LARSEN & TOUBRO

High on control
big on reliability

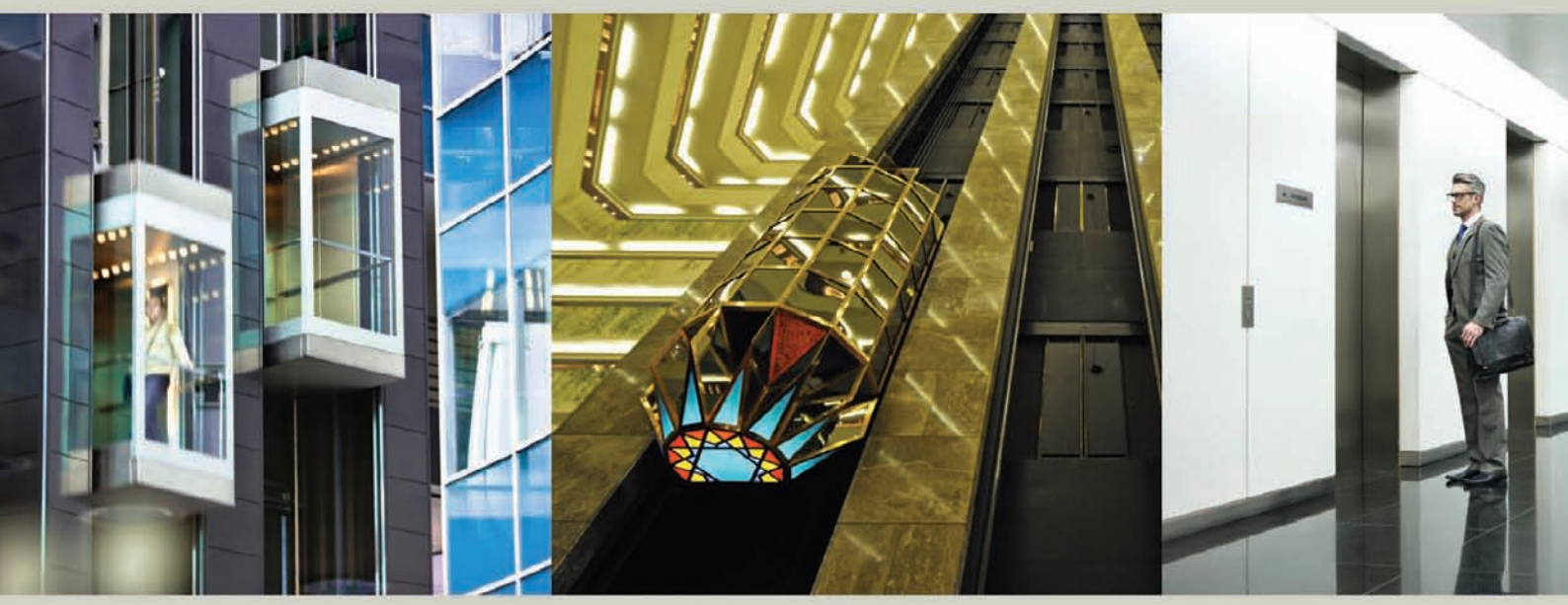
Lx2000 | AC Drive for Elevator

Three Phase 230V (2.2 ~ 37kW)
Three Phase 415V (2.2 ~ 45kW)

L&T SWITCHGEAR
SAFE & SURE

Two decades of application knowledge

For over two decades, various industry sectors have been reaping the benefits of L&T's cost-effective, performance-oriented AC Drive solutions. L&T's grasp of the specific needs of each industry enables it to offer application-specific solutions for various industries – such as processing, textile, plastic, ceramic, pharmaceutical, elevator, oil & gas, power, cement and material-handling.

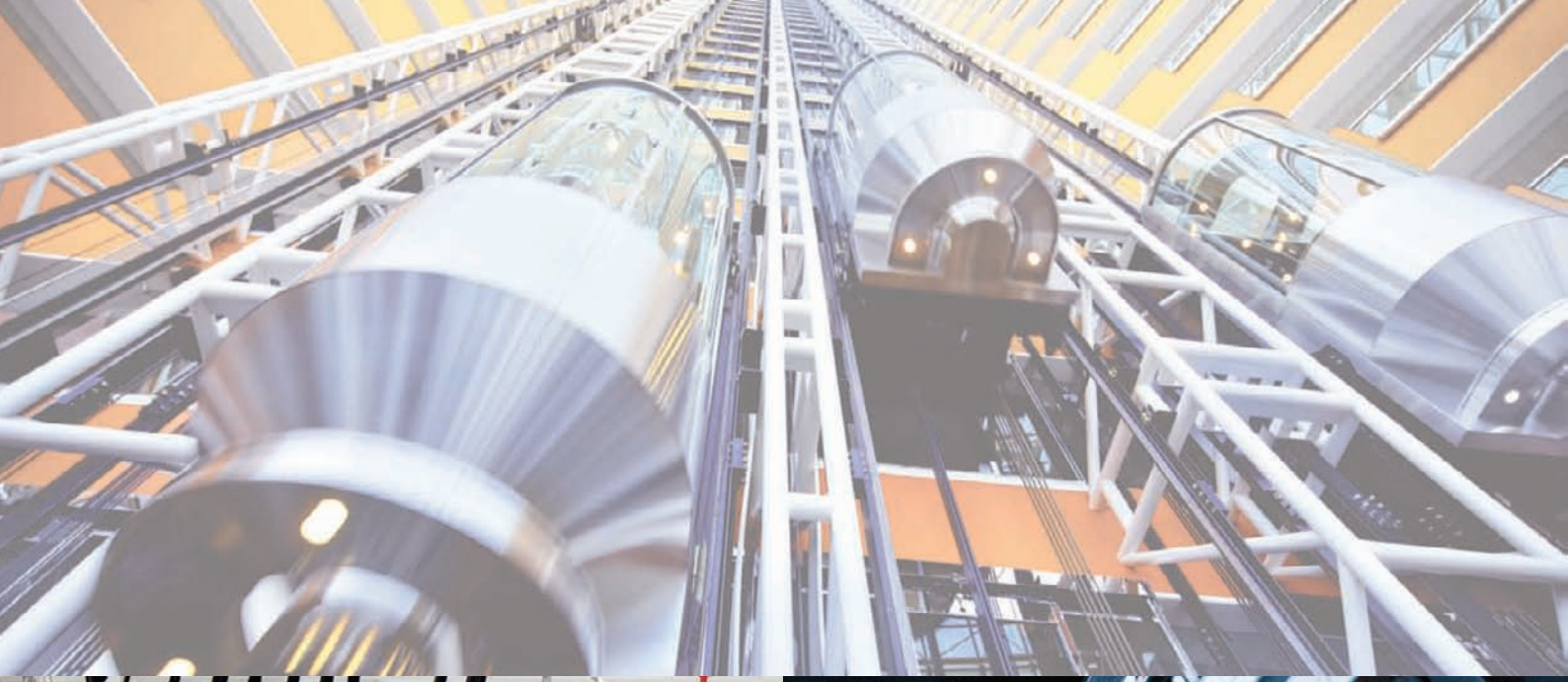


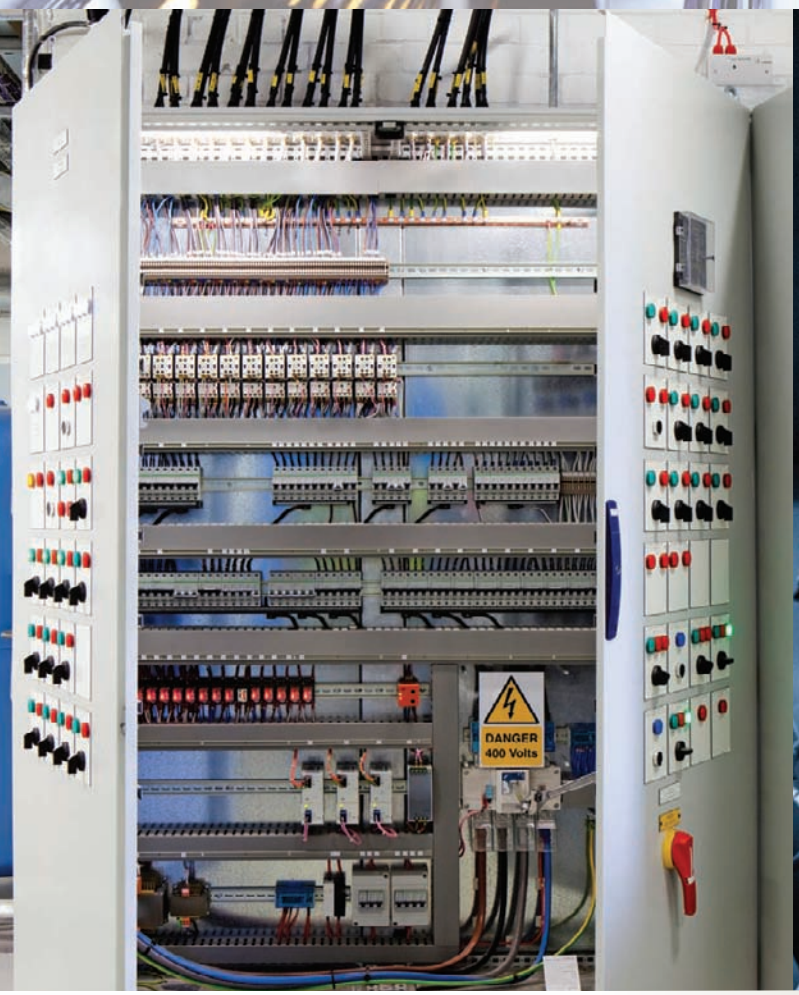
Lx2000 | AC Drive

› The new level of reliability

The Lx2000 is designed specifically to add power to elevator performance. Built to L&T's stringent quality standards, the Lx2000 is tested and certified to meet global benchmarks, thus giving you the assurance of total reliability.

It handles loads up to 45 kW, and is engineered to keep your elevator operating at optimum efficiency, even in the hot, humid and dusty conditions that characterise harsh environment.





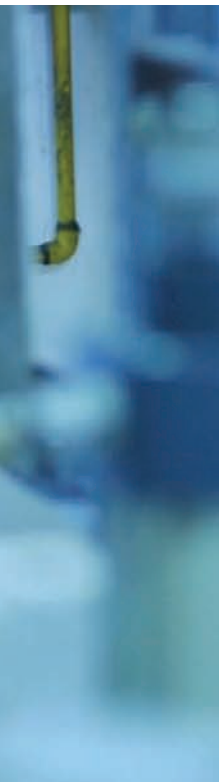
Backed by engineering knowledge across seven decades

A knowledge-based company, L&T brings you the benefits of over 75 years of engineering experience and expertise, and the richness of its collaborations with technology leaders across the globe.

For 50 years, L&T's low-tension switchgear – India's widest range – has been the preferred option of top industrial houses countrywide.

Meeting your needs, solving your problems

We believe in addressing your needs and not just selling a product. That's why a dedicated Solutions Team first focuses on understanding your application. Then helps you select the drive that best meets your needs. Our advice on installation, maintenance and replacement will ensure that your elevators function at peak productivity. From engineer to repair technician, our people have the knowledge and skill-sets to deliver total peace of mind.



Tested. Certified. Reliable.

L&T is one of the few switchgear manufacturers in India with a dedicated, NABL-certified testing facility. Our products are tested for conformity to standards that exceed minimum requirements, giving you the assurance of high-quality performance. Our focus on continuous improvement ensures that our standards are on par with the best in the world. Repeat orders endorse the value that we deliver.

After-sales service aimed at maximum uptime

A malfunction of the drive can bring an elevator to a halt. To ensure maximum uptime for you, our Rapid Response service team is available to analyze the situation and help you set the problem right. We have set up strategic service centres across the country to provide temporary replacement drives or ready spares to ensure that your business keeps running smoothly.

Rapid Response Service Team

Training your people to enhance your operations

At our countrywide Switchgear Training Centres, we can train your operators, electricians and supervisors to increase their effectiveness in the operation and maintenance and trouble-shooting of your drives. We can also conduct in-plant training and workshops at your premises to improve both power management and equipment maintenance skills. This gives you total operational excellence, minimising downtime.

L&T's engineers and channel partners also upgrade their skills through seminars, workshops, training sessions and white papers on electrical practices.

Features that ensure performance

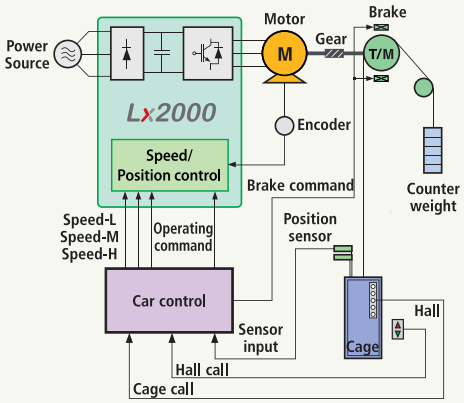
- Suitable for geared / gearless machines
- Compatibility with various types of encoders
- Anti-roll-back algorithm
- Load and direction based floor-leveling
- Built-in ARD function
- Conformal Coating as per IEC 60721-3-3 class 3C2

Lx2000

Provides **Dedicated Solutions** for Elevator Systems

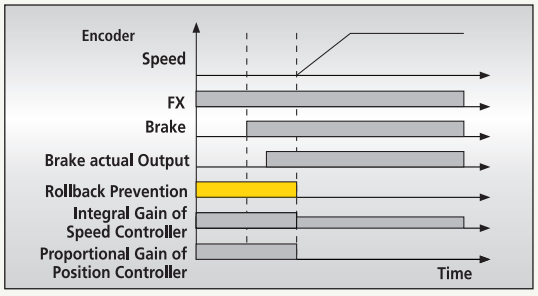
Controls the elevator system smoothly and efficiently

Lx2000 guarantees stable driving and monitoring of the elevator with both optimum speed pattern and position control.



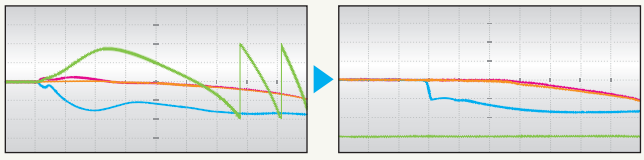
Rollback Prevention:
Anti-Rollback Function
(without external load cell)

Time Chart for Anti-Rollback Function



Before Anti-Rollback Algorithm

After Anti-Rollback Algorithm



Green : Posion Error between Command & Actual Spd.

Precise Control

Precise speed control
Accurate control with SIN/COS encoder
PM Sensorless control
Stationary Auto tuning (at standstill)
Brake Control

Auto-tuning

Standstill auto-tuning

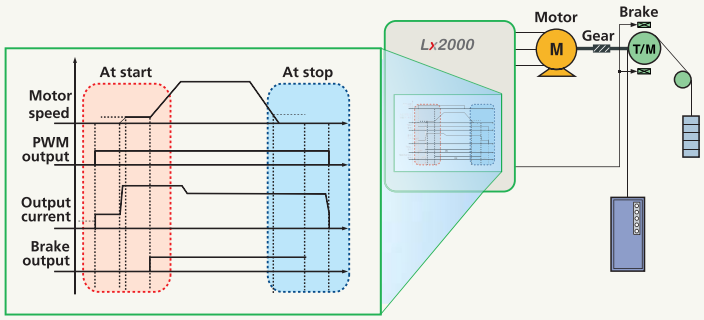
L&T's unique technology allows auto-tuning to be performed even with the motor shaft directly connected to the load. Standstill auto-tuning is useful for elevators because it does not require removal of the brake coupling connected to the motor.

Rotationel auto-tuning

Widely used for vector-control drives, this requires the motor shaft to be free from the coupling for proper operation.

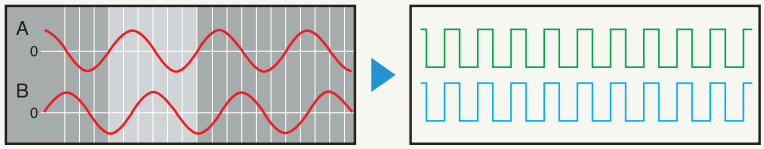
Built-in brake control for safe vertical loading

To minimize risk of the elevator's giving in to the gravitational pull of the earth, brake-control is built-in.



Extreme precise control

The SIN/COS encoder option enables more precise control over a normal encoder.

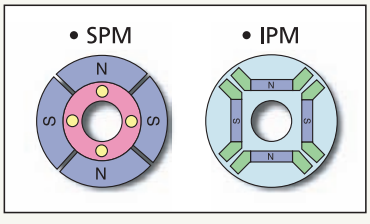


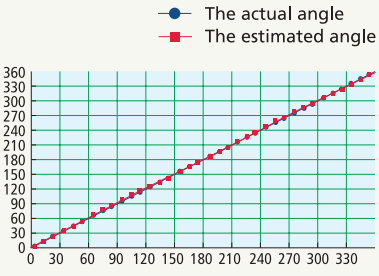
SPM, IPM motor control

SIN/COS encoder option

With synchronous motor initial stimulus position estimation, the Lx2000 perfectly controls the SPM and IPM motor.

- SPM, IPM motor
- 30,000 rpm driving fast response within 100msec





User-Friendly Interface

Easy-to-use with user-centric keypad and removable terminal blocks

Supports communication devices such as Modbus-RTU, CC-Link

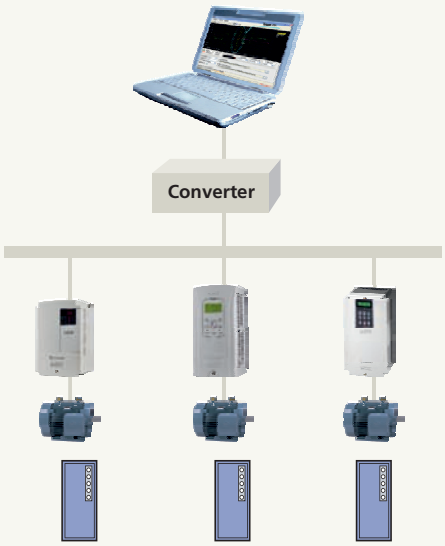
Systematic and efficient system management through DriveConnet 2.0

Easy-to-maintain drive/motor parameter via PC

PC-based Software for Easy Maintenance of Drive and Motor Parameters

DriveConnect software allows drive/system monitoring on a PC and easy maintenance of drive and motor parameters

- Windows-based graphic user interface (GUI]
- Modbus-RTU
- Connecting up to 31 drives
- Integrated control console
- Offline editing function
- Data upload/download
- 4-channel oscilloscope
- Trigger function



User-Friendly Design

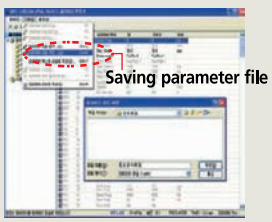
Easy-to-use keypad
By adopting a user-centered operation keypad, parameter setting becomes easier. When applying to the system, the varied information required can be monitored.

International standard removable terminal block
Wiring and maintenance is made easy by an international standard acquired terminal block.

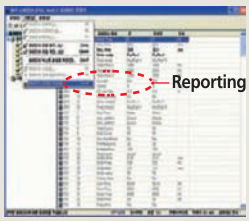
■ DriveConnect

■ Drive integrated console

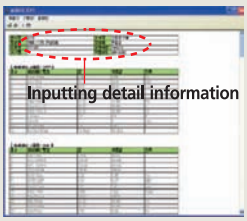
■ Parameter management



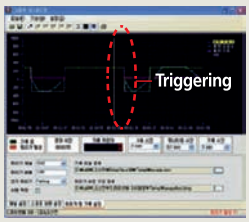
■ Reporting 1



■ Reporting 2

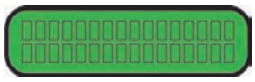


■ Oscilloscope/Trigger



Motor rating (Heavy Duty)	Three-Phase 230V	Three-Phase 415V
2.2kW	LTVF-L20012AAA	LTVF-L40006AAA
3.7kW	LTVF-L20016AAA	LTVF-L40008AAA
5.5kW	LTVF-L20024AAA	LTVF-L40012AAA
7.5kW	LTVF-L20032AAA	LTVF-L40016AAA
11kW	LTVF-L20046AAA	LTVF-L40024AAA
15kW	LTVF-L20059AAA	LTVF-L40030AAA
18.5kW	LTVF-L20074AAA	LTVF-L40039AAA
22kW	LTVF-L20088AAA	LTVF-L40045AAA
30kW	LTVF-L20122AAA	LTVF-L40061AAA
37kW	LTVF-L20146AAA	LTVF-L40075AAA
45kW	-	LTVF-L40091AAA

LTVF	L	4		0012	A	A	A
L&T Variable Frequency Drive	Series	Input Voltage		Drive Current Rating	Enclosure	Reserved	Reserved
	Lx2000	2	Three-Phase 200~240[V]	Drive Rated Current	A: IP00		
		4	Three-Phase 380~480[V]				



• Data and status display

MODE

• Shift between function groups
• Shifting from group code to the upper code

▲

• Function code shift
• Shift to next function code
• Data increase in set up mode

REV •

• Reverse run command key
• Only available, with loader operation
• LED is turned ON with reverse run
• Blinks during Acc/Deceleration of reverse run

▼

• Shift to function code
• Shift to previous code
• Data is decreased in set up mode

PROG

• Data set up start

ENT

• Data set up completion

SHIT ESC

• Decimal point shift
• Only available in case of data setup

FWD •

• Forward run command key
• Only available with loader operation
• LED is turned on with forward operation
• Blinks during Acc/Deceleration of forward operation

STOP RESET

• Stop command
• Available with the loader operation
• LED is turned on when drive stops its operation
• Blinks when fault occurs
• Reset
• Fault reset

Digital Operator Instructions

Classification	Display	Function Name	Function
KEY	MODE	Mode Key	Shift between groups. Shift from a group code to upper code.
	PROG	Program Key	Parameter setting value change.
	ENT	Enter Key	Saving altered setting values.
	▲ (up)	Up Key	Shift between codes and increase the parameter value.
	▼ (down)	Down Key	Shift between codes and decrease the parameter value.
	Shift/ESC	Shift/ESC Key	In case of set-up mode, it is operated with the shift key. Operation with ESC key in non-set up mode.
	REV	Reverse run	Reverse run key.
	STOP/RESET	Stop/Reset Key	Stop key when drive is on operation.
	FWD	Forward Key	Forward run key.
LED	(REV)	Reverse run key	Turns on at reverse operation. Blinks while the drive is on Acc/Deceleration and then turns on the constant speed operation.
	(STOP/RESET)	Stop/Fault display	Turns off when drive stops operation. Blinks when fault occurs.
	(FWD)	Forward Run Display	Turns on during forward operation. Acc/Deceleration running modes blink the lamp and it is turned on in the forward operation.

Input and Output Specification: Input Voltage Three-Phase 230V

LTVF-L2 □□□□ AAA		0012	0016	0024	0032	0046	0059	0074	0088	0122	0146
Maximum applicable motor ranges[1]	HP	3	5	7.5	10	15	20	25	30	40	50
	kW	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
Rated output	Capacity [kVA]	4.5	6.1	9.1	12.2	17.5	22.5	28.2	33.1	46	55
	Rated current [A]	12	16	24	32	46	59	74	88	122	146
	Output frequency	0 - 120 Hz									
	Output voltage	0 ~ 200V(230V) [2]									
Rated input	Voltage	3Phase 200 ~ 230V (-10% ~ +10%)									
	Frequency	50 ~ 60Hz (±5%)									
Overload Tolerance		150% of rated current for 60 sec.									
Dynamic Braking Unit		Built-in								External (option)	

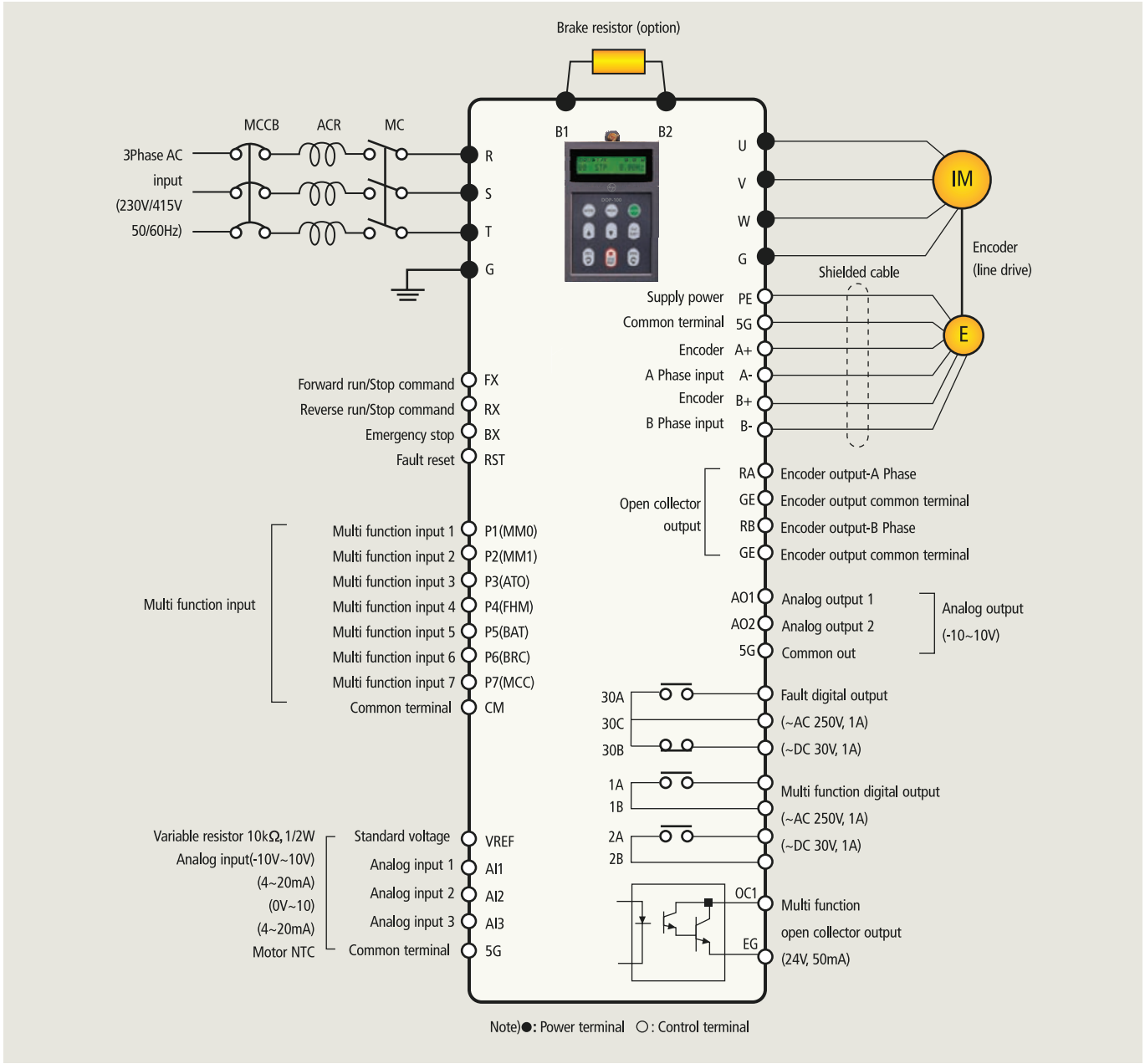
Input and Output Specification: Input Voltage Three-Phase 415V

LTVF-L4 □□□□ AAA		0006	0008	0012	0016	0024	0030	0039	0045	0061	0075	0091
Maximum applicable motor ranges[1]	HP	3	5	7.5	10	15	20	25	30	40	50	60
	kW	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45
Rated output	Capacity [kVA]	4.5	6.1	9.1	12.2	18.3	22.9	29.7	34.3	46	57	70
	Rated current [A]	6	8	12	16	24	30	39	45	61	75	91
	Output frequency	0 - 120 Hz										
	Output voltage	0 ~ 380V(480V) [2]										
Rated input	Voltage	3Phase 380 ~ 480V (-10% ~ +10%)										
	Frequency	50 ~ 60Hz (±5%)										
Overload Tolerance		150% of rated current for 60 sec.										
Dynamic Braking Unit		Built-in									External (option)	

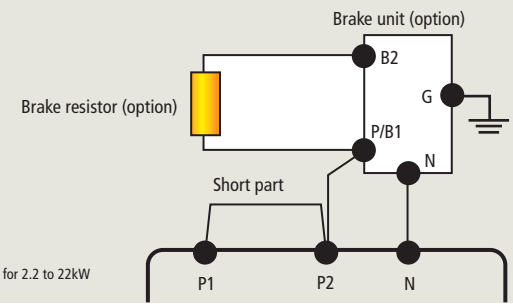
1) - Indicates the maximum applicable motor capacity when using a 4-pole standard motor.
2) - The maximum output voltage cannot be higher than the input voltage and it can be programmable below input voltage.

Item			Specification
	Circuit type		Circuit type
Control	Control type		Open Loop Vector, Closed Loop Vector & Closed Loop Vector PM
	Frequency / Speed		Analog: ± 0.2% of maximum command speed (25±10°C)
	Control accuracy		Digital: ±0.01% of maximum command speed (0~40°C)
	Frequency / Speed		Analog: ±0.05% of maximum command speed
	Resolution		Digital: 0.01% of maximum command speed
	Vector	Response speed	50Hz
		Torque control	3%
		Torque Boost	Manual torque boost (0-20%), Automatic torque boost
	Speed	Time setup	6000.0 sec (Time unit can be set)
	ACC/DEC	Combination	4 combined of Acc/Deceleration time
		Pattern	Linear, S-Curve
Braking	Braking type		Dynamic braking using external resistor
	Braking torque		150%
	Braking resistor		An external braking resistor is required
Input	Speed setting		Digital setting
			Multi-step-speed setup by digital input
			Analog input setting of -10~10V or 4~20mA
			Setting by options
	Analog input		3-Channels (AI1, AI2, AI3)
			-10 ~ 10V, 4 ~ 20mA, 10 ~ 0V, 20 ~ 4mA, motor NTC (selectable)
			Selectable among 9 different multi-function analog inputs
	Digital input		FX, RX, BX, RST, P1 ~ P7
			Multi-function input terminal (P1~P7) can be selected among various functions.
Output	Analog output		2-Channel (AO1, AO2)
			-10 ~ 10V output
			Selective among 31 multi-function analog output functions
			Multi function digital output: 2 channels (1A-1B, 2A-2B)
	Digital output		Fault digital output: 1 channel (30A-30C, 30B-30C)
	Open collector output		1 channel (OCI/EG)
	Protection function		Over-current, over/low voltage, drive overheat, drive thermal sensor open, motor over-heat, motor thermal sensor open, over speed, IGBT gate blocking (BX), fuse open, trip by unusual external signal, encoder error, communication error, electronic thermal, stall prevention (V/F), over load(V/F), drive over load.
Environment	Installation environment		Indoor, free of corrosive gas and direct sunlight
	Ambient temperature		o -10 ~ 40 C (Non-frozen condition)
	Ambient humidity		Below RH 90% (Dew-free)
	Cooling method		Forced cooling by FAN
	Altitude / Vibration		Below 1000 meters / above sea level 5.9 m/s^2 (=0.6G)

2.2~22kW (230/415V)



30~37kW (230V) & 30~45kW (415V)



Note: Control terminals & input-output power terminals are same for 2.2 to 22kW

Input and Output Specification: Input Voltage Three-Phase 230V

Display	Name	Description
R, S, T	AC Input	3Phase AC input connection 1) 230V: 200~230V, 50/60Hz 2) 415V: 380~480V, 50/60Hz
U, V, W	Output	Cable connection of 3 phase induction motor
G	Earth	Drive frame earth terminal
B1, B2	Braking resistor	Braking resistor connection
P1, P2	DC reactor and Braking unit	DC reactor, braking unit and DC link common connection terminal
P	DC Link(+-) terminal	DC Link common connection terminal
N	DC Link(-) terminal	Braking unit and DC link common terminal

Control Circuit Terminals

Item	Display	Name	Description
Digital input	FX	Forward run command	• ON when tied to CM terminal
	RX	Reverse run command	• Stops when FX and RX are ON/OFF simultaneously
	RST	Fault reset	• Clears the fault condition only when the fault state is removed
	P1(MMO)		• Selectable among the following functions: (Multi step speed selection 1/2/3, JOG run, MOP up/down/Save/Clear, analog hold, main drive, speed acc/dec time selection, 3-wire operation, external default signal B contact point, timer input, soft-start cancellation, ASR PI gain selection, ASR P.PI selection, pre-excitation, torque bias
	CM	Common	
	VREF		• ON in case of connection b etween CM and digital
Analog input	AI1	Analog setting power Voltage input	• V ariable resistor use standard voltage (+10V):10 • Voltage input (-10~10V), current input (4~20mA) The motor NTC input is selectable
	AI2	Current input	• Selectable among following functions; (Speed reference, Torque bias, Torque limit, Process PI control reference, Motor NTC input) • Jumper set up use AC voltage input → AI1, AI2: Open , AI3:Left of switch
	AI3	Voltage input Motor NTC input	• Jumper set to use as voltage input → AI1,AI2: Short • With motor NTC input, switch direction setup → AI3: Right of switch
	5G	COMMON	• Analog input COMMON terminal

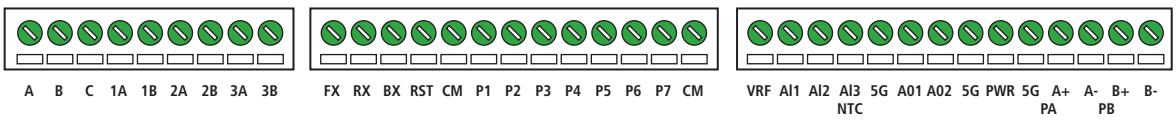
Control Circuit Terminals

Classification	Display	Name	Description
Encoder Input	PE	Encoder power	+5V Line drive power (Jumper set required)
	5G		0V
	A+	Encoder A phase signal	• A and B phase signals of line drive encoder
	A-		• T o use the line drive type encoder, the 'P5 pin' of I/O PCB JP2 should be shorted and then the JP1 switch should be pulled down to 'LD' direction
	B+	Encoder B phase signal	• Jumper set-up (factory default)
	B-		
	PE	Encoder power	+15V Open collector power (Jumper set-up is required)
	5G		0V
	PA	Encoder A phase signal	• A and B phase signals of complementary and open collector type signals
	PB	Encoder B phase signal	• Short the 'P15 pin' of I/O PCB JP2 and then pull up the JP1 switch to 'OC'
Encoder output	RA	Encoder output-phase A	• Encoder phase A and B output signal (Open collector type)
	GE	Encoder output common terminal	
	RB	Encoder output-phase B	
	GE	Encoder output common terminal	
Analog Output	AO1	Analog output1	• Output -10V~+10V
	AO2	Analog output2	• Select from among the following 31 items: (motor speed, speed reference1~2, Torque reference1~2, Torque current volume flux reference, flux reference volume, drive output current, drive output voltage, Motor temperature, DC voltage)
	5G	COMMON	• COMMON terminal for analog output
Digital Output	1A	Multi-function digital output1	• Select from among the following 14 items: (zero speed detection, speed detection (polarity valid), speed detection (rotation direction invalid), speed reach, speed matching, arbitrary torque detection torque limit feature, motor overheating signal, drive overheating signal, low voltage feature, drive run signal, drive regeneration signal, drive run function, timer output)
	1B	(contact point A)	
	2A	Multi-function digital output2	
	2B	(contact point B)	
	OC1	Multi-function open collector output	
	EG		
	30A	Fault signal A contact point	• Activates when the faults occur
	30B	Fault signal B contact point	• Not available in emergency stop
	30C	COMMON	• Common for A and B digital output

Control Circuit Terminal

Control Terminal Feature

- **Control Terminal Panel Arrangement(Standard Type(SIO) - Non insulated type)**

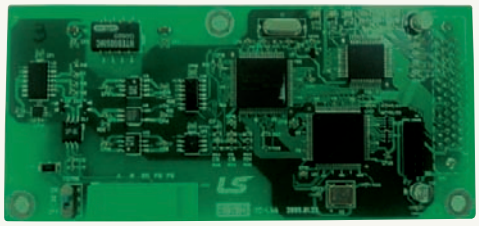


Various Optional Cards

Synchronous option, SIN/COS encoder option, expansion I/O, Elevator dedicated I/O, etc.

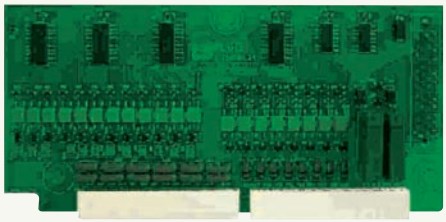
CC Link Option Card (LTCI-CCL-L)

- Max. 10 Mbps speed
- Customized LS profile
- CC Link customized cable
- Built-in termination resistor
- Remote I/O : each 32 point
- Remote register : 4 words

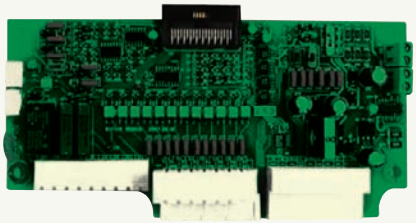


Distance Control Card (LTEL-EIO-L)

- Position sensor/safety switch input
- Car position output
- E/L position and sequence control
- MC/Brake operation signal output
- E/L exclusive connector



SIN/COS ENCODER (LTEN-SCE-L)



ENDAT & Sin/ Cos Encoder (LTEN-EDT-L)

- Selectable Endat & Sin/Cos Option
- Max. 3,600rpm speed
- Enhanced Comfortable feeling in Car
  - Compatibility with Heidenhain Encorder
  - ECN413, ECN1313, ERN487, ERN1387

Braking resistor specifications

Resistance values in the table shown below are calculated based on the 150% braking torque, 10%ED* standard.

Input Voltage	Drive Cat. No.	Capacity (10%ED)	
		[Ω]	[W]
Three-Phase 230V	LTVF-L20012AAA	50	800
	LTVF-L20016AAA	33	1200
	LTVF-L20024AAA	20	1600
	LTVF-L20032AAA	15	2400
	LTVF-L20046AAA	10	4800
	LTVF-L20059AAA	8	4800
	LTVF-L20074AAA	5	7200
	LTVF-L20088AAA	5	7200
Three-Phase 415V	LTVF-L40006AAA	200	800
	LTVF-L40008AAA	130	1200
	LTVF-L40012AAA	85	1600
	LTVF-L40016AAA	60	2400
	LTVF-L40024AAA	40	4800
	LTVF-L40030AAA	30	4800
	LTVF-L40039AAA	20	7200
	LTVF-L40045AAA	20	7200

▶ * % ED is based on 100sec.

Brake resistor wiring

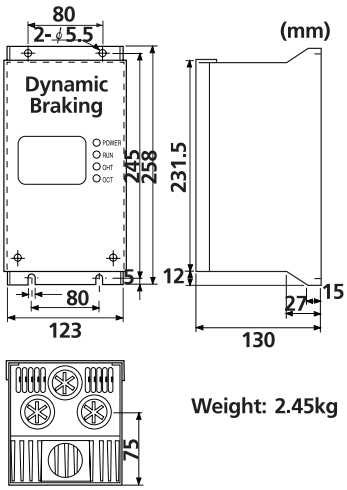
For brake resistor with a temperature detection sensor for fire protection, refer below when in use.

Brake resistor terminal blocks	Drive terminals	Operation
B1, B2	P,BR	
P7, CM	One of the multi-function input terminals, out of P1~P7, of control terminals board is used as defining 'External trip signal contact B'	The contact is ON in normal temperature and opens in overheat.

Braking Unit LED Functions

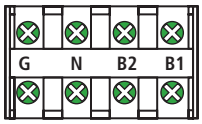
Displayed Item	Description
POWER	Main power in braking unit turns on the POWER LED. Generally the braking unit is wired to the drive, so once the input main power of drive is on, the POWER LED of braking unit turns on.
RUN	While braking unit operates its normal operation by the motor regenerative energy, the RUN LED blinks.
OHT	During the braking operation, if the braking unit heat sink is overheated and exceeds its limited value, the overheat protection function operates. This blocks the braking unit signal and then turns on the OHT LED.
OCT	During the braking operation, if over-current flows in the main circuit of braking unit then the over current protection function is operated in order to prevent the circuit from over current. The TURN ON signal of braking unit is blocked and then turns on the OCT LED.

Terminal Block and Braking Unit

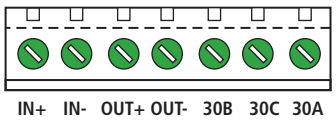


Weight: 2.45kg

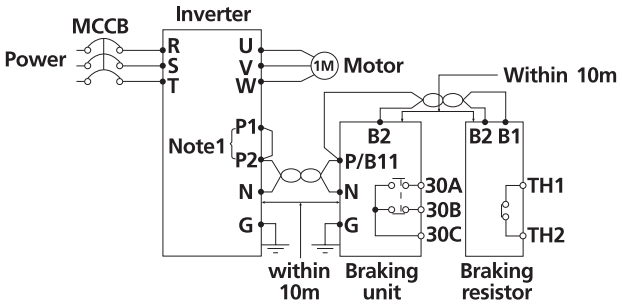
Main circuit terminal block



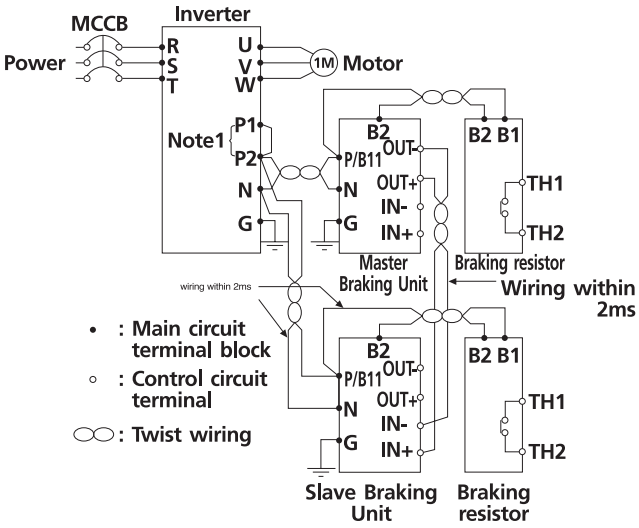
Control circuit terminal



Terminal Block and Braking Unit

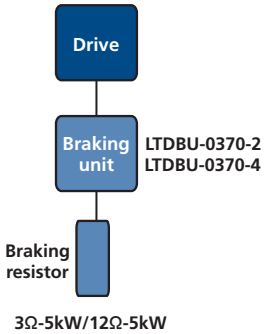


Double use of Braking Unit

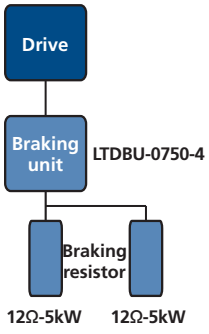


Combination of Braking Units and Braking Resistors

• 30~37kW (230V/415V)



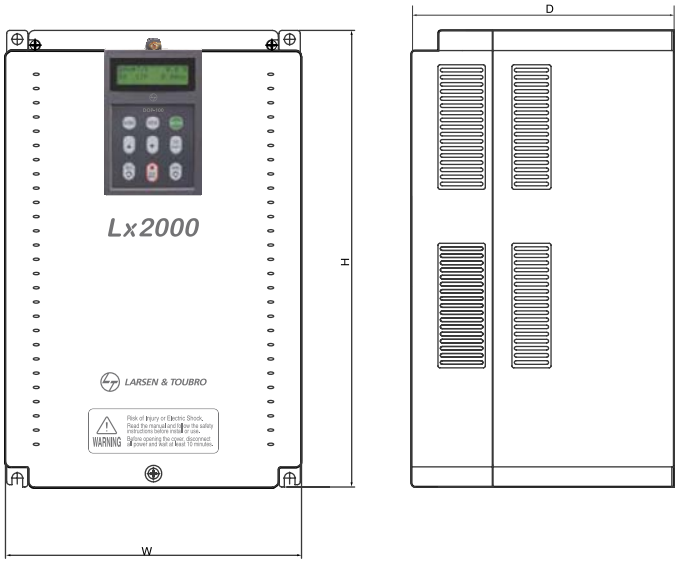
• 45kW (415V)



MCCB (Moulded Case Circuit Breaker) and MC (Magnetic Contactor)

Input Voltage	Motor (kW)	Drive Cat. No.	MCCB (L&T)	MC (L&T)
Three-Phase 230V	2.2	LTVF-L20012AAA	DM100/30	MO 18
	3.7	LTVF-L20016AAA	DM100/30	MO 32
	5.5	LTVF-L20024AAA	DM100/50	MO 50
	7.5	LTVF-L20032AAA	DM100/60	MO 50
	11	LTVF-L20046AAA	DN2-250M/100	MO 70
	15	LTVF-L20059AAA	DN2-250M/125	MO 95
	18.5	LTVF-L20074AAA	DN2-250M/160	MNX 140
	22	LTVF-L20088AAA	DN2-250M/160	MNX 140
	30	LTVF-L20122AAA	DN2-250M/250	MNX 140
	37	LTVF-L20146AAA	DN3-400M/320	MNX 225
Three-Phase 415V	2.2	LTVF-L40006AAA	DM16/16	MO 12
	3.7	LTVF-L40008AAA	DM16/16	MO 18
	5.5	LTVF-L40012AAA	DM100/30	MO 25
	7.5	LTVF-L40016AAA	DM100/30	MO 32
	11	LTVF-L40024AAA	DM100/50	MO 50
	15	LTVF-L40030AAA	DM100/60	MO 50
	18.5	LTVF-L40039AAA	DM100/80	MO 70
	22	LTVF-L40045AAA	DN2-250M/100	MO 70
	30	LTVF-L40061AAA	DN2-250M/125	MO 95
	37	LTVF-L40075AAA	DN2-250M/160	MNX 140
	45	LTVF-L40091AAA	DN2-250M/160	MNX 140

2.2 ~ 22kW (230V/415V)



Input Voltage	Drive Cat. No.	W (mm)	H (mm)	D (mm)	Weight (kg)
Three-Phase 230V	LTVF-L20012AAA	200	284	207	6
	LTVF-L20016AAA	200	284	207	6
	LTVF-L20024AAA	200	284	207	14
	LTVF-L20032AAA	200	355	202	14
	LTVF-L20046AAA	200	355	202	13.7
	LTVF-L20059AAA	250	385	221	13.7
	LTVF-L20074AAA	250	385	221	20.3
	LTVF-L20088AAA	304	460	254	20.3
Three-Phase 415V	LTVF-L40006AAA	200	284	207	6
	LTVF-L40008AAA	200	284	207	6
	LTVF-L40012AAA	200	355	202	14
	LTVF-L40016AAA	200	355	202	14
	LTVF-L40024AAA	250	385	221	13.7
	LTVF-L40030AAA	250	385	221	13.7
	LTVF-L40039AAA	304	460	254	20.3
	LTVF-L40045AAA	304	460	254	20.3

2.2 ~ 22kW (230V/415V)

Input Voltage	Drive Cat. No.	W (mm)	H (mm)	D (mm)	Weight (kg)
Three-Phase 230V	LTVF-L20122AAA	350	680	308.2	42
	LTVF-L20146AAA	350	680	308.2	42
Three-Phase 415V	LTVF-L40061AAA	350	680	308.2	42
	LTVF-L40075AAA	350	680	308.2	42
	LTVF-L40091AAA	375	780	326	63

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