Chapter 9 Specification

9-1 230V Models

Frame Size				A				B			C			D		E			F
VFD _ _ _C23A-00 / -21				007	015	022	037	055	075	110	150	185	220	300	370	450	550	750	900
Output Rating*	Heavy duty	Rated Output Capacity [kVA]		2.0	3.2	4.4	6.8	10	13	20	26	30	36	48	58	72	86	102	138
		Rated Output Current [A]		5	8	11	17	25	33	49	65	75	90	120	146	180	215	255	346
		Applicable Motor Output [kW]		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
		Applicable Motor Output [HP]		1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds															
		Max. Output Frequency [Hz]		0.00–599.00															
		Carrier Frequency [kHz]		2–15 (Default: 8)							2–10 (Default: 6)					2–9 (Default: 4)			
	Super Heavy Duty	Rated Output Capacity [kVA]		1.2	2	3.2	4.4	6.8	10	13	20	26	30	36	48	58	72	86	102
		Rated Output Current [A]		3	5	8	11	17	25	33	49	65	75	90	120	146	180	215	255
		Applicable Motor Output [kW]		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75
		Applicable Motor Output [HP]		0.5	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
		Overload Capacity		150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds															
		Max. Output Frequency [Hz]		0.00–599.00															
		Carrier Frequency [kHz]		2–15 (Default: 4)							2–10 (Default: 4)					2–9 (Default: 4)			
Input Rating	Input Current [A]		Heavy Duty	6.4	12	16	20	28	36	52	72	83	99	124	143	171	206	245	331
			Super Heavy Duty	3.9	6.4	12	16	20	28	36	52	72	83	99	124	143	171	206	245
	Rated Voltage / Frequency			3-phase AC 200–240V (-15 % – +10 %), 50 / 60 Hz															
	Operating Voltage Range			170–264 V_{AC}															
	Frequency Tolerance			47–63 Hz															
Efficiency [%]				97.8												98.2			
Power Factor				>0.98															
Drive Weight [Kg]				2.6 ± 0.3				5.4 ± 1			9.8 ± 1.5			38.5 ± 1.5		64.8 ± 1.5			86.5 ± 1.5
Cooling Method				Natural cooling	Fan cooling														
Braking Chopper				Frame A–C: Built-in										Frame D–F: Optional					
DC choke				Frame A–C: Optional										Frame D–F: Built-in					
EMC Filter				Frame A~F: Optional															
EMC-COP01				Frame A~F: Optional															

Table 9-1

NOTE

1. * : The default is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Refer to Pr.06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.

9-2 460V Models

Frame Size			A						B			C		
VFD _ _ _ C_ _ -00 / -21			007	015	022	037	040	055	075	110	150	185	220	300
Output Rating*	Heavy duty	Rated Output Capacity [kVA]	2.4	3.2	4.8	7.2	8.4	10	14	19	25	30	36	48
		Rated Output Current [A]	3.0	4.0	6.0	9.0	10.5	12	18	24	32	38	45	60
		Applicable Motor Output [kW]	0.75	1.5	2.2	3.7	4.0	5.5	7.5	11	15	18.5	22	30
		Applicable Motor Output [HP]	1	2	3	5	5	7.5	10	15	20	25	30	40
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds											
		Max. Output Frequency [Hz]	0.00–599.00											
		Carrier Frequency [kHz]	2–15 (Default: 8)									2–10 (Default: 6)		
	Super Heavy Duty	Rated Output Capacity [kVA]	1.4	2.4	3.2	4.8	7.2	8.4	9.6	14	19	25	30	36
		Rated Output Current [A]	1.7	3	4	6	9	10.5	12	18	24	32	38	45
		Applicable Motor Output [kW]	0.4	0.75	1.5	2.2	3.7	4.0	5.5	7.5	11	15	18.5	22
		Applicable Motor Output [HP]	0.5	1	2	3	5	5	7.5	10	15	20	25	30
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds											
		Max. Output Frequency [Hz]	0.00–599.00											
		Carrier Frequency [kHz]	2–15 (Default: 4)									2–10 (Default: 4)		
Input Rating	Input Current [A]	Heavy Duty	4.3	5.9	8.7	14	15.5	17	20	26	35	40	47	63
		Super Heavy Duty	3.5	4.3	5.9	8.7	14	15.5	17	20	26	35	40	47
	Rated Voltage / Frequency		3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz											
	Operating Voltage Range		323–528 V_{AC}											
	Frequency Tolerance		47–63 Hz											
Efficiency [%]			97.8											
Power Factor			>0.98											
Drive Weight [Kg]			2.6± 0.3						5.4± 1			9.8± 1.5		
Cooling Method			Natural cooling	Fan cooling										
Braking Chopper			Frame A–C: Built-in											
DC choke			Frame A–C: Optional											
EMC Filter			Frame A–C (VFDxxxC43A-21): Optional Frame A–C (VFDxxxC4EA-21): Built-in											
EMC-COP01			Frame A–C (VFDxxxC43A-21): Optional Frame A–C (VFDxxxC4EA-21): Built-in											

Table 9-2

NOTE

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless. Refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.

Frame Size			D0		D		E		F	
VFD-_ _ _ C_ _ _-21 / -00			370	450	550	750	900	1100	1320	1600
Output Rating*	Heavy duty	Rated Output Capacity [kVA]	58	73	88	120	143	175	207	247
		Rated Output Current [A]	73	91	110	150	180	220	260	310
		Applicable Motor Output [kW]	37	45	55	75	90	110	132	160
		Applicable Motor Output [HP]	50	60	75	100	125	150	175	215
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds							
		Max. Output Frequency [Hz]	0.00–599.00							
		Carrier Frequency [kHz]	2–10 (Default: 6)			2–9 (Default: 4)				
	Super Heavy Duty	Rated Output Capacity [kVA]	48	58	73	88	120	143	175	207
		Rated Output Current [A]	60	73	91	110	150	180	220	260
		Applicable Motor Output [kW]	30	37	45	55	75	90	110	132
		Applicable Motor Output [HP]	40	50	60	75	100	125	150	175
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds							
		Max. Output Frequency [Hz]	0.00–599.00							
		Carrier Frequency [kHz]	2–10 (Default: 4)			2–9 (Default: 4)				
Input Rating	Input Current [A]	Heavy Duty	74	101	114	157	167	207	240	300
		Super Heavy Duty	63	74	101	114	157	167	207	240
	Rated Voltage / Frequency		3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz							
	Operating Voltage Range		323–528 V_{AC}							
	Frequency Tolerance		47–63 Hz							
Efficiency [%]			97.8				98.2			
Power Factor			>0.98							
Drive Weight [Kg]			27 ± 1.5		38.5 ± 1.5		64.8 ± 1.5		86.5 ± 1.5	
Cooling Method			Fan cooling							
Braking Chopper			Frame D0–F: Optional							
DC choke			Frame D0–F: Built-in							
EMC Filter			Frame D0–F: Optional							
EMC-COP01			Frame D0–F (VFDxxxC43A-00): Optional Frame D0–F (VFDxxxC43A-21): Built-in							

Table 9-3

NOTE

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Please refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.

Frame Size			G				H						
VFD-_ _ _ C_ _ _-21 / -00			1850	2000	2200	2500	2800	3150	3550	4000	4500	5000	5600
Output Rating*	Heavy duty	Rated Output Capacity [kVA]	295	315	367	383	438	491	544	613	690	741	872
		Rated Output Current [A]	370	395	460	481	550	616	683	770	866	930	1094
		Applicable Motor Output [kW]	185	200	220	250	280	315	355	400	450	500	560
		Applicable Motor Output [HP]	250	270	300	340	375	420	475	530	600	675	750
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 180% of rated output current: 3 seconds for every 30 seconds										
		Max. Output Frequency [Hz]	0.00–599.00										
		Carrier Frequency [kHz]	2–9 (Default: 4)										
	Super Heavy Duty	Rated Output Capacity [kVA]	247	247	295	315	366	438	491	544	544	690	741
		Rated Output Current [A]	310	310	370	395	460	550	616	683	683	866	930
		Applicable Motor Output [kW]	160	160	185	200	220	280	315	355	355	450	500
		Applicable Motor Output [HP]	215	215	250	270	300	375	425	475	475	600	675
		Overload Capacity	150% of rated output current: 1 minute for every 5 minutes; 200% of rated output current: 3 seconds for every 30 seconds										
		Max. Output Frequency [Hz]	0.00–599.00										
		Carrier Frequency [kHz]	2–9 (Default: 4)				2–9 (Default: 3)						
Input Rating	Input Current [A]	Heavy Duty	380	395	400	447	494	555	625	770	866	930	1094
		Super Heavy Duty	300	300	380	390	400	494	555	590	625	866	930
	Rated Voltage / Frequency		3-phase AC 380–480V (-15 % – +10 %), 50 / 60 Hz										
	Operating Voltage Range		323–528 V_{AC}										
	Frequency Tolerance		47–63 Hz										
Efficiency [%]			98.2										
Power Factor			>0.98										
Drive Weight [Kg]			134 ± 4				228						
Cooling Method			Fan cooling										
Braking Chopper			Frame G–H: Optional										
DC choke			Frame G–H: Built-in										
EMC Filter			Frame G–H: Optional										
EMC-COP01			Frame G–H (VFDxxxC43A-00): Optional Frame G–H (VFDxxxC43A-21): Built-in										

Table 9-4

NOTE

1. * : The factory setting is heavy duty mode.
2. The carrier frequency is default. Increasing the carrier frequency requires a reduction in current. Refer to Section 9-7 Derating Curve for details.
3. The AC motor drive should operate in derating current when its control method is set to FOC Sensorless, TQC+PG, TQC sensorless. PM+PG, PM sensorless Please refer to Pr. 06-55 for more information.
4. The rated input current will be affected by not only power transformer and the connection of the reactors on input side, but also fluctuates with the impedance of power side.
5. Model VFD4500C43x-xx, VFD5000C43x-xx, VFD5600C43x-xx do not have UL certification.

9-3 575V Models

Frame Size				A			B			
VFD-_ _ _ C53A-21				015	022	037	055	075	110	150
*Output Rating	Light Duty	Rated Output Capacity [kVA]		3	4.3	6.7	9.9	12.1	18.6	24.1
		Rated Output Current [A]		3	4.3	6.7	9.9	12.1	18.7	24.2
		Applicable Motor Output [kW]		1.5	2.2	3.7	5.5	7.5	11	15
		Applicable Motor Output [HP]		2	3	5	7.5	10	15	20
	Normal Duty	Rated Output Capacity [kVA]		2.5	3.6	5.5	8.2	10	15.4	19.9
		Rated Output Current [A]		2.5	3.6	5.5	8.2	10	15.5	20
		Applicable Motor Output [kW]		0.75	1.5	2.2	3.7	5.5	7.5	11
		Applicable Motor Output [HP]		1	2	3	5	7.5	10	15
	Heavy Duty	Rated Output Capacity [kVA]		2.1	3	4.6	6.9	8.3	12.9	16.7
		Rated Output Current [A]		2.1	3	4.6	6.9	8.3	13	16.8
		Applicable Motor Output [kW]		0.75	1.5	2.2	3.7	3.7	7.5	7.5
		Applicable Motor Output [HP]		1	2	3	5	5	10	10
	Max. Output Frequency [Hz]			0.00–599.00						
	Carrier Frequency [kHz]			2–15 (Default: 4)						
Input Rating	Input Current [A]		Light Duty	3.8	5.4	10.4	14.9	16.9	21.3	26.3
			Normal Duty	3.1	4.5	7.2	12.3	15	18	22.8
			Heavy Duty	2.6	3.8	5.8	10.7	12.5	16.9	19.7
	Rated Voltage / Frequency			3-phase AC 525–600 V (-15% – +10%), 50 / 60 Hz						
	Operating Voltage Range			446–660 V_{AC}						
	Frequency Tolerance			47–63Hz						
Efficiency [%]				97			98			
Power Factor				>0.98						
Drive Weight [Kg]				3 ± 0.3			4.8 ± 1			
Cooling Method				Natural cooling		Fan cooling				
Braking Chopper				Frame A~B: Built-in						
DC choke				Frame A~B: Optional						
EMC Filter				Frame A~B: Optional						

Table 9-5

NOTE

* Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode

9-4 690V Models

Frame Size			C				D		E			
VFD-_ _ _ C63B-00 / -21			185	220	300	370	450	550	750	900	1100	1320
*Output Rating	Light Duty	Rated Output Capacity [kVA]	29	36	43	54	65	80	103	124	149	179
		Applicable Motor Output [690V, kW]	18.5	22	30	37	45	55	75	90	110	132
		Applicable Motor Output [690V, HP]	25	30	40	50	60	75	100	125	150	175
		Applicable Motor Output [575V, HP]	20	25	30	40	50	60	75	100	125	150
		Rated Output Current [A]	24	30	36	45	54	67	86	104	125	150
	Normal Duty	Rated Output Capacity [kVA]	24	29	36	43	54	65	80	103	124	149
		Applicable Motor Output [690V, kW]	15	18.5	22	30	37	45	55	75	90	110
		Applicable Motor Output [690V, HP]	20	25	30	40	50	60	75	100	125	150
		Applicable Motor Output [575V, HP]	15	20	25	30	40	50	60	75	100	125
		Rated Output Current [A]	20	24	30	36	45	54	67	86	104	125
	Heavy Duty	Rated Output Capacity [kVA]	17	24	29	36	43	54	65	80	103	124
		Applicable Motor Output [690V, kW]	11	15	18.5	22	30	37	45	55	75	90
		Applicable Motor Output [690V, HP]	15	20	25	30	40	50	60	75	100	125
		Applicable Motor Output [575V, HP]	10	15	20	25	30	40	50	60	75	100
		Rated Output Current [A]	14	20	24	30	36	45	54	67	86	104
	Max. Output Frequency [Hz]		0.00–599.00									
	Carrier Frequency [kHz]		2–9 (Default: 4)									
Input Rating	Input Current [A]	Light Duty	29	36	43	54	65	81	84	102	122	147
		Normal Duty	24	29	36	43	54	65	66	84	102	122
		Heavy Duty	20	24	29	36	43	54	53	66	84	102
	Rated Voltage / Frequency		3-phase AC 525–690 V (-15% – +10%), 50 / 60 Hz									
	Operating Voltage Range		446–759 V_{AC}									
	Frequency Tolerance		47–63Hz									
Efficiency [%]			97									
Power Factor			>0.98									
Drive Weight [Kg]			10 ± 1.5				39 ± 1.5		61 ± 1.5			
Cooling Method			Fan cooling									
Braking Chopper			Frame C: Built-in				Frame D–E: Optional					
DC choke			Frame C: Optional				Frame D–E: Built-in					
EMC Filter			Frame C–E: Optional									

Table 9-6

NOTE

* Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode

Frame Size			F		G		H			
VFD-_ _ _ C63B-00/21			1600	2000	2500	3150	4000	4500	5600	6300
*Output Rating	Light Duty	Rated Output Capacity [kVA]	215	263	347	418	494.5	534.7	678.5	776
		Applicable Motor Output [690V, kW]	160	200	250	315	400	450	560	630
		Applicable Motor Output [690V, HP]	215	270	335	425	530	600	745	850
		Applicable Motor Output [575V, HP]	175	200	250	350	400	450	500	745
		Rated Output Current [A]	180	220	290	350	430	465	590	675
	Normal Duty	Rated Output Capacity [kVA]	179	215	239	347	402.5	442.7	534.7	776
		Applicable Motor Output [690V, kW]	132	160	200	250	315	355	450	630
		Applicable Motor Output [690V, HP]	175	215	270	335	425	475	600	850
		Applicable Motor Output [575V, HP]	150	175	200	250	350	400	450	745
		Rated Output Current [A]	150	180	220	290	350	385	465	675
	Heavy Duty	Rated Output Capacity [kVA]	149	179	215	263	333.5	356.5	483	776
		Applicable Motor Output [690V, kW]	110	132	160	200	250	280	400	630
		Applicable Motor Output [690V, HP]	150	175	215	270	335	375	530	850
		Applicable Motor Output [575V, HP]	125	150	175	200	250	335	450	745
		Rated Output Current [A]	125	150	180	220	290	310	420	675
	Max. Output Frequency [Hz]		0.00–599.00							
	Carrier Frequency [kHz]		2–9 (Default: 4)							2–9 (Default: 3)
Input Rating	Input Current [A]	Light Duty	178	217	292	353	454	469	595	681
		Normal Duty	148	178	222	292	353	388	504	681
		Heavy Duty	123	148	181	222	292	313	423	681
	Rated Voltage / Frequency		3-phase AC 525–690 V (-15% – +10%), 50 / 60 Hz							
	Operating Voltage Range		446–759 V_{AC}							
	Frequency Tolerance		47–63 Hz							
Efficiency [%]			97		98					
Power Factor			>0.98							
Drive Weight [Kg]			88 ± 1.5		135 ± 4		243 ± 5			
Cooling Method			Fan cooling							
Braking Chopper			Frame F~H: Optional							
DC choke			Frame F~H: Built-in							
EMC Filter			Frame F~H: Optional							

Table 9-7

NOTE

* Pr.00-16; available duty modes: Light Duty (LD), Normal Duty (ND) and Heavy Duty (HD); default setting is LD mode

General Specifications

Item		Specifications
Control Characteristics	Control Mode[*1]	230V_{AC} / 460V_{AC} models Select a control mode listed below via parameter, ● IMVF (Induction Motor, V/F control) ● IMVF + PG (Induction Motor, V/F control, with encoder) ● IM / PM SVC (Induction Motor / Permanent-Magnet Synchronous Motor, Space Vector Control) ● IMFOC + PG (Induction Motor, Field-Oriented Control, with encoder) ● PMFOC + PG (Permanent-Magnet Synchronous Motor, Field-Oriented Control, with encoder) ● IMFOC Sensorless (Induction Motor, sensorless Field-Oriented Control) ● PM Sensorless (Permanent-Magnet Synchronous Motor, sensorless Field-Oriented Control) ● IPM Sensorless (Interior Permanent-Magnet Synchronous Motor, sensorless Field-Oriented Control) ● SynRM Sensorless (Synchronous Reluctance Motor, sensorless Field-Oriented Control) ● IM TQCPG (Induction Motor, Torque Control, with encoder) ● PM TQCPG (Permanent-Magnet Synchronous Motor, Torque Control, with encoder) ● IM TQC Sensorless (Induction Motor, sensorless Torque Control) ● SynRM TQC Sensorless (Synchronous Reluctance Motor, sensorless Torque Control)
		575V_{AC} / 690V_{AC} models Select a control mode listed below via parameter, ● IMVF (Induction Motor, V/F control) ● IMVF + PG (Induction Motor, V/F control, with encoder) ● IM / PM SVC (Induction Motor / Permanent-Magnet Synchronous Motor, Space Vector Control)
	Max. Output Frequency[*2]	0–599 Hz
	Frequency Output Accuracy	Digital command: ±0.01%, -10°C– +40°C; Analog command: ±0.1%, 25±10°C
	Output Frequency Resolution	Digital command: 0.01 Hz ; Analog command: 0.05% x max. output frequency (Pr.01-00), 11 bit plus sign
	Speed Control Range (Ratio of Speed control)[*3]	● IMVF, IMVF + PG, IMSVC 1:50 ● IMFOC Sensorless 1:100 ● IMFOC + PG 1:1000 ● PMSVC 1:20 ● PM Sensorless 1:50 ● IPM Sensorless 1:100 ● PMFOC + PG 1:1000
	Starting Torque	● IMVF, IMVF + PG, IMSVC 150% / 3 Hz ● IMFOC Sensorless 200% / 0.5 Hz ● IMFOC + PG 200% / 0 Hz ● PMSVC 100% / (motor rated frequency / 20) ● PM Sensorless 100% / (motor rated frequency / 50)

		● IPM Sensorless 100% / 0 Hz ● PMFOC + PG 200% / 0 Hz
	Torque Accuracy[*4]	TQC + PG: ±5%; TQC Sensorless: ±15%
	Torque Limit	230V AC / 460V AC models Heavy duty 180%, super heavy duty 220% of torque current ➢ Under field-oriented control (FOC), you can set up separately in quadrant via parameters. 575V AC / 690V AC models Maximum 200% of torque current
Protection Characteristics	Output Over-current	230V AC / 460V AC models Over-current protection for 240% of rated current (Heavy duty) 575V AC / 690V AC models Over-current protection for 240% rated current (Normal duty) ➢ Drive stops and display related fault code when over current tripped.
	Output Current Clamp	230V AC / 460V AC models Current clamp by hardware, heavy duty and super heavy duty: 190–195% rated current 575V AC / 690V AC models ● Current clamp by hardware, Light duty: 125–145% rated current; normal duty: 170–175% rated current; heavy duty: 200–250% rated current ● VFD6300C63B-00/21: Current clamp by hardware, light duty / normal duty / heavy duty: 170–175% rated current ➢ Drive will be auto-recovered after output backs to rated current.
	Over-voltage (DC)	C2000 Plus shuts down under below condition: 230V$_{AC}$: DC bus over 410 V; 460V$_{AC}$: DC bus over 820 V; 575 V$_{AC}$ / 690 V$_{AC}$: DC bus over 1189 V
	Grounding Leakage Current Protection[*5]	The output is grounding, the leakage current is higher than 60% of the rated current.
	Output Low / Under Current Fault[*5]	The output is broken, no current outputs.
	Short-circuit Current Rating (SCCR)	Per UL 508C, the drive is suitable for using on a circuit capable of delivering not more than 100kA symmetrical amperes (rms) when protected by fuses given in the fuse table.
	Motor Overheat Protection[*5]	Support electronic thermal relay, PTC, KTY84-13-, PT100 for overheat protection.
	Drive Overheat Protection	Built-in temperature sensor (driven element oH1, capacitance module oH2) for overheat protection.
	Fan Control	230V AC models For the models VFD150C2XX-XX and above use PWM control; for the models VFD110C2XX-XX and below use switch button (ON / OFF) 460V AC models For the models VFD185C4XX-XX and above use PWM control; for the models VFD150C4XX-XX and below use switch button (ON / OFF) 575V AC / 690V AC model PWM control

Product Compliance	**CE** Low Voltage Directive(LVD) 2014/35/EU, EN61800-5-1 EMC Directive 2014/35/EU, EN61800-3 **UL**508C, **cUL** CAN/CSA C22.2 No.14-13, No.274*6 , **Plenum rated** **RCM**, **KC***7, **EAC***7, (**C**م mark)*8 , **SEMI F47**-0706, **GB**12668.3 **WEEE** 2012/19/EU**, RoHS** 2011/95/EU*9 Quality assurance system **ISO 9001** and Environmental system **ISO 14001**
Safety Standard	Safe Torque Off (EN / IEC61800-5-2) TUV Rheinland Certified IEC62061/IEC61508, SIL CL2 EN ISO13849-1, Cat.3/PL d

Table 9-8

NOTE

*1: 230V AC / 460V AC models: support synchronous reluctance control mode after the firmware V3.06; 575V AC / 690V AC models: support field-oriented control (FOC) mode after the firmware V2.06.

*2: The setting range of the maximum output frequency varies from carrier and control modes. Refer to Pr.01-00 and Pr.06-55 for more information.

*3: Based on heavy duty, and the speed control range varies from environment, application conditions, types of motor and encoder.

*4: Defined under torque control (TQC) mode.

*5: The protection level can adjust via parameters.

*6: VFD4500C43x-xx, VFD5000C43x-xx, VFD5600C43x-xx do not have UL certification.

*7: Only for 230V AC / 460V AC models.

*8: Mandatory conformity mark in Morocco.

*9: In the process of applying for RoHS 2015/863/EU.

9-5 Environment for Operation, Storage and Transportation

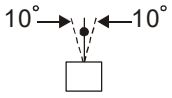
DO NOT expose the AC motor drive in the bad environment, such as dust, direct sunlight, corrosive / inflammable gasses, humidity, liquid and vibration environment. The salt in the air must be less than 0.01mg / cm^2 every year.			
Environment	Installation location	IEC60364-1 / IEC60664-1 Pollution degree 2, Indoor use only	
	Surrounding Temperature (°C)	Storage / Transportation	-25 – +70
		Non-condensation, non-frozen	
	Rated Humidity (%)	Operation	Max. 95
		Storage / Transportation	Max. 95
		No condense water	
	Air Pressure (kPa)	Operation / Storage	86–106
		Transportation	70–106
	Pollution Level	IEC 60721-3-3	
		Operation	Class 3C3; Class 3S2
		Storage	Class 1C2; Class 1S2
		Transportation	Class 2C2; Class 2S2
		If the AC motor drive is to be used under harsh environment with high level of contamination (e.g. dew, water, dust), make sure it is installed in an environment qualified for IP54 such as in a cabinet.	
	Altitude	Operation	If the AC motor drive is installed at an altitude of 0–1000 m, follow normal operation restrictions. For altitudes of 1000–2000 m, decrease the drive's rated current by 1% or lower the temperature by 0.5°C for every 100 m increase in altitude. The maximum altitude for corner grounding is 2000 m.
Package Drop	Storage	ISTA procedure 1A (according to weight) IEC60068-2-31	
	Transportation		
Vibration	1.0 mm, peak to peak value range from 2 Hz to 13.2 Hz; 0.7–1.0G range from 13.2 Hz to 55 Hz; 1.0G range from 55 Hz to 512 Hz. Comply with IEC 60068-2-6		
Impact	IEC / EN 60068-2-27		
Operation Position	Max. allowed offset angle ±10° (under normal installation position)		

Table 9-9

9-6 Specification for Operation Temperature and Protection Level

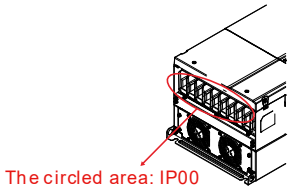
Model	Frame	Top cover	Conduit Box	Protection Level	Operation Temperature
VFDxxxCxxx-21	Frame A–C 230V: 0.75–22 kW 460V: 0.75–30 kW 575V: 1.5~15 kW 690V: 18.5–37 kW	Top cover removed	Standard conduit plate	IP20 / UL Open Type	-10–50°C
		Standard with top cover		IP20 / UL Type1 / NEMA1	-10–40°C
VFDxxxCxxx-21	Frame D0–H 230V: ≥ 22 kW 460V: ≥ 37 kW 690V: ≥ 45 kW	N/A	Standard conduit box	IP20 / UL Type1 / NEMA1	-10–40°C
VFDxxxCxxx-00	Frame D0–H 230V: ≥ 22 kW 460V: ≥ 37 kW 690V: ≥ 45 kW	N/A	No conduit box	IP00 IP20 / UL Open Type  Figure 9-1	-10–50°C

Table 9-10

9-7 Derating Curve

☑ For more information on calculation for derating curve, refer to Pr.06-55.

☑ When choosing the correct model, consider factors such as ambient temperature, altitude, carrier frequency, control mode, and so on. That is,
Actual rated current for application (A) = Rated output current (A) x Ambient temp. rated derating (%) x Altitude rated derating (%) x [Normal / Advanced control] carrier frequency rated derating (%)

Protection Level	Operating Environment
UL Type I / IP20	230V / 460V: If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–40°C. If the temperature is above 40°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C. 575V / 690V: If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–40°C. If the temperature is above 40°C, decrease 2.5% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.
UL Open Type / IP20	230V / 460V: If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–50°C. If the temperature is above 50°C, decrease 2% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C. 575V / 690V: If the AC motor drive operates at the rated current, the ambient temperature needs to be between -10–50°C. If the temperature is above 50°C, decrease 2.5% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.

Table 9-11

Ambient Temperature Derating Curve

230V / 460V

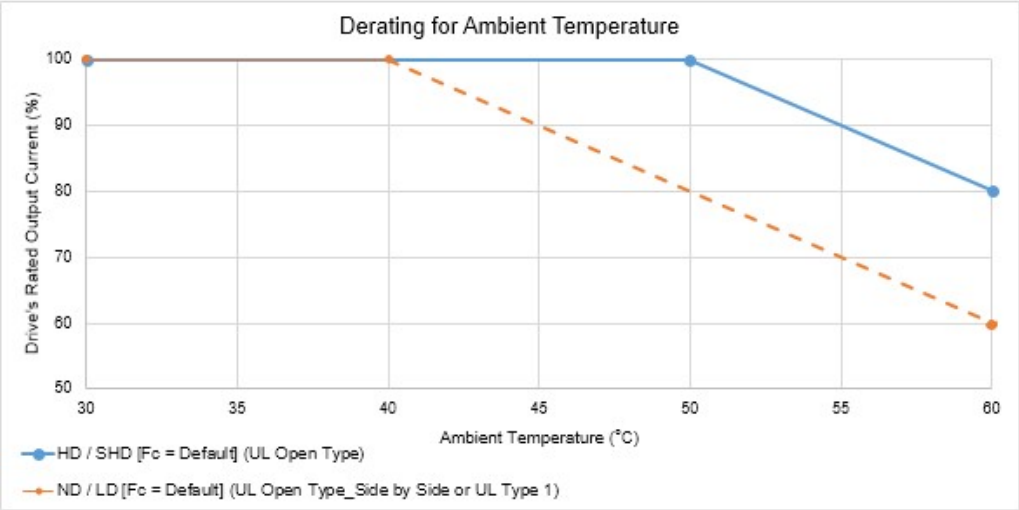


Figure 9-2

UL Open Type:

The rated output current derating (%) in normal duty / light duty / heavy duty when carrier frequency is the default value:

Ambient Temp. / 100% Load Fc (kHz)	30°C	50°C	60°C
Default Value	100	100	80

Table 9-12

UL Open Type_Side by Side or UL Type 1:

The rated output current derating (%) in normal duty / light duty when carrier frequency is the default value:

Ambient Temp. / 100% Load Fc (kHz)	30°C	40°C	60°C
Default Value	100	100	60

Table 9-13

575V / 690V

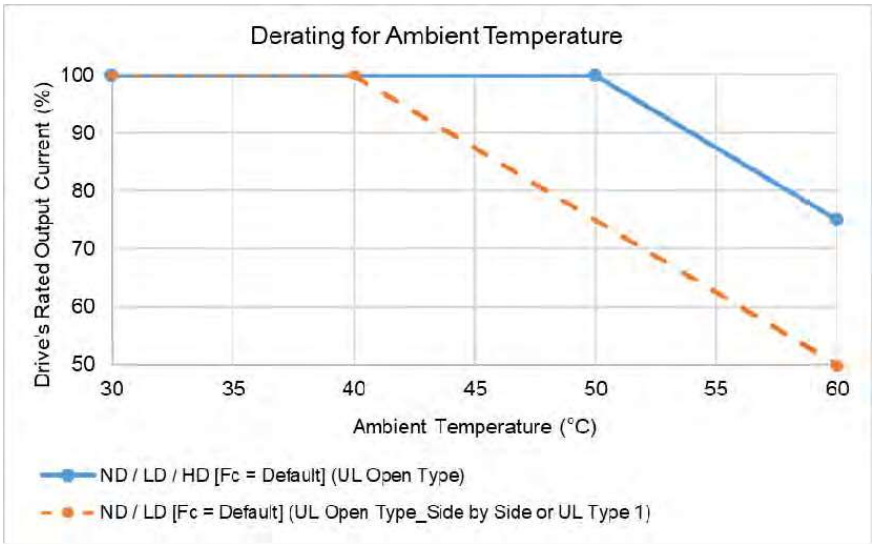


Figure 9-3

UL Open Type:

The rated output current derating (%) in normal duty / light duty / heavy duty when carrier frequency is the default value:

Ambient Temp. / 100% Load Fc (kHz)	30°C	50°C	60°C
Default Value	100	100	75

Table 9-14

UL Open Type_Side by Side or UL Type 1:

The rated output current derating (%) in normal duty / light duty when carrier frequency is the default value:

Ambient Temp. / 100% Load Fc (kHz)	30°C	40°C	60°C
Default Value	100	100	50

Table 9-15

Altitude Derating Curve

Condition	Operating Environment
High Altitude	If the AC motor drive is installed at an altitude of 0–1000 m, follow normal operation restrictions. For altitudes of 1000–2000 m, decrease the drive's rated current by 1% or lower the temperature by 0.5°C for every 100 m increase in altitude. The maximum altitude for corner grounding is 2000 m. If installing at an altitude higher than 2000 m is required, contact Delta for more information.

Table 9-16

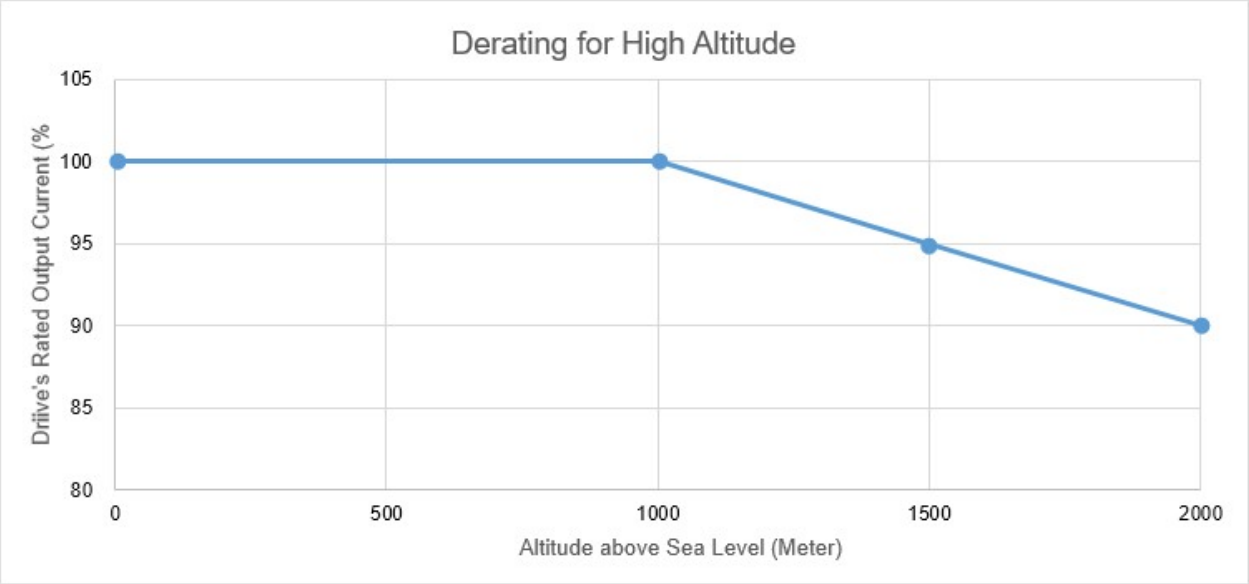


Figure 9-4

The rated output current derating (%) for different altitudes above sea level:

Altitude above Sea Level (Meter)	0	1000	1500	2000	2000	2000
Output Current / Rated Current (%)	100	100	95	90	85	80

Table 9-17

Carrier Frequency Derating Curve

- 230V / 460V Normal Control

  Pr.00-11 = 0 (IMVF)

  = 1 (IMVFPG)

  = 2 (IM SVC, Pr.05-33 = 0)

  = 3 (IMFOCPG)

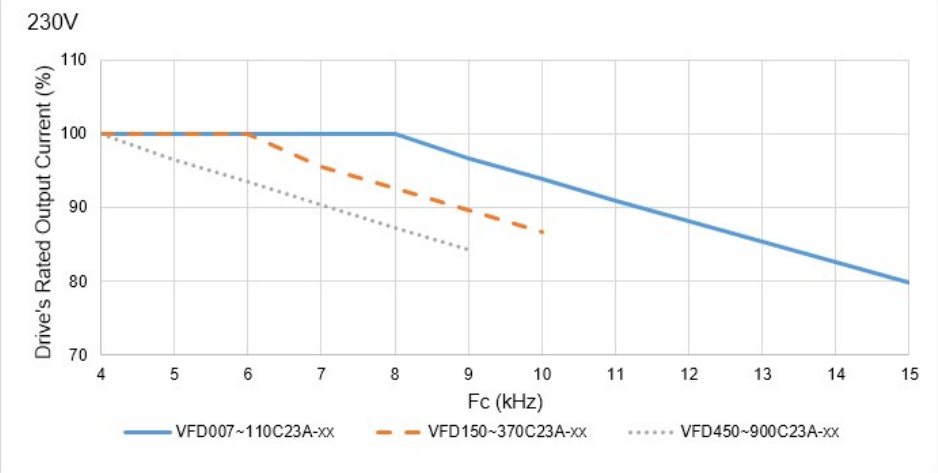


Figure 9-5

The rated output current derating (%) of 230V models in normal control mode for different carrier frequencies:

Model No. \ Fc (kHz)	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~110C23A-xx	100	100	100	100	100	97	94	91	88	85	83	80
VFD150~370C23A-xx	100	100	100	96	93	90	87	-	-	-	-	-
VFD450~900C23A-xx	100	97	93	90	87	84	-	-	-	-	-	-

Table 9-18

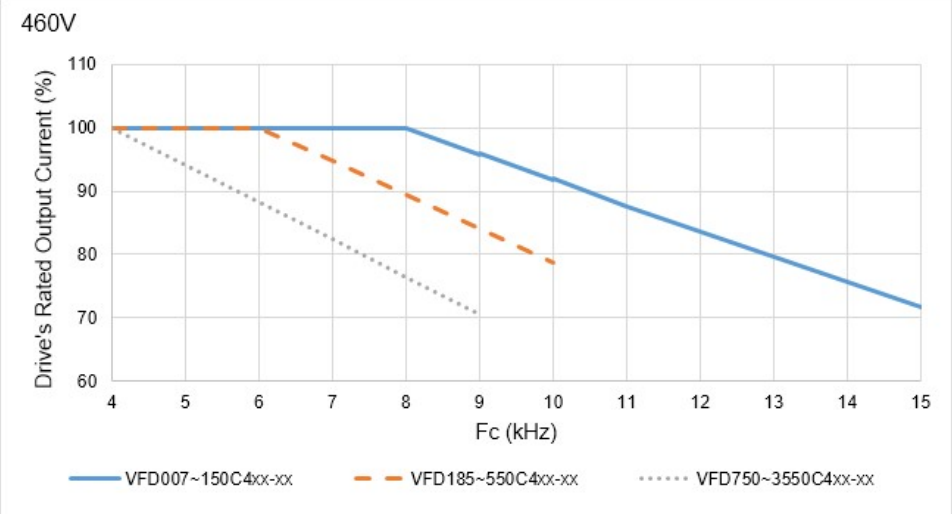


Figure 9-6

The rated output current derating (%) of 460V models in normal control mode for different carrier frequencies:

Model No. \ Fc (kHz)	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~150C4xx-xx	100	100	100	100	94	88	82	76	71	65	59	53	47	41
VFD185~550C4xx-xx	100	100	100	92	84	76	68	60	52	-	-	-	-	-
VFD750~3550C4xx-xx	100	92	83	75	67	58	50	42	-	-	-	-	-	-

Table 9-19

- 230V / 460V Advanced Control

  Pr.00-11 = 2 (PM SVC, Pr.05-33 = 1, 2)
  = 4 (PMFOCPG)
  = 5 (IMFOC Sensorless)
  = 6 (PM Sensorless)
  = 7 (IPM Sensorless)

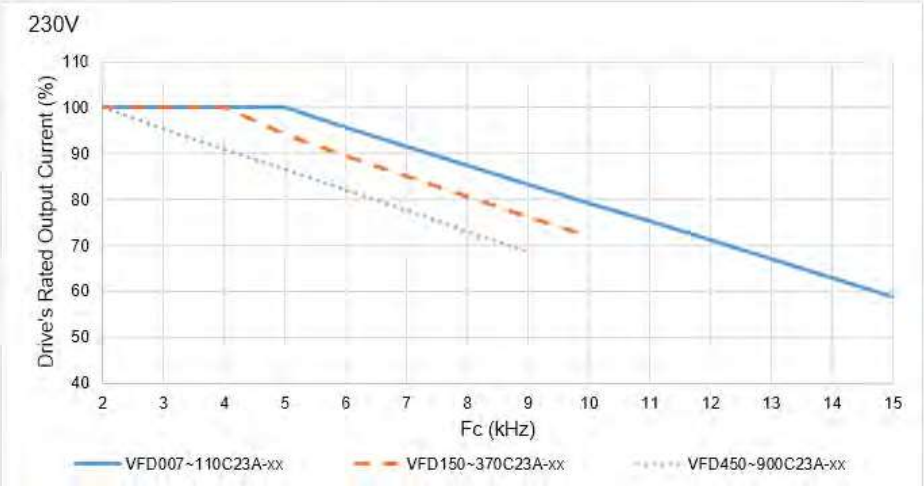


Figure 9-7

The rated output current derating (%) of 230V models in advanced control mode for different carrier frequencies:

Model No. \ Fc (kHz)	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~110C23A-xx	100	100	100	100	96	92	88	83	79	75	71	67	63	59
VFD150~370C23A-xx	100	100	100	94	90	85	81	76	72	-	-	-	-	-
VFD450~900C23A-xx	100	96	91	87	82	78	73	69	-	-	-	-	-	-

Table 9-20

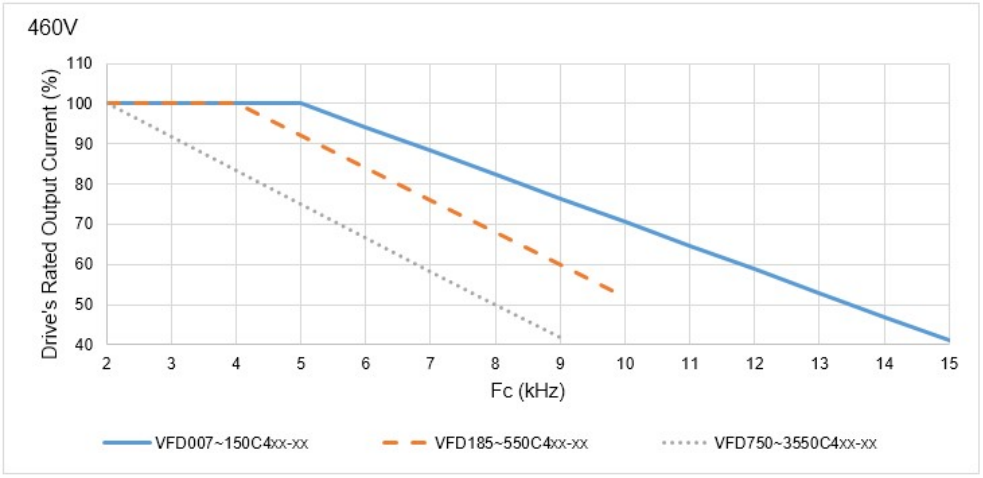


Figure 9-8

The rated output current derating (%) of 460V models in advanced control mode for different carrier frequencies:

Model No. \ Fc (kHz)	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VFD007~150C4xx-xx	100	100	100	100	94	88	82	76	71	65	59	53	47	41
VFD185~550C4xx-xx	100	100	100	92	84	76	68	60	52	-	-	-	-	-
VFD750~3550C4xx-xx	100	92	83	75	67	58	50	42	-	-	-	-	-	-

Table 9-21

- 575V / 690V

  Pr.00-16 = 2, light duty:

  Pr.00-11 = 0 (IMVF)

  = 1 (IMVFPG)

  = 2 (IM SVC, Pr.05-33 = 0)

  = 3 (IMFOCPG)

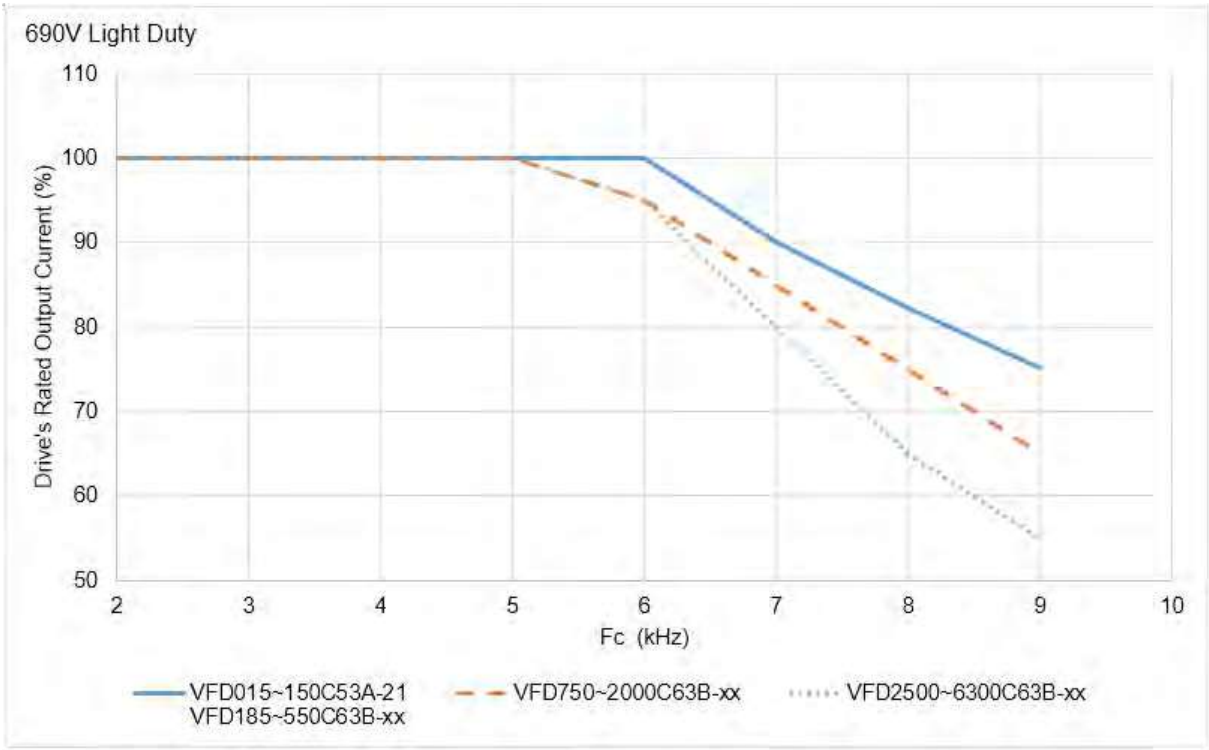


Figure 9-9

The rated output current derating (%) of 575V / 690V models in light duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6	7	8	9
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	100	90	82	75
VFD750~2000C63B-xx	100	100	100	100	95	85	75	65
VFD2500~6300C63B-xx	100	100	100	100	95	80	65	55

Table 9-22

Pr.00-16 = 0, normal duty:

Pr.00-11 = 0 (IMVF)

= 1 (IMVFPG)

= 2 (IM SVC, Pr.05-33 = 0)

= 3 (IMFOCPG)

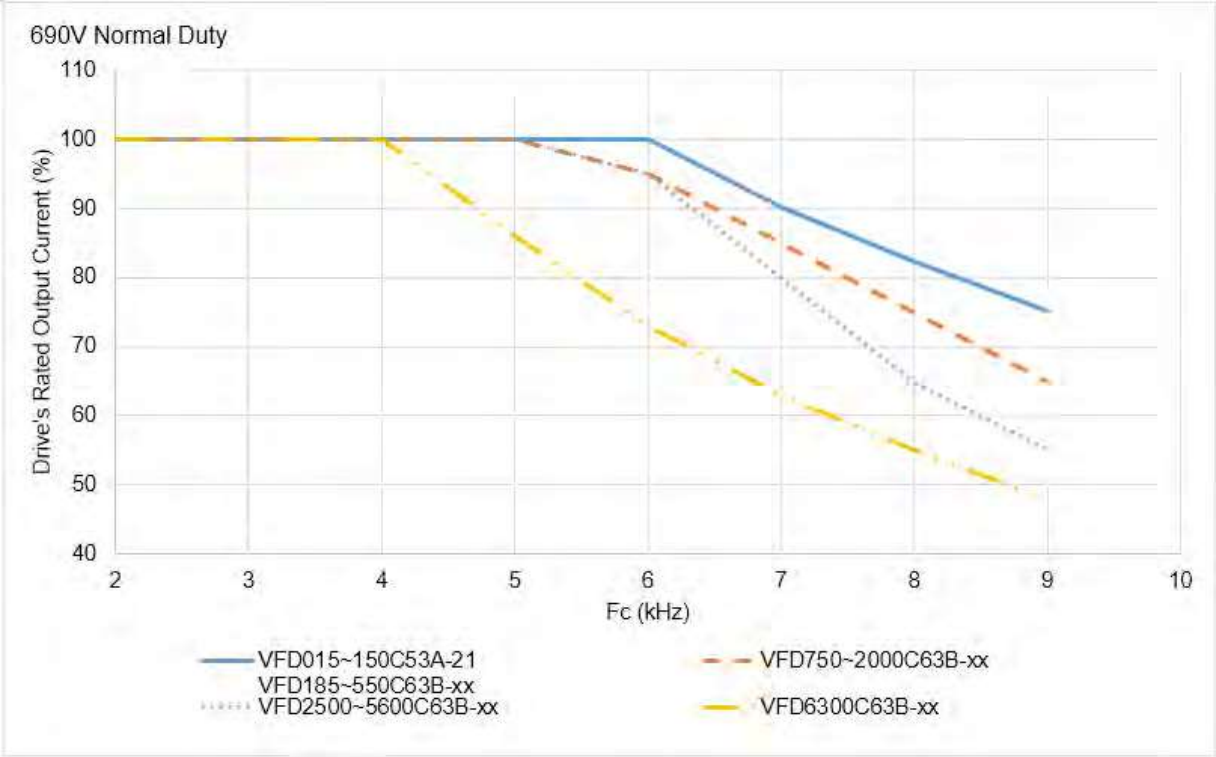


Figure 9-10

The rated output current derating (%) of 575V / 690V models in normal duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6	7	8	9
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	100	90	82	75
VFD750~2000C63B-xx	100	100	100	100	95	85	75	65
VFD2500~5600C63B-xx	100	100	100	100	95	80	65	55
VFD6300C63B-xx	100	100	100	86	73	63	55	48

Table 9-23

Pr.00-16 = 1, heavy duty:

Pr.00-11 = 0 (IMVF)

= 1 (IMVFPG)

= 2 (IM SVC, Pr.05-33 = 0)

= 3 (IMFOCPG)

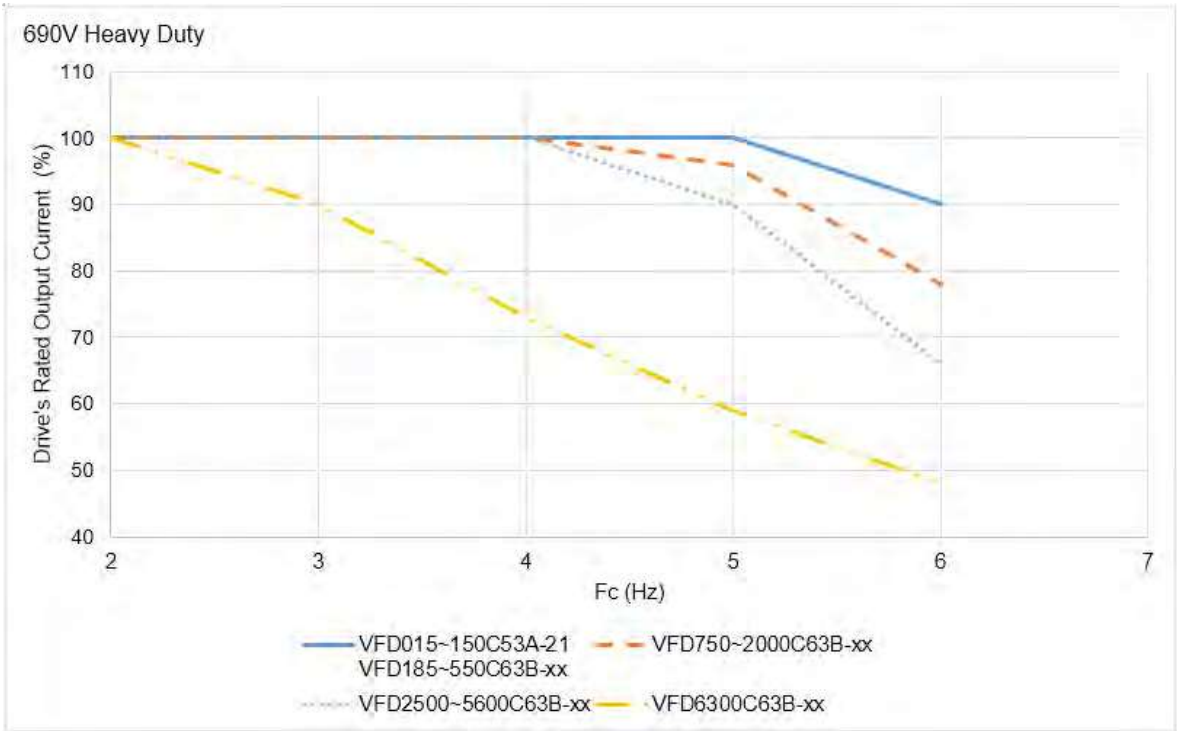


Figure 9-11

The rated output current derating (%) of 575V / 690V models in heavy duty for different carrier frequencies:

Fc (kHz) / Model No.	2	3	4	5	6
VFD015~150C53A-21 VFD185~550C63B-xx	100	100	100	100	90
VFD750~2000C63B-xx	100	100	100	96	78
VFD2500~5600C63B-xx	100	100	100	90	66
VFD6300C63B-xx	100	90	73	59	48

Table 9-24

9-8 Efficiency Curve

- Models:
  VFD007~370C23A-xx
  VFD007~750C4xx-xx

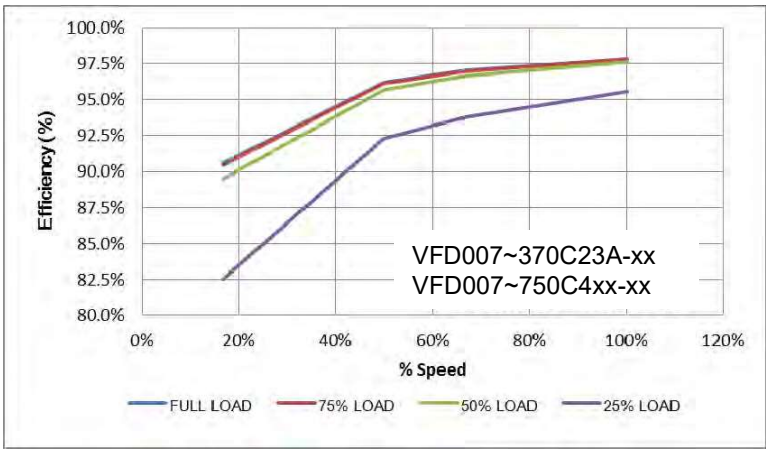


Figure 9-12

Efficiency (%) under different loads:

Load (%) \ Speed (%)	16.7	50	66.7	100
100% Load	90.6	96.2	97.0	97.8
75% Load	90.4	96.1	96.9	97.8
50% Load	89.5	95.7	96.6	97.6
25% Load	82.5	92.3	93.8	95.5

Table 9-25

- Models:
  VFD450~900C23A-xx
  VFD900~5600C4xx-xx

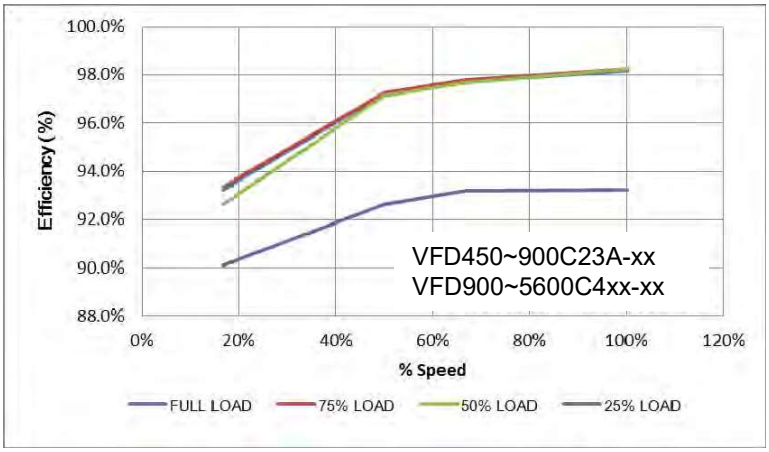


Figure 9-13

Efficiency (%) under different loads:

Load (%) \ Speed (%)	16.7	50	66.7	100
100% Load	93.2	97.2	97.7	98.2
75% Load	93.4	97.3	97.8	98.3
50% Load	92.6	97.1	97.7	98.2
25% Load	90.1	92.6	93.2	93.2

Table 9-26

- Models:
  VFD055~150C53A-21
  VFD2500~4500C63B-xx

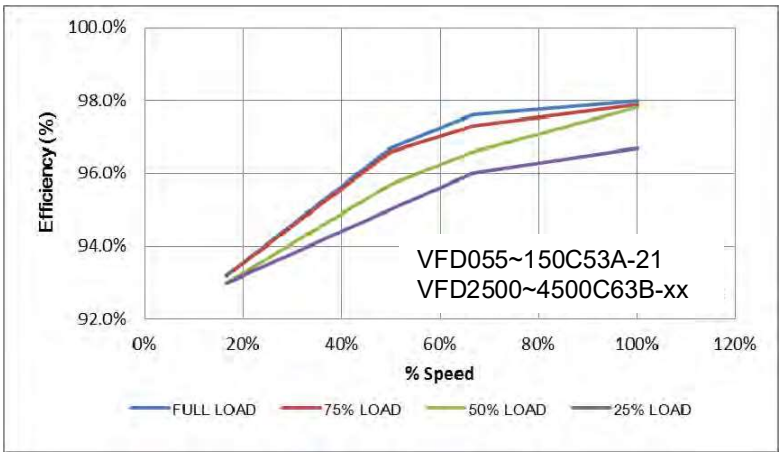


Figure 9-14

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	93.2	96.7	97.6	98
75% Load	93.2	96.6	97.3	97.9
50% Load	93	95.7	96.6	97.8
25% Load	93	95	96	96.7

Table 9-27

- Models:
  VFD015~037C53A-21
  VFD185~2000C63B-xx

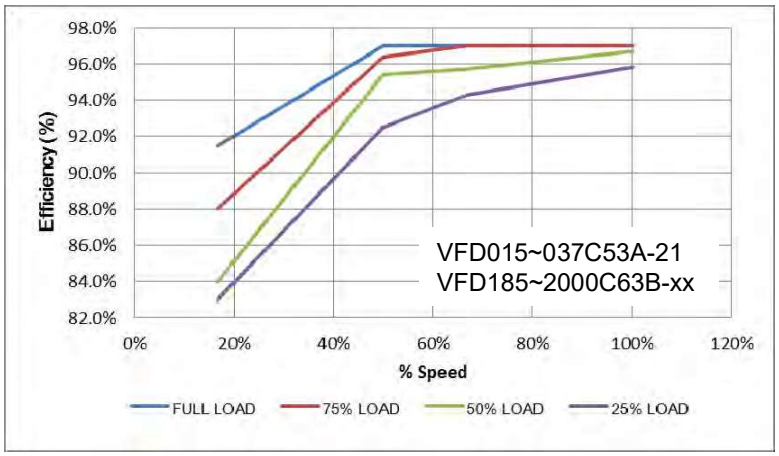


Figure 9-15

Efficiency (%) under different loads:

Speed (%) / Load (%)	16.7	50	66.7	100
100% Load	91.5	97	97	97
75% Load	88	96.4	97	97
50% Load	84	95.4	95.7	96.7
25% Load	83	92.5	94.3	95.8

Table 9-28