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VFD-E_C_EN_20100705

DELTA ELECTRONICS, INC.

VFD-E

High Performance / Flexible Extension / Micro Type AC Motor Drive

www.delta.com.tw/industrialautomation

Features

- **Modular Design**
  Modular structure and extension with optional cards

- **Standard MODBUS Protocol**
  Standard MODBUS Protocol via RS-485

- **Built-in EMI Filter (230V 1-phase and 460V 3-phase)**
  To reduce electromagnetic interference efficiently

- **Compact Design**
  Space saving and easy DIN rail mounting with optional DIN rail adapter

- **Optional Fieldbus Modules**
  Provide connection to a variety of networks, including Profibus, DeviceNet, LonWorks and CANopen

- **Flexible Extension**
  Via optional cards, such as I/O card, Relay card, PG (Encoder) card and USB card, to meet your application requirements

- **RFI-Switch for IT Mains**
  Removable "Y" capacitor to use with IT mains supplies.

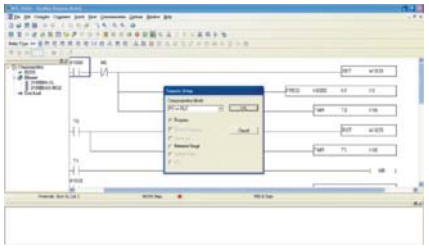
- **Easy DC BUS Sharing**
  Multiple VFD-E can be connected in parallel to share the regenerative braking energy. In this way, over-voltage is prevented and the DC-bus voltage stabilized.

- **Complete Protection Function**
  High precision current detection, full overload protection (oL, oL1 and oL2), over-voltage/over-current stall prevention, short-circuit protection, reset after fault, speed search function and motor overheat protection by PTC.

- **Removable Keypad**
  The standard keypad acts as status monitor. More functions, including parameter modification, RUN/STOP, speed change, and status display, via optional keypad

- **Power Range**
  1-phase 115V series: 0.2~0.75kW (0.25~1hp)
  1-phase 230V series: 0.2~2.2kW (0.25~3hp)
  3-phase 230V series: 0.2~7.5kW (0.25~20hp)
  3-phase 460V series: 0.4~22kW (0.50~30hp)

- **Built-in PLC Function**
  Easy to write PLC program without additional PLC



- **Side-by-side Installation(40°C)**
  High-efficiency cooling and flexible space

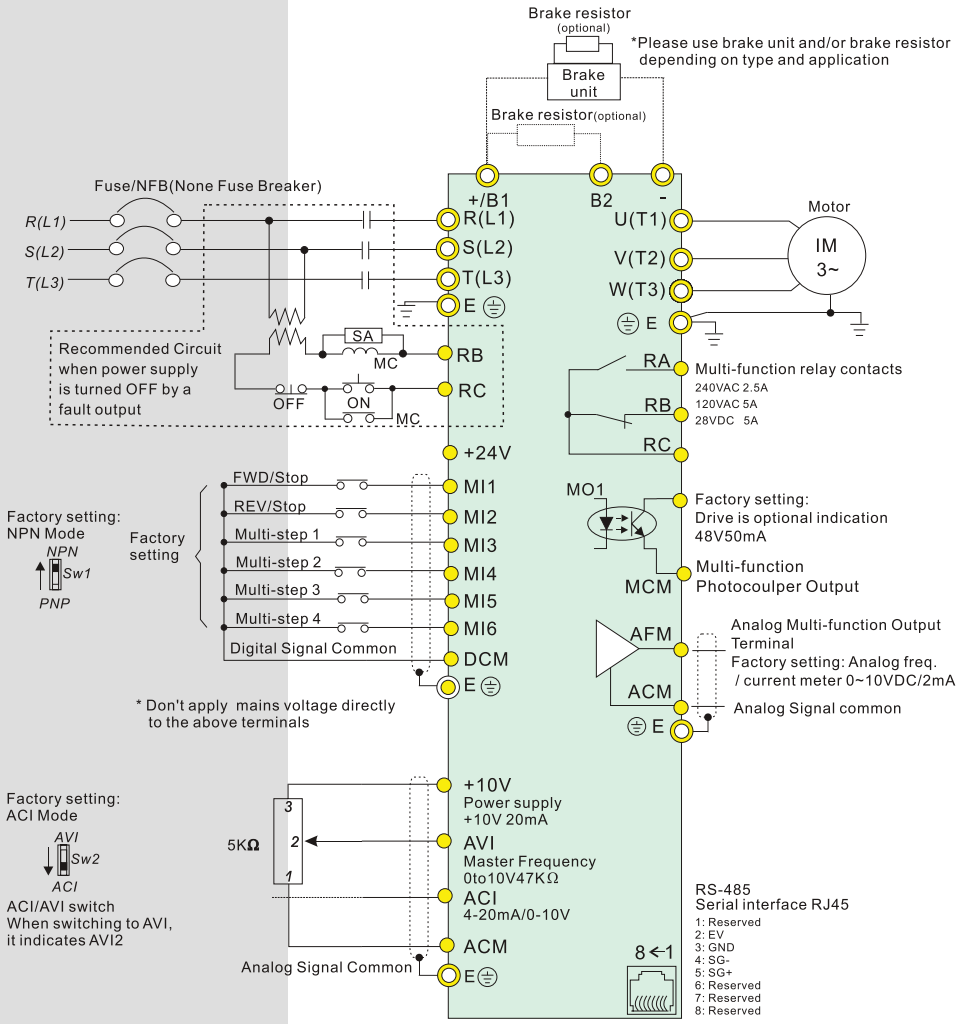
- **Easy Maintenance**
  Removable cooling fan for easy maintenance

Application Cases

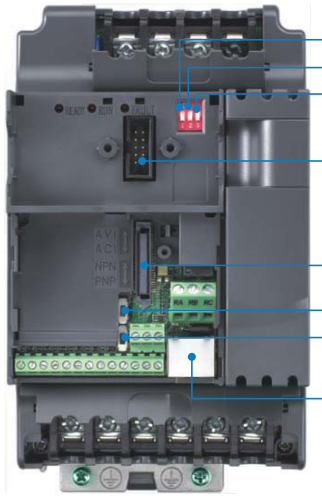
- **Vacuum compressor**
  It reduces the large load of instant vacuum with VFD-E outstanding overload capacity.

- **Escalator**
  It not only saves energy with built-in PLC function and multi-step speed but also eliminates cost of external controller.

Standard Wring Diagram

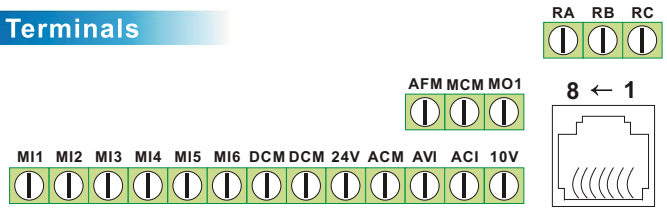


External Parts



- Switch to ON for 50Hz
- Switch to ON for free run to stop
- Switch to ON for setting frequency source to ACI(P 02.00=2)
- Keypad mounting port
- Mounting port for extension card
- ACI terminal ACI/AVI2 switch
- NPN/PNP
- RS-485 port(RJ-45)

Control Terminals



Model Explanation

VFD 007 E 23 A

- **Version Type**
  - A: Standard drive
  - P: Cold plate drive (frame A only)
  - C: CANopen
  - T: Frame A, built-in brake chopper
- **Mains Input Voltage**
  - 11: 115V 1-Phase
  - 23: 230V 3-Phase
  - 21: 230V 1-Phase
  - 43: 460V 3-Phase
- **E Series**
- **Applicable motor capacity**
  - 002: 0.25HP(0.2kW)
  - 004: 0.5HP(0.4kW)
  - 007: 1HP(0.75kW)
  - 015: 2HP(1.5kW)
  - 022: 3HP(2.2kW)
  - 037: 5HP(3.7kW)
  - 055: 7.5HP(5.5kW)
  - 075: 10HP(7.5kW)
  - 110: 15HP(11kW)
  - 150: 20HP(15kW)
  - 185: 25HP(18.5kW)
  - 220: 30HP(22kW)
- **Series Name (Variable Frequency Drive)**

Application Fields

Conveyor and Transportation Machinery

- Conveyor belt
- Escalator
- Automatic doors
- Parking device
- Roller door
- Small elevator
- X-Y axis of traveling crane

Food Processing

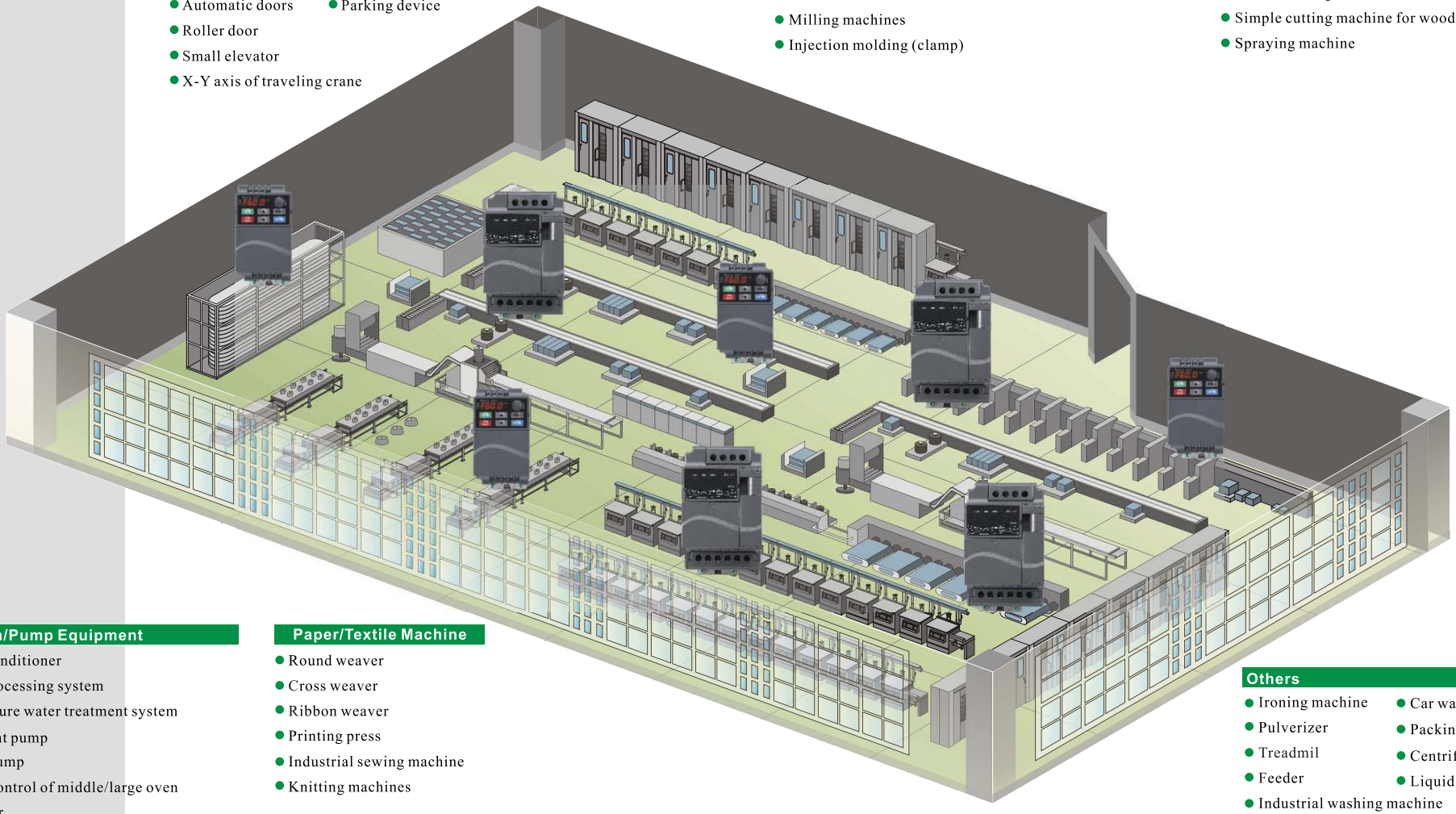
- Dumpling maker
- Food stirrer
- Noodle maker

Machine Tool/Metal Processing Machinery

- Grinder
- Drill
- Small lathe
- Milling machines
- Injection molding (clamp)

Wood Working Machinery

- 4 side planer
- Wood carver
- Wood working machine
- Simple cutting machine for wood working
- Spraying machine



Fan/Pump Equipment

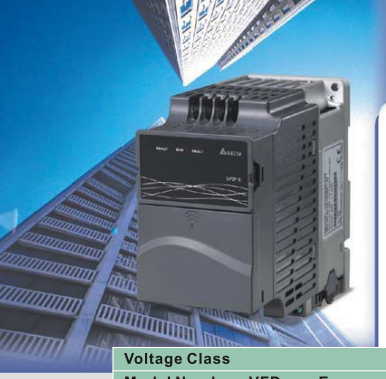
- Building air conditioner
- Wastewater processing system
- Constant pressure water treatment system
- Water treatment pump
- Agricultural pump
- Temperature control of middle/large oven
- Air compressor
- Heat exchange fans
- Building water dispenser system
- Dryer's windmill

Paper/Textile Machine

- Round weaver
- Cross weaver
- Ribbon weaver
- Printing press
- Industrial sewing machine
- Knitting machines

Others

- Ironing machine
- Car washing machine
- Pulverizer
- Packing machine
- Treadmil
- Centrifuge
- Feeder
- Liquid mixer
- Industrial washing machine



Specifications

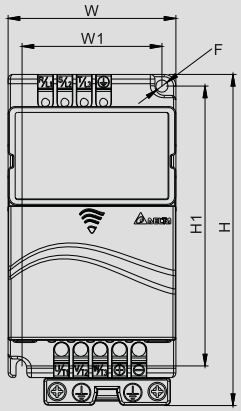
Voltage Class		115V		
Model Number VFD-___ E		002	004	007
Max. Applicable Motor Output (kW)		0.2	0.4	0.75
Max. Applicable Motor Output (hp)		0.25	0.5	1.0
Output Rating	Rated Output Capacity (kVA)	0.6	1.0	1.6
	Rated Output Current (A)	1.6	2.5	4.2
	Maximum Output Voltage (V)	3-phase proportional to twice the input voltage		
	Output Frequency (Hz)	0.1~600Hz		
	Carrier Frequency (kHz)	1-15		
Input Rating	Rated Input Current (A)	Single-phase		
		6	9	18
	Rated Voltage/Frequency	Single phase 100-120V, 50/60Hz		
	Voltage Tolerance	± 10%(90-132V)		
	Frequency Tolerance	± 5%(47-63Hz)		
Cooling Method		Natural Cooling		Fan Cooling
Weight (kg)		1.2	1.2	1.2

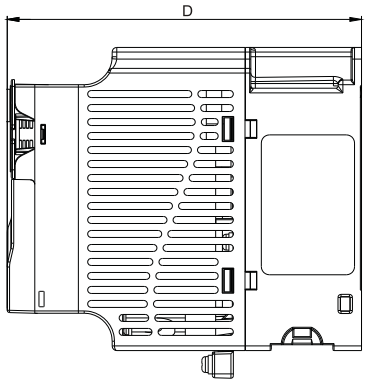
Voltage Class		230V								
Model Number VFD-___ E		002	004	007	015	022	037	055	075	110	150
Max. Applicable Motor Output (kW)		0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Max. Applicable Motor Output (hp)		0.25	0.5	1.0	2.0	3.0	5.0	7.5	10.0	15	20
Output Rating	Rated Output Capacity (kVA)	0.6	1.0	1.6	2.9	4.2	6.5	9.5	12.5	17.1	25
	Rated Output Current (A)	1.6	2.5	4.2	7.5	11.0	17	25	33	45	65
	Maximum Output Voltage (V)	3-phase proportional to input voltage									
	Output Frequency (Hz)	0.1~600Hz									
	Carrier Frequency (kHz)	1-15									
Input Rating	Rated Input Current (A)	Single/3-phase					3-phase				
		4.9/1.9	6.5/2.7	9.7/5.1	15.7/9	24/15	20.6	26	34	48	70
	Rated Voltage/Frequency	Single/3-phase, 200-240V, 50/60Hz					3-phase, 200-240V, 50/60Hz				
	Voltage Tolerance	± 10%(180-264V)									
	Frequency Tolerance	± 5%(47-63Hz)									
Cooling Method		Natural Cooling			Fan Cooling						
Weight (kg)		1.1	1.1	1.1	1.9	1.9	1.9	3.5	3.5	3.57	6.6

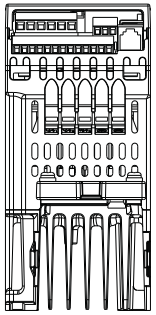
Voltage Class		460V										
Model Number VFD-___ E		004	007	015	022	037	055	075	110	150	185	220
Max. Applicable Motor Output (kW)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0	15	18.5	22
Max. Applicable Motor Output (hp)		0.5	1.0	2.0	3.0	5.0	7.5	10.0	15.0	20	25	30
Output Rating	Rated Output Capacity (kVA)	1.2	2.0	3.3	4.4	6.8	9.9	13.7	18.3	24	29	34
	Rated Output Current (A)	1.5	2.5	4.2	5.5	8.5	13.0	18.0	24.0	32	38	45
	Maximum Output Voltage (V)	3-phase proportional to input voltage										
	Output Frequency (Hz)	0.1~600Hz										
	Carrier Frequency (kHz)	1-15										
Input Rating	Rated Input Current (A)	3-phase										
		1.9	3.2	4.3	7.1	11.2	14	19	26	35	41	49
	Rated Voltage/Frequency	3-phase, 380-480V, 50/60Hz										
	Voltage Tolerance	± 10%(342-528V)										
	Frequency Tolerance	± 5%(47-63Hz)										
Cooling Method		Natural Cooling		Fan Cooling								
Weight (kg)		1.2	1.2	1.2	1.9	1.9	4.2	4.2	4.2	7.47	7.47	7.47

Control Characteristics	Control System		SPWM (Sinusoidal Pulse Width Modulation) Control (V/f or sensorless vector control)
	Frequency Setting Resolution		0.01Hz
	Output Frequency Resolution		0.01Hz
	Torque Characteristics		Including the auto-torque/auto-slip compensation; starting torque can be 150% at 3.0Hz
	Overload Endurance		150% of rated current for 1 minute
	Skip Frequency		Three zones, setting range 0.1~600Hz
	Accel/Decel Time		0.1to 600 seconds (2 Independent setting of Accel/Decel time)
	Stall Prevention Level		Setting 20 to 250% of rated current
	DC Braking		Operation frequency 0.1~600.0Hz, output 0~100% rated current Start time 0~60 seconds, stop time 0~60 seconds
	Regenerated Braking Torque		Approx. 20% (up to 125% possible with optional brake resistor or externally mounted brake unit, 1-15hp models (built-in brake chopper))
	V/f Pattem		Adjustable V/f pattern
Operating Characteristics	Frequency Setting	Keypad	Setting by ▲▼
		External Signal	Potentiometer-5kΩ/0.5W, 0 to +10VDC, 4 to 20mA,RS-485 interface; Multi-function Inputs 3 to 9 (15 steps, Jog, up/down)
	Operation Setting Signal	Keypad	Set by RUN and STOP
		External Signal	2 wires/3 wires (FWD, REV, EF), JOG operation, RS-485 serial interface (MODBUS), programmable logic controller
	Multi-function Input Signal		Multi-step selection 0 to 15, Jog, accel/decel inhibit, 2 accel/decel switches, counter, external Base Block (NC, NO), auxiliary motor control is invalid, ACI/AVI/AUI selections, driver reset, UP/DOWN key settings, sink/source (=NPN/PNP) selection
	Multi-function Output Indication		AC drive operating, frequency attained, non-zero frequency, Base Block, fault indication, local/remote indication, auxiliary motor output, drive is ready, overheat alarm, emergency stop and status selections of input terminals (NC/NO)
	Analog Output Signal		Output frequency/current
Alarm Output Contact			Contact will be On when drive malfunctions (1 Form C/change-over contact or 1 open collector output)
Operation Functions			Built-in PLC, AVR, accel/decel S-Curve, over-voltage/over-current stall prevention, 5 fault records, reverse inhibition, momentary power loss restart, DC braking, auto torque/slip compensation, auto tuning, adjustable carrier frequency, output frequency limits, parameter lock/reset, vector control, PID control, external counter, MODBUS communication, abnormal reset, abnormal re-start, power-saving, sleep/wake function, fan control, 1st/2nd frequency source selections, 1st/2nd frequency source combination, NPN/PNP selection
Protection Functions			Over voltage, over current, under voltage, under current, external fault, overload, ground fault, overheating, electronic thermal, IGBT short circuit, PTC
Display Keypad			6-key, 7-segment LED with 4-digit, 5 status LED, master frequency, output frequency, output current, custom units, parameter values for setup and lock, faults, RUN, STOP, RESET, FWD/REV
Built-in EMI Filter			For 230V 1-phase and 460V 3-phase models
Environmental Conditions	Enclosure Rating		IP20
	Pollution Degree		2
	Installation Location		Altitude 1,000m or lower, keep from corrosive gasses, liquid and dust
	Ambient Temperature		-10°C to + 50°C (40°C for side-by-side mounting) Non-Condensing and not frozen
	Storage/Transportation Temperature		-20°C to 60°C
	Ambient Humidity		Below 90% RH (non-condensing)
	Vibration		9.80665m/s^2 (1G) less than 20Hz, 5.88m/s^2 (0.6G) at 20 to 50Hz
Approvals			CE c UL us

Dimensions







Unit: mm(inch)

Model		W	W1	H	H1	D	F
VFD002E11A/11/11C VFD002E21A/21T/21C VFD002E23A/23T/23C VFD004E11A/11T/11C VFD004E21A/21T/21C VFD004E23A/23T/23C VFD004E43A/43T/43C	VFD007E21A/21T/21C VFD007E23A/23T/23C VFD007E43A/43T/43C VFD015E23A/23T/23C VFD015E43A/43T/43C	72.0 (2.83)	60.0 (2.36)	142.0 (5.59)	120.0 (4.72)	152.0 (5.98)	5.2 (0.20)
VFD007E11A/11C VFD015E21A/21C VFD022E21A/21C VFD022E23A/23C VFD022E43A/43C	VFD037E23A/23C VFD037E43A/43C	100.0 (3.94)	89.0 (3.51)	174.0 (6.86)	162.0 (6.38)	152.0 (5.98)	5.5 (0.22)
VFD055E23A/23C VFD055E43A/43C VFD075E23A/23C	VFD075E43A/43C VFD110E43A/43C	130.0 (5.12)	116.0 (4.57)	260.0 (10.24)	246.5 (9.71)	169.2 (6.67)	5.5 (0.22)
VFD150E23A/23C VFD150E43A/43C	VFD185E43A/43C VFD220E43A/43C	200.0 (7.87)	180.0 (7.09)	310.0 (12.20)	290.0 (11.42)	190.0 (7.48)	10.0 (0.39)
VFD002E11P VFD002E21P VFD002E23P VFD004E11P VFD004E21P VFD004E23P VFD004E43P	VFD007E21P VFD007E23P VFD007E43P VFD015E23P	72.0 (2.83)	56.0 (2.20)	155.0 (6.10)	143.0 (5.63)	111.5 (4.39)	5.3 (0.21)

New Models

VFD-E-T : Built-in brake chopper for frame A
VFD-E-P : Plate drive
VFD-E-C: Built-in CANopen communication

Accessories

Optional Cards

EME-R3AA
Relay card (3 form A/ NO contacts)

EME-R2CA
Relay card (2 form C/ Change-over contacts)

EME-33A
I/O card
(photocoupler 3in+3out)

EME-A22A
Anglog I/O Card (12 bits)

EME-PG01
PG card

CME-USB01
Second communication card
(USB1.1)

Fieldbus Modules

DeviceNet

Profibus

LonWorks

CANopen

Others

Digital keypad

Brake resistor

- **Keypad for communication (VFD-PU06)**
- **Zero phase reactor**
- **Keypad cable**
- **DIN rail(Width35mm)**
- **EMI input filter**
- **Grounding plate**
- **Brake unit**
- **DC fan**
- **AC reactor**