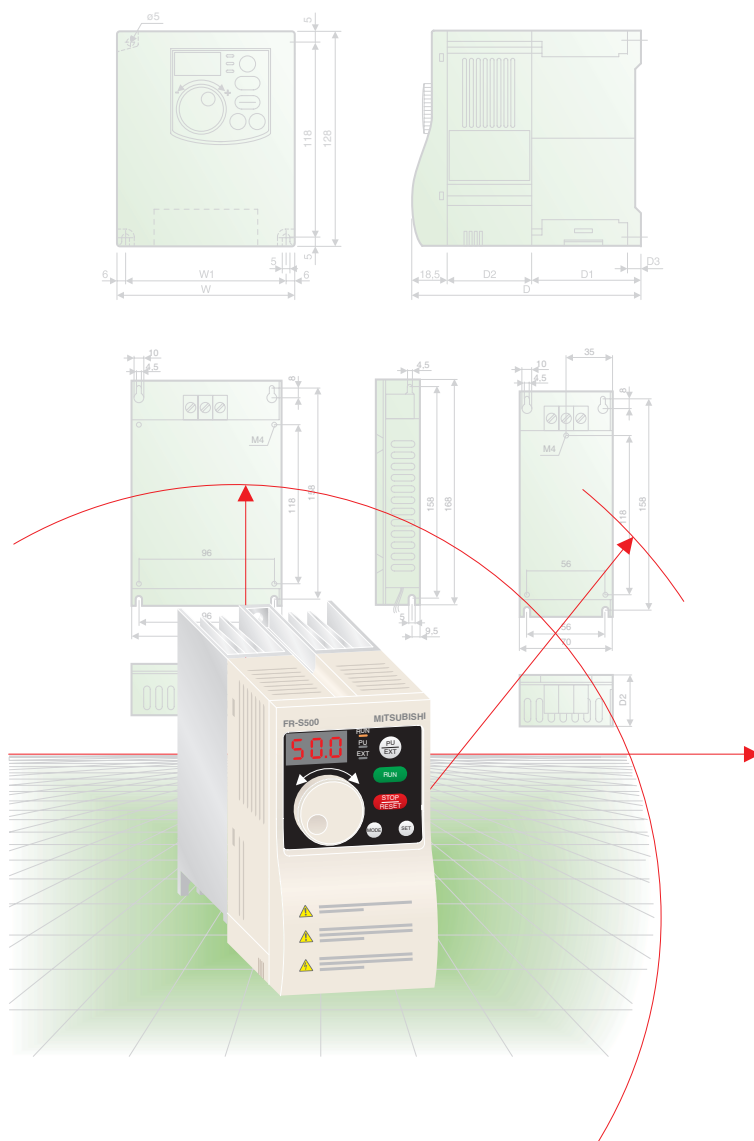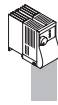# MITSUBISHI ELECTRIC

Frequency Inverter

FR-S 500E EC

Technical Catalogue

2005

FR-S 500E EC Frequency Inverters

Dial in Your Advantage

The inverters are available in the performance range from 0.2 to 1.5kW for operation with single-phase 200 to 240VAC power supplies (50/60Hz) and for capacities of 0.4kW to 3.7kW with three-phase 380 to 480VAC power supplies (50/60Hz).

Further Publications within the Factory Automation Range

Technical Catalogues

Technical catalogues FR-A 500, FR-F 700 and FR-E 500

Product catalogues for frequency inverters and accessories of the FR-A 500 (L-G) EC, FR-F 700 EC and FR-E 500 series

Technical catalogues MELSERVO and Motion Controllers

Product catalogues for MR-J2S series amplifiers, servo motors and motion controllers with SSCNET connection

Technical catalogues PLC and HMI

Product catalogues for programmable logic controllers, operator terminals, software, and accessories of the MELSEC PLC series

Technical catalogue Networks

Product catalogue for Master and Slave modules as well as accessories for the use of programmable logic controllers and frequency inverters in open and MELSEC networks (art. no. 136730)

Additional services

You will find current information on updates, alterations, new items, and technical support on MITSUBISHI ELECTRIC's web pages (www.mitsubishi-automation.com).

The products section of the MITSUBISHI home site includes various documentations of the whole product range by MITSUBISHI ELECTRIC as well as the current version of this catalogue on hand. All manuals and catalogues can be downloaded. The content is updated daily and to date is provided in German and English.

About this product catalogue

This catalogue is periodically updated due to product range enlargement, technical changes or new or changed features. Texts, figures and diagrams shown in this product catalogue are intended exclusively for explanation and assistance in planning and ordering the frequency inverter series FR-S 500E EC and the associated accessories. Only the manuals supplied with the devices are relevant for installation, commissioning and handling of the devices and the accessories. The information given in these manuals must be read before installation and commissioning of the devices or software.

Should questions arise with regard to the planning of devices described in this product catalogue, do not hesitate to contact MITSUBISHI ELECTRIC EUROPE B.V. in Ratingen (Germany) or one of its distributors (see cover page).

MITSUBISHI ELECTRIC

FREQUENCY INVERTER FR-S 500E EC

SYSTEM DESCRIPTION

PARAMETERS + PROTECTIVE FUNCTIONS

ACCESSORIES

DIMENSIONS

APPENDIX

The Frequency Inverter FR-S 500E EC

The FR-S 500 Evolution is a further development of the well-tried frequency inverter FR-S 500 EC/ECR that – due to its versatility and compact dimensions – solves your individual drive tasks efficiently.

The ultra-compact frequency inverters FR-S 500E EC allow for numerous applications. Typical applications include for example:

● Material transport systems such as conveyor belts, chain conveyors, feed belts, transport belts and worm conveyors
● Saws, millling cutters, grinding and drilling machines
● Pumps
● Fans
● Door drives

The frequency inverters are available with outputs from 0.2 to 1.5kW for operation with single-phase 200 to 240VAC power supply (FR-S 520SE EC) or 0.4 to 3.7kW with three-phase 380 to 480VAC power supply (FR-S 540E EC).
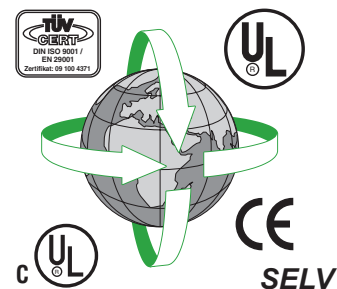
The frequency range is from 0.5 to 120Hz.

Overview of the Outstanding Characteristics

Communications capability and networking

The FR-S 500 E EC is equipped with a serial interface (RS485) as standard. This enables communication both with a personal computer and with a PLC, which can be networked with up to 31 other devices with RS485 interface.

Compatible with many new applications

● PID control
  The integrated PID control for example supports a flow control for pumps.
● Torque boost
  Automatic torque boost selection is possible.

Automatic restart after instantaneous power failure

When an instantaneous power failure occurs, the motor can be restarted automatically after the power is recoverd. The system simply reactivates the coasting motor and automatically accelerates it back up to its setpoint speed.

Maintenance timer

The maintenance timer function can be used to monitor the service life of different components.

Second electronic thermal function

This function is used to rotate two motors of different rated currents individually by a single inverter.

Comprehensive protection functions for safe operation

● Built-in electronic overcurrent protection
● Free selection of the protection function for automatic retry after alarm occurence.

Compatible with numerous I/Os

● Multi-speed operation
  15 different pre-selected speeds are available
● Control input for 0/4–20mA (0–10V)
● 4 Multi-input terminals
  Selection of different input variations from 14 different input types (e. g. digital motor potentiometer)
● Multi-output terminals
  Selection of 2 different output variations from 12 different output types
● 24V power supply output (24VDC/ 0.1A) for external devices
● Analog output from 0 to 5V

Automatic torque boost

The new transistorized power module supports an automatic torque boost on demand feature for significantly more stable drive performance.
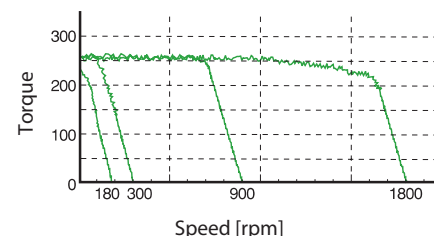
User-friendly Operation

Easy operation

The **integrated control panel** provides a quick and easy operation of the frequency inverter and displays several operational signals and error messages. The "Digital Dial" provides a far more quick and direct access to all important drive parameters than conventional keys would allow.

In addition, for example the speed of the connected motor can be continuously controlled directly.

For a remote control of the inverter among others the parameter unit **FR-PU04** is available. It provides a long-life backlight LC display. Operational data is input directly via the numeric keypad.

Eight different selectable languages are supported by the display.

The integrated copy function transfers the entire parameter settings to other inverters and thus shortens the initialisation time significantly.
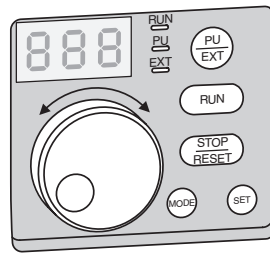
Integrated control panel

In addition to control panel operation the frequency inverter can also be connected to a standard PC via an RS-485 port and operated from the PC with the optional VFD setup software package (see page 20). Version 2.4 and above of this package run under Windows® 95, 98, Me and XP and also under Windows® NT and 2000. Using this software you can configure, operate and monitor multiple frequency inverters in a network or directly from a single PC or notebook computer.
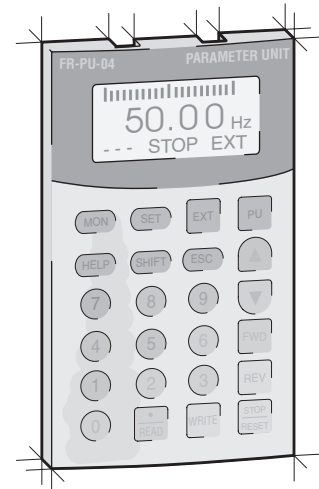
FR-PU04

By default, only the 12 most important parameters are activated to ensure a quick parameterizing. If required, all parameters can be easily accessed.

Simplified Maintenance

Easy access to cooling fans

The easily accessible cooling fans can be replaced quickly and easily, if required.

The integrated cooling fan can be switched OFF automatically in stand-by operation to increase its lifetime significantly.
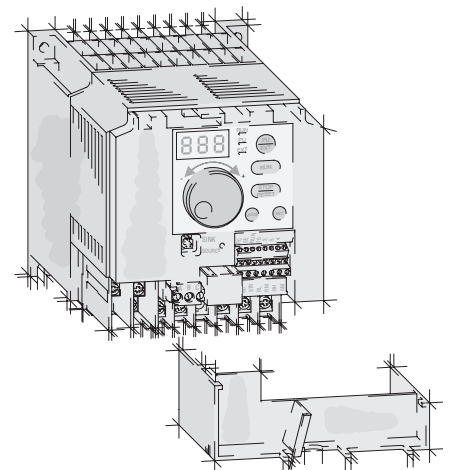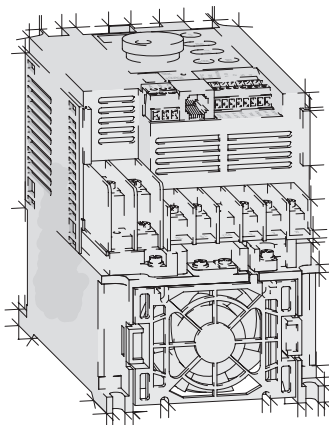
Easy installation and maintenance

Since the control and power terminal block is easy of access, the installation and main-tenance of the inverter is also very easy.

All connection points are designed as screw terminals.

The housing includes a cable routing facility which can be removed for in-stalling.
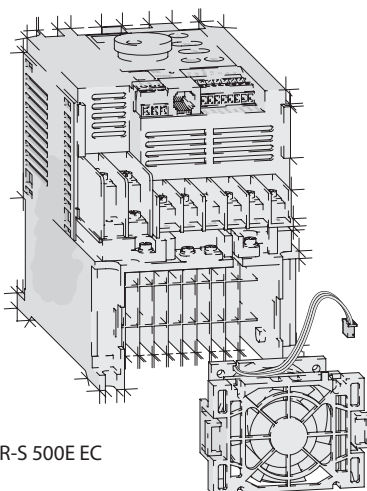
FR-S 500E EC

The Integrated Control Panel

RUN-LED	
Operation indication of the inverter	

LED display
3-digit 7-segment display for operational values, error messages, and the different functions

PU/EXT-LEDs
Indication of the selected operation mode

Digital dial
Setting the frequency and parameters

PU/EXT key
Selection of the operation mode: • PU = Control via control panel   (or **p**arameter **u**nit) • EXT = Control via external signals

Operation mode keys
Start/Stop keys of the inverter: • RUN = Start   (for right-hand or left-hand rotation) • STOP/RESET = Stop and reset

Function keys
Keys for function settings: • MODE = Switches the setting mode for the selection of the display function • SET = Confirmation key for parameter or frequency settings

Menu Guide

The control panel facilitates the setting and display of different control variables (parameters) and the monitoring and output of current operational values and alarm messages. All the information is output on a 3-digit LED display.

Besides the display and setting of the parameters all operation conditions of inverter and motor can be monitored. Malfunction is indicated by error codes.

Fast, simple configuration and operation save time and money. The integrated "digital dial" jog shuttle control gives the user direct and much faster access to all key drive parameters than is possible with standard pushbutton solutions.

Press MODE key until the parameters are displayed.

Press PU/EXT key for control panel operation.
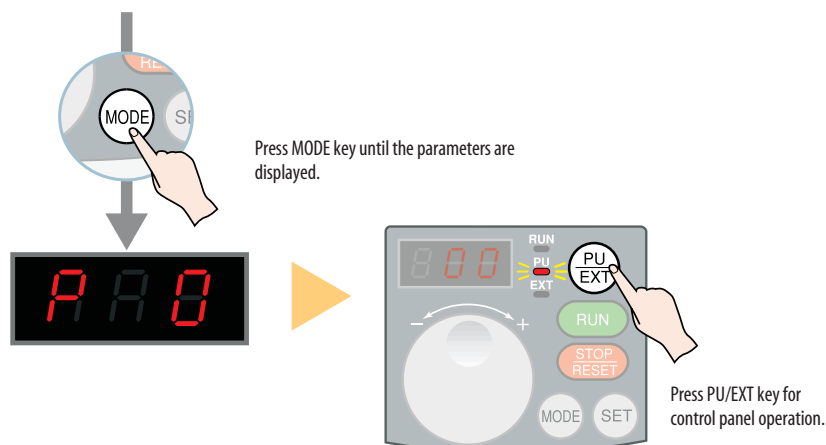
Parameter Setting Procedure

❶ Turn the digital dial.

❷ Parameter no. is displayed.

❸ The stored value is displayed.

❹ Turn the digital dial.

❺ The value is changed.

❻ Confirm the value.

Ready!
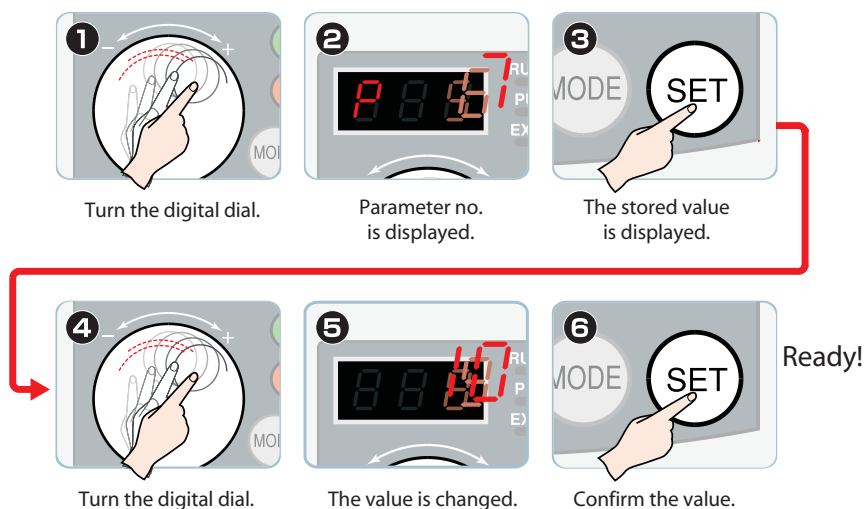
Environmentally Friendly Operation

Soft-PWM control

In addition to the conventional low-noise mode, MITSUBISHI ELECTRIC has developed its original Soft-PWM control that suppresses acoustic noise and limits RFI noise to a minimum.

The switchable PWM control facilitates a motor noise as silent as whisper even at low carrier frequencies. The diagrams illustrate the difference.

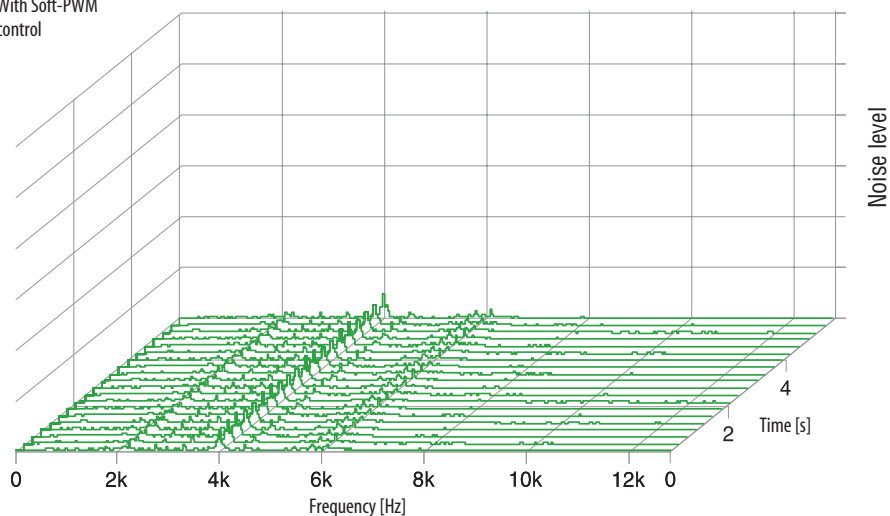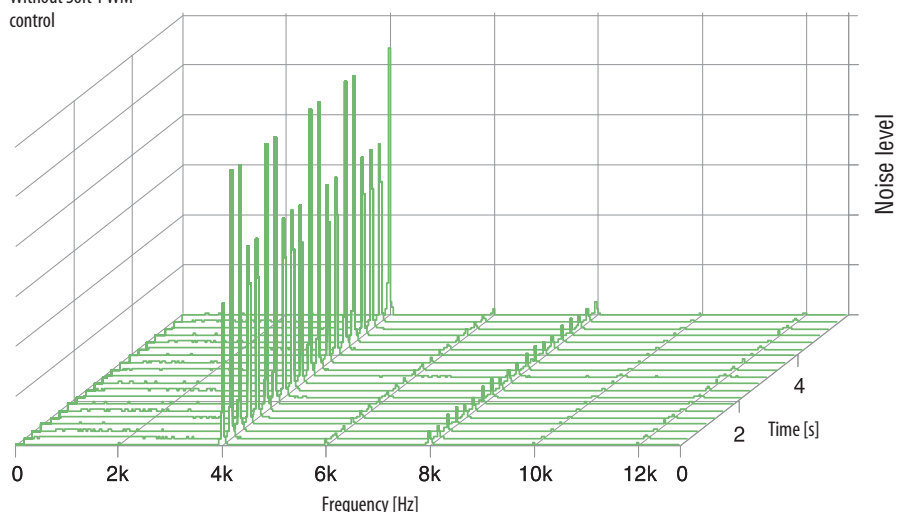In the upper diagram the frequency components are dispersed: The inverter only generates little noise that might be compared to the sound of flowing water. The noise does not sound unpleasant.

In the lower diagram the frequency components are concentrated: The inverter generates the typical noise.

With Soft-PWM control

Without Soft-PWM control

EMC compatibility

Regarding its electromagnetic compatibility the frequency inverter FR-S 500E EC complies with the European EMC directives. To meet these standards specially adjusted compact noise filters have been developed for each performace range. These noise filters can be mounted simply on or under the inverter.

For details refer to page 21.

By connecting an optional converter choke coil harmonic feedback into the mains supply is suppressed.

Standards

The devices of the FR-S 500E EC product line are designed to be used world-wide without further effort or certifications.

● Compliant with world-wide standards CE, UL, cUL
● Selectable sink or source logic
The logic for input and output signals can be freely selected. The result is a flexible and easy customization of the units to the needs of the world market.
● Extended input voltage range
FR-S 520SE EC: 1~ 200–240V; 50/60Hz;
FR-S 540E EC: 3~ 380–480V; 50/60Hz;
Tolerance: −15%; +10%
● Multi-language parameter unit (8 languages) optionally available

● Due to the integrated PID control the frequency inverter for instance can be used for temperature control without further requirements.
● All inverters are equipped with an inrush current limiter protecting the connected components.
● MS-Windows compatible world-wide standardized multi-language parameterizing software (VFD-Setup).

The FR-S 500E EC is a world product complying with all relevant standards and easily adopting to the according needs of a country.

Specifications FR-S 500E EC

Product line			FR-S 520SE EC				FR-S 540E EC				
			-0.2 k	-0.4 k	-0.75 k	-1.5 k	-0.4 k	-0.75 k	-1.5 k	-2.2 k	-3.7 k
Output	Applicable motor capacity* ①	kW	0.2	0.4	0.75	1.5	0.4	0.75	1.5	2.2	3.7
	Rated motor capacity	kVA	0.5	1.0	1.6	2.8	0.9	1.6	2.7	3.7	5.9
	Rated current*	A	1.4	2.5	4.1	7.0	1.2 (1.3)*	2.3 (2.5)*	3.7 (4.1)*	5.3 (5.8)*	7.7 (8.5)*
	*Overload capacity ②		200% of rated motor capacity for 0.5s; 150% for 1 min. (ambient temperature not higher than 50 ℃)								
	Voltage ③		3phase, 0V up to power supply voltage								
Input	Power supply voltage		1phase, 200–240VAC, −15% / +10%				3phase, 380–480VAC, −15% /+10%				
	Voltage range		170–264VAC at 50 / 60Hz				325–528VAC at 50 / 60Hz				
	Frequency range		50 / 60Hz ± 5%				50 / 60Hz ± 5%				
	Rated input capacity ④	kVA	0.9	1.5	2.5	4.4	1.5	2.5	4.5	5.5	9.5
Control specifi-cations	Control method		V/f control or automatic torque boost control								
	Modulation method		Sinusoidal PWM, Soft PW								
	PWM switching frequency	kHz	0.7–14.5, user adjustable								
	Frequency range	Hz	0.5–120								
	Frequency resolution	Analog	From terminals 2-5: 1/500 of maximum set frequency (input 5VDC); 1/1000 (input 10V, 20mADC)								
		Digital	0.1Hz (less than 100Hz), 1Hz (100Hz or higher)								
	Frequency precision		±1% of max. output frequency (temperature range 25 ℃±10 ℃) during analog input; ±0.5% of max. output frequency during digital input (set via Digital Dial)								
	Voltage / frequency characteristics		Base frequency adjustable from 0 to 120Hz								
	Possible starting torque		≥ 150% / 5Hz (with automatic torque boost)								
	Torque boost		Manual torque boost; selectable between 0–30%								
	Acceleration / deceleration time		0, 0.1 to 999s (may be set individually for acceleration and deceleration)								
	Acceleration / deceleration characteristics		Linear or S-pattern acceleration/deceleration mode selectable								
	Braking torque ⑤	Regenerative	0.2 k: 150%; 0.4 k and 0.75 k: 100%; 1.5 k: 50%; 2,2 k and 3,7 k: 20%								
		DC braking	Braking time and braking moment adjustable, Operating frequency: 0–120Hz, operating time: 0–10 s, voltage: 0–15% (externally adjustable)								
	Current stall prevention operation level		Operation current level setting 0–200%, user adjustable								
	High-response current restriction level		Operation level is fixed, enable/disable selection								
	Motor protection		Electronic motor protection relay (rated current user adjustable)								
Control signals for operation	Frequency setting signal	Analog input	0–5VDC, 0–10VDC, 0/4–20mA								
		Digital input	From control panel (parameter unit), RS-485 or network								
	Input signals	Start signal	Individual selection of forward / reverse run Start signal self retaining input								
		Multi-speed selection	Up to 15 speeds can be preset in the range of 0–120Hz. The current speed can be adjusted during operation via the control panel.								
		2nd function	Selects 2nd function (acceleration time, deceleration time, torque boost, base frequency, electronic overcurrent protection)								
		Selection of current input	Frequency setting via current input signal 0/4 to 20mADC (terminal 4)								
		External thermal input	Stopping the inverter with an externally mounted thermal relay								
		PU<->External operation	Switch between the operating modes "PU" and "External"								
		PID control	Select PID control								
		Output stop	Instant cutoff of inverter output (frequency and voltage)								
		Alarm reset	The error indication (alarm signal) is reset with the reset of the protective function.								
	Operation functions		Maximum and minimum frequency setting, frequency jump operation, external thermal input selection, instantaneous power failure restart operation, forward run/reverse run prevention, slip compensation, operation mode selection, PID control, computer link or open network operation								
	Output signals	Operation status	1 output type (open collector output) selectable: Inverter running, frequency reached, frequency detection, overload warning, zero current detection, output current detection, maximum PID, minimum PID, PID forward run, PID reverse run, operation ready, current average value monitor signal, maintenance timer alarm, minor failure and error. Instead of the open collector output type 1 relay contact can be selected for the output (230VAC; 0.3A / 30VDC; 0.3A).								
		Analog signal	One of the following output types can be selected: Output frequency, motor current, analog output (0–5VDC with 1mA full scale).								

* The values in brackets indicate the values for an ambient temperature up to 40℃ without restriction of PWM.

Product line			FR-S 520SE EC				FR-S 540E EC				
			-0.2 k	-0.4k	-0.75 k	-1.5 k	-0.4 k	-0.75 k	-1.5 k	-2.2 k	-3.7 k
Display option	Displayed on integrated control panel	Operating state	Output voltage, motor current, frequency setting value, operation speed								
		Alarm display	Error messages are displayed after a protective function has been activated. Up to 4 error codes can be stored.								
	Additional displays on parameter unit FR-PU04	Operating state	Signal status of input and output terminals								
		Interactive operating guide	Interactive guide for operation and troubleshooting via help function								
Protection	Functions		Overcurrent cutoff (during acceleration, deceleration, constant speed), regenerative overvoltage cutoff (during acceleration, deceleration, constant speed), overload cutoff (motor/inverter), fin overheating, fan error [6], overcurrent cut off, ground fault during start [7], external motor protection signal [8], PU connection error, number of retries, communications error, CPU error, undervoltage [9]								
	Protective structure		IP 20								
Others	Cooling		Self-cooling	Self-cooling	Self-cooling	Fan cooling	Self-cooling	Self-cooling	Fan cooling	Fan cooling	Fan cooling
	Stray power	(W)	20	45	50	85	40	50	80	110	170
	Weight	(kg)	0.6	0.8	1.0	1.5	1.5	1.5	1.5	1.6	1.7

Remarks:

[1] The specifications of the rated motor capacity are related to a motor voltage of 230V for 1phase output and 440V for 3phase output (max. ambient temperature of 50 °C).

[2] The overload capacity indicated in % is the ratio of the overload current to the inverters rated current. For repeated duty, allow time for the inverter and motor to return to or below the temperature and 100% load.

[3] The maximum output voltage cannot exceed the input voltage. The maximum output voltage may be programmed individually, but it must be input voltage.

[4] The input capacity changes with the values of the power supply side inverter impedances (including those of the input reactor and cables).

[5] The braking torque indicated is short-duration average torque (which varies with motor loss) when the motor alone is decelerated from 50Hz in the shortest time and is not a continuous regenerative torque. When the motor is decelerated from the frequency higher than the base frequency, the average deceleration torque will reduce. Since the inverter does not contain a brake resistor, use the optional brake resistor when regenerative energy is large. A brake unit (e.G. BU-UFS) may also be used.

[6] Only valid for frequency inverters equipped with a cooling fan.

[7] To activate the function, set parameter 40 to "1".

[8] The input OH is activated by the parameters on the function assignment of the input terminals (Pr. 60 to Pr. 63).

[9] When undervoltage or instantaneous power failure has occurred, alarm display or alarm output is not provided but the inverter itself is protected. Overcurrent, regenerative overvoltage, or other protection may be activated at power restoration according to the operating condition.

Product line		FR-S 520SE EC				FR-S 540E EC				
		-0.2 k	-0.4k	-0.75 k	-1.5 k	-0.4 k	-0.75 k	-1.5 k	-2.2 k	-3.7 k
Order information	Art. no.	158459	158460	158461	158462	158463	158464	158465	158466	158467

General Operating Conditions

Item	Specifications
Ambient temperature in operation	−10°C bis +50°C (non-freezing)
Storage temperature [1]	−20 to +65°C
Ambient humidity	Max. 90% (non-condensing)
Altitude	Max. 1000m above sea level. After that derate by 3% for every extra 500m up to 2500m.
Protective structure	Enclosed type IP 20
Shock resistance	10G (3 times each in 3 directions)
Vibration resistance	0.6G: resistance to vibrations from 10 to 55Hz for 2 hours along all 3 axes
Ambient conditions	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.
Approvals	UL / CSA / CE / EN

[1] Temperature applicable for a short period such as transportation.

Block Diagram (Source Logic)
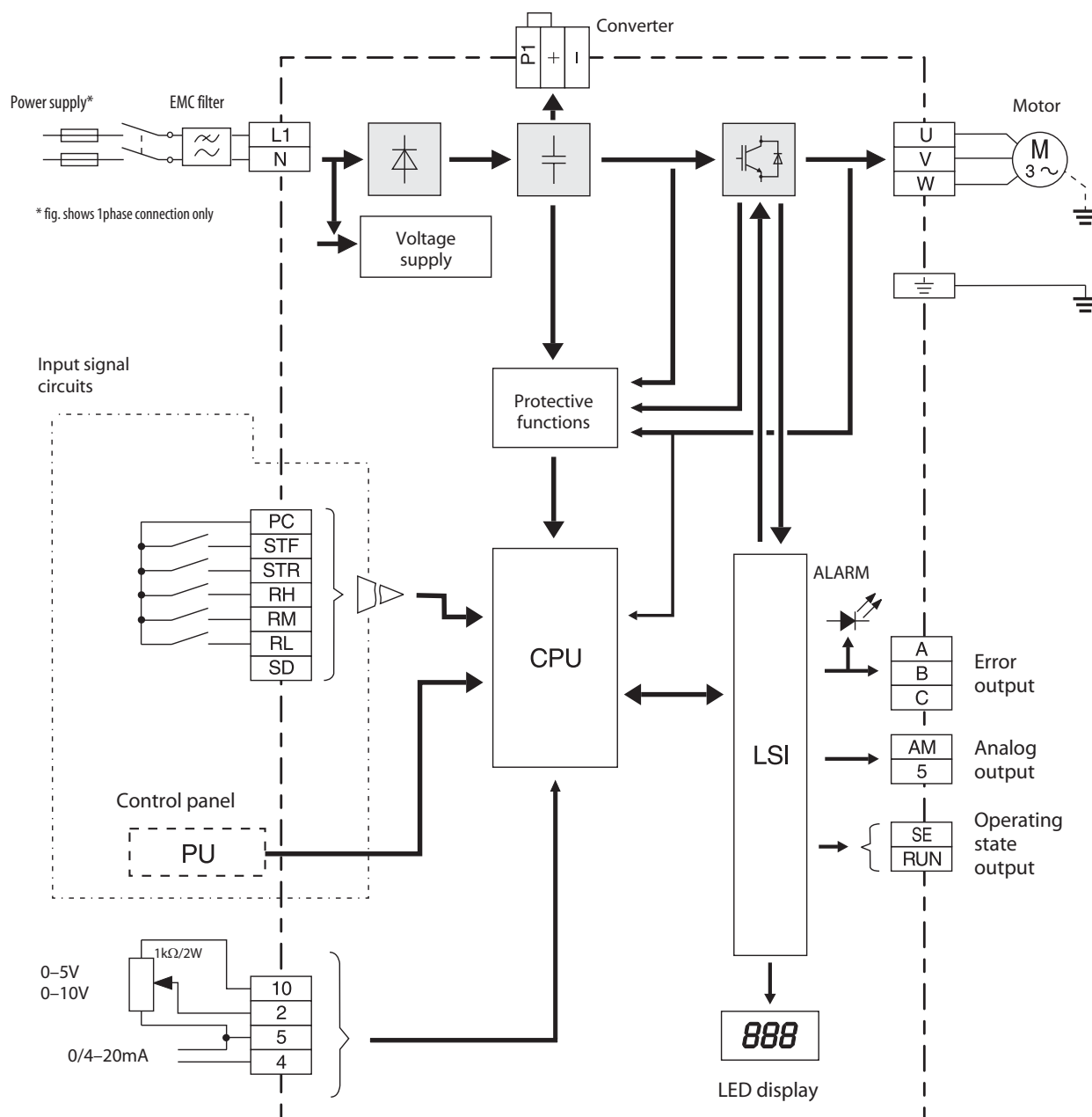
Terminal Assignment of Main Circuit Terminals

Funkction	Terminal	Terminal name	Description
Main circuit connection	L1, N	Power supply 1phase	Power supply of the inverter types FR-S 520SE EC (200–240VAC, 50/60Hz)
	L1, L2, L3, N	Power supply 3phase	Power supply of the inverter types FR-S 540E EC (380–480VAC, 50/60Hz)
	+, −	External brake unit connection	An external brake unit can be connected to the terminals + and − .
	P1, +	Converter choke coil connection	An optional choke coil can be connected to the terminals P1 and +. Before connecting the choke coil, disconnect the jumper from terminals P1 and +.
	U, V, W	Motor connection	Voltage output of the inverter (3phase, 0V up to input voltage, 0.5–120Hz)
	⏚	PE	Protective earth connection of inverter

⯁ MITSUBISHI ELECTRIC

Terminal Assignment of Signal Terminals

Function	Terminal	Terminal name	Description
Control connection	STF	Forward rotation start	The motor rotates forward, if a signal is applied to terminal STF. If the signals STF and STR are applied simultaneously, the STOP command is executed.
	STR [3]	Reverse rotation start	The motor rotates reverse, if a signal is applied to terminal STR. If the signals STF and STR are applied simultaneously, the STOP command is executed.
	RH, RM, RL [3]	Multi-speed selection	Up to 15 different output frequencies can be preset; for the speed commands the following priorities apply: Jog, speed selection (RH, RM, RL, RX) and AU.
Common	SD [1]	Common sink for contact input/reference potential	A determined control function is activated, if the corresponding terminal is connected to the terminal SD. The SD terminal is isolated from the digital circuits via optocouplers. When connecting the transistor output (open collector output), such as a programmable controller (PLC), connect the negative external power supply for transistor output to this terminal to prevent a malfunction caused by undesirable currents. When source logic has been selected, connect this terminal with 0V of the external power supply.
	PC [1]	+24VDC output and common source for contact input/reference potential	24VDC / 0.1A output via PC-SD In sink logic, when activated by open collector transistors (e.g. PLC) the positive pole of an external power supply has to be connected to the PC terminal. In source logic, the PC terminal serves as common reference point for the control inputs.
Setting value specification	10	Voltage output for potentiometer	Output voltage 5VDC Max. output current 10mA Recommended potentiometer: 1kΩ, 2W linear (multi-turn potentiometer)
	2	Input for frequency setting value signal	The voltage setting value 0−5 (10)V is applied to this terminal. The voltage range is preset to 0−5V. The input resistance is 10kΩ. The maximum permitted voltage is 20V.
	5	Reference point for frequency setting value signal	Terminal 5 is the reference point for all analog setting values and for the analog output signal AM. The terminal is not isolated from the reference potential of the control circuit and should not be earthed for reasons of noise immunity.
	4	Input for current setting value signal 0/4−20mADC	The current setting value signal (4−20mADC) is applied to this terminal. The input is active only if the AU signal is set. The function of the AU signal is assigned via parameters 60 to 63. The input resistance is 250Ω., the maximum permitted current is 30mA. By default, this signal is set to 0Hz at 4mA and 50Hz at 20mA.
Signal outputs	A, B, C [4] [5]	Potential free alarm output	The alarm is output via relay contacts (C-B = Normally Open, C-A = Normally Closed). The maximum contact load is 230VAC / 0.3A or 30VDC / 0.3A.
	RUN [2] [4]	Signal output for motor operation	The output is switched low (that means, that the voltage of terminal SE is output), 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. The maximum contact load is 24VDC / 0.1A. (The voltage drop is 3.4V maximum, when the signal is on.)
	SE [6]	Reference potential for signal outputs	Reference potential for the signal RUN. This terminal is isolated from the reference potential of the control circuit 5 and SD.
	AM	Analog output	The output can be used for external frequency output or motor current output. The functions are determined by parameters. A DC voltmeter can be connected. The output signal across terminals AM-5 is factory set to about 5VDC at 50Hz and is proportional to the corresponding output frequency. The max. output voltage is 5V. The maximum permitted output current is 1mA.
Interface	—	Connection of control panel (RS485)	Communications via RS485 I/O standard: RS485, Multi-drop operation, max. 19200 Baud

Remarks:

[1] The terminals PC and SD must not be connected to each other.
  In source logic (initial setting), the terminal PC serves as common reference point for the control inputs.
  In sink logic, the terminal SD serves as common reference point for the control inputs.

[2] Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).

[3] The following function assignments of the input terminals are supported: RL, RM, RH, RT, AU, STOP, MRS, OH, REX, JOG, RES, X14, X16 und (STR).

[4] The following function assignments of the output terminals are supported: RUN, SU, OL, FU, RY, Y12, Y13, FDN, FUP, RL, Y93, Y95, LF und ABC.

[5] To be compliant with the European Directive (Low Voltage Directive), the operating capacity of relay outputs (A, B, C) should be 30VDC 0.3A.

[6] When source logic has been selected, connect this terminal with the positive pole of the external power supply.

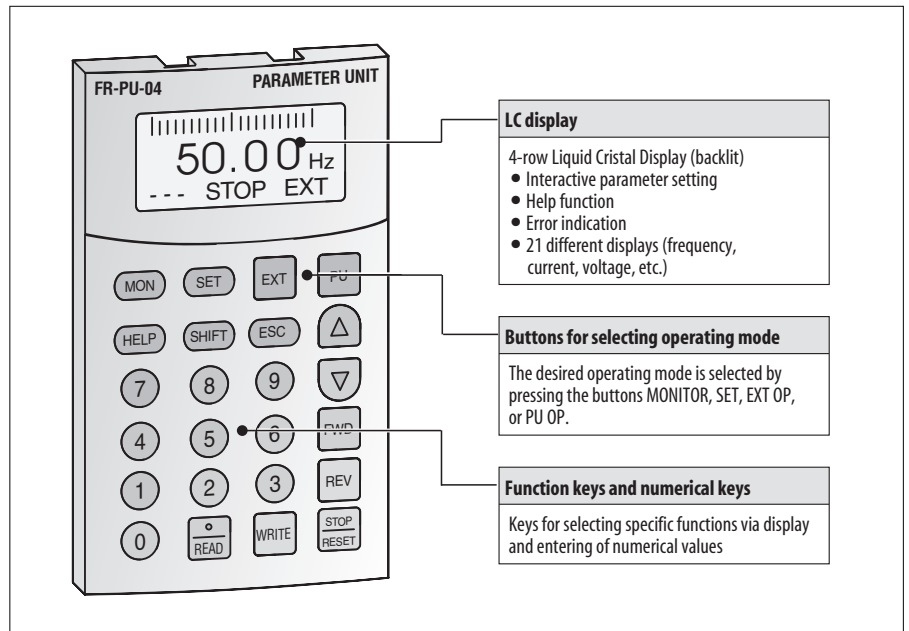## Parameter Unit FR-PU04 (Optional)

The parameter unit FR-PU04 including extended functions is available as optional accessory. It provides a 10-key keypad for entering directly numerical values.
A 4-row LC display returns operational data, parameter names, or status and error messages in uncoded text. The parameter unit displays text in the following selectable languages:
English, German, French, Spanish, Swedish, Italian, Finnish, and Japanese.

In addition to the functions of the integrated control panel the FR-PU04 displays and monitors 21 different values and states in total.

Only those functions supported by the FR-S500E can be invoked. For the connection the connecting cable FR-A5 CBL is required.

LC display

4-row Liquid Cristal Display (backlit)
- Interactive parameter setting
- Help function
- Error indication
- 21 different displays (frequency, current, voltage, etc.)

Buttons for selecting operating mode

The desired operating mode is selected by pressing the buttons MONITOR, SET, EXT OP, or PU OP.

Function keys and numerical keys

Keys for selecting specific functions via display and entering of numerical values

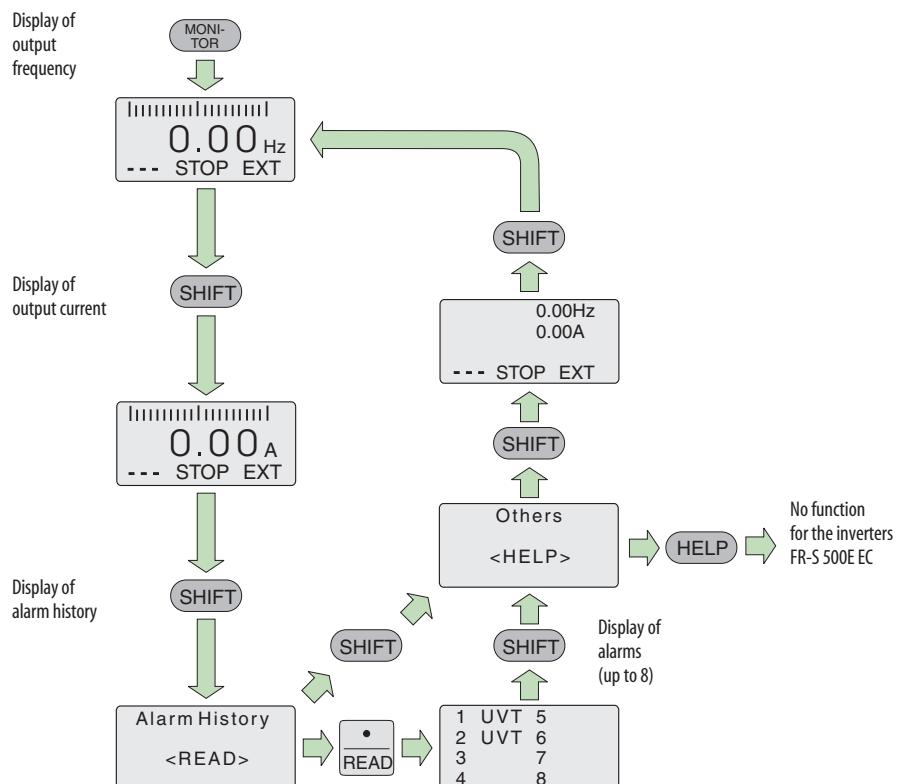## Menu Guide to the Parameter Unit FR-PU04

Displaying parameter lists

Press the SET key to enter the parameter setting menu. Then press the HELP key to display the parameter lists. After pressing the READ key, the according parameter value will be read in.

Copying parameters

Press the SET key and then the ▲ key to enter the copy mode. There are the following three options:
- Press the READ key to read out all parameters from the inverter.
- Press the WRITE key to write parameters to the inverter.
- Press the ▼ key to verify the values stored in the parameter unit and the inverter.

Display of output frequency

Display of output current

Display of alarm history

Display of alarms (up to 8)

No function for the inverters FR-S 500E EC

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Operating Modes

The inverter can alternatively be operated via external signals or directly via the integrated control panel or an external parameter unit such as FR-PU04. A combined operation is possible too.

The operating mode on the integrated control panel is selected within the operation mode menu. The operating mode on the parameter unit FR-PU04 is selected by pressing the EXT OP key for external signal operation or pressing the PU OP key for parameter unit operation.

Sample connection

FR-S 500E EC

These connections are required for combined operation or operation via external signals.
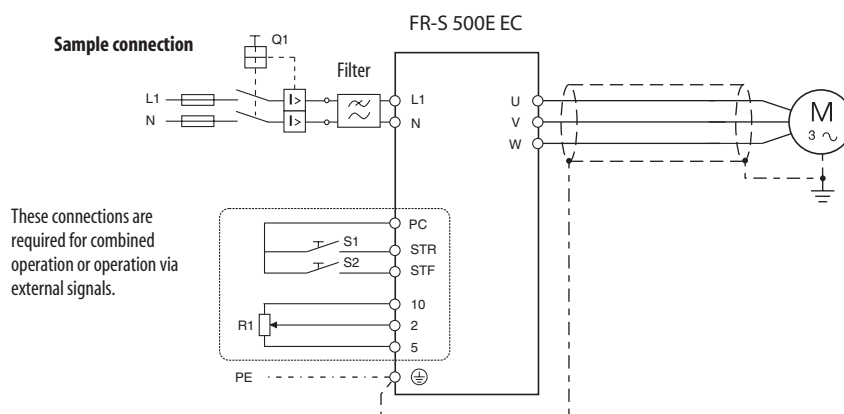
Operation via the integrated control panel

The direction of rotation and frequency setting of the inverter are controlled via the integrated control panel.

The setting of the output frequency is increased or decreased via the "digital dial".

The example below shows the operational steps for a frequency setting including a following motor start and motor stop.

Operation via external signals

The direction of rotation and frequency setting of the inverter are controlled by external signals. The following figure shows the display on the integrated control panel for forward rotation of the motor and a frequency of 50Hz.

Combined operation

In addition to the operation via external signals and via integrated control panel or external parameter unit the inverter can be operated in combined operation mode.

● Setting value preset via the control panel or parameter unit and external starting signal
● External setting value signal and starting signal via the control panel or parameter unit

① Press the PU/EXT key.

② Adjust the frequency via the "digital dial".

③ Set the frequency via the SET key.

④ Start the motor via the RUN key.

⑤ Stop the motor.

Parameters

Function	Parameter	Meaning	Setting range	Default setting
Basic parameters	0	Torque boost (manual)	0–15%	6 % / 5 % / 4 % [1]
	1	Maximum output frequency	0–120Hz	60Hz
	2	Minimum output frequency	0–120Hz	0Hz
	3	V/f characteristics (base frequency)	0–120Hz	60Hz
	4	1. Multispeed preset - RH [2]	0–120Hz	60Hz
	5	2. Multispeed preset - RM [2]	0–120Hz	30Hz
	6	3. Multispeed preset - RL [2]	0–120Hz	10Hz
	7	Acceleration time	0–999s	5s
	8	Deceleration time	0–999s	5s
	9	Electronic thermal overload relay (motor protection)	0–50A	Rated output current
	30	Extended function diaplay selection [2]	0 / 1	0
	79	Operating mode selection	0–4 / 7 / 8	0
Parameters for standard drive operation	10	DC injection brake (initial frequency)	0–120Hz	3Hz
	11	DC injection brake (operation time)	0–10s	0.5s
	12	DC injection brake (voltage)	0–15%	6%
	13	Starting frequency	0–60Hz	0.5Hz
	14	Selection of load pattern	0–3	0
	15	JOG frequency	0–120Hz	5Hz
	16	JOG acceleration and deceleration time	0–999s	0.5s
	17	RUN key rotation direction selection	0 / 1	0
	19	Max. output voltage	0 –800V / 888 / —	888
	20	Acceleration / deceleration reference frequency	1–120Hz	50Hz
	21	Acceleration / deceleration time increments	0 – 31 / 100	0
	22	Stall prevention operation level [2]	0–200%	150%
	23	Stall prevention operation at double speed	0–200% / —	—
	24	4. Multispeed preset [2]	0–120Hz / —	—
	25	5. Multispeed preset [2]	0–120Hz / —	—
	26	6. Multispeed preset [2]	0–120Hz / —	—
	27	7. Multispeed preset [2]	0–120Hz / —	—
	28	Stall prevention operation reduction starting frequency	0–120Hz	50Hz
	29	Acceleration / deceleration pattern	0 / 1 / 2	0
	31	Frequency jump 1A	0–120Hz / —	—
	32	Frequency jump 1B	0–120Hz / —	—
	33	Frequency jump 2A	0–120Hz / —	—
	34	Frequency jump 2B	0–120Hz / —	—
	35	Frequency jump 3A	0–120Hz / —	—
	36	Frequency jump 3B	0–120Hz / —	—
	37	Speed display	0 / 0.1–999	0
	38	Frequency at 5V (10V) input voltage	1–120Hz	50Hz
	39	Frequency at 20mA input current	1–120Hz	50Hz
	40	Ground fault detection	0 / 1	1
Settings of control outputs	41	Setting value / current value comparison (SU output)	0–100%	10%
	42	Output frequency monitoring (FU output)	0–120Hz	6Hz
	43	Output frequency detection for reverse rotation	0–120Hz / —	—
2nd parameter set	44	2. Acceleration / deceleration	0–999s	5s
	45	2. Deceleration time	0–999s / —	—
	46	2. Manual torque boost	0–15% / —0	—
	47	2. V/f characteristics	0–120Hz / —	—

Function	Parameter	Meaning	Setting range	Default setting
Current detection	48	Output current detection level	0–200%	150%
	49	Output current detection signal delay time	0–10s	0s
	50	Zero current detection level	0–200%	5s
	51	Zero current detection time	0.05–1s	0.5s
Display functions	52	Control panel display data selection [2]	0 / 1 / 100	0
	53	Digital Dial function selection [2]	0 / 1	0
	54	Output AM terminal [2]	0 / 1	0
	55	Frequency monitoring reference [2]	0–120Hz	50Hz
	56	External current monitoring reference [2]	0–50A	Rated current
Restart	57	Restart coasting time after power failure	0–5s / —	—
	58	Restart cushion time before automatic synchronisation	0–60s	1s
Aux. function	59	Selection of digital motor potentiometer	0 / 1 / 2	0
Terminal function selection	60	RL terminal function	0–10 / 14 / 16	0
	61	RM terminal function	0–10 / 14 / 16	1
	62	RH terminal function	0–10 / 14 / 16	2
	63	STR terminal function	0–10 / 14 / 16 / —	—
	64	RUN terminal function	0 / 1 / 3 / 4 / 11–16 / 98 / 99	0
	65	ABC terminal function	0 / 1 / 3 / 4 / 11–16 / 93 / 95 / 98 / 99	99
Operation selection functions	66	Retry selection	0 / 1 / 2 / 3	0
	67	Number of restart retries	0–10 / 101–110	0
	68	Waiting time for automatic restart retry	0.1–360s	1s
	69	Retry count display erasure	0	0
	70	Soft PWM setting [2]	0 / 1 / 10 / 11	1
	71	Motor selection	0 / 1 / 100 / 101	0
	72	PWM function [2]	0–15	1
	73	Specification of setting value input data	0 / 1	0
	74	Setting value signal filter	0–8	1
	75	Reset selection / PU stop selection [2]	0 / 1 / 14 / 15	14
	76	Cooling fan operation selection	0 / 1	1
	77	Write protection for parameters [2]	0 / 1 / 2	0
	78	Prevention of reverse rotation	0 / 1 / 2	0
Motor constants	80	8. Multispeed preset [2]	0–120Hz / ---	—
	81	9. Multispeed preset [2]	0–120Hz / ---	—
	82	10. Multispeed preset [2]	0–120Hz / ---	—
	83	11. Multispeed preset [2]	0–120Hz / ---	—
	84	12. Multispeed preset [2]	0–120Hz / ---	—
	85	13. Multispeed preset [2]	0–120Hz / ---	—
	86	14. Multispeed preset [2]	0–120Hz / ---	—
	87	15. Multispeed preset [2]	0–120Hz / ---	—
	88	PID action selection	20 / 21	20
	89	PID proportional band [2]	0.1–999% / —	100%
	90	PID integral time [2]	0.1–999s / —	1s
	91	PID upper limit	0–100% / —	—
	92	PID lower limit	0–100% / —	—
	93	PID action set point for PU operation [2]	0–100%	0%
	94	PID differential time [2]	0.01–10s / —	—
Slip compensation	95	Rated motor slip	0–50% / —	—
	96	Slip compensation time constant	0.01–10s	0.5s
	97	Output region for slip compensation	0 / —	—
Autom. torque boost	98	Automatic torque boost (motor capacity)	0.1–3.7kW / —	—
	99	Motor primary resistance constant A	0–50Ω / —	—

Function	Parameter	Meaning	Setting range	Default setting
Maintenance function	H1 (503) [4]	Maintenance timer	0–999	0
	H2 (504) [4]	Maintenance timer alarm output set time	0–999	36 (3600h)
	H3 (555) [4]	Current average time	0.1–1s	1s
	H4 (556) [4]	Data output mask time	0–20s	0s
	H5 (557) [4]	Current average value monitor signal output reference current	0.1–999A	1A
Additional function	H6 (162) [4]	Automatic restart after instantaneous power failureselection	0 / 1 / 10	1
	H7 (559) [4]	Second electronic thermal O/L relay	0–50A / —	—
Calibration functions	C1 (901) [4]	AM terminal calibration [2]	Calibration range	—
	C2 (902) [4]	Frequency setting voltage bias frequency	0–60Hz	0Hz
	C3 (902) [4]	Frequency setting voltage bias	0–300%	0% [3]
	C4 (903) [4]	Frequency setting voltage gain	0–300%	96% [3]
	C5 (904) [4]	Frequency setting current bias frequency	0–60Hz	0Hz
	C6 (904) [4]	Frequency setting current bias	0–300%	20% [3]
	C7 (905) [4]	Frequency setting current gain	0–300%	100% [3]
	C8 (269) [4]	Parameter set by manufacturer: Do not set!	—	—
Clear functions	CLr	Clear parameter	0 / 1 / 10	0
	ECL	Clear alarm history [2]	0 / 1	0
Communication functions	n1 (331) [4]	Station number	0–31	0
	n2 (332) [4]	Communication speed	48 / 96 / 192	192
	n3 (333) [4]	Stop bit length / data length	0 / 1 data length 8 10 / 11 data length 7	1
	n4 (334) [4]	Parity check	0 / 1 / 2	2
	n5 (335) [4]	Number of communication retries	0–10 / —	1
	n6 (336) [4]	Communication check time interval	0–999s/ —	—
	n7 (337) [4]	Wait time setting	0–150ms / —	—
	n8 (338) [4]	Operation command write	0 / 1	0
	n9 (339) [4]	Speed command write	0 / 1	0
	n10 (340) [4]	Link start mode selection	0 / 1	0
	n11 (341) [4]	CR / LF selection	0 / 1 / 2	1
	n12 (342) [4]	E²PROM selection	0 / 1	0
	n13 (145) [4]	PU display language	0–7	1
	n14 (990) [4]	PU buzzer sound control [2]	0 / 1	1
	n15 (991) [4]	PU contrast adjustment [2]	0–63	58
	n16 (992) [4]	PU main display screen data selection [2]	0 / 100	0
	n17 (993) [4]	PU disconnection detection / PU setting lock	0 / 1 / 10	0

Remarks:

[1] FR-S 520SE EC, FR-S 540E-0.4 k and 0.75 k = 6%, FR-S 540E-1,5 k and 2,2 k = 5%, FR-S 540E-3.7 k = 4%

[2] The settings of the parameters can be changed during operation, provided parameter 77 is set to "0". Parameters 53, 70, and 72 can only be changed during PU operation.

[3] The values depend on the settings of the calibration parameters.

[4] The parameter numbers in brackets are displayed by the parameter unit FR-PU04.
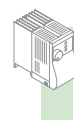
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Overview of protective functions

The inverters FR-S 500E EC provide a large number of protective functions that protect the drive and the inverter against damage in case of any malfunction.

If an error occurs, the output of the inverter is suspended and the control panel returns an error message.

Display	Meaning	Description	Remedy
OC1	Overcurrent 1 (acceleration)	A) The output current of the inverter has reached or exceeded 200% of the rated current during acceleration, deceleration, or at constant speed. B) The temperature of the main circuits of the inverter rises rapidly.	The cause for the activation of the protective function is a short circuit or a ground fault across the main outputs, an exceeding moment of inertia of the load (GD^2), too short acceleration / deceleration time presets, restart during a motor idling phase, operation of a motor with an exceeding capacity. For a coasting drive remedy by using the function for detecting the motorspeed at start. Overheating due to insufficient cooling (defective cooling fan or choked heat sink).
OC2	Overcurrent 2 (constant speed)		
OC3	Overcurrent 3 (deceleration)		
OV1	Overvoltage 1 (acceleration)	The converter voltage has increased highly due to regenerative energy. The overvoltage limit was exceeded during acceleration, deceleration, or at constant speed.	In most cases the protective function is activated due to a too short deceleration time preset or a regenerative overload. Increase the deceleration time by connecting an external brake unit. An overvoltage in the mains power supply activates this protective function as well. For a coasting drive remedy by using the function for detecting the motorspeed at start.
OV2	Overvoltage 2 (constant speed)		
OV3	Overvoltage 3 (deceleration)		
THN	Overload (motor)	The electronic overload protection for the motor or inverter was activated.	Decrease the motor load to avoid an activation. Check whether the performance range of the motor and inverter correspond.
THT	Overload (inverter)	The electronic motor protection switch continually detects the motor current and the output frequency of the inverter. If a self-cooling motor operates over a long period at low speed but high torque, the motor is thermally overloaded and the protective function is activated. If several motors are operated by one inverter the motor protection switch will not operate properly. In this case deactivate the motor protection and replace it by external protection switches.	
FIn	Fin overheat	If the cooling fin overheats, the fin overheat sensor activates and halts inverter output.	Check ambient temperature.
Fn	Fan breakdown	The cooling fan breaks down or an operation different from the setting of parameter 76 is performed.	Replace cooling fan. Check parameter 76.
GF	Ground fault	An overcurrent occured due to a ground fault upon the inverter output (load side).	Check load connections (motor circuit).
OHT	Activation of an external motor protection relay (thermal contact)	An external motor protective switch was activated. If an external motor protective switch for thermal monitoring is used, this switch can activate the protective function of the inverter.	Check motor load and drive.
OLT	Stall prevention overload	A long lasting excess of the current limit (OL display) shuts down the inverter.	Reduce the load. Check the preset values for the current limit (parameter 22) and the stall prevention selection (parameter 21).
OPT	Communication error	The protective function is activated, if a setting or connection error occurs during serial communication.	Check connections and connectors of the optional unit.
PE	Memory error	Error on access of the data memory of the inverter.	Please contact your nearest MITSUBISHI ELECTRIC representative if the error occurs again.
PUE	Parameter unit connection error	A connection error between inverter and external parameter unit occurred during operation. This alarm is only returned, if parameter 17 is set to "1".	Check the connection of the parameter unit.
rET	Automatic restart retry exceeded	After activation of a protective function the inverter failed to be restarted automatically within the number of retries specified in parameter 67.	Remedy the actual cause of the originary protective function.
CPU	CPU error	Scan time of CPU was exceeded. Failure on CPU printed circuit board.	Restart the inverter. Contact the MITSUBISHI ELECTRIC customer service if the error occurs again.
PS	Inverter was stopped via control panel or PU	STOP key on the control panel or PU was pressed during external operating mode.	Check parameter 75.

Display	Meaning	Description	Remedy
OL	Overcurrent during acceleration	If a current of more than 150% [1] of the rated inverter current flows in the motor, this function stops the increase of the frequency until the overload current reduces to prevent the inverter from resulting in overcurrent shut-off. When the overload current has reduced below 150%, this function increases the frequency again.	Change the acceleration/deceleration time. Increase the stall prevention operation level via parameter 22. Disable the stall prevention via parameter 21. Check whether the torque boost in parameter 0 is set higher than required.
	Overcurrent during constant speed	If a current of more than 150% [1] of the rated inverter current flows in the motor, this function lowers the frequency until the overload current reduces to prevent the inverter from resulting in overcurrent shut-off. When the overload current has reduced below 150%, this function increases the frequency up to the set value.	
	Overcurrent during deceleration	If a current of more than 150% [1] of the rated inverter current flows in the motor, this function stops the decrease of the frequency until the overload current reduces to prevent the inverter from resulting in overcurrent shut-off. When the overload current has reduced below 150%, this function decreases the frequency again.	
oL	Overvoltage during deceleration	If the regenerative energy of the motor exceeds the brake capacity of the inverter, this function stops the decrease of the frequency to prevent overvoltage shut-off. When the regenerative energy has reduced, deceleration resumes.	Increase the deceleration time via parameter 8.
Uu	Undervoltage	The power supply voltage is too low (Ue = 115VAC).	Check the power supply voltage.
Er1	Write error	Write was performed with "1" (write disable) set in parameter 77 or frequency jump setting range overlapped or parameter write was performed via the control panel although it was not write enabled.	Check the settings of parameters 77, 31 to 36, and 17.
Er2	Write error	Write was performed during operation or in the external operation mode or an attempt was made to change the operation mode set by an operation command via parameter 79.	Stop operation before changing settings. Select PU (parameter unit) operation mode.
Er3	Calibration error	Analog input bias and gain are set too closely.	Check the settings of parameters C3, C4, C6, and C7.
Err	Error (general)	Error in the internal CPU	Contact your MITSUBISHI ELECTRIC customer service.

① The stall prevention operation current (Pr. 22) may be set to any value. It is factory set to 150%.

Activating a protective function and resetting methods

When a protective function is activated, the output of the inverter is switched off. The motor runs until stop. The output remains switched off until the error cause is eliminated and the inverter is reset. The inverter can be reset following four different methods:

● Switch the power supply OFF and ON again.
● Switch the reset signal ON for at least 0.1s and switch it OFF again. (shortly connect the terminals RES and SD (sink logic) or RES and PC (source logic))
● Press the RESET key on the integrated control panel.
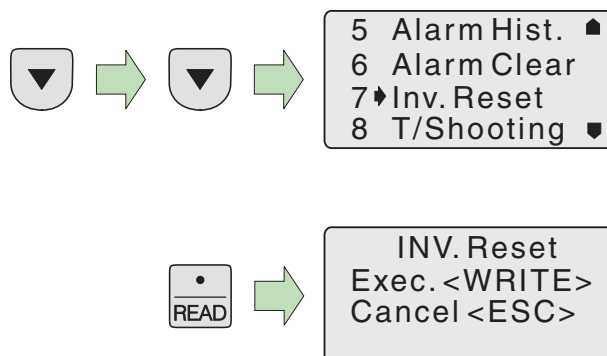● Menu-guided reset via the optional parameter unit FR-PU04

If the reset signal is ON continuously, the integrated control panel returns an error message while the control unit FR-PU04 indicates that the reset procedure is in progress.

When a protective function is activated, the control panel returns an error code as listed in the table above.

The parameter unit FR-PU04 returns a more detailed error message.

If an error occurs and the input protection contactor is triggered, the error message cannot be retained, since there is no power supply for the control circuit.

Menu-guided reset via FR-PU04

```
5  Alarm Hist.  ▲
6  Alarm Clear
7 ▸Inv. Reset
8  T/Shooting  ▼
```

```
INV. Reset
Exec. <WRITE>
Cancel <ESC>
```

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Sample Applications

Automatic operation using DC (0/4–20mA) current signals

The figure on the right shows the layout of a circuit for automatic operation when used in combination with controllers such as temperature control for air-conditioners.

It can be switched from inverter operation to commercial power supply operation and vice versa. To switch from commercial power supply operation to inverter operation, the motor has to be stopped first.

Operation automatically switches to commercial power supply operation when an alarm stop occurs in the inverter.

Assign the AU signal to the RM terminal to switch between a 4 to 20mA signal from the controller and a manual signal (voltage) from the speed setter.

Parameter 75 should be set so that the reset input signal can be changed to an error reset only when an inverter alarm has been stopped.

Related parameters:

Pr. 75 "Reset selection", Pr. 60 to Pr. 63 "Input terminal function selection"
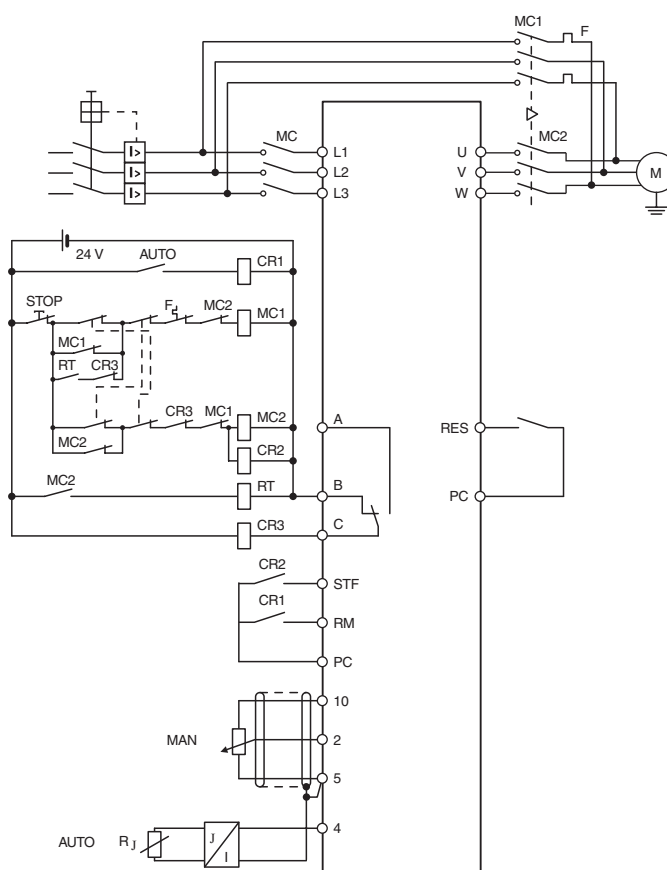
Multi-speed operation (with Mitsubishi PLC)

The figure on the right shows the layout of a sample circuit for multi-speed operation with a Mitsubishi PLC. The PLC is equipped with a digital output module AY80.

To prevent wrap-arounds, the output modules common pin 10 for preventing wrap-arounds must be connected to inverter terminal SD.

A variety of functions for the inverters transistor input signals (RH, RM, STOP etc.) are selectable using parameter 60 to 63. These inverter output signals (RUN, ABC), however, can be received at a separate digital input module.

Up to 15 speeds can be set with the multi-speed setter, and by shorting terminals 10 and 2 for an upper limit frequency setting (Pr. 1) and terminals 2 and 5 for a lower limit frequency setting (Pr. 2) 17 speeds can be obtained.
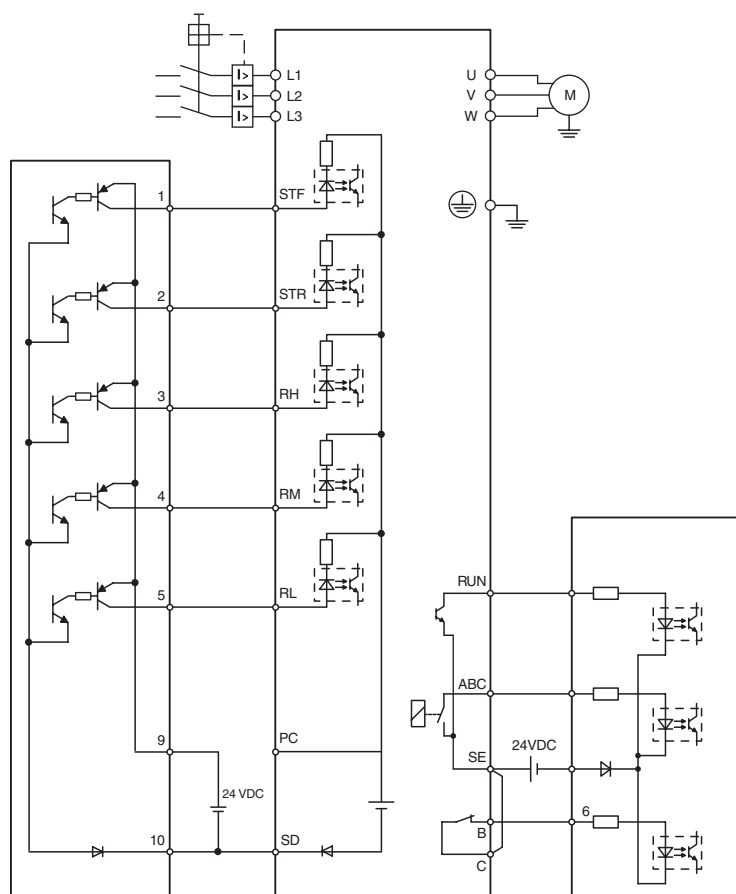
Options

External options

Besides the parameter unit FR-PU04 that provides an interactive control of the inverter the external options include noise filters complying with the EMC directives, filters improving the efficiency as well as brake units and brake resistors.

Option		Type	Description	Remarks / specifications	Art. no.
External options	Parameter unit (8 languages)	FR-PU04	Interactive parameter unit with LC display	For details refer to p.12.	67735
	Connection cable for the parameter unit	FR-A5 CBL	Cable for a remote connection of the parameter unit FR-PU04.	Available length: 1; 2.5 and 5 m	1 m: 70727 2.5 m: 70728 5 m: 70729
	Interface cable	SC-FR PC	Communications cable for RS232 or RS485 interface to connect an external personal computer	Length 3 m; can be used for example with the VFD Setup Software	88426
	VFD Setup Software	FR-SW0-SETUP-W☐	Parameter and setup software for the FR-S 500E, FR-E 500, FR-F500, FR-F 700 and FR-A 500 series inverters	English / German	149718
	EMC noise filter — FR-S 520SE-0.2–0.75k EC	FFR-S520S-14A-RF1	Noise filter for the FR-S 520SE series for compliance with EMC directives	For details refer to p. 21	see p. 21
	FR-S 520SE-1.5k EC	FFR-S520S-20A-RF1			
	FR-S 540E-0.4–1.5 k EC	FFR-S540-8A-RF100	Noise filter for the FR-S 540E series for compliance with EMC directives	For details refer to p. 21	138425
	FR-S 540E-2.2–3.7 k EC	FFR-S540-13A-RF100			138423
	Brake unit — FR-S 520SE EC	BU-UFS-22J	For improving the brake capacity. For loads with high moment of inertia or negative loads. Used in combination with a resistor unit.	For details refer to p. 21	127962
	FR-S 540E EC	BU-UFS-22			127947
	DIN rail mounting set	FR-UDA 01	Adapter for mounting frequency inverters up to 0.75 k on a DIN rail	When using the DIN rail adapter, filters can not be footprint mounted	130833
		FR-UDA 02	Adapter for mounting frequency inverters from 1.5 k on a DIN rail		130832
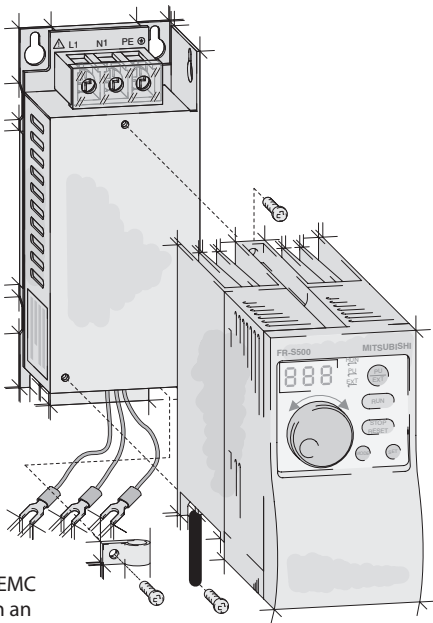
Installing an EMC noise filter on an FR-S 520SE EC
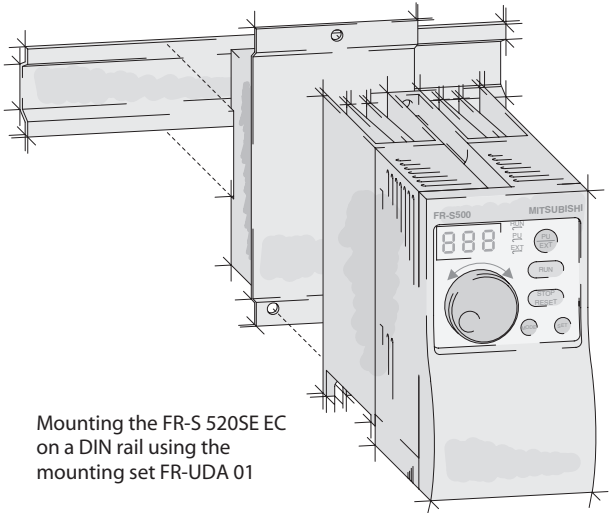
Mounting the FR-S 520SE EC on a DIN rail using the mounting set FR-UDA 01

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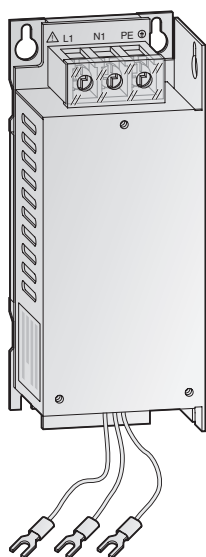
■ **Noise Filters**

Noise filters

For complying with the EMC directives of the European Community regarding the electromagnetic compatibility, the FR-S 500E inverter has to be equipped with a noise filter across the input circuit. Additionally it has to be installed and wired according to the EMC directives.

To ensure a proper and safe operation of the components follow the points below:

● For the selection of a ground fault protective switch or relay take the leakage current of the filter into account.

● Ensure a perfect grounding of the filter, if you do not intend to use a protective switch or relay across the input circuit.

Filter	Inverter	Power loss [W]	Rated current [A]	Leakage current [mA]	Weight [kg]	Art no.
FFR-S520S-14A-RF1 [1]	FR-S 520SE-0.2 k–0.75 k EC	6.5	14	< 7	0.8	152736
FFR-S520S-20A-RF1 [2]	FR-S 520SE-1.5 k EC	12	20	< 10	1.0	152740
FFR-S540-8A-RF100 [3]	FR-S 540E-0.4–1.5 k EC	5.1	8	< 10	0.8	138425
FFR-S540-13A-RF100 [3]	FR-S 540E-2.2–3.7 k EC	7.1	13	< 10	0.9	138423

[1] The filters can provide conformity with the limits for: Environment 1 (unrestricted distribution) with motor cable lenght of up to 30m, Environment 1 (restricted distribution) with motor cable lenght of up to 75m, 100 A limits of Environment2 with motor cable lengths of up to 75m.

[2] The filters can provide conformity with the limits for: Environment 1 (unrestricted distribution) with motor cable lenght of up to 30m, Environment 1 (restricted distribution) with motor cable lenght of up to 100m, 100 A limits of Environment2 with motor cable lengths of up to 100m.

[3] The filters can provide conformity with the limits for: Environment 1 (unrestricted distribution) with motor cable lenght of up to 20m, Environment 1 (restricted distribution) with motor cable lenght of up to 100m, 100 A limits of Environment2 with motor cable lengths of up to 100m.

■ **Brake Units**
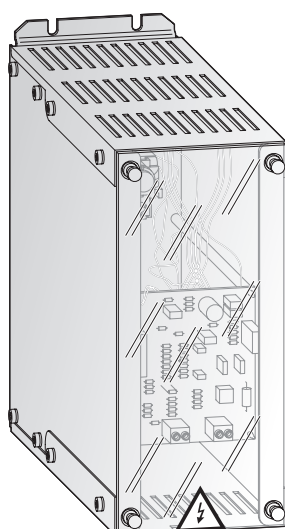
Brake units

If an application demands a braking torque higher than 20% of the nominal motor torque, an external brake unit including the appropriate resistors has to be installed.

The brake units BU-UFS listed below are cascadable and therefore always providing the optimum adjustment.

For informations on the dimensioning of the appropriate brake resistors please refer to the appropriate brake unit manual.

Inverter	Brake unit	Application	Rated voltage	Braking torque	Art no.
FR-S 520SE EC	BU-UFS22J	FR-S 520SE-0.2–1.5 k	200V	100%, 15s	127962
FR-S 540E EC	BU-UFS22	FR-S 540E-0.4–3.7 k	400V	100%, 15s	127947

■ Parameter Unit FR-PU04

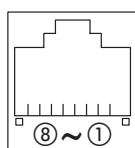All dimensions in mm
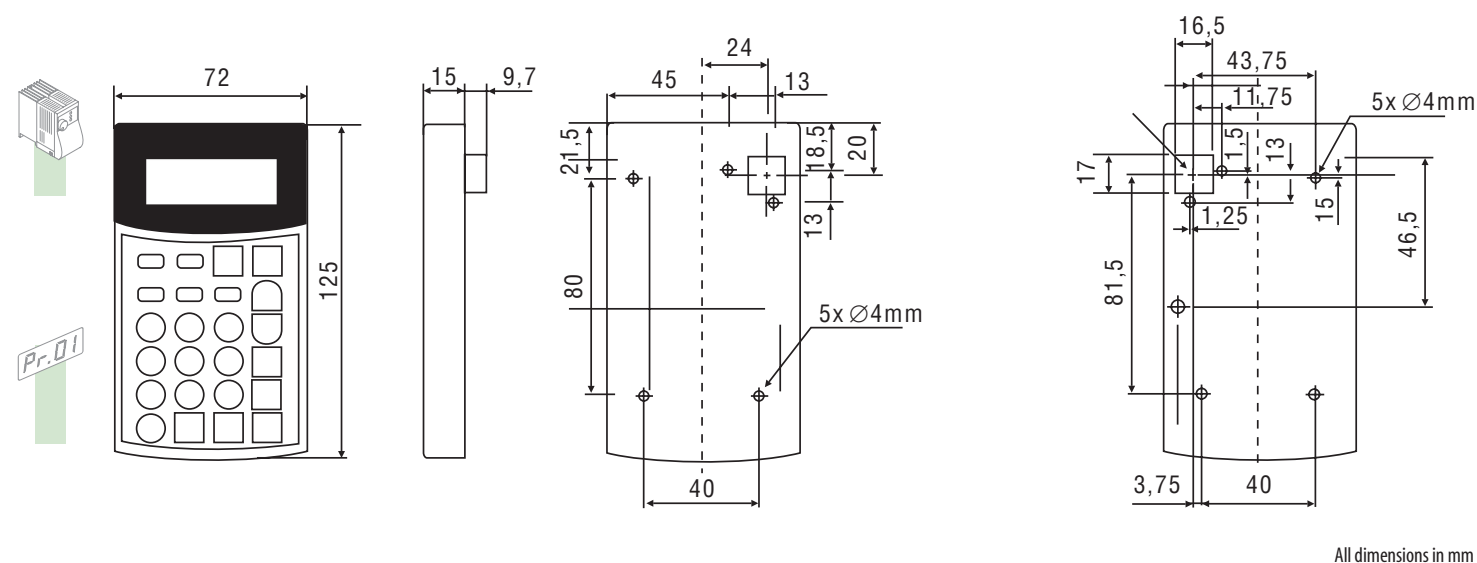
Connecting the parameter unit

After the protective cover has been removed, the parameter unit can be installed directly on the inverter. The parameter unit can be connected to the inverter remotely via the connecting cable FR-A5-CBL (1m; 2.5m; 5m). You must use only the original MITSUBISHI ELECTRIC cable. This cable is optionally available.

Plug the cable in the according connectors on the parameter unit and the inverter.

The figure aside shows the pin assignment of the connector plugs.

Do not connect fax modems, LAN network boards, or modular telephone plugs with the connectors. Otherwise, the inverter might be damaged.

The connector for the parameter unit can as well be used to connect a personal computer via the communications cable SC-FR PC.

① SG ⑤ SDA
② P5S ⑥ RDB
③ RDA ⑦ SG
④ SDB ⑧ P5S

⟁ MITSUBISHI ELECTRIC

■ FR-S 520SE-0.2 k to 0.75 k EC
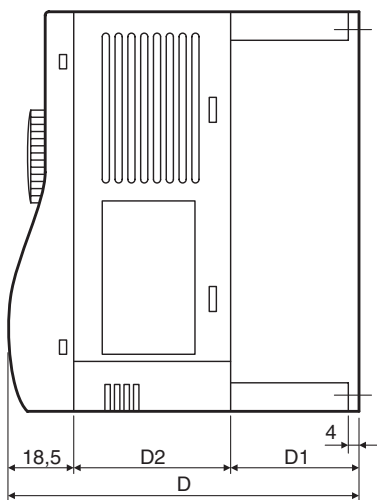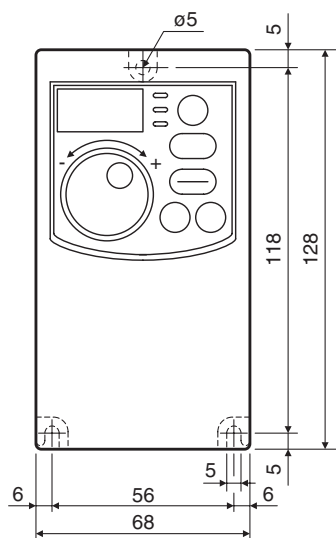
Type	D	D1	D2
FR-S 520SE-0.2 k	80.5	10	52
FR-S 520SE-0.4 k	142.5	42	82
FR-S 520SE- 0.75 k	162.5	62	82
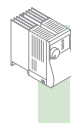
All dimensions in mm

■ FR-S 520SE-1.5 k EC and FR-S 540E-0.4 k to 3.7 k EC
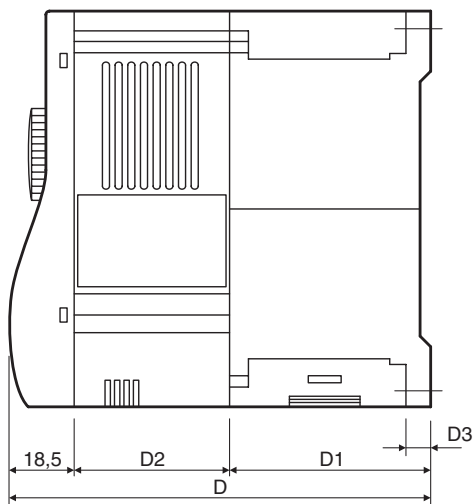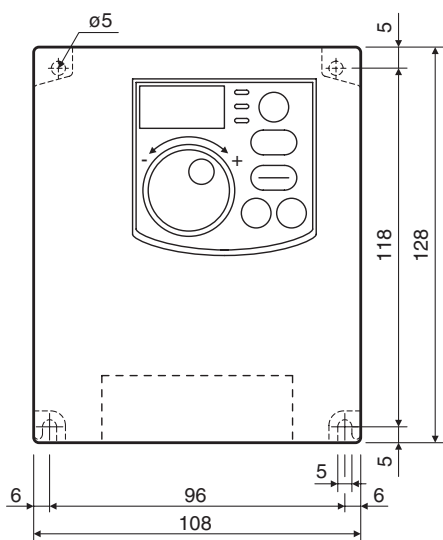
All dimensions in mm

Type	D	D1	D2	D3
FR-S 500SE-1.5 k	155.5	65	72	8
FR-S 540E-0.4 k	129.5	59	52	5
FR-S 540E-0.75 k	129.5	59	52	5
FR-S 540E-1.5 k	135.5	65	52	8
FR-S 540E-2.2 k	155.5	65	72	8
FR-S 540E-3.7 k	165.5	65	82	8

■ Noise Filters FFR-S520S-14A/20A-RF1
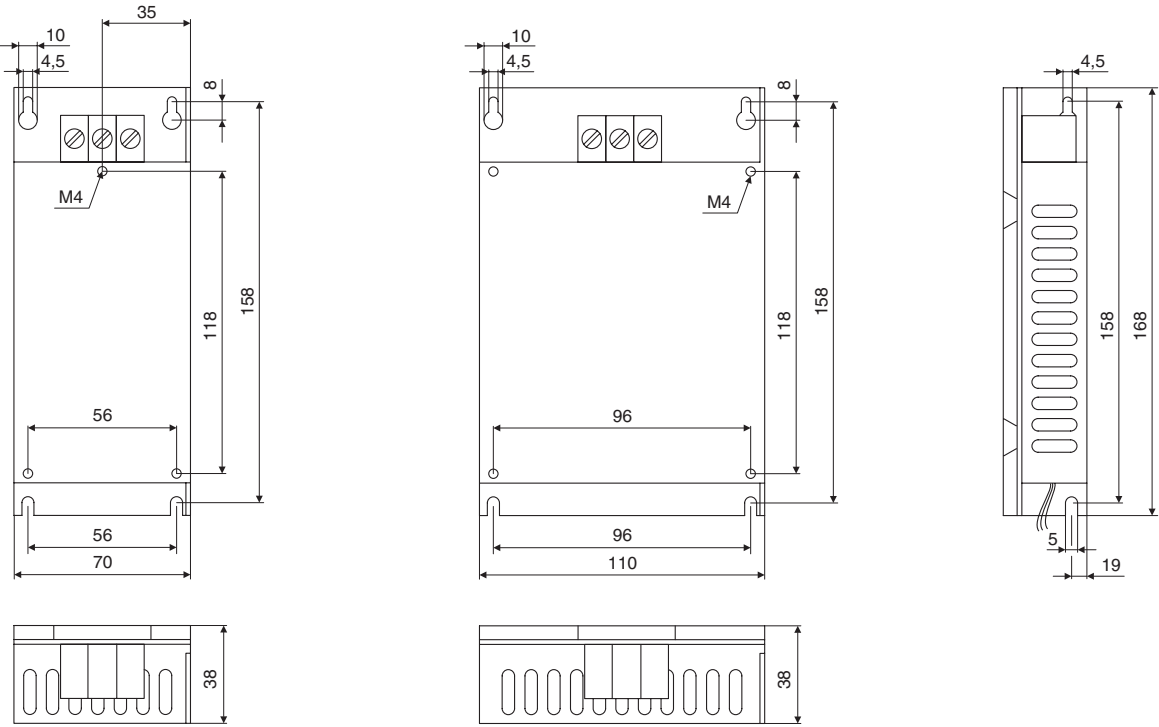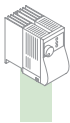
All dimensions in mm

■ Noise Filters FFR-S540-8A-RF100 and FFR-S540-13A-RF100
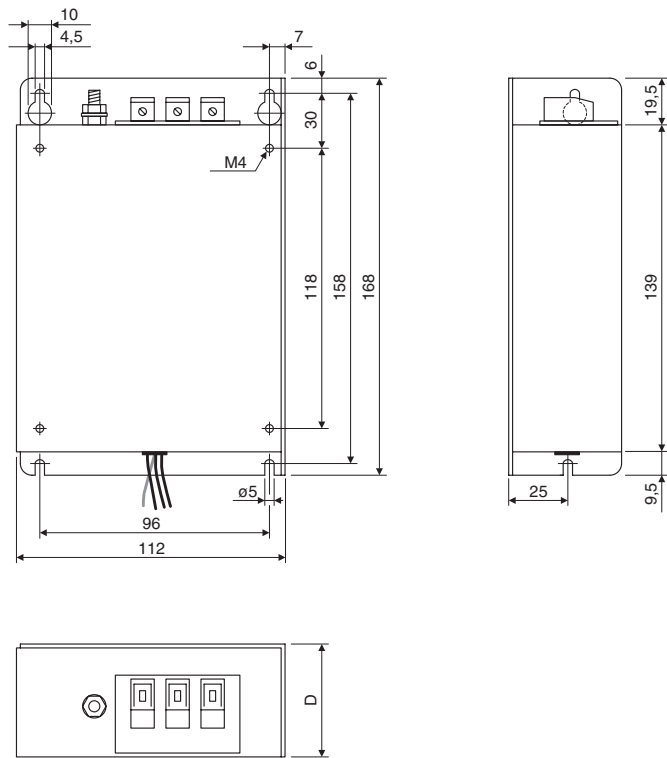
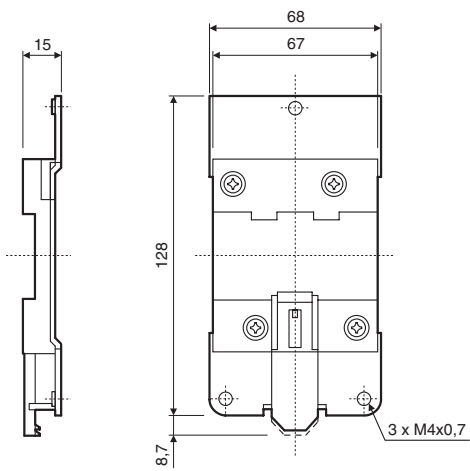| Type	D
FFR-S540-8A-RF100	40
FFR-S540-13A-RF100	45

All dimensions in mm

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■ Brake Unit BU-UFS22J and BU-UFS22

M5 x 15
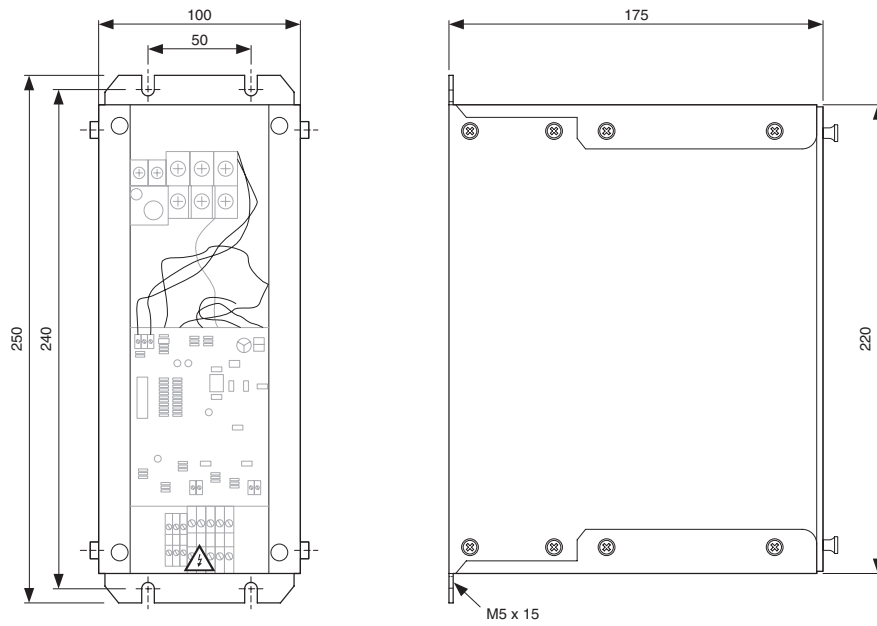
All dimensions in mm

■ DIN Rail Mounting Set FR-UDA

FR-UDA01

FR-UDA02

All dimensions in mm

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Order declaration

Pos.	Number	Item (type)	Article number	Description	Remarks
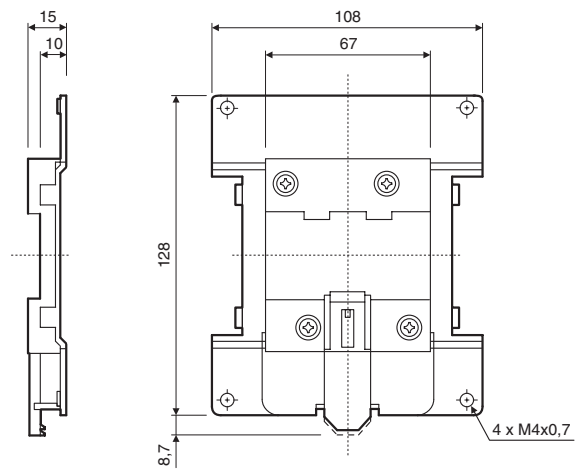
Notes when ordering:

When ordering, please use only the type designations and order numbers shown in this catalogue.

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