

# AFE2000

Active Front End Unit

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## Delta Electronics (India) Pvt. Ltd.

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Gurgaon 122001, Haryana, India  
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## America

### Delta Products Corporation (USA)

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P.O. Box 12173, 5101 Davis Drive,  
Research Triangle Park, NC 27709, U.S.A.  
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## Delta Greentech (Brasil) S/A

Sao Paulo Office  
Rua Itapeva, Nº 26, 3º andar, Bela vista  
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## Europe

### Deltronics (The Netherlands) B.V.

Eindhoven Office  
De Witboet 15, 5652 AG Eindhoven, The Netherlands  
TEL: 31-40-2592850 / FAX: 31-40-2592851



## Features

- Replaces traditional brake resistor to reduce heat energy.
- Clear energy savings: more than 95% of the energy is regenerated and supplied back to the mains.
- Full-load operation: input-side current THD lower than 4% and power factor up to 99%.
- AC motor drives with AFE2000: supports 4-quadrant operation with variable frequencies and adjustable system.
- Constant DC bus voltage: unaffected by mains voltage fluctuations.

## Applications

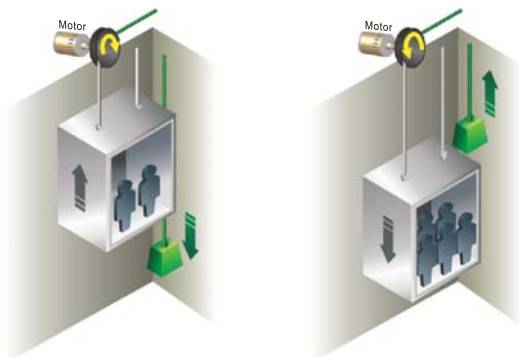
- Large-inertia loads, such as centrifuge equipment, dewatering machines and roving machines.
- 4-quadrant loads including elevators, cranes and pumpjacks (oil extraction machines)
- Quick braking, such as machine tools, bag making machines, auto storage and retrieval systems, and lathes
- Long-term energy feedback, such as wind power, water power, steel printing and paper making machinery (winding equipment).
- Improves power quality for industries such as semiconductor and panel industries

- Crane and Unloading Applications: the AFE2000 replaces the traditional brake resistor to convert the excess heat of motor into reusable energy.

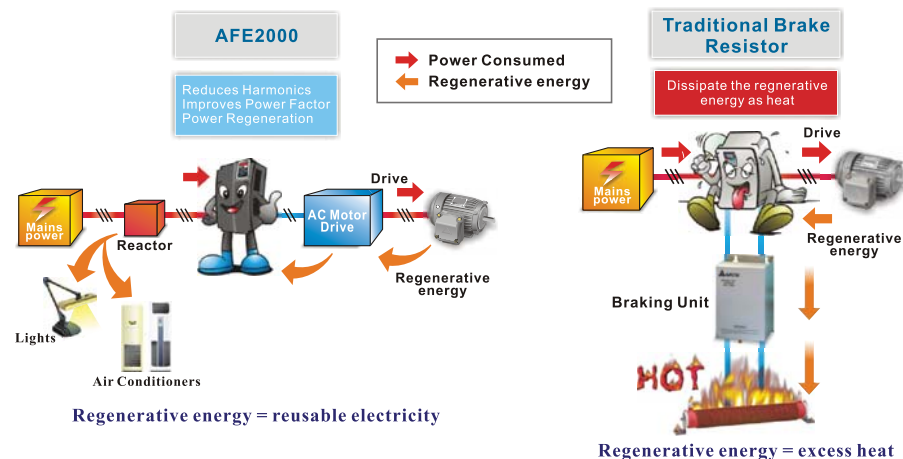


### ► Four-quadrant operations:

Elevators, Winches and Crane Applications: four possible speed and torque bundles including speed (+/-) and torque (+/-). The excess heat is converted to reusable energy and supplied back to the mains.

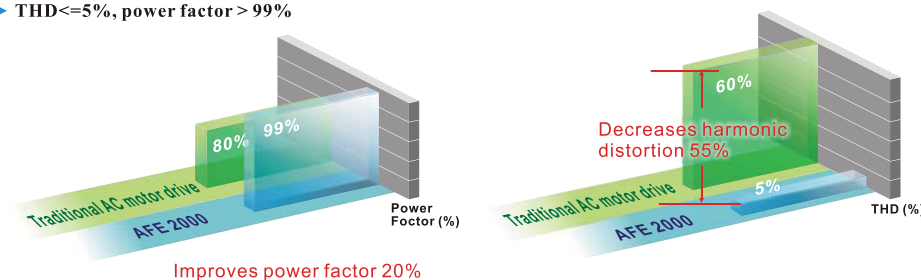


- Replace traditional brake resistors with the AFE2000 to convert regenerative energy (excess heat) into reusable electricity.

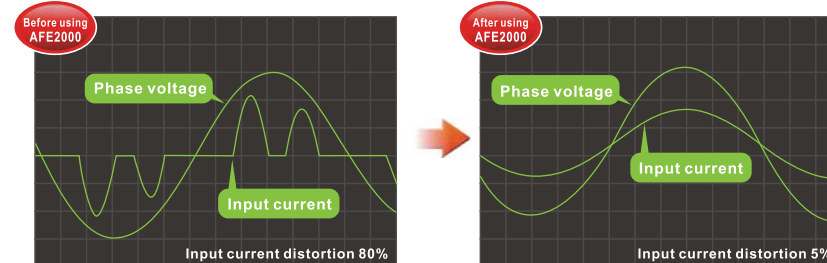


- Improves power factor and decreases harmonic distortion.

- THD ≤ 5%, power factor > 99%



- Improve power factor, lower harmonic distortion, and decrease energy consumption to reduce energy costs and protect the environment.



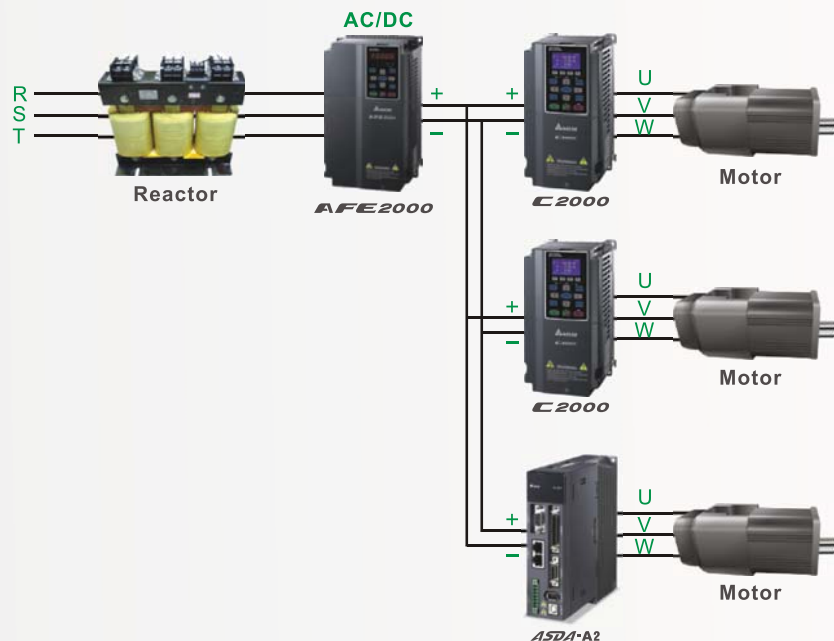
- The AFE2000 is your best choice for the following international standards:

- IEEE519-1992
- IEC/EN61000-3-12
- IEC/EN61000-3-4
- IEC/EN61000-3-2



## Multiple solutions

The AFE2000 provides multiple solutions for regenerative energy, offering better power quality while reducing total electricity costs. It achieves Delta's mission "to provide innovative, clean and efficient energy solutions for a better tomorrow".



This figure is for demonstration purposes only, please refer to standard wiring diagrams for wiring details.

## High-speed Fieldbus

■ Provides various communication network cards and fieldbus cards

■ Built-in RS-485 modbus protocol

■ CANopen (DS301)

■ DeviceNet®

■ Advanced network functions

■ PROFI<sup>®</sup>  
BUS

■ MODBUS TCP

■ EtherNet/IP<sup>®</sup>

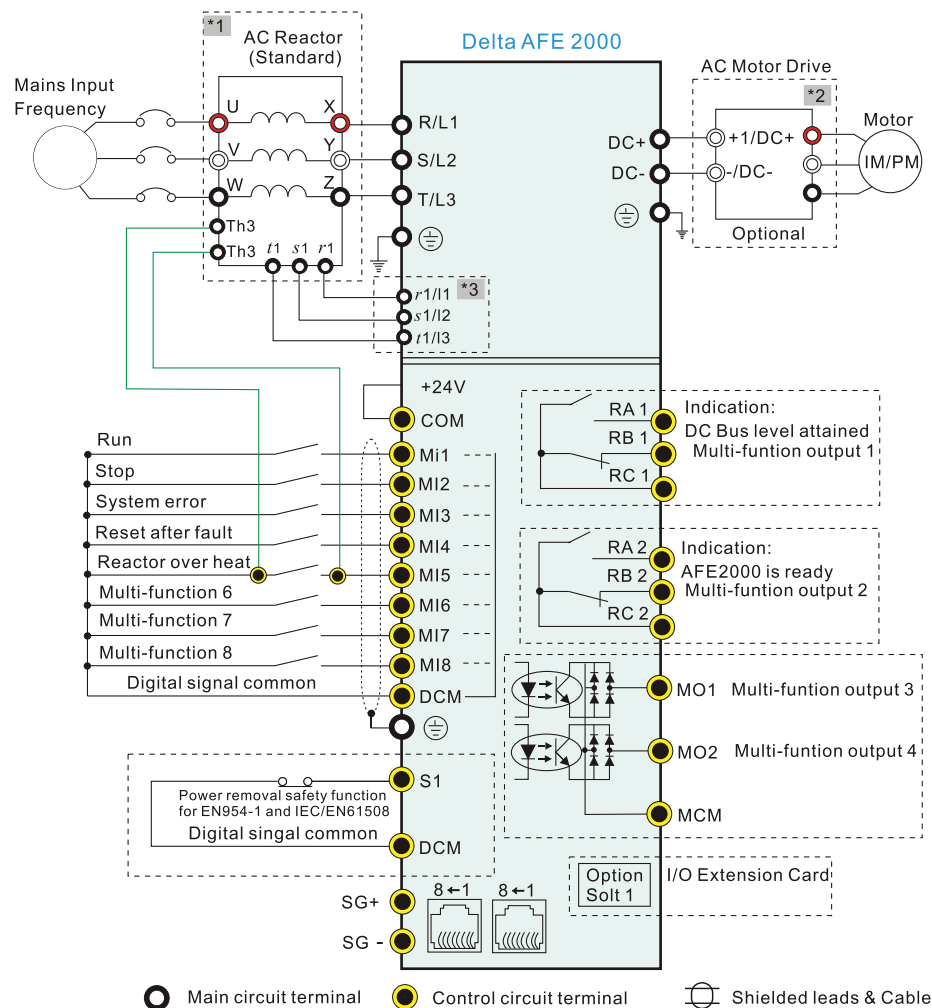
## Specifications

| 230V                               | Model AFE-__ _A23A | 075                                                                                                                                                                                                                                                                                      | 150 | 220 | 370 |
|------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|
| Applicable power (kW)              |                    | 7.5                                                                                                                                                                                                                                                                                      | 15  | 22  | 37  |
| Rated input voltage (V)            |                    | 170~250Vac                                                                                                                                                                                                                                                                               |     |     |     |
| Rated input current (A)            |                    | 35                                                                                                                                                                                                                                                                                       | 70  | 95  | 150 |
| Voltage control                    |                    | 300~370Vdc                                                                                                                                                                                                                                                                               |     |     |     |
| Overload capacity                  |                    | 150% 60Sec                                                                                                                                                                                                                                                                               |     |     |     |
| Frequency tolerance                |                    | ±5%                                                                                                                                                                                                                                                                                      |     |     |     |
| Power factor at input side         |                    | 0.95 to above 0.99                                                                                                                                                                                                                                                                       |     |     |     |
| Harmonic (%)                       |                    | Less than 5% (at rated current)                                                                                                                                                                                                                                                          |     |     |     |
| Enclosure type                     |                    | IP20/NEMA1                                                                                                                                                                                                                                                                               |     |     |     |
| Cooling method                     |                    | Fan cooling                                                                                                                                                                                                                                                                              |     |     |     |
| Installation environment           |                    | For indoors and altitudes of 0~1000m (3280.60 feet), keep away from direct sunlight, corrosive gases, liquids and dust. For altitudes above 1000m (3280.60 feet), please decrease 3% of rated current for every 500m (1640.40 feet) increase. The maximum altitude is 2500m (8202.00 ft) |     |     |     |
| Ambient temperature                |                    | -10°C~+50°C                                                                                                                                                                                                                                                                              |     |     |     |
| Storage/transportation temperature |                    | -25~+65°C                                                                                                                                                                                                                                                                                |     |     |     |
| Ambient humidity                   |                    | Lower than 90%RH (non-condensing)                                                                                                                                                                                                                                                        |     |     |     |
| Vibration                          |                    | 5.9m/ S <sup>2</sup> (0.6G) less than 10~55Hz (JIS C0040)                                                                                                                                                                                                                                |     |     |     |

| 460V                               | Model AFE-__ _A43A | 075                                                                                                                                                                                                                                                                                      | 150 | 220 | 370 | 450 | 750 |
|------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|
| Applicable power (kW)              |                    | 7.5                                                                                                                                                                                                                                                                                      | 15  | 22  | 37  | 45  | 75  |
| Rated input voltage (V)            |                    | 325~500Vac                                                                                                                                                                                                                                                                               |     |     |     |     |     |
| Rated input current (A)            |                    | 20                                                                                                                                                                                                                                                                                       | 35  | 50  | 75  | 95  | 160 |
| Voltage control                    |                    | 600~740Vdc                                                                                                                                                                                                                                                                               |     |     |     |     |     |
| Overload capacity                  |                    | 150% 60Sec                                                                                                                                                                                                                                                                               |     |     |     |     |     |
| Frequency tolerance                |                    | ±5%                                                                                                                                                                                                                                                                                      |     |     |     |     |     |
| Power factor at input side         |                    | 0.95 to above 0.99                                                                                                                                                                                                                                                                       |     |     |     |     |     |
| Harmonic (%)                       |                    | Less than 5% (at rated current)                                                                                                                                                                                                                                                          |     |     |     |     |     |
| Enclosure type                     |                    | IP20/NEMA1                                                                                                                                                                                                                                                                               |     |     |     |     |     |
| Cooling method                     |                    | Fan cooling                                                                                                                                                                                                                                                                              |     |     |     |     |     |
| Installation environment           |                    | For indoors and altitudes of 0~1000m (3280.60 feet), keep away from direct sunlight, corrosive gases, liquids and dust. For altitudes above 1000m (3280.60 feet), please decrease 3% of rated current for every 500m (1640.40 feet) increase. The maximum altitude is 2500m (8202.00 ft) |     |     |     |     |     |
| Ambient temperature                |                    | -10°C~+50°C                                                                                                                                                                                                                                                                              |     |     |     |     |     |
| Storage/transportation temperature |                    | -25~+65°C                                                                                                                                                                                                                                                                                |     |     |     |     |     |
| Ambient humidity                   |                    | Lower than 90%RH (non-condensing)                                                                                                                                                                                                                                                        |     |     |     |     |     |
| Vibration                          |                    | 5.9m/ S <sup>2</sup> (0.6G) less than 10~55Hz (JIS C0040)                                                                                                                                                                                                                                |     |     |     |     |     |

## Standard Wiring

### One-to-One Installation (One AFE unit + One AC motor drive)

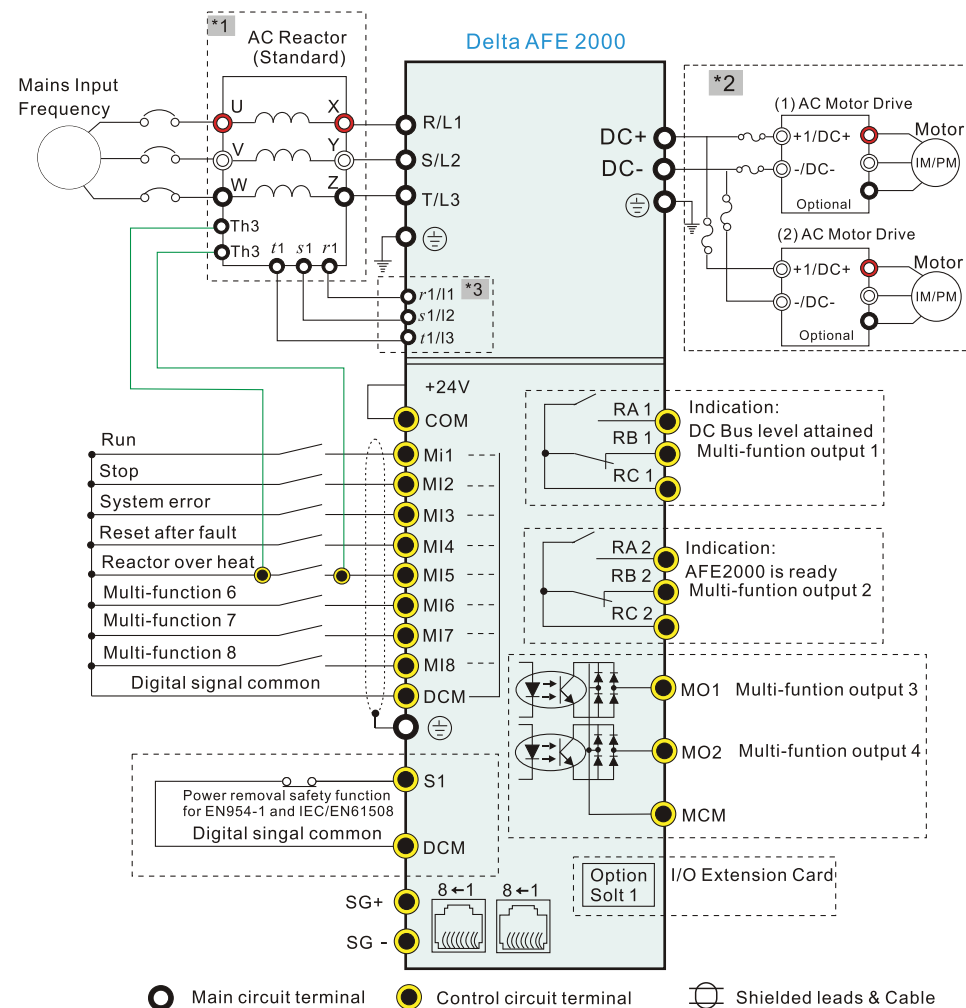


\*1 The Delta AC reactor (optional accessory) comes with a thermal protection function. When the reactor's temperature exceeds 120°C, the TH3 terminal will come ON and the AFE 2000 will receive a signal from the MI terminal to issue a warning message.

\*2 For one-to-many installation, installing a fuse on the AC motor drive's input side is recommended. Please select a compatible fuse for your AC motor drive using the equation: Fuse specification = AC rated input current / 0.78 x 1.5

\*3 If the AC reactor installed on the system is not Delta's AC reactor, please connect the reactor's terminal to the power input terminal (R/L1, S/L2, T/L3) for wiring.

### One-to-Many Installation (One AFE unit + Many AC motor drives)



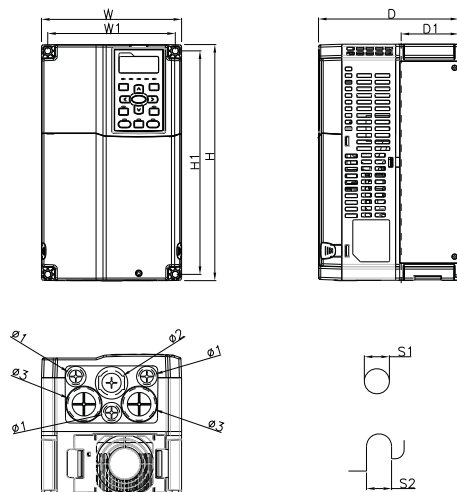
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\*3 If the AC reactor installed on the system is not Delta's AC reactor, please connect the reactor's terminal to the power input terminal (R/L1, S/L2, T/L3) for wiring.

## ■ Dimensions

### ■ Frame B

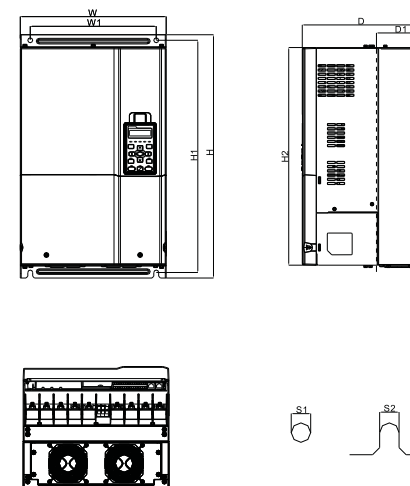


**MODEL**  
AFE075A23A  
AFE075A43A  
AFE150A43A

D1\* : Flange mounting

| Frame |      | W     | H     | D     | W1    | H1    | D1*  | S1   | S2   | Ø1   | Ø2   | Ø3   |
|-------|------|-------|-------|-------|-------|-------|------|------|------|------|------|------|
| B1    | mm   | 190.0 | 320.0 | 190.0 | 173.0 | 303.0 | 77.9 | 8.5  | 8.5  | 22.2 | 34.0 | 43.8 |
|       | inch | 7.48  | 12.60 | 7.48  | 6.81  | 11.93 | 3.07 | 0.33 | 0.33 | 0.87 | 1.34 | 1.72 |

### ■ Frame D

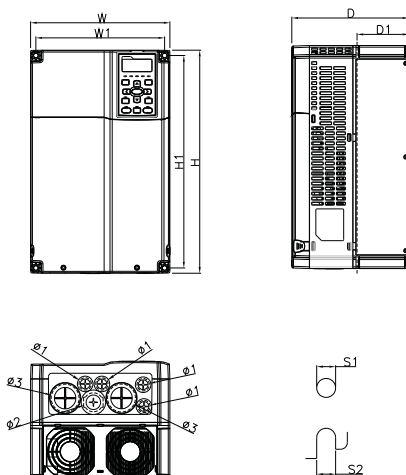


**MODEL**  
AFE370A23A  
AFE370A43A  
AFE450A43A  
AFE750A43A

D1\* : Flange mounting

| Frame | W    | H     | D     | W1    | H1    | H2    | D1*   | S1   | S2   |
|-------|------|-------|-------|-------|-------|-------|-------|------|------|
| B1    | mm   | 330.0 | 550.0 | 275.0 | 285.0 | 492.0 | 107.2 | 11.0 | 11.0 |
|       | inch | 12.99 | 21.65 | 10.83 | 11.22 | 19.37 | 4.22  | 0.43 | 0.43 |

### ■ Frame C

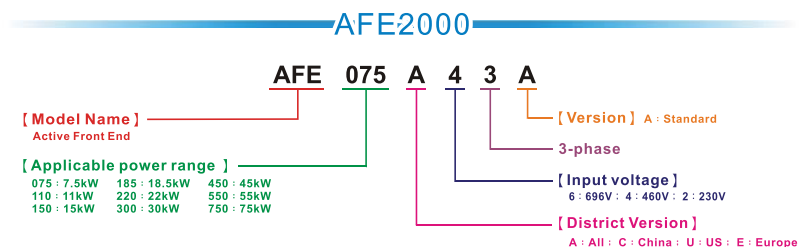


**MODEL**  
AFE150A23A  
AFE220A23A  
AFE220A43A

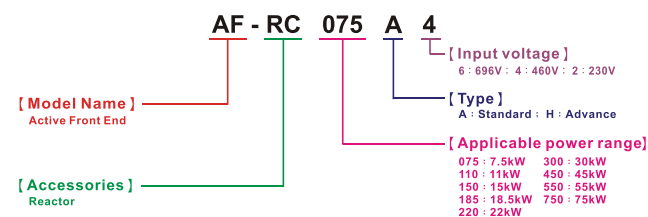
D1\* : Flange mounting

| Frame |      | W     | H     | D     | W1    | H1    | D1*  | S1   | S2   | Ø1   | Ø2   | Ø3   |
|-------|------|-------|-------|-------|-------|-------|------|------|------|------|------|------|
| C1    | mm   | 250.0 | 400.0 | 210.0 | 231.0 | 381.0 | 92.9 | 8.5  | 8.5  | 22.2 | 34.0 | 50.0 |
|       | inch | 9.84  | 15.75 | 8.27  | 9.09  | 15.00 | 3.66 | 0.33 | 0.33 | 0.87 | 1.34 | 1.97 |

## ■ Model Name



## Reactor



## Standard Reactors

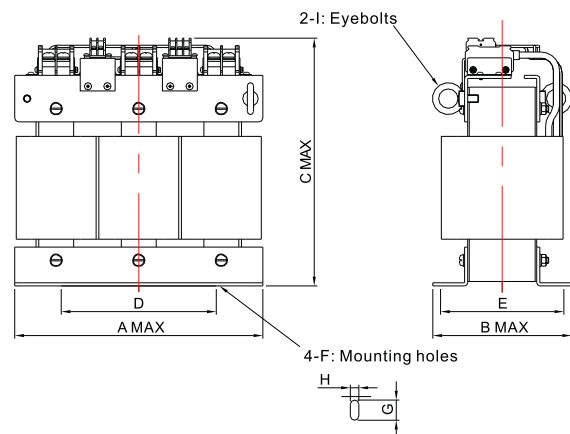
230V

| kW  | Frame | Applicable Model<br>AFE-___A23A | Reactor Model | Inductance(mH) | Rated Current<br>(Arms) |
|-----|-------|---------------------------------|---------------|----------------|-------------------------|
| 7.5 | B     | 075                             | AF-RC075A2    | 2.1            | 35                      |
| 15  | C     | 150                             | AF-RC150A2    | 1.05           | 70                      |
| 22  | D     | 220                             | AF-RC220A2    | 0.77           | 95                      |
| 37  | D     | 370                             | AF-RC370A2    | 0.5            | 150                     |

460V

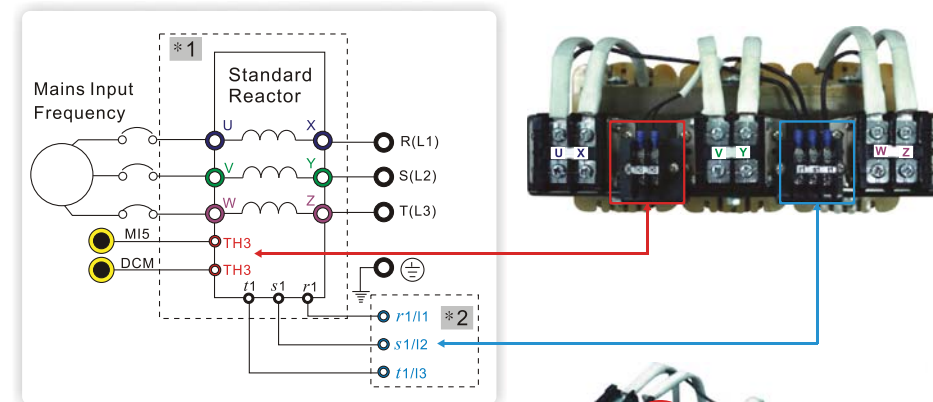
| kW  | Frame | Applicable Model<br>AFE-___A43A | Reactor Model | Inductance(mH) | Rated Current<br>(Arms) |
|-----|-------|---------------------------------|---------------|----------------|-------------------------|
| 7.5 | B     | 075                             | AF-RC075A4    | 7.32           | 20                      |
| 15  | C     | 150                             | AF-RC150A4    | 4.18           | 35                      |
| 22  | C     | 220                             | AF-RC220A4    | 2.92           | 50                      |
| 37  | D     | 370                             | AF-RC370A4    | 1.96           | 75                      |
| 45  | D     | 450                             | AF-RC450A4    | 1.54           | 95                      |
| 75  | D     | 750                             | AF-RC750A4    | 0.92           | 160                     |

## Standard Reactor Diagram



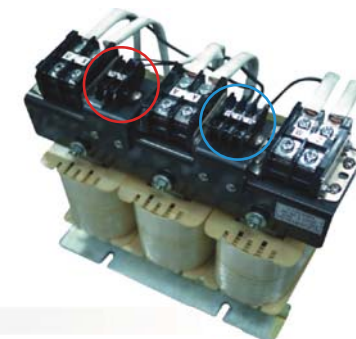
Unit: mm(inch)

| Model      | A   | B   | C   | D   | E   | F   | G  | H  | I   | kg<br>Approx. Mass |
|------------|-----|-----|-----|-----|-----|-----|----|----|-----|--------------------|
| AF-RC075A2 | 305 | 159 | 280 | 150 | 125 | M10 | 11 | 22 | M10 | 28                 |
| AF-RC150A2 | 355 | 180 | 328 | 200 | 139 | M10 | 11 | 26 | M10 | 52                 |
| AF-RC220A2 | 355 | 200 | 328 | 200 | 159 | M10 | 11 | 26 | M10 | 62                 |
| AF-RC370A2 | 385 | 210 | 385 | 200 | 168 | M12 | 13 | 25 | M10 | 87                 |
| AF-RC150A4 | 355 | 180 | 328 | 200 | 139 | M10 | 11 | 26 | M10 | 52                 |
| AF-RC220A4 | 355 | 200 | 328 | 200 | 159 | M10 | 11 | 26 | M10 | 62                 |
| AF-RC370A4 | 385 | 210 | 385 | 200 | 168 | M12 | 13 | 25 | M10 | 87                 |
| AF-RC450A4 | 385 | 230 | 385 | 200 | 188 | M12 | 13 | 25 | M10 | 105                |
| AF-RC750A4 | 420 | 240 | 440 | 250 | 200 | M12 | 13 | 25 | M12 | 137                |
| AF-RC075A4 | 305 | 159 | 280 | 150 | 125 | M10 | 11 | 22 | M10 | 28                 |



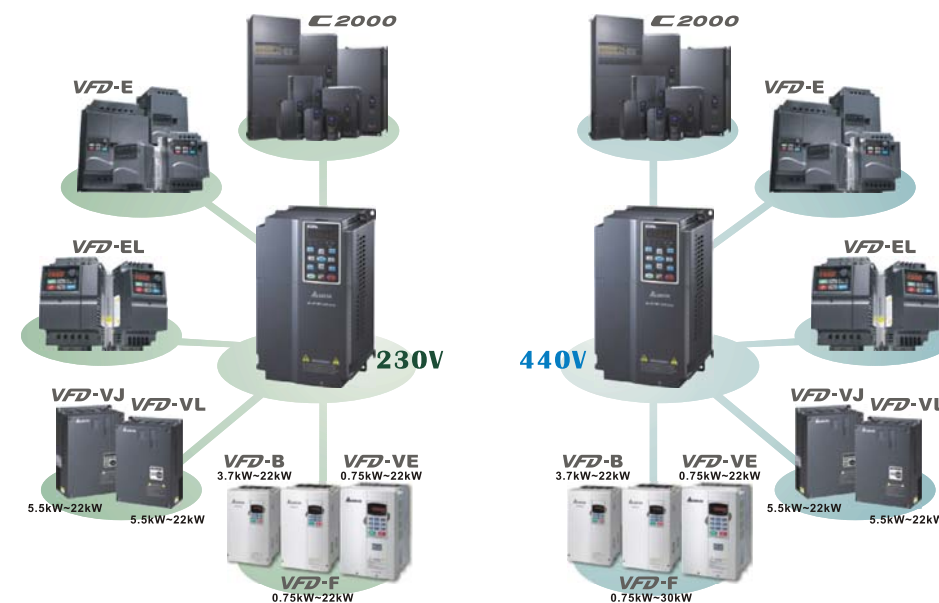
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## Delta AC Motor Drives for AFE2000

### Delta Motor Drive



### Delta Servo Drive: ASDA-A+, ASDA-A2, ASDA-B2