



Digitized Automation for a Changing World

Delta Active Front End AFE2000 Series



www.deltaww.com

 **DELTA**
Smarter. Greener. Together.

Features

- ▶ Full-load operation: input-side current THD lower than 5% and power factor up to 99%, reducing equipment capacity and installation cost
- ▶ Lowers the excess heat generated by traditional brake resistors to reduce air-conditioning operation load
- ▶ Energy-saving: more than 95% of the regenerative energy is converted into electricity and supplied back to the mains
- ▶ AC motor drives with AFE2000: supports 4-quadrant operation with variable frequencies and adjustable system
- ▶ Constant DC bus voltage: unaffected by mains voltage fluctuations
- ▶ Built-in Modbus RS-485 protocol: Modbus TCP communication card is available for equipment connection

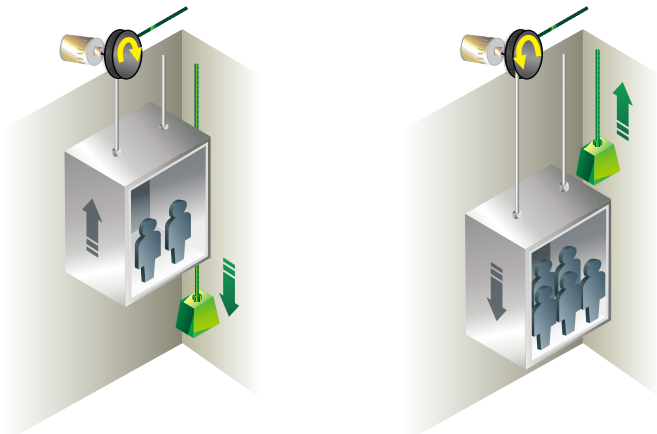
Applications

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

When unloading large goods or cargos, the crane's motor is in generator mode and produces excess energy. The AFE2000 reduces the excess heat generated by a traditional brake resistor and converts the excess energy into reusable energy for the crane system.

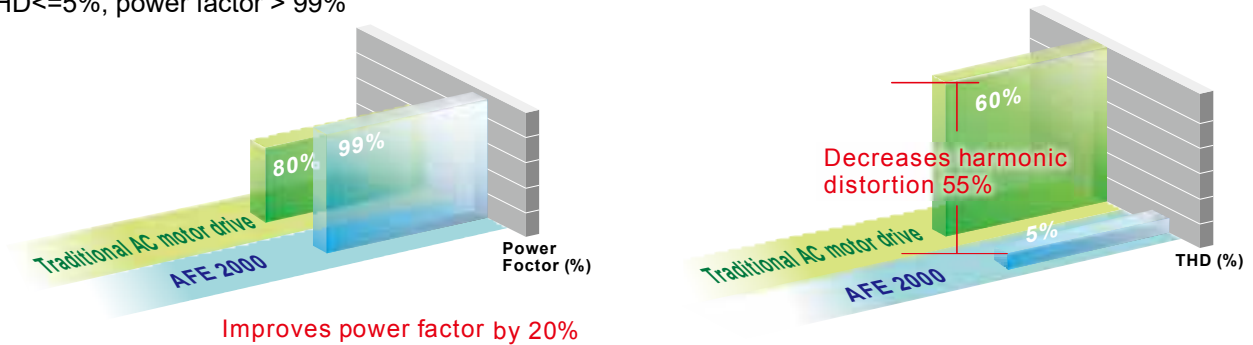


When traveling upward with a light load or downward with a heavy load, the elevator's motor is in generator mode and produces excess energy. The AFE2000 converts the excess energy into reusable electricity for the use of other devices and equipment.

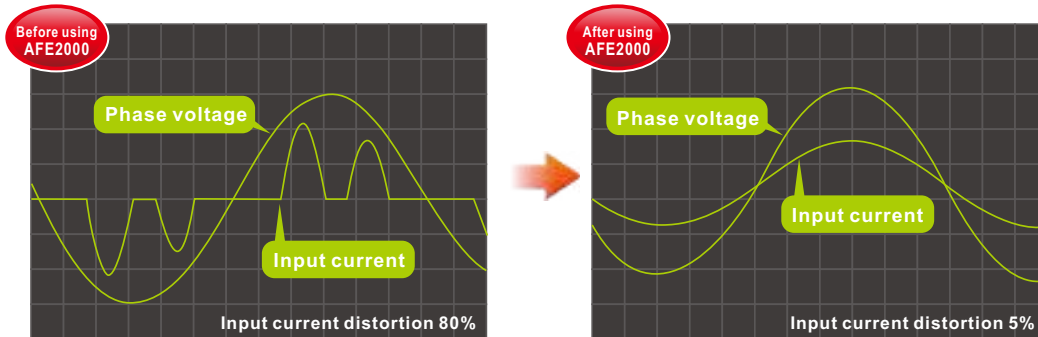


■ **The AFE improves power factor and decreases harmonic distortion**

- ▶ THD ≤ 5%, power factor > 99%



- ▶ Improves power factor, lowers harmonic distortion, and decreases energy consumption to reduce energy costs and protect the environment.

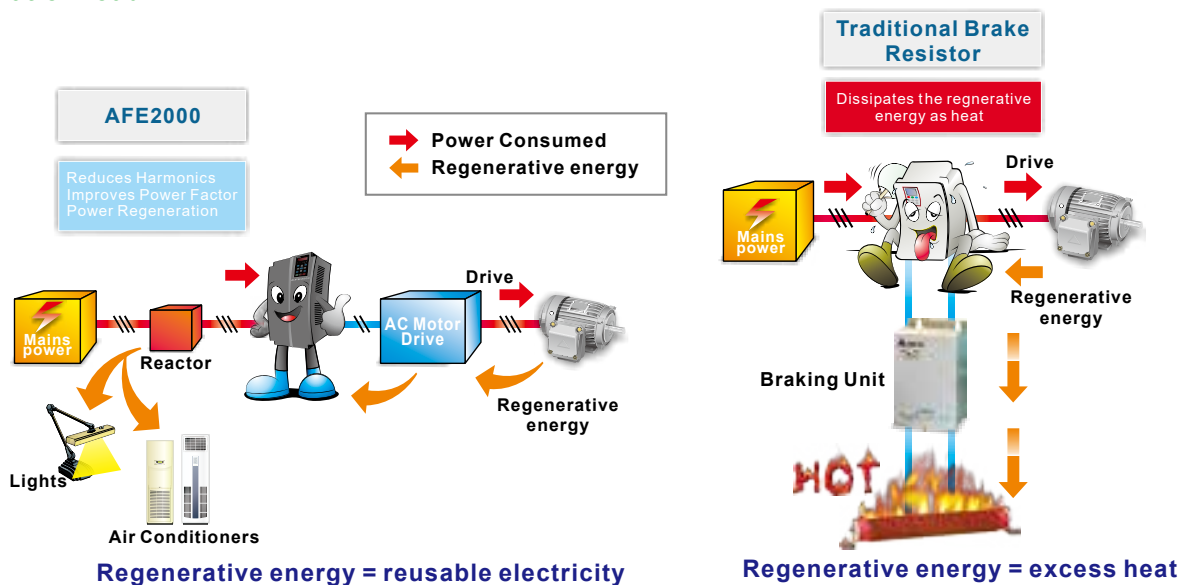


- ▶ The AFE2000 is your best choice to comply with the following international standards:

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



■ **Lowers the excess heat generated by traditional brake resistors with the AFE200 converting regenerative energy (excess heat) into reusable electricity and reducing air-conditioning operation load**

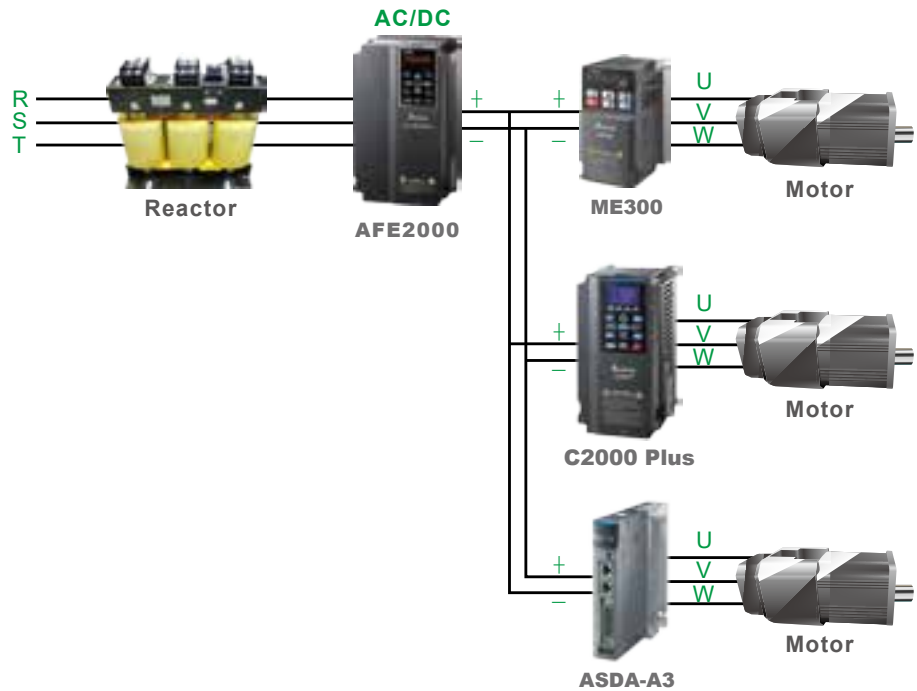




Multiple Solutions

The AFE2000 Series is an energy-saving product that offers a regenerative energy solution and at the same time improves overall power quality while reducing total electricity costs.

■ One-to-Many Structure



■ One-to-One Structure



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

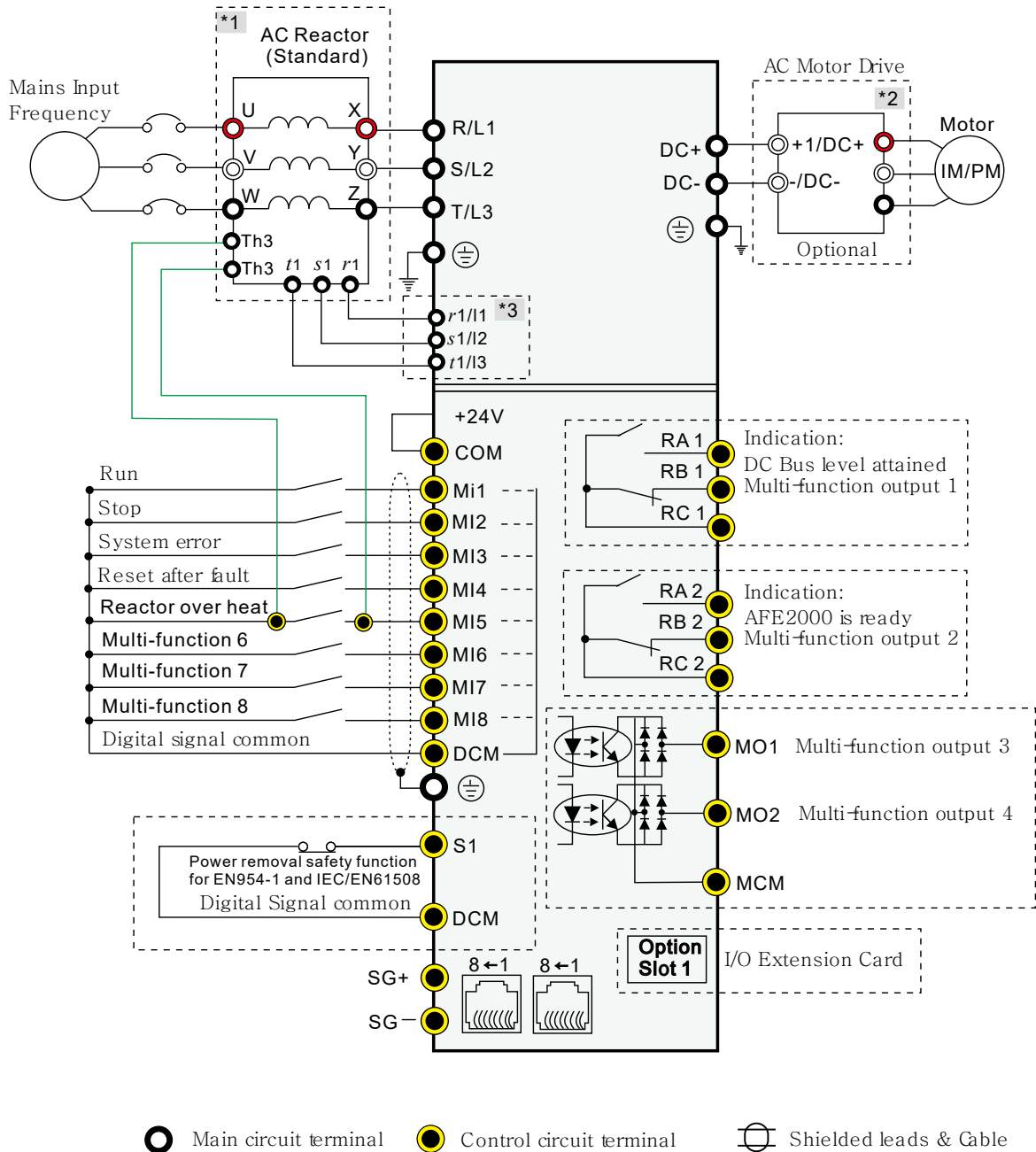
Specifications

230V				
Model AFE-__A23A	075	150	220	370
Applicable Power (kW)	7.5	15	22	37
Rated Input Voltage (V)	170 ~ 250 V _{AC}			
Rated Input Current (A)	35	70	95	150
Voltage Control	300 ~ 370 V _{DC}			
Overload Capacity	150% 60 sec			
Frequency Tolerance	±5%			
Power Factor at Input Side	0.95 to 0.99 above			
Harmonic (%)	Less than 5% (at rated current)			
Enclosure Type	IP20/NEMA1			IP00/UL Open Type
Cooling Method	Fan cooling			
Installation Environment	For indoors and altitudes of 0 ~ 1000 m (3280.60 feet), keep away from direct sunlight, corrosive gases, liquids and dust. For altitudes above 1000 m (3280.60 feet), please decrease 3% of rated current for every 500 m (1640.40 feet) increase. The maximum altitude is 2500 m (8202.00 feet)			
Ambient Temperature	-10 °C ~ +50 °C			
Storage/Transportation Temperature	-25 ~ +65 °C			
Ambient Humidity	Lower than 90% RH (non-condensing)			
Vibration	5.9m/S ² (0.6G) less than 10 ~ 55 Hz (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 ~ 500 V _{AC}					
Rated Input Current (A)	20	35	50	75	95	160
Voltage Control	600 ~ 740 V _{DC}					
Overload Capacity	150% 60 sec					
Frequency Tolerance	±5%					
Power Factor at Input Side	0.95 to 0.99 above					
Harmonic (%)	Less than 5% (at rated current)					
Enclosure Type	IP20/NEMA1			IP00/UL Open Type		
Cooling Method	Fan cooling					
Installation Environment	For indoors and altitudes of 0 ~ 1000 m (3280.60 feet), keep away from direct sunlight, corrosive gases, liquids and dust. For altitudes above 1000 m (3280.60 feet), please decrease 3% of rated current for every 500 m (1640.40 feet) increase. The Maximum altitude is 2500 m (8202.00 feet)					
Ambient Temperature	-10 °C ~ +50 °C					
Storage/Transportation Temperature	-25 ~ +65 °C					
Ambient Humidity	Lower than 90% RH (non-condensing)					
Vibration	5.9m/S ² (0.6G) less than 10 ~ 55 Hz (JIS C0040)					

Wiring

One-to-One Installation (One AFE2000 + One AC Motor Drive)



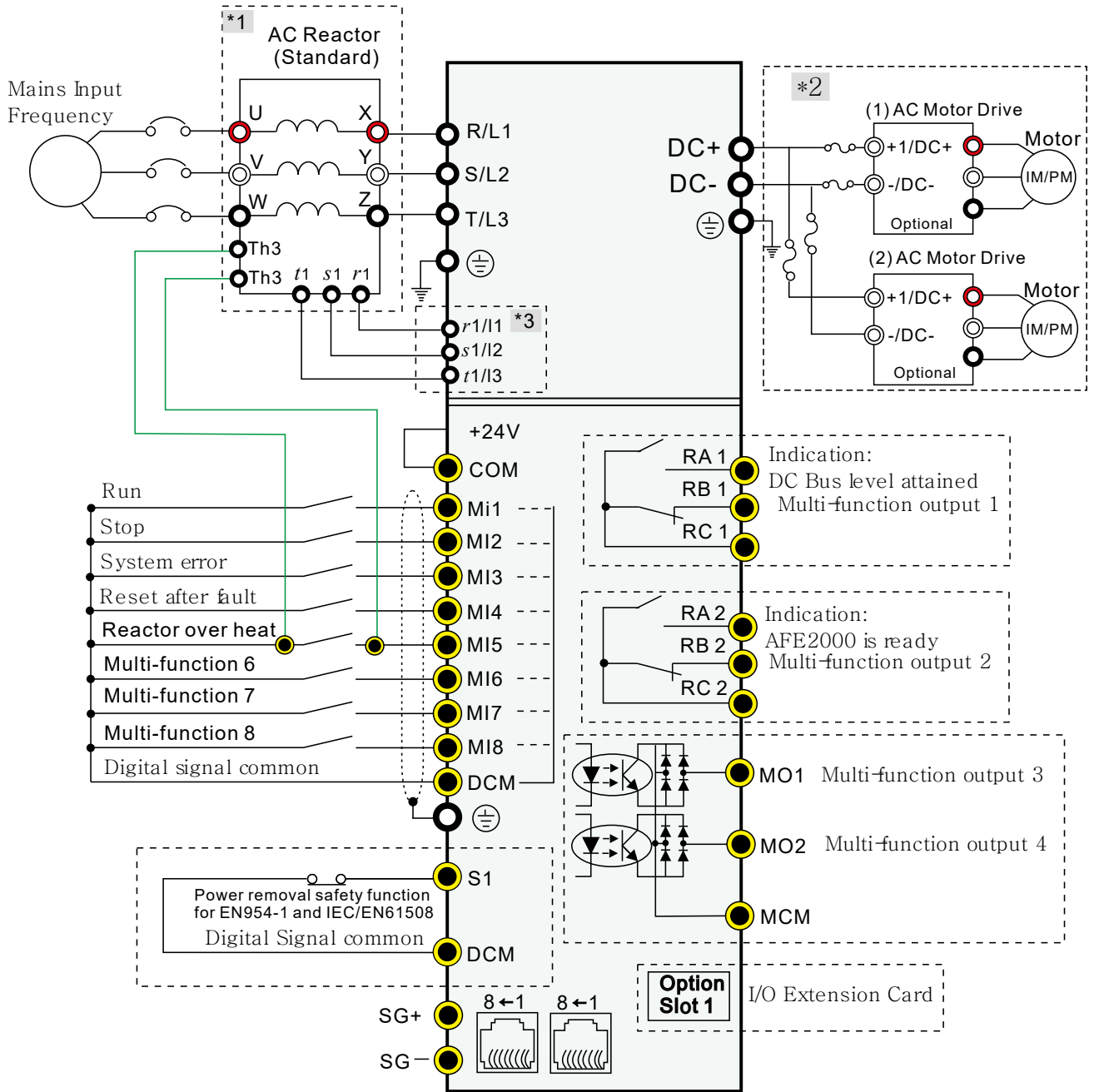
Note:

*1. Delta's AC reactor (standard installation accessory) is equipped with a thermal protection function. The TH3 terminal will have the AFE2000 send out a warning message, when the reactor temperature exceeds 120°C.

*2. For one-to-many installation, it is recommended to install a fuse at the DC input side of the drive. Please calculate and select a suitable fuse for your drive: Fuse type= (Rated input current of drive/0.78)x 1.5

*3. For installing a non-Delta brand AC reactor, please connect the PLL power input terminals (r1/I1, s1/I2, t1/I3) to the power input terminals (R/L1, S/L2, T/L3).

One-to-Many Installation (One AFE2000 + Multiple AC Motor Drives)



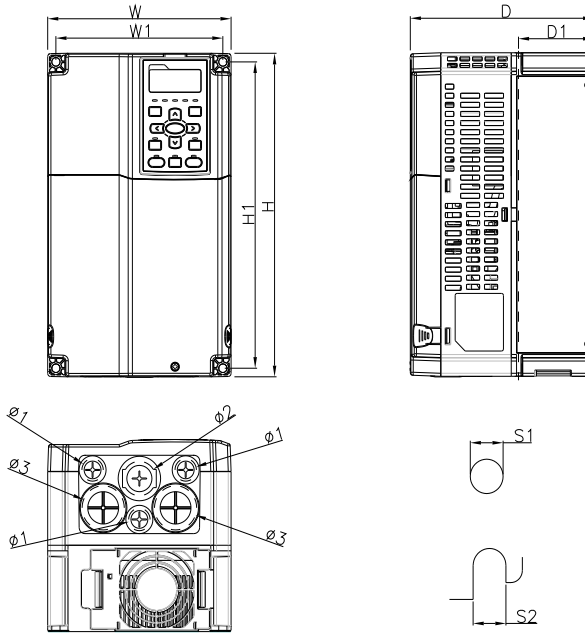
Main circuit terminal
 Control circuit terminal
 Shielded leads & Cable

Note:

- *1. Delta's AC reactor (standard installation accessory) is equipped with a thermal protection function. The TH3 terminal will have the AFE2000 send out a warning message, when the reactor temperature exceeds 120 °C.
- *2. For one-to-many installation, it is recommended to install a fuse at the DC input side of the drive. Please calculate and select a suitable fuse for your drive: Fuse type= (Rated input current of drive/0.78)x1.5
- *3. For installing a non-Delta brand AC reactor, please connect the PLL power input terminals (r1/l1, s1/l2, t1/l3) to the power input terminals (R/L1, S/L2, T/L3).

Dimensions

Frame B



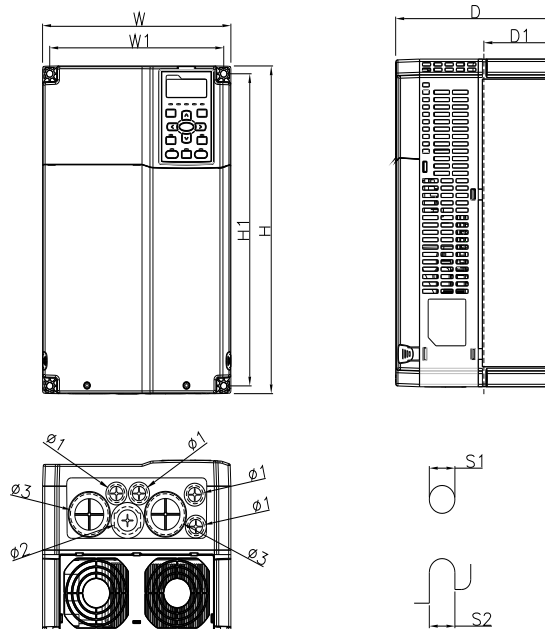
MODEL

AFE075A23A
AFE075A43A
AFE150A43A

Frame		W	H	D	W1	H1	D1*	S1	S2	Ø1	Ø2	Ø3
B	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

D1*: Flange mounting

Frame C



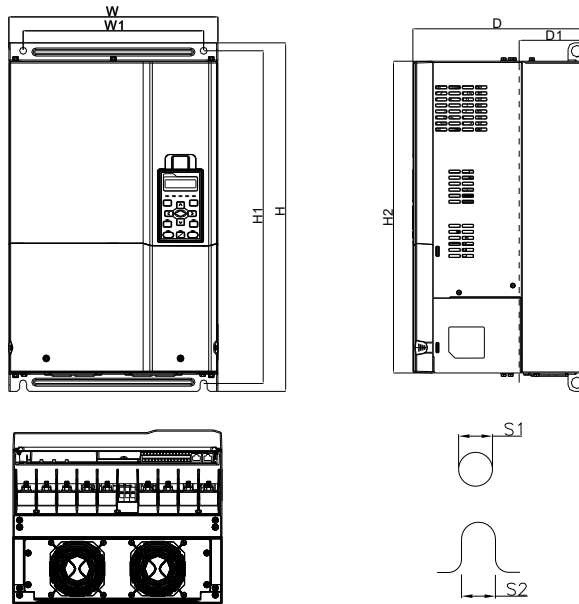
MODEL

AFE150A23A
AFE220A23A
AFE220A43A

Frame		W	H	D	W1	H1	D1*	S1	S2	Ø1	Ø2	Ø3
C	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	17.75	8.27	9.09	15.00	3.66	0.33	0.33	0.87	1.34	1.97

D1*: Flange mounting

Frame D



MODEL

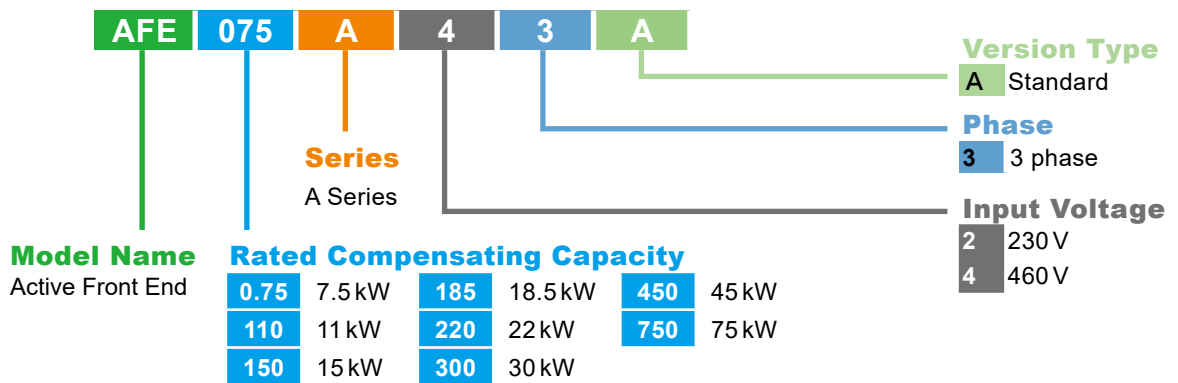
AFE370A23A
 AFE370A43A
 AFE450A43A
 AFE750A43A

Frame		W	H	D	W1	H1	H2	D1*	S1	S2
D	mm	330.0	550.0	275.0	285.0	525.0	492.0	107.2	11.0	18.0
	inch	12.99	21.65	10.83	11.22	20.67	19.37	4.22	0.43	0.71

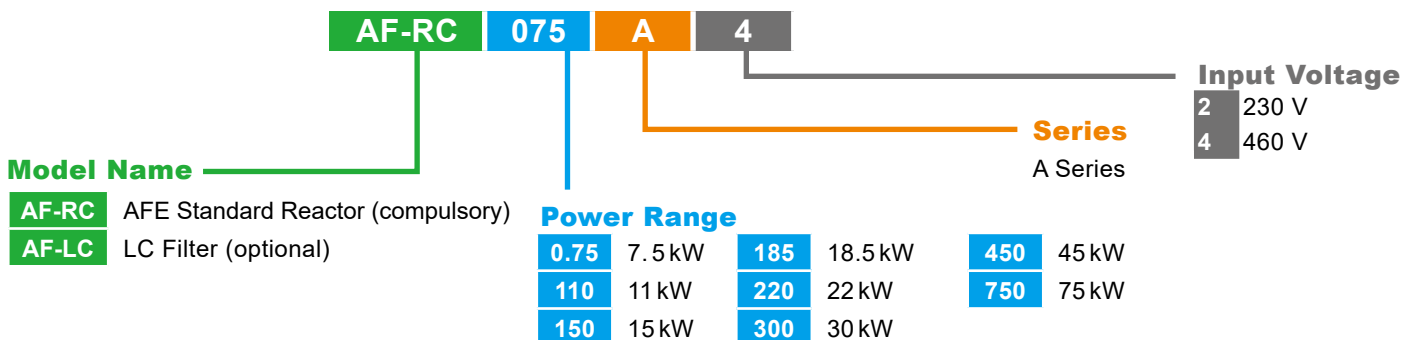
D1*: Flange mounting

Model Name

AFE2000



LC Filters and Energy Storage Accessories



AFE Standard Reactors and LC Filters



AFE Standard Reactor and LC Filter Selection Table

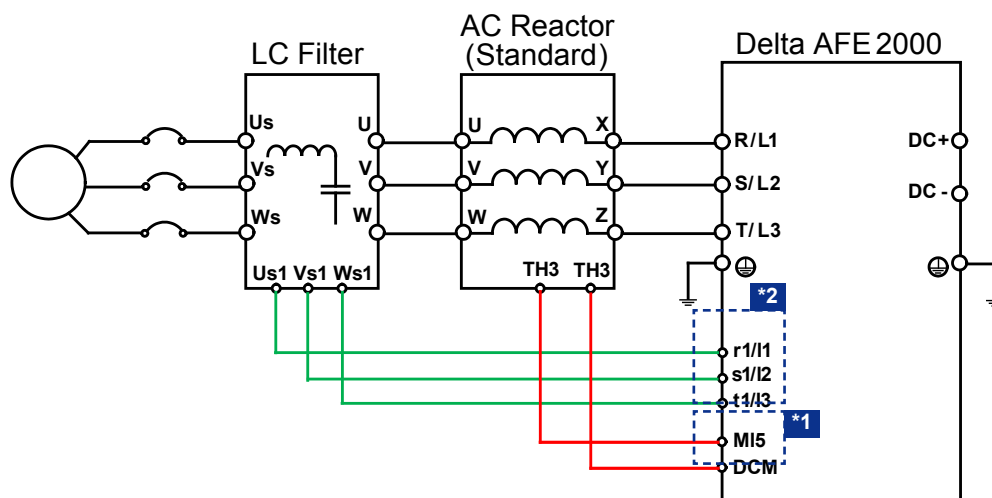
The AFE Standard Reactor is a mandatory accessory. Please select a model based on the capacity of AFE2000.

230V						
kW	Frame	Applicable Model	Reactor Model	Inductance (mH)	LC Filter Model	Rated Current (A)
7.5	B	075	AF-RC075A2	2.1	AF-LC075A2	35
15	C	150	AF-RC150A2	1.05	AF-LC150A2	70
22		220	AF-RC220A2	0.77	AF-LC220A2	95
37	D	370	AF-RC370A2	0.5	AF-LC370A2	150

460V						
kW	Frame	Applicable Model	Reactor Model	Inductance (mH)	LC Filter Model	Rated Current (A)
7.5	B	075	AF-RC075A4	7.32	AF-LC075A4	20
15		150	AF-RC150A4	4.18	AF-LC150A4	35
22	C	220	AF-RC220A4	2.92	AF-LC220A4	50
37	D	370	AF-RC370A4	1.96	AF-LC370A4	75
45		450	AF-RC450A4	1.54	AF-LC450A4	95
75		750	AF-RC750A4	0.92	AF-LC750A4	160

LC Filter Wiring Diagram

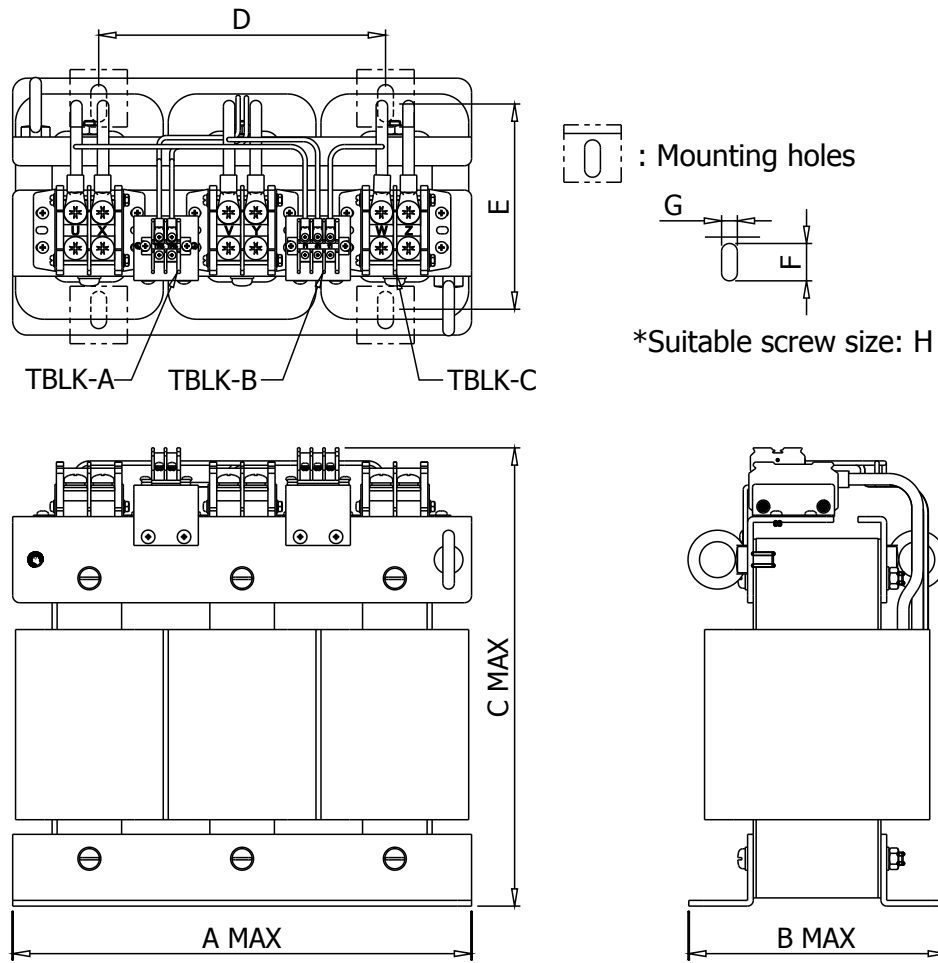
The AFE LC filter enhances system power efficiency and suppresses frequency interference when matched with standard reactors and active front end units.



*1 Delta's AC reactor (standard installation accessory) is equipped with a thermal protection function. The TH3 terminal will have the AFE2000 send out a warning message when the reactor temperature exceeds 120°C.

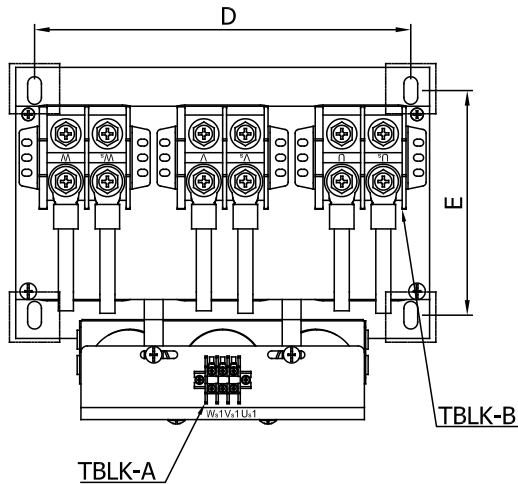
*2 For installing an LC filter, please connect the AFE's power input terminals (r1/I1, s1/I2, t1/I3) to the LC filter's AC detection terminals (Us1, Vs1, Ws1).


AFE Standard Reactor Dimensions

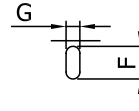


Model Name	A	B	C	D	E	F	G	H	Weight (Kg)
AF-RC075A2	305	159	280	150	125	22	11	M10	28
AF-RC150A2	355	180	308	200	139	26	11	M10	47
AF-RC220A2	355	180	328	200	139	26	11	M10	52
AF-RC370A2	385	210	385	200	168	25	13	M12	87
AF-RC075A4	305	159	280	150	125	22	11	M10	28
AF-RC150A4	355	180	308	200	139	26	11	M10	47
AF-RC220A4	355	180	328	200	139	26	11	M10	54
AF-RC370A4	385	210	385	200	168	25	13	M12	87
AF-RC450A4	385	220	385	200	178	25	13	M12	95
AF-RC750A4	420	230	440	250	190	25	13	M12	120

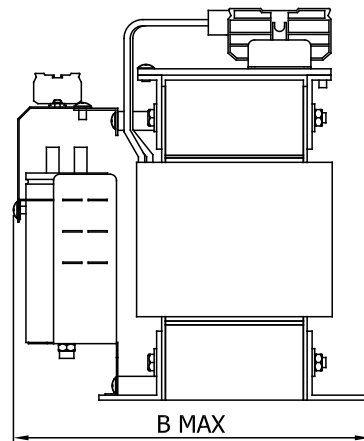
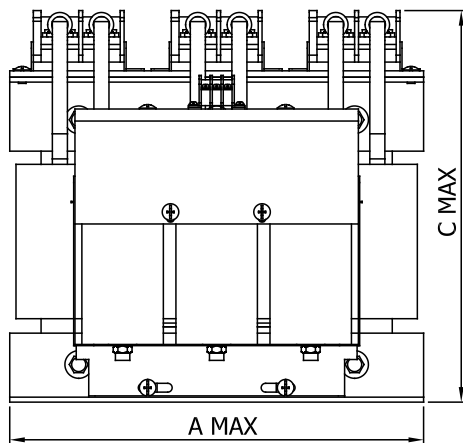
LC Filter Dimensions



 : Mounting holes



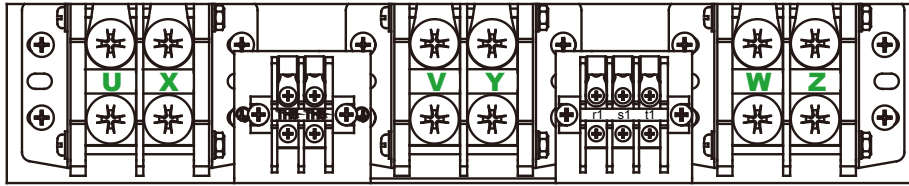
*Suitable screw size: H



Unit: mm

Model Name	A	B	C	D	E	F	G	H	Weight (Kg)
AF-LC075A2	275	220	280	235	89	22	11	M10	16
AF-LC150A2	275	225	280	235	109	22	11	M10	25
AF-LC220A2	335	250	330	300	134	22	11	M10	41
AF-LC370A2	335	260	330	300	149	22	11	M10	51
AF-LC075A4	275	220	280	235	89	22	11	M10	17
AF-LC150A4	275	220	280	235	109	22	11	M10	22
AF-LC220A4	335	250	330	300	134	22	11	M10	40
AF-LC370A4	335	265	330	300	149	22	11	M10	49
AF-LC450A4	335	275	330	300	159	22	11	M10	55
AF-LC750A4	335	295	330	300	179	22	11	M10	68

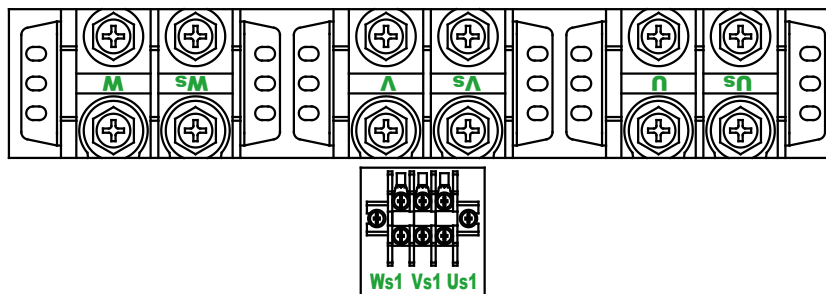
AC Reactor Terminal Diagram



■ Screw Torque

Reactor Model Name	Torque: (Kg-cm) $\pm 10\%$			Torque: (Lb-in.) $\pm 10\%$			Torque: (Nm) $\pm 10\%$		
	Mounting	TBLK-A, B	TBLK-C	Mounting	TBLK-A, B	TBLK-C	Mounting	TBLK-A, B	TBLK-C
AF-RC075A2	80	5.1	30.5	69.4	4.4	26.5	7.9	0.5	3
AF-RC150A2	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-RC220A2	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-RC370A2	160	5.1	102	138.9	4.4	88.5	15.7	0.5	10
AF-RC075A4	80	5.1	30.5	69.4	4.4	26.5	7.9	0.5	3
AF-RC150A4	80	5.1	30.5	69.4	4.4	26.5	7.9	0.5	3
AF-RC220A4	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-RC370A4	160	5.1	102	138.9	4.4	88.5	15.7	0.5	10
AF-RC450A4	160	5.1	102	138.9	4.4	88.5	15.7	0.5	10
AF-RC750A4	220	5.1	102	191	4.4	88.5	21.6	0.5	10




LC Filter Terminal Diagram



■ Screw Torque

460V Reactor Model Name	Torque: (Kg-cm) $\pm 10\%$			Torque: (Lb-in.) $\pm 10\%$			Torque: (Nm) $\pm 10\%$		
	Mounting	TBLK-A, B	TBLK-C	Mounting	TBLK-A, B	TBLK-C	Mounting	TBLK-A, B	TBLK-C
AF-LC075A2	60	5.1	30.5	52.1	4.4	26.5	5.9	0.5	3
AF-LC150A2	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-LC220A2	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-LC370A2	80	5.1	102	69.4	4.4	88.5	7.9	0.5	10
AF-LC075A4	60	5.1	30.5	52.1	4.4	26.5	5.9	0.5	3
AF-LC150A4	80	5.1	30.5	69.4	4.4	26.5	7.9	0.5	3
AF-LC220A4	80	5.1	81.6	69.4	4.4	70.8	7.9	0.5	8
AF-LC370A4	80	5.1	102	69.4	4.4	88.5	7.9	0.5	10
AF-LC450A4	80	5.1	102	69.4	4.4	88.5	7.9	0.5	10
AF-LC750A4	120	5.1	102	104.2	4.4	88.5	11.8	0.5	10

Ordering Information

Frame Size		Power Range	Models
Frame B		230V: 7.5W 460V: 7.5kW ~ 15kW	AFE075A23A AFE075A43A AFE150A43A
Frame C		230V: 15kW ~ 22kW 460V: 22kW	AFE150A23A AFE220A23A AFE220A43A
Frame D		230V: 37kW 460V: 37kW ~ 75kW	AFE370A23A AFE370A43A AFE450A43A AFE750A43A

Delta AC Motor Drives for the AFE2000

- Delta AC Motor Drives



- Delta Servo Drives: ASDA-A2, ASDA-B2, ASDA-A3, ASDA-B3

Accessories

▪ Non-fuse Circuit Breaker

Complies with UL standard: Per UL 508, paragraph 45.8.4, part a,
The rated current of the breaker shall be 2 ~ 4 times of the maximum rated input current of the AFE unit.

3-phase 230V	
Model	Recommended Current (A)
AFE075A23A	60
AFE150A23A	125
AFE220A23A	200
AFE370A23A	250

3-phase 460V	
Model	Recommended Current (A)
AFE075A43A	40
AFE150A43A	60
AFE220A43A	100
AFE370A43A	150
AFE450A43A	175
AFE750A43A	300

▪ Fuse Specification Chart

Fuses with a specification smaller than what the following table indicates are allowed.

230V Model	Manufacturer	Class / Catalog No	Rating
AFE075A23A	Cooper Bussmann Inc.	Class _T / JJS-60	600 V _{AC} , 60 A
AFE150A23A		Class _T / JJS-125	600 V _{AC} , 125 A
AFE220A23A		Class _T / JJS-175	600 V _{AC} , 175 A
AFE370A23A		Class _T / JJS-250	600 V _{AC} , 250 A
230V Model	Manufacturer	Class / Catalog No	Rating
AFE075A43A	Cooper Bussmann Inc.	Class _T / JJS-35	600 V _{AC} , 35 A
AFE150A43A		Class _T / JJS-60	600 V _{AC} , 60 A
AFE220A43A		Class _T / JJS-90	600 V _{AC} , 90 A
AFE370A43A		Class _T / JJS-125	600 V _{AC} , 125 A
AFE450A43A		Class _T / JJS-175	600 V _{AC} , 175 A
AFE750A43A		Class _T / JJS-300	600 V _{AC} , 300 A

▪ KPC-CC01



- Highly illuminated LCD display
- Modbus RS-485A
- Languages: Traditional / Simplified Chinese, English



Smarter. Greener. Together.

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