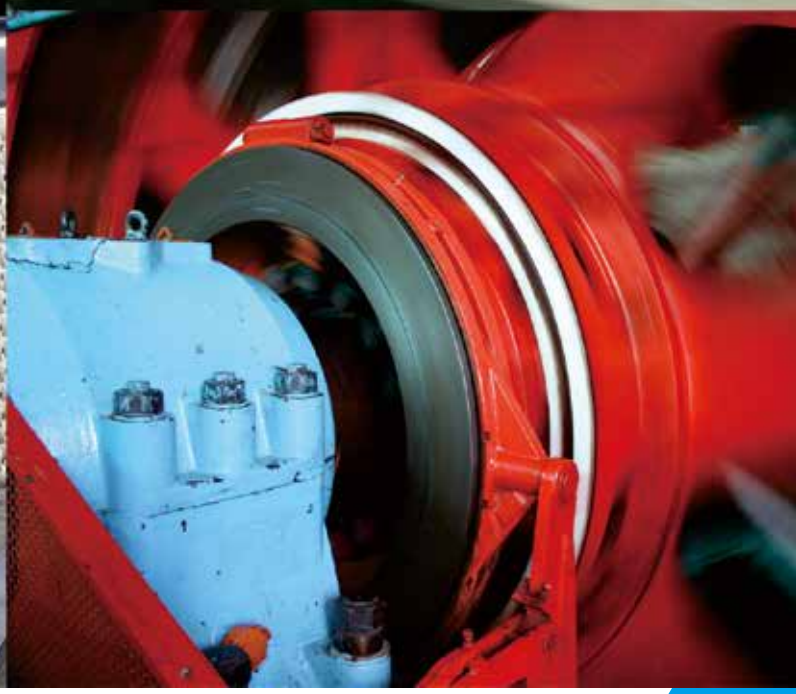


Automation for a Changing World

Delta Active Front End
AFE2000 Series

www.deltaww.com

DELTA

Smarter. Greener. Together.

Features

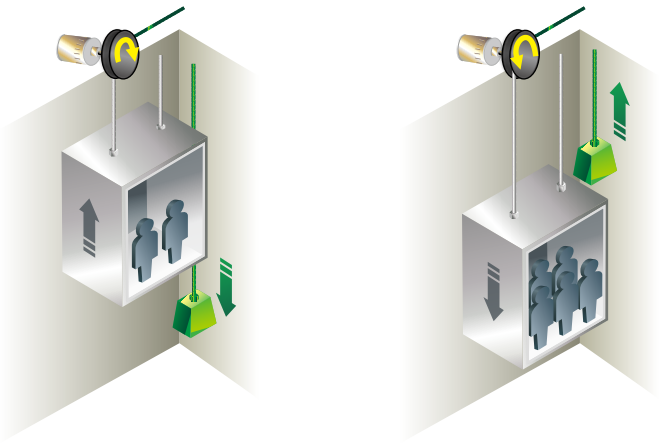
- Replaces traditional brake resistor to reduce heat energy.
- Clear energy savings: more than 95% of the regenerative energy is converted into electricity and supplied back to the mains.
- Full-load operation: input-side current THD lower than 5% and power factor up to 99%.
- AC motor drives with AFE2000: supports 4-quadrant operation with variable frequencies and adjustable system.
- Constant DC bus voltage: unaffected by mains voltage fluctuations.

Applications

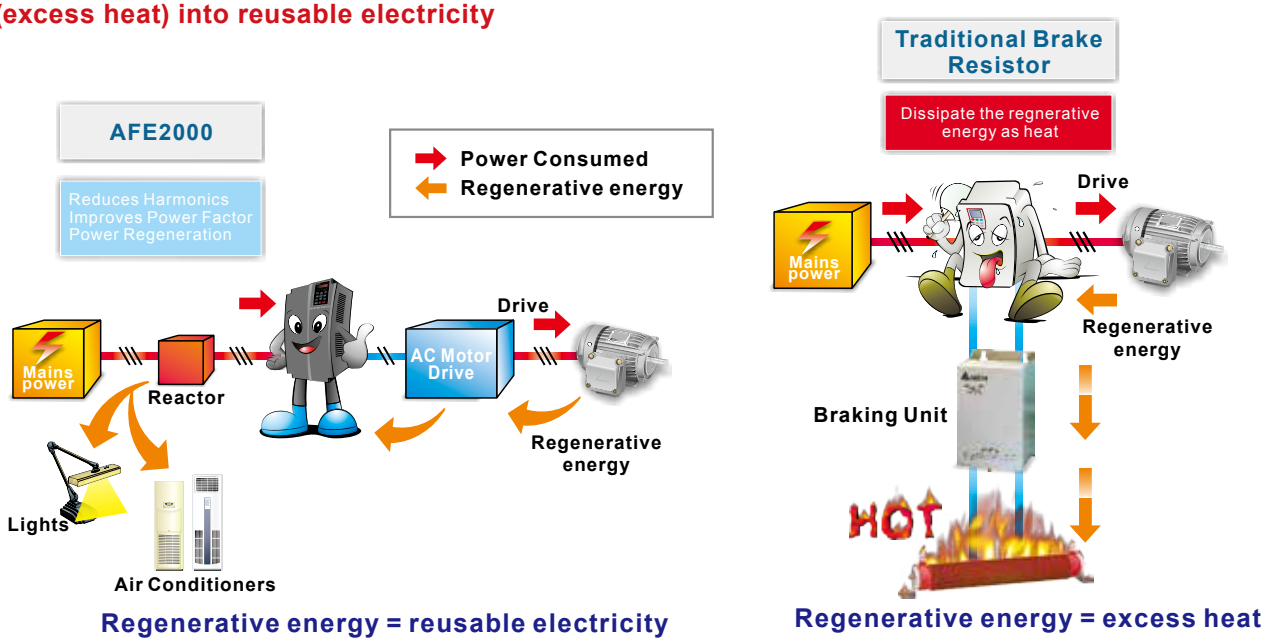
- Large-inertia loads: centrifuge equipment, dewatering machines and roving machines
- 4-quadrant loads: elevators, cranes and pumpjacks (oil extraction machines)
- Quick braking: machine tools, bag making machines, auto storage and retrieval systems, and lathes
- Long-term energy feedback: wind power, 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 replaces 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.

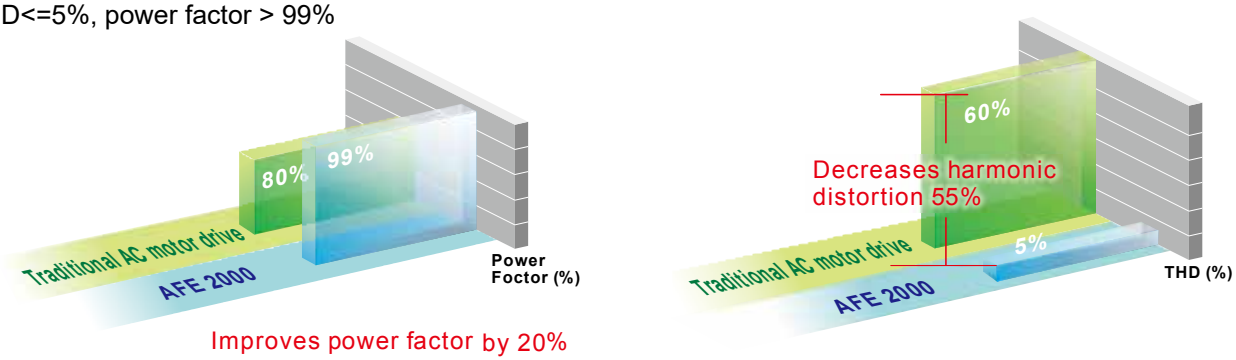


■ Replace traditional brake resistors with the AFE2000 to convert regenerative energy (excess heat) into reusable electricity

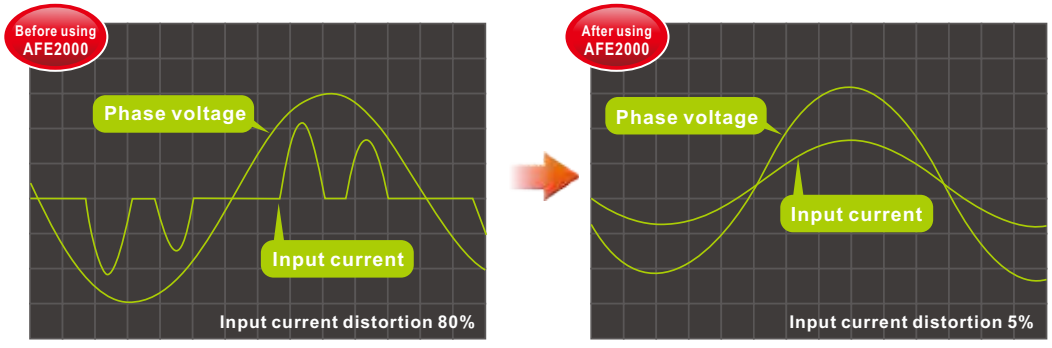


■ The AFE improves power factor and decreases harmonic distortion

- THD<=5%, power factor > 99%



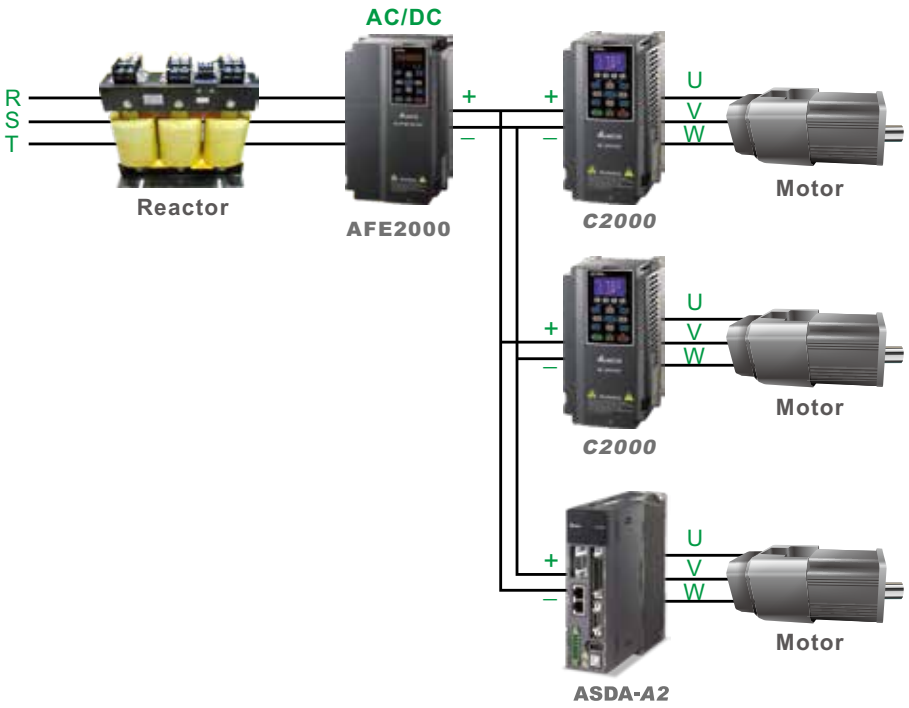
- Improves power factor, lowers harmonic distortion, and decreases energy consumption to reduce energy costs and protect the environment.



- The AFE2000 is your best choice with the following international standards:
  - · IEEE519-1992
  - · IEC/EN61000-3-12
  - · IEC/EN61000-3-4
  - · IEC/EN61000-3-2

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.



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

High-speed Fieldbus

- Various communication network cards and fieldbus cards
- Built-in RS-485 (MODBUS) protocol
- Supports various communications for real-time monitoring of power statistics:

CANopen DeviceNet EtherNet/IP MODBUS TCP

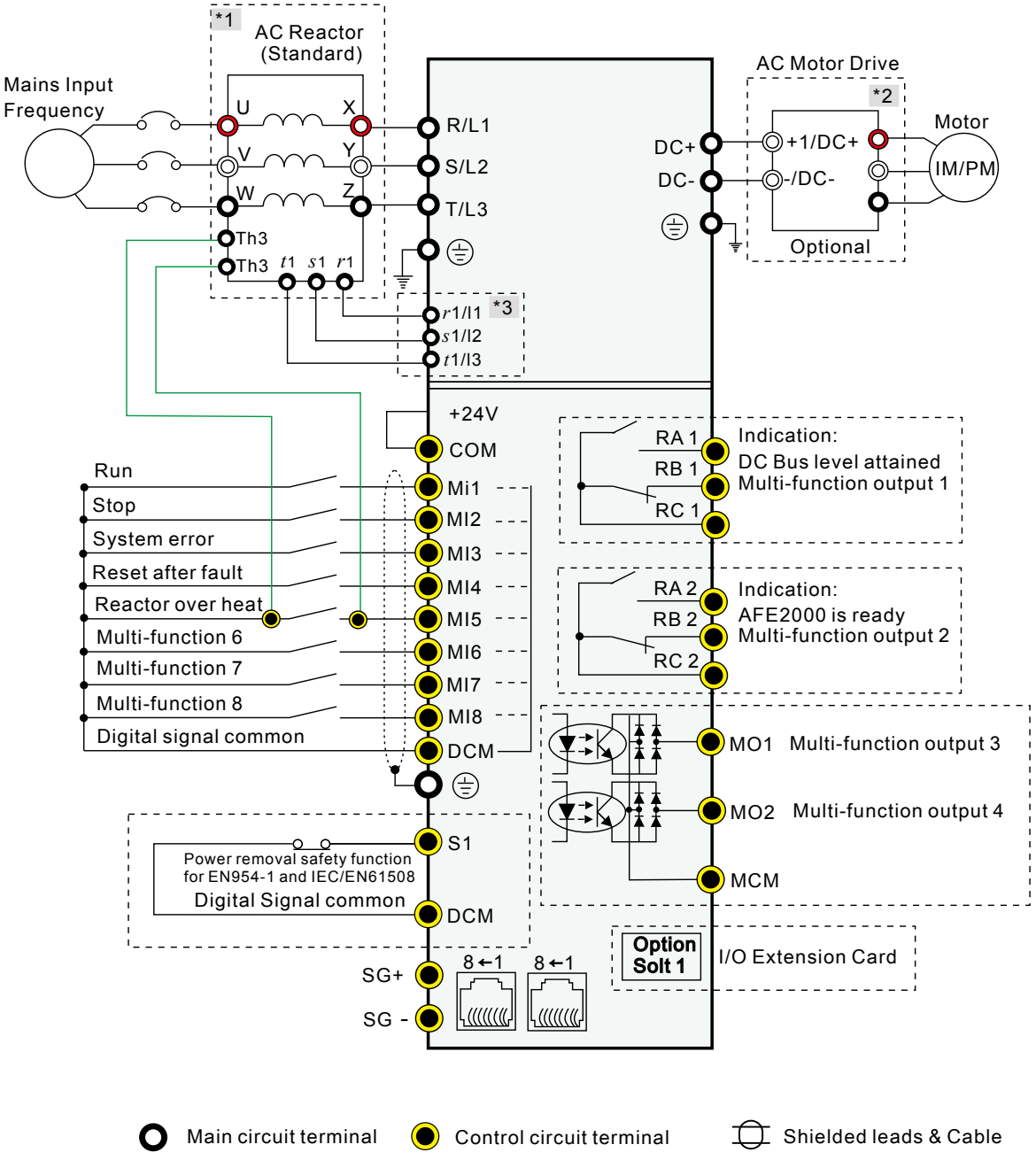
Specifications

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	5.9 m/S^2 (0.6 G) 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 Max.imum 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	5.9 m/S^2 (0.6 G) less than 10 ~ 55 Hz (JIS C0040)					

Wiring

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



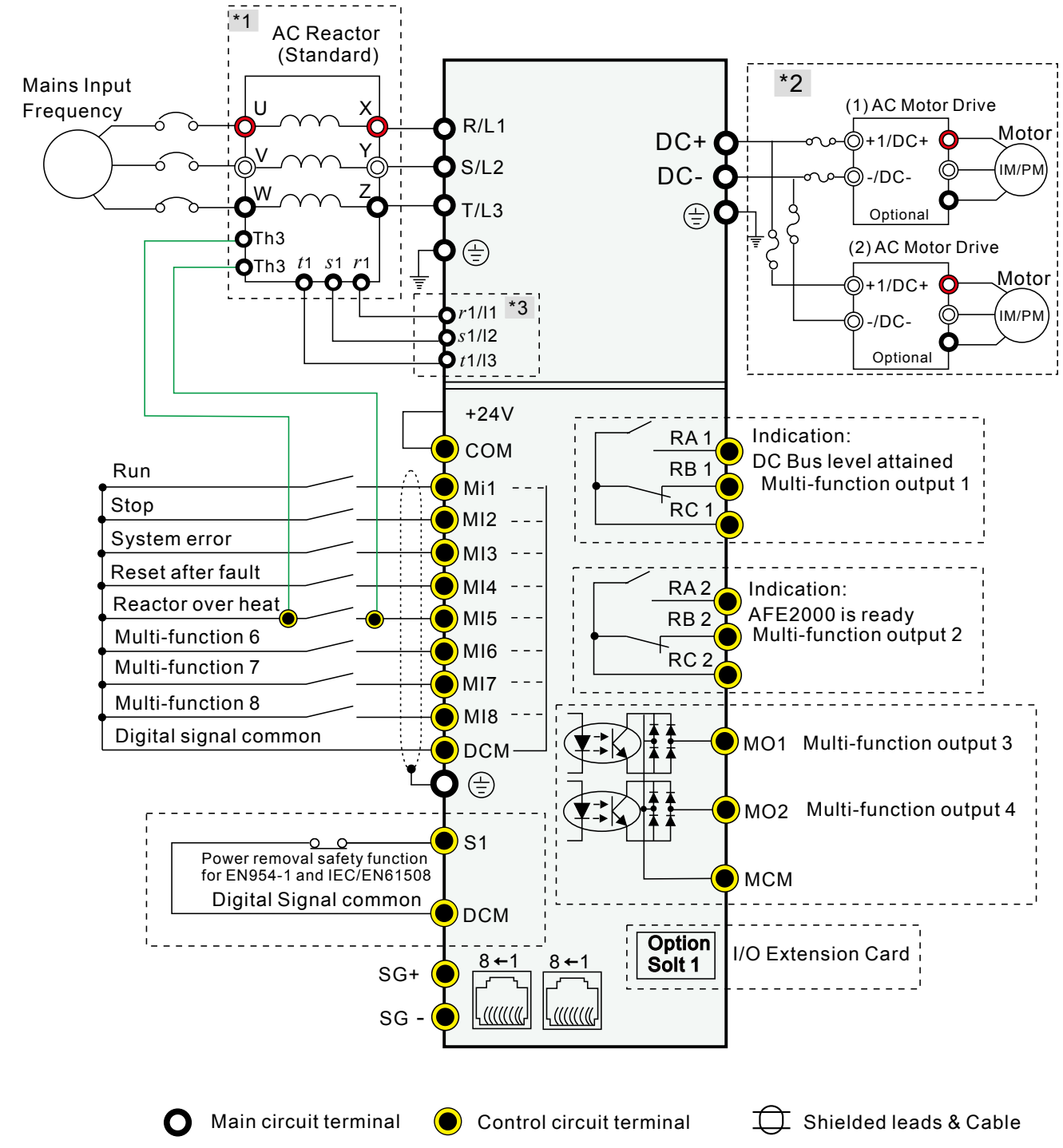
Note:

*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/l1, s1/l2, t1/l3) to the power input terminals (R/L1, S/L2, T/L3).

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



Note:

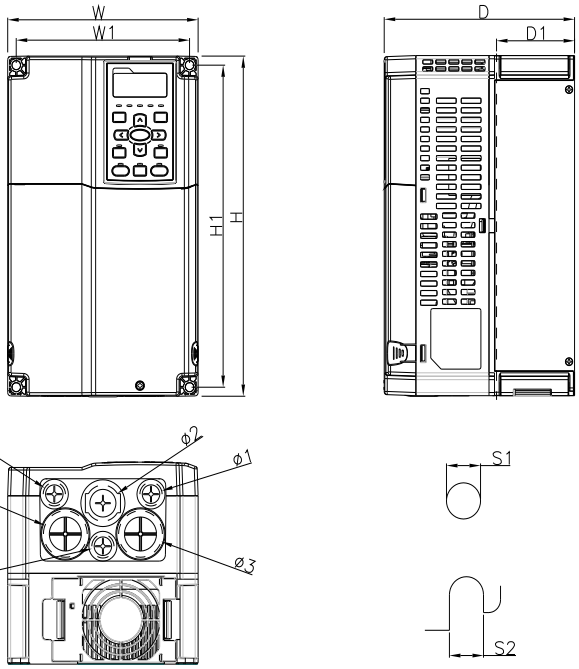
*1. Delta's AC reactor (standard installation accessory) is equipped with a thermal protection function. The TH3 terminal will have the AFE2000 send out a warning message, when the reactor temperature exceeds 120 °C.

*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/l1, s1/l2, t1/l3) to the power input terminals (R/L1, S/L2, T/L3).

Dimensions

Frame B

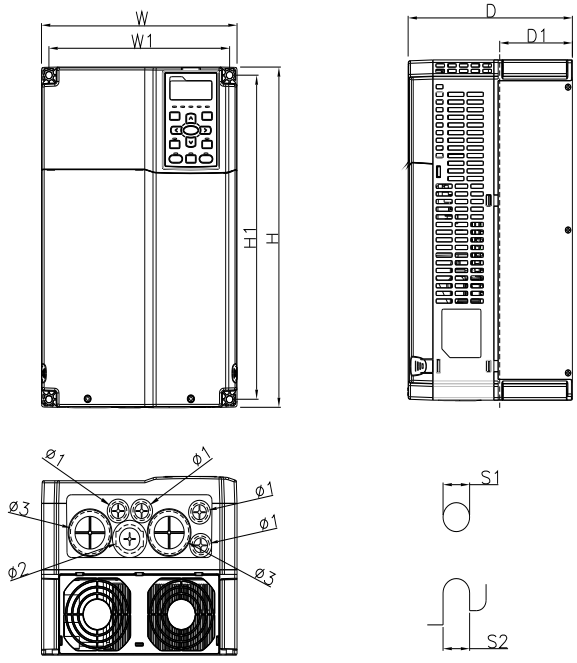


MODEL
AFE075A23A
AFE075A43A
AFE150A43A

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

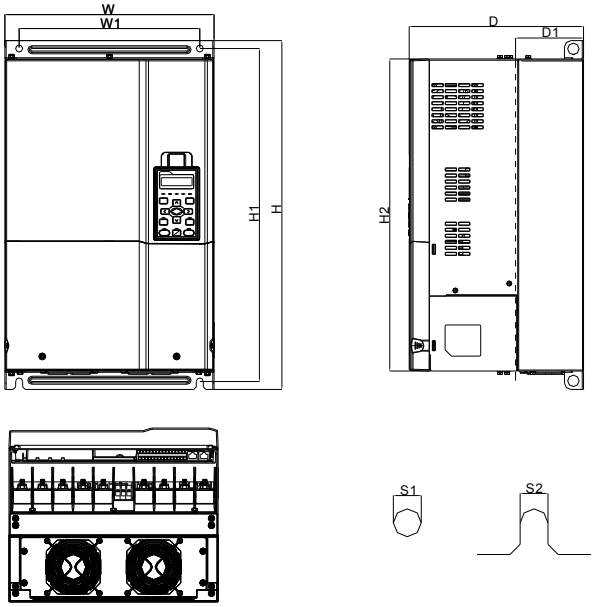


MODEL
AFE150A23A
AFE220A23A
AFE220A43A

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

AFE | 075 | A | 4 | 3 | A

Model Name
Active Front End

Series
A Series

Rated Compensating Capacity

0.75	7.5 kW	185	18.5 kW	450	45 kW
110	11 kW	220	22 kW	750	75 kW
150	15 kW	300	30 kW		

Input Voltage
2 230 V
4 460 V

Phase
3 3 phase

Version Type
A Standard

LC Filters and Energy Storage Accessories

AF-RC | 075 | A | 4

Model Name
AF-RC AFE Standard Reactor
AF-LC LC Filter

Power Range

0.75	7.5 kW	185	18.5 kW	450	45 kW
110	11 kW	220	22 kW	750	75 kW
150	15 kW	300	30 kW		

Series
A Series

Input Voltage
2 230 V
4 460 V

AFE Standard Reactors and LC Filters

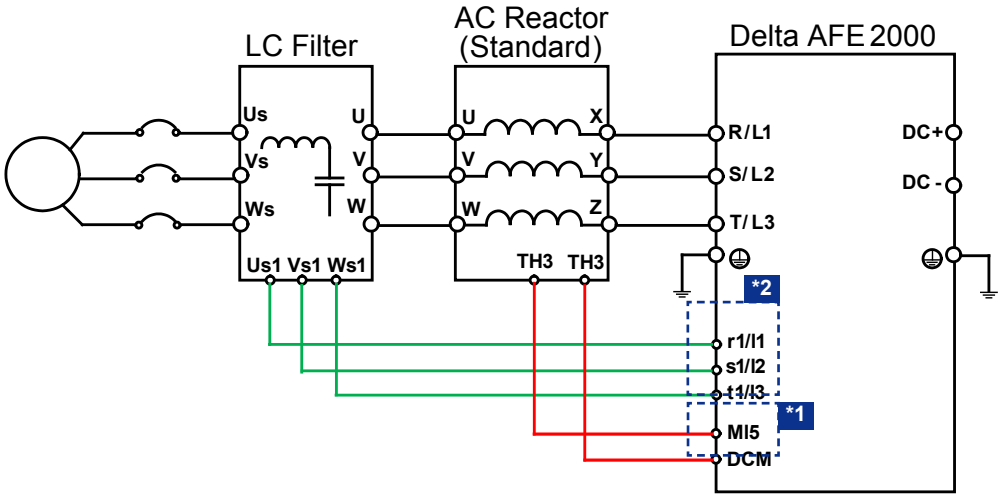
AFE Standard Reactor and LC Filter Selection Table

230V						
KW	Frame	Applicable Model	Reactor Model	Inductance (mH)	LC Filter Model	Rated Curreut (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 Curreut (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

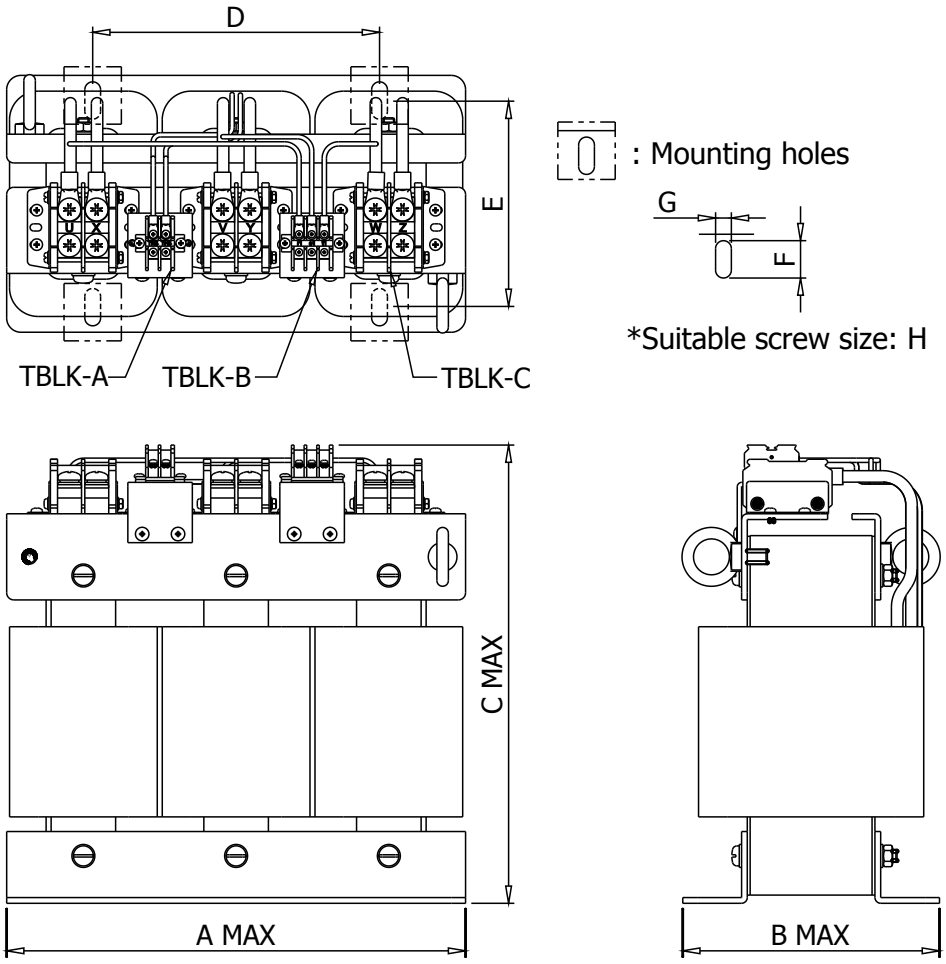
The AFE LC filter enhances system power efficiency and suppresses frequency interference when matched with standard reactors and active front end units.



*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℃ .

*2 For installing an LC filter, please connect the AFE's power input terminals (r1/l1, s1/l2, t1/l3) to the LC filter's AC detection terminals (Us1, Vs1, Ws1).

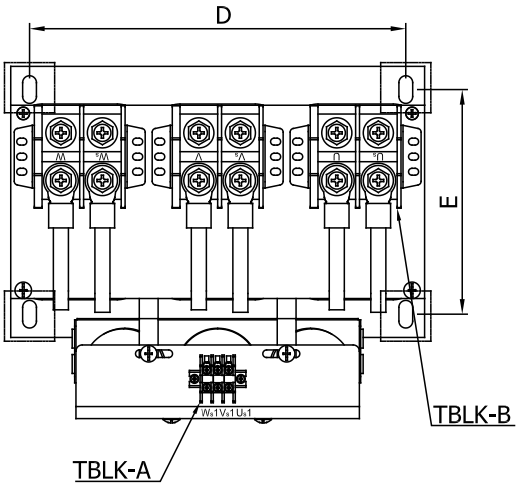
AFE Standard Reactor Dimensions

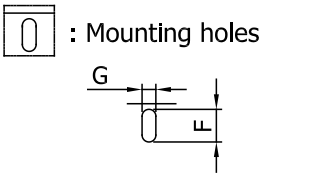


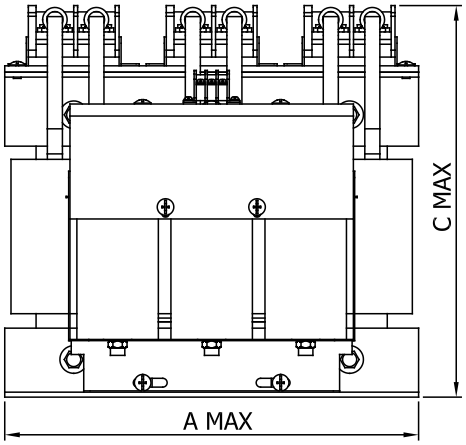
Unit: mm

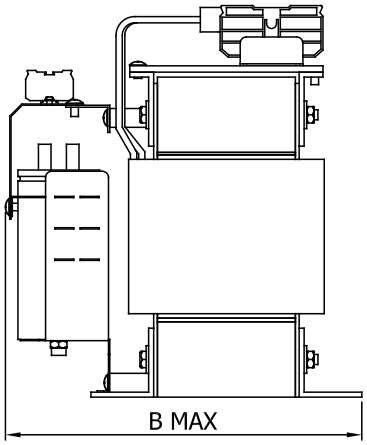
Model Name	A	B	C	D	E	F	G	H	Weight (Kg)
AF-RC075A2	305	159	280	150	125	22	11	M10	28
AF-RC150A2	355	180	308	200	139	26	11	M10	47
AF-RC220A2	355	180	328	200	139	26	11	M10	52
AF-RC370A2	385	210	385	200	168	25	13	M12	87
AF-RC075A4	305	159	280	150	125	22	11	M10	28
AF-RC150A4	355	180	308	200	139	26	11	M10	47
AF-RC220A4	355	180	328	200	139	26	11	M10	52
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





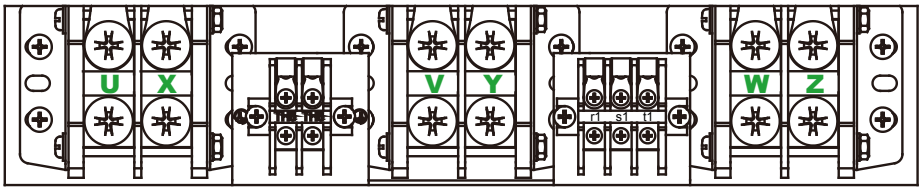




Unit: mm

Model Name	A	B	C	D	E	F	G	H	Weight (Kg)
AF-LC075A2	275	220	280	235	89	22	11	M10	17
AF-LC150A2	275	225	280	235	109	22	11	M10	25.5
AF-LC220A2	335	250	330	300	134	22	11	M10	42.6
AF-LC370A2	335	260	330	300	149	22	11	M10	53
AF-LC075A4	275	220	280	235	89	22	11	M10	18
AF-LC150A4	275	220	280	235	109	22	11	M10	22.8
AF-LC220A4	335	250	330	300	134	22	11	M10	42
AF-LC370A4	335	265	330	300	149	22	11	M10	50.9
AF-LC450A4	335	275	330	300	159	22	11	M10	56.7
AF-LC750A4	335	295	330	300	179	22	11	M10	70.9

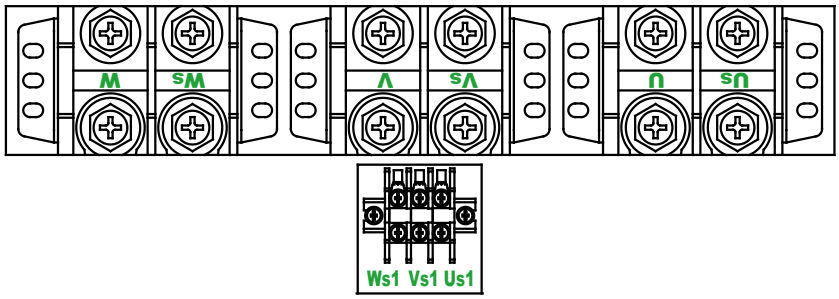
AC Reactor Terminal Diagram



■ Screw Torque

Reactor Model Name	Torque: (Kg-cm) ±10%			Torque: (Lb-in.) ±10%			Torque: (Nm) ±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

460 V Reactor Model Name	Torque: (Kg-cm) ±10%			Torque: (Lb-in.) ±10%			Torque: (Nm) ±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-A+, ASDA-A2, ASDA-B2**

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

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

▪ Fuse Specification Chart

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

230 V 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

230 V 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.

Industrial Automation Headquarters

Delta Electronics, Inc.
Taoyuan Technology Center
No.18, Xinglong Rd., Taoyuan District,
Taoyuan City 33068, Taiwan
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Shanghai) Co., Ltd.
No.182 Minyu Rd., Pudong Shanghai, P.R.C.
Post code : 201209
TEL: 86-21-6872-3988 / FAX: 86-21-6872-3996
Customer Service: 400-820-9595

Delta Electronics (Japan), Inc.
Tokyo Office
Industrial Automation Sales Department
2-1-14 Shibadaimon, Minato-ku
Tokyo, Japan 105-0012
TEL: 81-3-5733-1155 / FAX: 81-3-5733-1255

Delta Electronics (Korea), Inc.
Seoul Office
1511, 219, Gasan Digital 1-Ro., Geumcheon-gu,
Seoul, 08501 South Korea
TEL: 82-2-515-5305 / FAX: 82-2-515-5302

Delta Energy Systems (Singapore) Pte Ltd.
4 Kaki Bukit Avenue 1, #05-04, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.
Plot No.43, Sector 35, HSIIDC Gurgaon,
PIN 122001, Haryana, India
TEL: 91-124-4874900 / FAX : 91-124-4874945

Delta Electronics (Thailand) PCL.
909 Soi 9, Moo 4, Bangpoo Industrial Estate (E.P.Z),
Pattana 1 Rd., T.Phraksa, A.Muang,
Samutprakarn 10280, Thailand
TEL: 66-2709-2800 / FAX : 662-709-2827

Delta Energy Systems (Australia) Pty Ltd.
Unit 20-21/45 Normanby Rd., Notting Hill Vic 3168, Australia
TEL: 61-3-9543-3720

Americas

Delta Electronics (Americas) Ltd.
Raleigh Office
P.O. Box 12173, 5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3813 / FAX: 1-919-767-3969

Delta Greentech (Brasil) S/A
São Paulo Office
Rua Itapeva, 26 – 3˚ Andar - Bela Vista
CEP: 01332-000 – São Paulo – SP - Brasil
TEL: 55-11-3530-8642 / 55-11-3530-8640

Delta Electronics International Mexico S.A. de C.V.
Mexico Office
Vía Dr. Gustavo Baz No. 2160, Colonia La Loma,
54060 Tlalnepantla Estado de Mexico
TEL: 52-55-2628-3015 #3050/3052

EMEA

Headquarters: Delta Electronics (Netherlands) B.V.
Sales: Sales.IA.EMEA@deltaww.com
Marketing: Marketing.IA.EMEA@deltaww.com
Technical Support: iatechnicalsupport@deltaww.com
Customer Support: Customer-Support@deltaww.com
Service: Service.IA.emea@deltaww.com
TEL: +31(0)40 800 3800

BENELUX: Delta Electronics (Netherlands) B.V.
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
Mail: Sales.IA.Benelux@deltaww.com
TEL: +31(0)40 800 3800

DACH: Delta Electronics (Netherlands) B.V.
Coesterweg 45, D-59494 Soest, Germany
Mail: Sales.IA.DACH@deltaww.com
TEL: +49(0)2921 987 0

France: Delta Electronics (France) S.A.
ZI du bois Challand 2, 15 rue des Pyrénées,
Lisses, 91090 Evry Cedex, France
Mail: Sales.IA.FR@deltaww.com
TEL: +33(0)1 69 77 82 60

Iberia: Delta Electronics Solutions (Spain) S.L.U
Ctra. De Villaverde a Vallecas, 265 1º Dcha Ed.
Hormigueras – P.I. de Vallecas 28031 Madrid
TEL: +34(0)91 223 74 20

Carrer Llacuna 166, 08018 Barcelona, Spain
Mail: Sales.IA.Iberia@deltaww.com

Italy: Delta Electronics (Italy) S.r.l.
Ufficio di Milano Via Senigallia 18/2 20161 Milano (MI)
Piazza Grazioli 18 00186 Roma Italy
Mail: Sales.IA.Italy@deltaww.com
TEL: +39 02 64672538

Russia: Delta Energy System LLC
Vereyskaya Plaza II, office 112 Vereyskaya str.
17 121357 Moscow Russia
Mail: Sales.IA.RU@deltaww.com
TEL: +7 495 644 3240

Turkey: Delta Greentech Elektronik San. Ltd. Sti. (Turkey)
Şerifali Mah. Hendem Cad. Kule Sok. No:16-A
34775 Ümraniye – İstanbul
Mail: Sales.IA.Turkey@deltaww.com
TEL: + 90 216 499 9910

GCC: Delta Energy Systems AG (Dubai BR)
P.O. Box 185668, Gate 7, 3rd Floor, Hamarain Centre
Dubai, United Arab Emirates
Mail: Sales.IA.MEA@deltaww.com
TEL: +971(0)4 2690148

Egypt + North Africa: Delta Electronics
511 Cairo Business Plaza, North 90 street,
New Cairo, Cairo, Egypt
Mail: Sales.IA.MEA@deltaww.com

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