YASKAWA

INVERTERS FOR ELEVATOR DRIVES
Varispeed L7

VECTOR CONTROL FOR BOTH INDUCTION AND SYNCHRONOUS MOTORS

200V CLASS 3.7kW to 55kW
400V CLASS 3.7kW to 55kW

A Comfortable Elevator Ride around the World

Going up in Comfort and Economy in New or Conventional Elevators

The Varispeed L7 controls not only induction motors(IM) for conventional elevators but also permanent-magnet synchronous motors(PM): the new trend in elevator drives. Use Varispeed L7!
It has just what you're looking for in an inverter!

Varispeed L7, the inverter for both IM and PM drives

◆ **With an induction motor (IM)**
The motor, gear, and inverter are installed in a machine room.

- Machine Room
- Gear Motor
- Sheave
- Controller
- Counterweight
- Elevator
- Ground
- Underground
- Buffer

◆ **With a permanent-magnet synchronous motor (PM)**
No gears required.
The motor and inverter are installed in a machine room.
The motor can be separately installed in a corner as shown in the figure below.

- Machine Room (requires less space)
- IPM Motor
- Controller
- Inverter
- Counterweight
- Elevator
- Ground
- Underground
- Buffer

Varispeed L7

Advanced Functions and Performance for a Ride in Comfort

The Varispeed L7 has enhanced functions to assure a smooth, quiet, and safe ride in an elevator and it has a high-operation efficiency for energy savings.
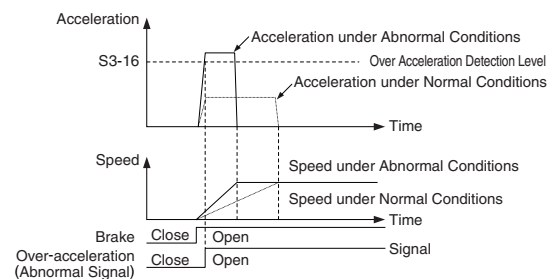
Safe

● **Reduced External Contactor with Improved Safety Function (Conforms to EN81-1 or equivalent)**
A hardware baseblock, not the conventional software baseblock, is applied, so that the safety is improved. With a hardware baseblock, an external contactor is not required.

● The alarm detection prevents an elevator from moving unexpectedly in case of incorrect parameter settings, incorrect wiring, or motor failure.

● **Over-acceleration/Reverse Detection**
Safety can be drastically improved with functions to detect malfunctions such as over acceleration or reverse caused by incorrect wiring or parameter settings. (Only for PM motor drives.)

Acceleration
- Acceleration under Abnormal Conditions
- S3-16
- Over Acceleration Detection Level
- Acceleration under Normal Conditions
- Time

Speed
- Speed under Abnormal Conditions
- Speed under Normal Conditions
- Time

Brake: Close / Open
Over-acceleration (Abnormal Signal): Close / Open
Signal

● **Excessive Speed Deviation Detection**
The function improves safety by detecting malfunctions such as speed deviation if the motor speed does not correspond with the speed reference.

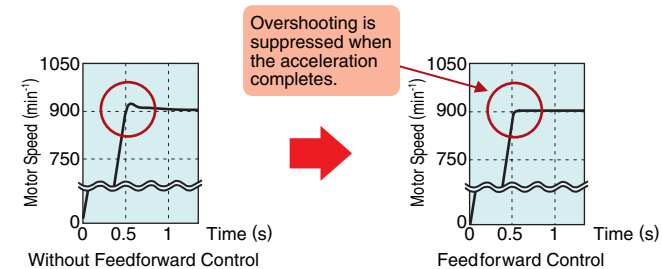● The backup battery ensures safe elevator travel in case of power loss.

Smooth

● The Zero-servo function and the Starting Torque Compensation control (requires a load sensor) realize smooth start-ups.

● The S-curve operation realizes smooth acceleration and deceleration.

● **Feedforward Control**
The feedforward control is effective for speed control without overshooting when acceleration is completed, resulting in a comfortable ride.

Overshooting is suppressed when the acceleration completes.

Without Feedforward Control

Feedforward Control

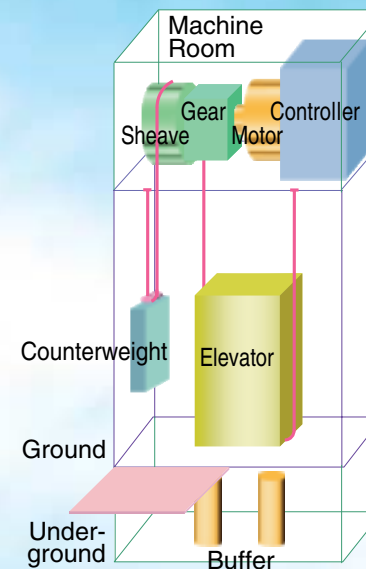(Motor Speed (min⁻¹): 1050, 900, 750, 0 — Time (s): 0, 0.5, 1)

Quiet

The carrier frequency (fc) can be set to the optimum value for the application(Note). For smooth operation in passenger elevators, set the frequency to 15kHz.

Note: Derating may be required.
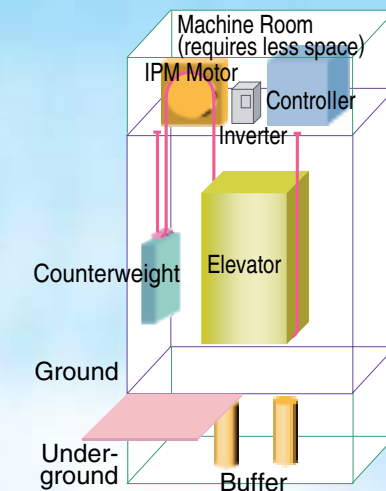
Easy-to-use Features for Simplified Adjustments and Maintenance

The Varispeed L7 has been developed not only for the comfort of passengers but also for the comfort of technicians who adjust and maintain the elevator inverters. Its global specifications and easy-to-use features reduce the adjustment and maintenance time, which leads to the reduction of total costs.

Global Specifications

● Certified by UL/cUL and CE marking.

● Meets a variety of world power supply.
Three-phase 200 V series (200 V to 240 V)
Three-phase 400 V series (380 V to 480 V)

c(UL)us LISTED   CE

● Supports global field networks.
All models are fully compliant with RS-422/485(MEMOBUS/Modbus protocol) standards. The networks are available by using communications option cards[1]. Now you can connect to hosts and PLC, implement centralized management of production equipment and reduce wiring easily.

Field Network[1]
- MEMOBUS
- DeviceNet[2]
- PROFIBUS-DP
- CC-Link
- CANopen

Communications Option Cards
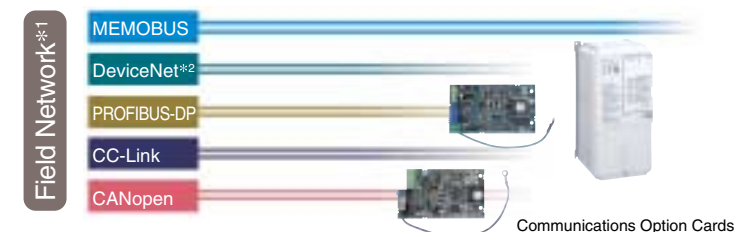
[1]: Communication cards for various field networks are under development.
[2]: Devicenet is a registered trademark of Open DeviceNet Vendors Association.

● **PG Interfaces**
A wide variety of PG interfaces required to drive the motors of the world are available.

PG Interface Specifications	Motor	PG Speed Control Card (Optional)
EnDat 2.1/2.2 (ECN1313,ECN113,ECN413)	SPM	PG-F2
HIPERFACE (SRC50/60)	SPM	PG-F2
Voltage Output	IM	PG-B2
RS-422 Serial Interface	IM/IPM	PG-X2

Easy Tuning

● Four tuning methods are included for selecting the most efficient adjustment of the motor (IM/PM):
① Rotational Autotuning
All required motor data is automatically measured.
② Stationary Autotuning
All required motor data is automatically measured while the motor is stopped.
③ Stationary Autotuning for Line-to-line Resistance only
Reduces cable errors if motor cables are 50m or more in length.
④ Encoder Offset Tuning
Tuning method used only for pole position of permanent magnet (PM) motors.

Easy Maintenance

● "DriveWizard™", the inverter-supporting tool for the PC, is available.
The management of inverter cons-tants on your personal computer reduces the time required for maintenance.

● The copy unit (optional) enables the parameters to be quickly uploaded or downloaded.
It's useful when copying the parameters to multiple inverters.

Standard Specifications

200 V Class

Inverter Model CIMR-L7B			23P7	25P5	27P5	2011	2015	2018	2022	2030	2037	2045	2055
Output Rating	Nominal Motor Output kW		3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated Current*1 A	fc = 8 kHz	17.5	25	33	49	64	80	96	130	160	183	224
	(3 min., 50%ED)	fc =15 kHz	12	17.5	25	33	49	64	80	96	130	160	183
	Max. Output Voltage		Three-phase; 200, 208, 220, 230, or 240 VAC (Proportional to input voltage.)										
	Max. Output Frequency		Up to 120 Hz by parameter setting.										
Power Supply	Rated Input Voltage and Frequency		Three-phase; 200/208/220/230/240 VAC 50/60 Hz										
	Rated Input Current A		21	25	40	52	68	96	115	156	176	220	269
	Allowable Voltage Fluctuation		+10% −15%										
	Allowable Frequency Fluctuation		±5%										
	Reactor for Harmonic Wave Prevention (Optional)		DC Reactor							AC Reactor			
	Braking Transistor		Built-in (30% ED, 30 s)							Optional			

400 V Class

Inverter Model CIMR-L7B			43P7	44P0	45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055
Output Rating	Nominal Motor Output kW		3.7	4.0	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated Current*1 A	fc = 8 kHz	8.5	11	14	18	27	34	41	48	65	80	96	128
	(3 min., 50%ED)	fc =15 kHz	6.2	8.5	11	14	18	27	34	41	48	65	80	96
	Max. Output Voltage		Three-phase; 380, 400, 415, 440, 460, or 480 VAC (Proportional to input voltage.)											
	Max. Output Frequency		Up to 120 Hz by parameter setting.											
Power Supply	Rated Input Voltage and Frequency		Three-phase; 380/400/415/440/460/480 VAC 50/60 Hz											
	Rated input current A		10.2	13.2	17	22	32	41	49	58	78	96	115	154
	Allowable Voltage Fluctuation		+10% −15%											
	Allowable Frequency Fluctuation		±5%											
	Reactor for Harmonic Wave Prevention (Optional)		DC Reactor								AC Reactor			
	Braking Transistor		Built-in (30% ED, 30 s)								Optional			

200 V / 400 V Class

Control Characteristics	Control Method	Sine wave PWM [Closed-loop vector, open-loop vector 1, V/f, closed-loop vector (PM)]
	Starting Torque	Standard duty: 8 kHz of carrier frequency, 150% of rated output current for 30 s.
	Speed Control Range	1:40 (V/f control) 1:100(Open-loop vector control 1) 1:1000 [Closed-loop vector control, Closed-loop vector control (PM)]
	Speed Control Accuracy*2	±3% (V/f control) ±0.2% (Open-loop vector control 1) ±0.02% [Closed-loop vector control, Closed-loop vector control (PM)]
	Speed Response	5 Hz (Open-loop vector control 1), 40 Hz (Closed-loop vector control)
	Torque Limit	Provided for vector control only. (4 quadrant steps can be changed by parameter settings.)
	Torque Accuracy	±5%
	Frequency Control Range	0.01 to 120 Hz
	Frequency Accuracy (Temperature Characteristics)	Digital reference：±0.01%, −10℃ to + 40℃; Analog reference: ±0.1%, 25℃ ±10℃
	Frequency Setting Resolution	Digital reference：0.01 Hz; Analog reference: 0.025 Hz/50 Hz (11 bit with no sign)
	Output Frequency Resolution	0.01 Hz
	Overload Capacity / Max. Current	Standard duty:150% of rated output current for 30 s
	Frequency Setting Signal	0 to 10 V
	Accel/Decel Time	0.01 to 600.00 s (4 selectable combinations of independent acceleration and deceleration settings.)
	S-curve Setting	Starting, acceleration end, deceleration start, leveling, stop setting independently.
	Braking Torque*3	Approx. 20% (Approx. 125% when using braking resistor), Built-in braking transistor provided for inverters of 18.5 kW or less (200/400 V).
	Major Control Functions	Hardware baseblock conforms to EN954-1 safety category 3 and stop category 0. Overtorque/undertorque detection, torque limits, 8-step speed operation (maximum), 4 acceleration and deceleration time change, autotuning (rotational or stationary), dwell function, cooling fan ON/OFF control, slip compensation, torque compensation, DC braking for starting and stopping, automatic fault restart, parameter copy, special elevator functions and sequences, brake sequence, short floor, hardware baseblock
Protective Functions	Motor Overheat Protection	Protection by electronic thermal overload relay. This does not protect the internal magnets of the PM motor from demagnetization.
	Instantaneous Overcurrent	Stops at approximately 200% of inverter rated output current.
	Fuse Protection	Motor coasts to stop at blown fuse.
	Overload	150% of rated current for 30 s.
	Overvoltage	200 V class inverter：Stops if the main-circuit voltage exceeds 410 VDC. 400 V class inverter：Stops if the main-circuit voltage exceeds 820 VDC.
	Undervoltage	200 V class inverter：Stops if the main-circuit voltage is below 190 VDC. 400 V class inverter：Stops if the main-circuit voltage is below 380 VDC.
	Momentary Power Loss	Continuous operation during power loss less than 2 s by parameter settings.
	Fin Overheat	Protection by Thermistor.
	Stall Prevention	Stall prevention during accel/decel and parameter speed operation.
	Ground Fault*4	Protection by electronic circuit.
	Power Charge Indication	Charge LED stays ON until bus voltage drops 50 VDC max.
Environmental Conditions	Ambient Temperature	−10℃ to + 45℃
	Humidity	95%RH max. (non-condensing)
	Storage Temperature	−20℃ to + 60℃ (for short period during shipping)
	Location	Indoor (protected from corrosive gases and dust)
	Altitude	1000 m max.
	Vibration	10 to 20 Hz, 9.8 m/s² max. 20 to 50 Hz, 2 m/s² max.
	Protective Structure	Enclosed wall-mounted type (IP20) : All models Enclosed wall-mounted type (NEMA1) : 18.5 kW or less (same for 200 V and 400 V class inverters) Open chassis type (IP00) : 22 kW or more (same for 200 V and 400 V class inverters)

＊1：Factory setting of carrier frequency (fc)：8 kHz for inverters of 30 kW or less ; 5 kHz for inverters of 37 kW or less.
＊2：The speed control accuracy depends on the installation conditions and type of motor used. Contact your Yaskawa representative for details.
＊3：When using a braking resistor or braking resistor unit, set L3-04 = 0 (deceleration stall prevention disabled).
　　　If not, motor may not stop at the set time.
＊4：The ground fault here is one that occurs in the motor wiring during operation. Ground faults may not be detected under the following conditions.
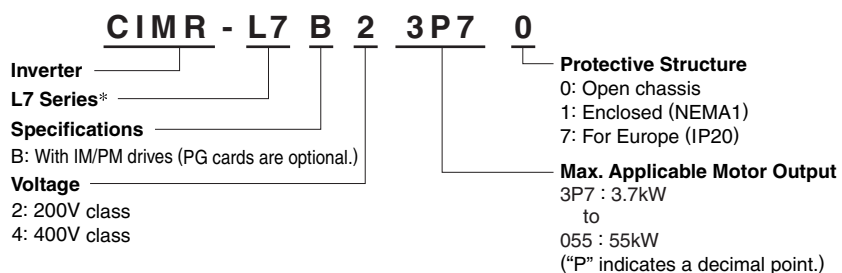　　　・A ground fault with low resistance which occurs in motor cables or terminals.
　　　・The inverter power supply is turned ON after a ground fault has occurred.

Applications [With Yaskawa's standard Surface Permanent Magnet (SPM) motors and encoder with EnDat interface.]

Load Capacity kg	Elevator Speed m/min	Motor Output[*1] kW	Motor Speed[*2] min⁻¹	Motor Model SSE4-◻◻◻◻	Inverter Model CIMR-L7B ◻◻◻◻
200 V Class					
450	45	2.1	72	22P1072	25P5
	60	2.8	96	22P8096	
	90	4.2	144	24P2144	27P5
600	45	2.8	72	22P8072	27P5
	60	3.7	96	23P7096	
	90	5.6	144	25P6144	2011
	105	6.5	168	26P5168	
750	45	3.5	72	23P5072	27P5
	60	4.6	96	24P6096	
	90	6.9	144	26P9144	2015
	105	8.1	168	28P1168	
900	45	4.2	72	24P2072	2011
	60	5.6	96	25P6096	
	90	8.3	144	28P3144	2015
	105	9.7	168	29P7168	
1,000	45	4.6	72	24P6072	2011
	60	6.2	96	26P2096	
	90	9.2	144	29P2144	2018
	105	11	168	2011168	
400 V Class					
450	45	2.1	72	42P1072	45P5
	60	2.8	96	42P8096	
	90	4.2	144	44P2144	47P5
600	45	2.8	72	42P8072	45P5
	60	3.7	96	43P7096	
	90	5.6	144	45P6144	4011
	105	6.5	168	46P5168	
750	45	3.5	72	43P5072	47P5
	60	4.6	96	44P6096	
	90	6.9	144	46P9144	4011
	105	8.1	168	48P1168	
900	45	4.2	72	44P2072	
	60	5.6	96	45P6096	
	90	8.3	144	48P3144	4015
	105	9.7	168	49P7168	
1,000	45	4.6	72	44P6072	4011
	60	6.2	96	46P2096	
	90	9.2	144	49P2144	4015
	105	11	168	4011168	

*1： When the elevator speed is below 105 m/min and the load capacity is under 1000 kg.
*2： Based on a sheave diameter of 400 mm and a roving ratio of 2:1.

Model Designation

CIMR - L7 B 2 3P7 0

- **Inverter** — CIMR
- **L7 Series*** — L7
- **Specifications** — B: With IM/PM drives (PG cards are optional.)
- **Voltage**
  2: 200V class
  4: 400V class
- **Protective Structure**
  0: Open chassis
  1: Enclosed (NEMA1)
  7: For Europe (IP20)
- **Max. Applicable Motor Output**
  3P7 : 3.7kW
  to
  055 : 55kW
  ("P" indicates a decimal point.)

*: The Varispeed L7 series is available worldwide. When ordering, specify the region: Japan, China, Asia, Europe, or USA. Factory settings and nameplate information will vary.

Standard Connection

■ Wiring Example for IM/PM Drives (with optional PG card)
3.7 kW in the 400 V class, CIMR-L7B43P7
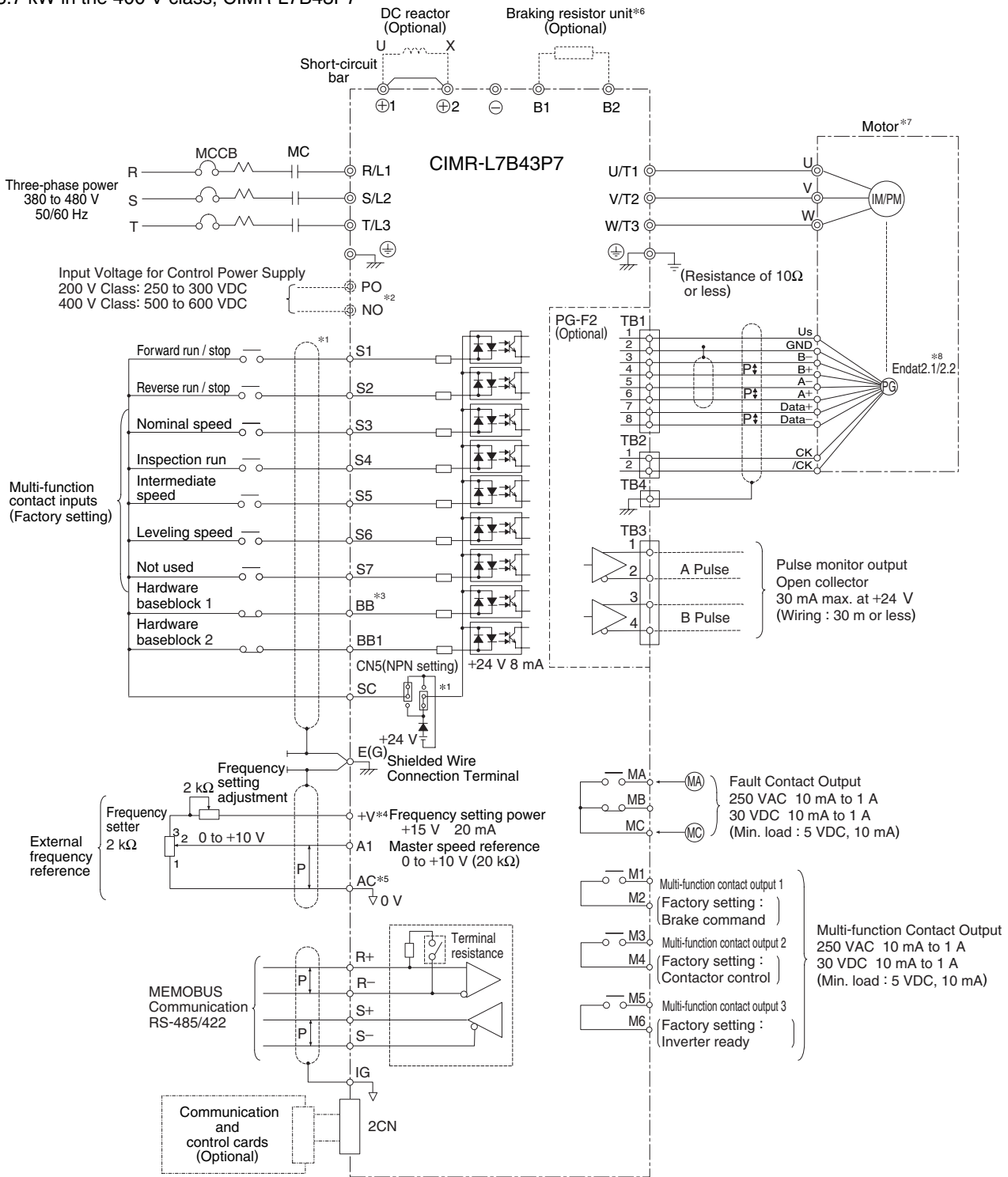
Terminal symbols : ◎ shows main circuit ; ○ shows control circuit.

＊1 : Connection when sequence input signals (S1 to S7, BB, and BB1) are no-voltage contacts or sequence connections (0 V common/sink mode) by NPN transistor (factory setting).
When preparing sequence connections by NPN transistor (+24 V common/source mode) or an external +24 V power supply, refer to the Instruction Manual.

＊2 : When the battery is used, the power supply to the control board must be input from the PO and NO terminals. As a factory setting, the PO and NO terminals are connected to the B1 (or⊕3) and ⊖terminals.

＊3 : Be sure that both the BB and BB1 terminals are closed when the inverter is enabled. If not, "BB" will be displayed on the digital operator, and the inverter will not operate.

＊4 : The output current capacity of the +V terminal is 20 mA. Never short-circuit between the +V and AC control circuit terminals. It may cause a malfunction or damage.

＊5 : Do not ground nor connect the AC terminal on the control circuit to the unit. Doing so may result in a malfunction or a breakdown of the inverter.

＊6 : When using a braking resistor or braking resistor unit, set L3-04 = 0 (deceleration stall prevention disabled). If not, motor may not stop at the set time.

＊7 : If an externally fan-cooled motor is used, provide wiring for a cooling-fan motor.

＊8 : Models ECN1313, ECN113, and ECN413 support the EnDat 2.1 or EnDat 2.2 interface.
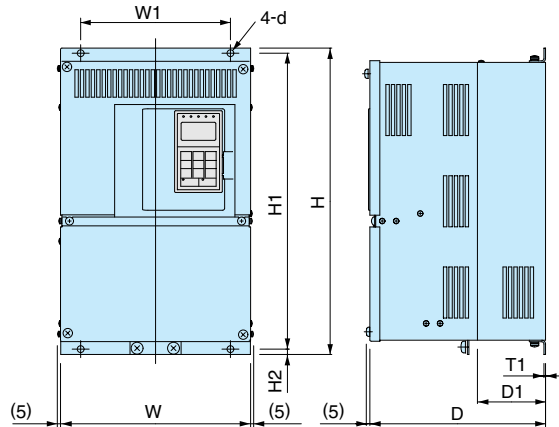
Dimensions Units : mm

■ Inverter (Open-chasis Model)
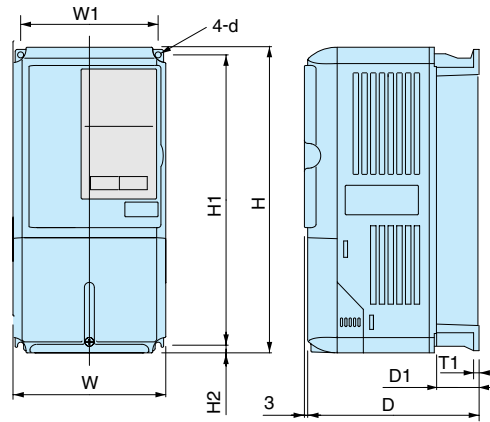
Drawing 1
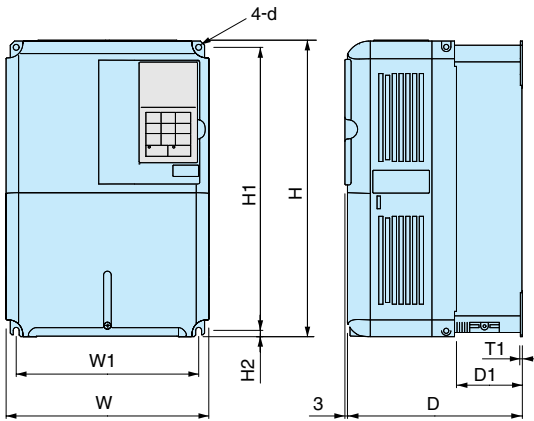
Drawing 2

Drawing 3

Voltage	Max. Applicable Motor Output kW	Inverter CIMR-L7B⬚	DWG	Dimensions mm									Approx. Mass kg	Heat Generation w			Cooling Method
				W	H	D	W1	H1	H2	D1	T1	d		Fin	Inside Unit	Total Heat Loss	
200 V Class (3-phase)	3.7	23P7	1	140	280	177	126	266	7	59	5	M5	4	112	74	186	Fan cooled
	5.5	25P5												164	84	248	
	7.5	27P5	2	200	300	197	186	285	8	65.5	2.3	M6	6	219	113	332	
	11	2011											7	374	170	544	
	15	2015		240	350	207	216	335	7.5	78			11	429	183	612	
	18.5	2018												501	211	712	
	22	2022	3	250	400	258	195	385		100			21	586	274	860	
	30	2030		275	450		220	435		100			24	865	352	1217	
	37	2037		375	600	298	250	575	12.5	100	3.2	M10	57	1015	411	1426	
	45	2045				328				130			63	1266	505	1771	
	55	2055		450	725	348	325	700					86	1588	619	2207	
400 V Class (3-phase)	3.7	43P7	1	140	280	177	126	266	7	59	5	M5	4	80	68	148	Fan cooled
	4.0	44P0												91	70	161	
	5.5	45P5												127	82	209	
	7.5	47P5	2	200	300	197	186	285	8	65.5	2.3	M6	6	193	114	307	
	11	4011												252	158	410	
	15	4015		240	350	207	216	335	7.5	78			10	326	172	498	
	18.5	4018												426	208	634	
	22	4022	3	275	450	258	220	435		100			21	466	259	725	
	30	4030												678	317	995	
	37	4037		325	550	283	260	535		105			36	784	360	1144	
	45	4045												901	415	1316	
	55	4055												1203	495	1698	

Note : Contact your Yaskawa representative for the dimensions of enclosed wall-mounted models.
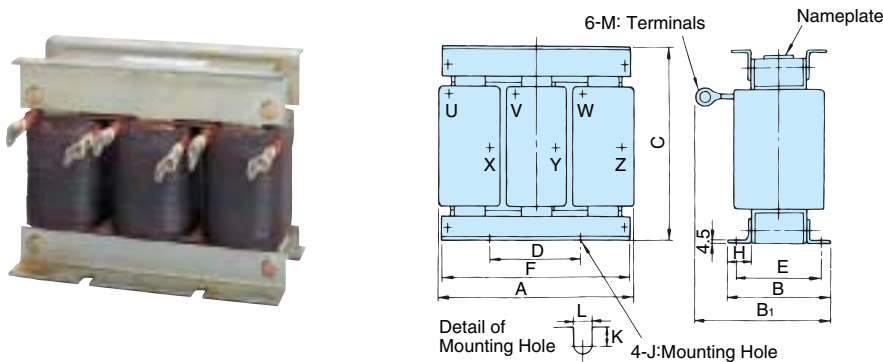
Peripheral Devices/Optional Cards

■ DC Reactor (Only for Inverters of 3.7 kW to 18.5 kW)
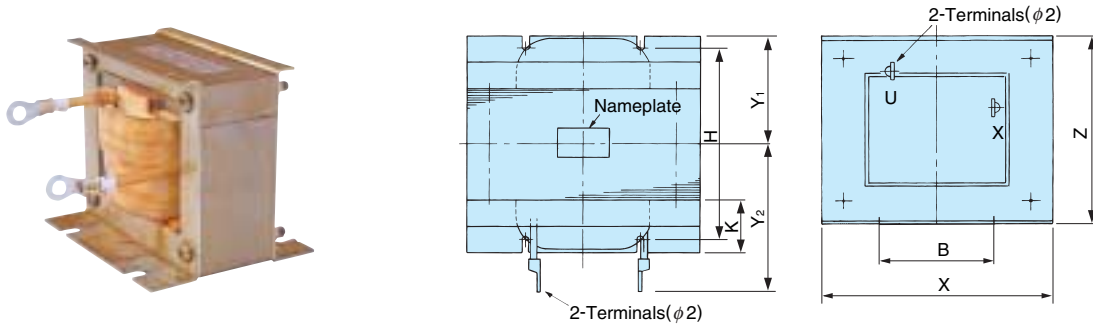
Voltage	Max. Applicable Motor Output kW	Inverter CIMR-L7B□□□	Current Value A	Inductance mH	Code No.	Dimensions mm									Approx. Mass kg	Loss W	Wire Size mm²
						X	Y₂	Y₁	Z	B	H	K	φ1	φ2			
200 V Class (3-phase)	3.7	23P7	18	3	X010049	86	80	36	76	60	55	18	M4	M5	2.0	18	5.5
	5.5	25P5	36	1	X010050	105	90	46	93	64	80	26	M6	M6	3.2	22	8
	7.5	27P5															
	11	2011	72	0.5	X010051	105	105	56	93	64	100	26	M6	M8	4.9	29	30
	15	2015															
	18.5	2018	90	0.4	X010176	133	120	52.5	117	86	80	25	M6	M8	6.5	45	30
400 V Class (3-phase)	3.7	43P7	12	6.3	X010054	86	80	36	76	60	55	18	M4	M5	2.0	16	2
	4.0	44P0															
	5.5	45P5	23	3.6	X010055	105	90	46	93	64	80	26	M6	M5	3.2	27	5.5
	7.5	47P5															
	11	4011	33	1.9	X010056	105	95	51	93	64	90	26	M6	M6	4.0	26	8
	15	4015															
	18.5	4018	47	1.3	X010177	115	125	57.5	100	72	90	25	M6	M6	6.0	42	14

■ AC Reactor (Only for Inverters of 22 kW to 55 kW)

Units : mm

Voltage	Max. Applicable Motor Output kW	Inverter CIMR-L7B□□□	Current Value A	Inductance mH	Code No.	Dimensions mm												Approx. Mass kg	Loss W
						A	B	B₁	C	D	E	F	H	J	K	L	M		
200 V Class (3-phase)	22	2022	120	0.09	X002555	180	100	155	150	75	80	180	25	M6	10	7	M10	8	90
	30	2030	160	0.07	X002556	210	100	170	175	75	80	205	25	M6	10	7	M10	12	100
	37	2037	200	0.05	X002557	210	115	182.8	175	75	95	205	25	M6	10	7	M10	15	110
	45	2045	240	0.044	X002558	240	126	218	215±5	150	110	240	25	M6	8	7	M10	23	125
	55	2055	280	0.038	X002559	240	126	218	215±5	150	110	240	25	M8	8	10	M12	23	130
400 V Class (3-phase)	22	4022	60	0.36	X002506	180	100	150	150	75	80	180	25	M6	10	7	M6	8.5	90
	30	4030	80	0.26	X002508	210	100	150	175	75	80	205	25	M6	10	7	M8	12	95
	37	4037	90	0.24	X002509	210	115	177.5	175	75	95	205	25	M6	10	7	M8	15	110
	45	4045	120	0.18	X002566	240	126	193	205±5	150	110	240	25	M8	8	10	M10	23	130
	55	4055	150	0.15	X002567	240	126	198	205±5	150	110	240	25	M8	8	10	M10	23	150

■ Braking Unit (Optional)

CDBR-2015B, -2022B
CDBR-4030B, -4045B

4-M4 Mounting Holes

72   66.5

138   150

30 or more   128   140   30 or more

38   38

3-lead Wire Inlet
(20 Dia. Rubber Bush)

114.5

138.5
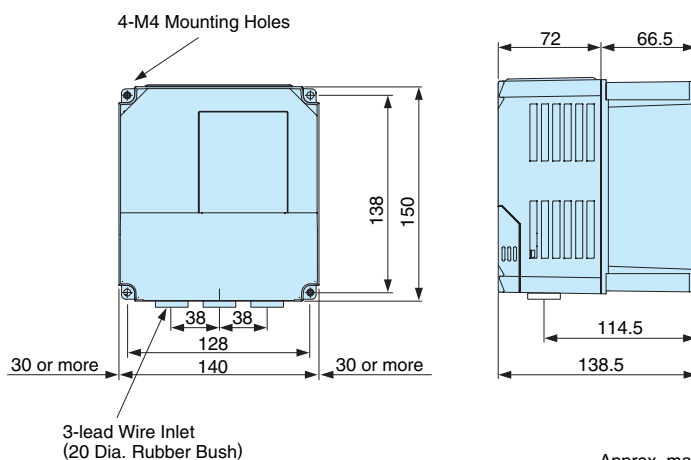
Approx. mass : 1.8 kg

Units : mm

■ PG Speed Control Card

Name	Code No.	Function	Manual No.
PG-F2	73600-A028X	Used for closed-loop vector control (PM). · Applicable encoder : ECN1313(EnDat2.1) : ECN113(EnDat2.1) : ECN413(EnDat2.1) : SRS50/60(HIPERFACE) · Maximum motor speed: 1,200 min^{-1} (sin/cos cycles per revolution: 1024) ·Pulse monitor output: Open collector (+24 V, 30 mA max.) · Cable length : 50 m max. (HIPERFACE/EnDat) : 30 m max. (Pulse monitor)	TOEP C730600 13
PG-B2	73600-A013X	Used for closed-loop vector control. · Compatible with complementary outputs · A/B-phase (two phases) pulse inputs · Max. input frequency: 32767 Hz ·Pulse monitor output: Open collector (+24 V, 30 mA max.) ·Power supply for pulse generator : +12 V, Max. current: 200 mA	TOBP C730600 09
PG-X2	73600-A015X	Used for closed-loop vector control. · Compatible with RS-422 outputs · A/B/Z-phase (differential pulse) pulse inputs · Max. input frequency: 300 kHz · Pulse monitor output: RS-422 · Power supply for pulse generator: +5 V or +12 V, Max. current: 200 mA	TOBP C730600 10

Varispeed L7

YASKAWA ELECTRIC CORPORATION

YASKAWA

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice
for ongoing product modifications and improvements.