contact supplier

### Error messages that can be reset manually

message	Significance	Cause	Remedy
<i>OC</i>	Overcurrent in standby mode	Measuring arrangement defective	- Contact supplier
<i>OL1</i>	Motor overload	1. To much strain 2. Incorrect V/F characteristic 3. Current limit F18 set incorrectly	- Use larger motor - Select different V/F characteristic - Check current limit F18
<i>OL2</i>	Frequency converter overload	1. To much strain 2. Incorrect V/F characteristic	- Use larger frequency converter - Select different V/F characteristic

## Error messages that can be reset manually and via auto-reset

Message	Significance	Cause	Remedy
<i>OCS</i>	<b>Short-term start-up peak current</b>	1 Motor short at housing 2 Motor cable short at earth 3 Power transistor defective	- Check motor - Check motor cable - Contact supplier
<i>OCA</i>	<b>Overcurrent on boosting</b>	1 Boost ramp set too short 2 Incorrect V/F characteristic 3 Motor performance too high	- Set boost ramp longer - Select different V/F characteristic - Use larger frequency converter
<i>OCC</i>	<b>Overcurrent in continuous operation</b>	1 Short-term overload 2 Short-term power cut	- Check load conditions - Apply power choke
<i>OCD</i>	<b>Overcurrent during coasting</b>	Coasting ramp too short	- Set coasting ramp longer
<i>OCB</i>	<b>Overcurrent on braking</b>	<b>Direct current braking</b> 1 Braking time too long F15 2 Starting frequency too high F16 3 Braking voltage too high F17	- Check parameter settings F15, F16, F17
<i>OUC</i>	<b>Overvoltage during operating or coasting</b>	1 Coasting ramp too short 2 Moment of inertia too large 3 Excessive supply fluctuations	- Set coasting ramp longer - Use larger frequency converter - Apply power choke
<i>LUC</i>	<b>Mains voltage insufficient</b>	1 Mains voltage too low 2 Excessive supply fluctuations	- Check the power voltage - Set boost ramp longer - Use larger frequency converter - Apply power choke
<i>OHC</i>	<b>Heat sink overtemperature</b>	1 To much strain 2 Ambient temperature too high 3 Insufficient ventilation	- Check strain - Use larger frequency converter - Check ventilation

## 6.2 Pin configuration control socket (FRU-200-25E / 37E / 75E)

Con tact	Designa tion	Signal, function	Explication
1 (A) 2 (B)	TRIP RELAY	Digital output (multi-function output): Message turned on; message specified value reached; fault	-potential-free relay contact
3 (C)	FW	Digital input "boost", for starting and shutdown (configurable) of drive +12 V (+24 V) = Boost / forward 0V = Stop Stop	-Shutdown set the same as stop mode (F14) (See pages 4-13)
4 (D)	RE	Configurable digital input, preferably for "reverse" direction of rotation: +12 V (+24 V) = forward / reverse 0V = forward / stop	- FW/RE configurable via operating mode (F03)
5 (E)	+12V	12 V voltage for control inputs	- 50 mA max. load
6 (F) 7 (G)	SP RS	Multi-function inputs: Inching, fixed specified value 1; emergency shutdown; external supervision; reset; fixed specified value 2 +12 V (+24 V) = e. g. inching speed 0V = Standard Operation	- configurable via multi-function inputs (F19/F20)
8 (H)	+10V	Internal +10 V reference for analogue inputs	- 10 mA max. load
9 (I)	Vin	Analogue input for speed specified value: +10 V = max. speed (F06) 0 V = min. speed (F07)	- Enabling of analogue inputs via specified value selection (F11)
10 (K)	0V	Mass for all analogue signals, reference potential for external supervision voltage <b>Warning: See page 16</b>	- Do not use for any other purposes
11 (L)	FM+	Analogue output within range 0...+10 V according to output frequency of the following scaling: +10 V = max. speed (P2) 0 V = 0 Hz	- 10 mA max. load
<div style="display: flex; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px; text-align: center;"> <b>i</b> </div> <div> <ul style="list-style-type: none"> <li>• For information on wire cross-section see chpt. 4.1.3 Electrical Specifications of Control Section on page 12.</li> </ul> </div> </div> <p><b>Note</b></p>			

## 5 Technische Daten

Order No. Art.No.:	06.10.010 / 020 / 030 / 040	06.10.011 / 021 / 031 / 041	06.10.012 / 022 / 032 / 042
Power (kW)	0,25	0,37	0,75
Voltage	3 x 0-240 V		
Current/Phase (A)	1,4	2,3	4,2
Frequency	0 - 200 Hz		
Overload	150% I <sub>n</sub> / 60s		
Input-voltage	1 x 230 V +/-10% 50/60 Hz		
Input-current (A)	3,0	5,2	9,4
Hedging (A)	16	16	16
Weight (kg)	0,8	0,8	0,8
Dimension (mm) (H x B x T)	200x 130 x120	200 x 130 x 120	200 x 126 x 142
Filters built	Class A		
Clock frequency	4 - 16 kHz		
Overload	150% I <sub>n</sub> / 60s		
Ramp time	0,1 - 999 sec		
Boost	10%		
Protection	IP54		
Temperature range	0 - 40 °C		