

World's first

3-Level Control

technology for the LV Class...

VARISPEED G7

from YASKAWA

Truly Beyond Class!



Simply ahead!

LARSEN & TOUBRO LIMITED

The new Yaskawa Varispeed G7 Inverter

- Unique new 3-level PWM flux vector control method
- Exceptional low speed/high torque control
- Low electrical and acoustic noise
- Low surge voltage
- Constant or variable torque applications
- 0.4 kW to 300 kW power range
- Quick and easy installation
- Autotuning - static or dynamic
- Fieldbus compatible
- Energy saving

Technical Specifications

Superb new performance features

- Yaskawa's unique new 3-level control method sets a new global standard for AC variable speed control
- Extended open-loop speed control range, increased from 100:1 to 200:1
- Smooth stable performance at ultra low speeds
- Full control at zero speed
- Accurate torque control in open loop

Fantastic control and protection features

- Low acoustic noise
- Low electrical noise (reduced RFI)
- Reduces electrolytic corrosion in motor bearings caused by motor shaft voltages
- Eliminates micro surge problems due to reflected voltage waves
- Leakage current greatly reduced
- Can be used on existing standard motors, without the use of output chokes for cable runs of upto 300m

Low cost of ownership

- Easy to install and simple to use - 7 language LCD display fitted as standard
- High efficiency
- Low maintenance

Global certification

- Global availability and interchangeability
- Global certification - CE, UL, cUL



Main Features of Varispeed G7 Inverter

Feature 1:

3-level Control Technology

◆ 400V frequency inverter solution

The first 400V frequency inverter with 3-level control technology are now available to approach sinusoidal output voltage. This technology helps to solve problems such as stressing of the insulation of motor windings by overvoltages (caused by travelling waves), and electrolytic corrosion of the bearings (caused by leakage currents via the motor shaft). It also considerably reduces motor acoustical noise and leakage currents (particularly with long motor cables).

◆ Advantages of 3 level control technology

1 Low voltage peaks

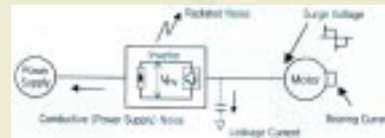
Lower voltage peaks increase the life of the motor by reducing the stress on the insulation of the motor windings. They also make operation with long cables readily possible.

2 Low level of radio interference

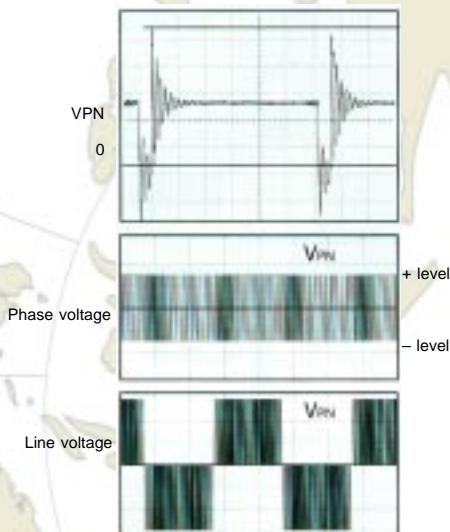
Considerably reduced conducted emission caused by the inverter reduces the cost of line filters.

3 Quiet motor operation

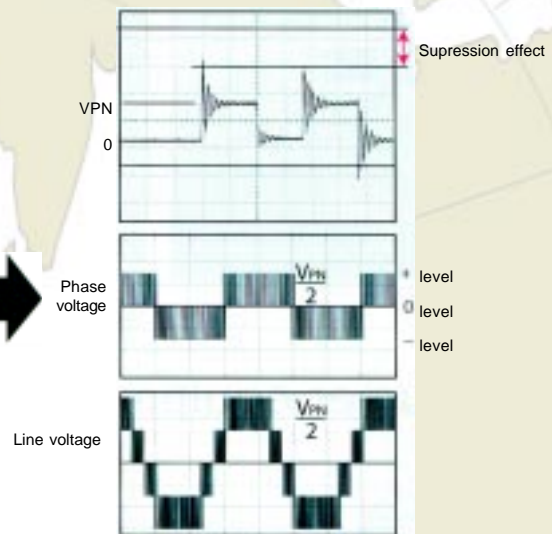
The 3-level technology drastically reduces the noise due to magnetic transients in the motor.



2-level control (Conventional technology)



3-level control (new technology)

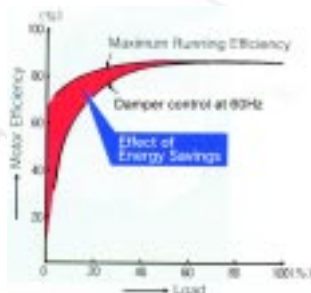


Feature 2:

Ecologically friendly

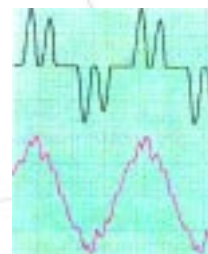
◆ Effective energy saving function

The energy-saving control approaches the maximum efficiency. High efficient, energy-saving operations are achieved for any applications either in vector or V/f control.



◆ Suppression of harmonic distortion

All inverters larger than 15kW are equipped with a DC bus reactor and second rectifier bridge as standard. In combination with a transformer with two secondary windings (star and delta), the harmonics can be suppressed using the 12 pulse method.



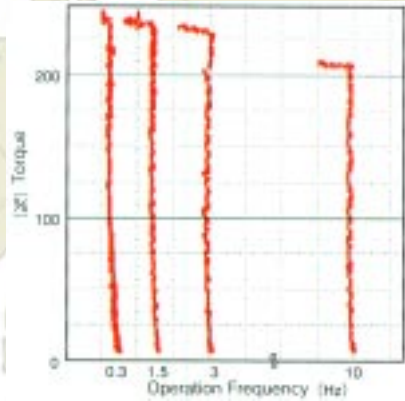
Mains current without suppression of harmonic distortion

Mains current with 12 pulse method

Feature 3: Highly Dynamic and Precise Control

◆ Excellent torque characteristic

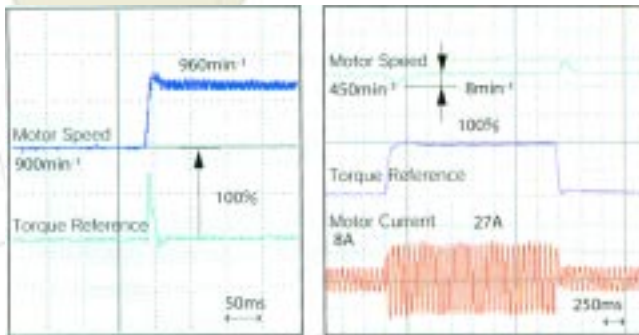
The new dual flux observation method improves the torque characteristic (150% at 0.3Hz for open loop vector control 2). 150% torque is available at 0rpm with pulse generator feedback.



High torque with a speed control range of 1:200
(after rotating autotuning in open loop vector mode)
[speed control range with pulse generator feedback 1:1000]

◆ Extremely fast response

The model tracking control assures fast response even without PG (doubled in in-house comparison). With a PG you can make use of our unique high speed current vector, rapidly responses speed reference changes (speed response 40 Hz/motor unit). Speed keeps constant even if load fluctuates.



Fast response to changes in speed (reference speed step response)

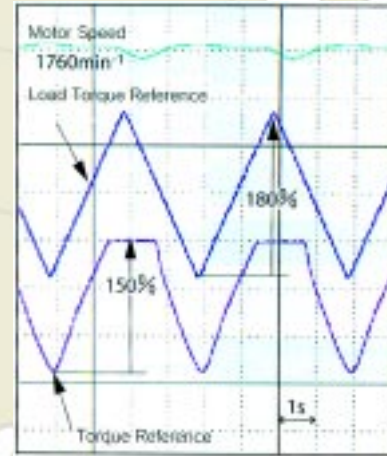
Handles sudden changes in load (speed characteristic with change in load)

◆ Simple method of autotuning

Another method of autotuning, with the motor shaft stationary, is now available as an alternative to the established rotating technique. This allows the performance of any make of motor to be optimised.

◆ Accurate torque control

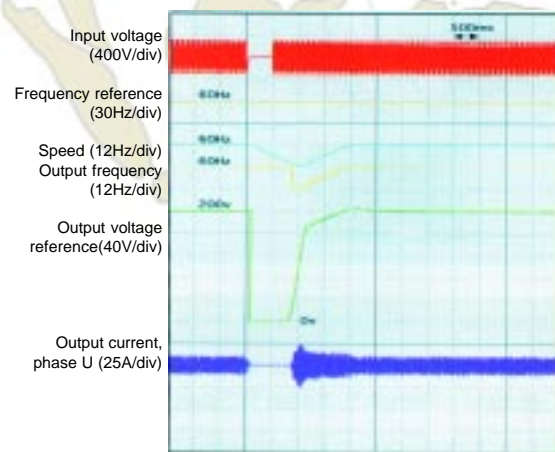
The precision of the limiting function allows accurate control of the output torque in order to protect machines and materials against sudden changes in load.



Torque control (torque limiting set to 150%)

◆ Very fast speed search function

This function reduces the recovery time after momentary power loss. Recovery is possible regardless of the direction of rotation.



Fast, smooth start (power loss ridedthrough)

◆ Reliable protective function

Very fast and accurate current regulation functions support continuous operation by preventing overcurrent tripping. Power loss ridedthrough, motor stall prevention and automatic restart after fault also support the uninterruptible operation. A motor thermistor can be evaluated using an analog input and protects the motor against overheating.

Feature 4: User friendly



◆ Easy to operate

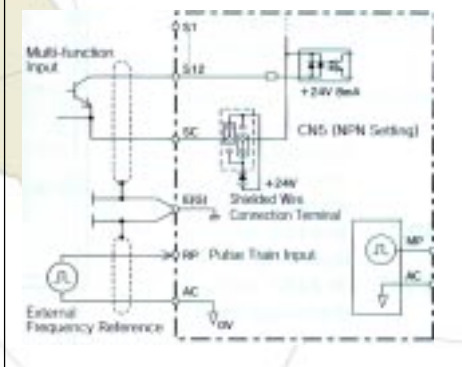
The 5 line, illuminated LCD display allows easy operation. The copy function provided by the removable operator makes it easy to copy a set of parameters from one inverter to another. The Quick Programming Mode makes start up easier. Parameters differing from the factory defaults can be read and altered by choosing Modified Constants from the menu.

◆ Easy maintenance and inspection

The removable control terminal block allows the inverter to be replaced without disconnecting the control lines. The cooling fans can be changed without dismantling the inverter. The operating time of the inverter and individual fans can be recorded and displayed. A support tool using a PC is also available. All constants of inverter can be managed by a PC.



Varispeed G7



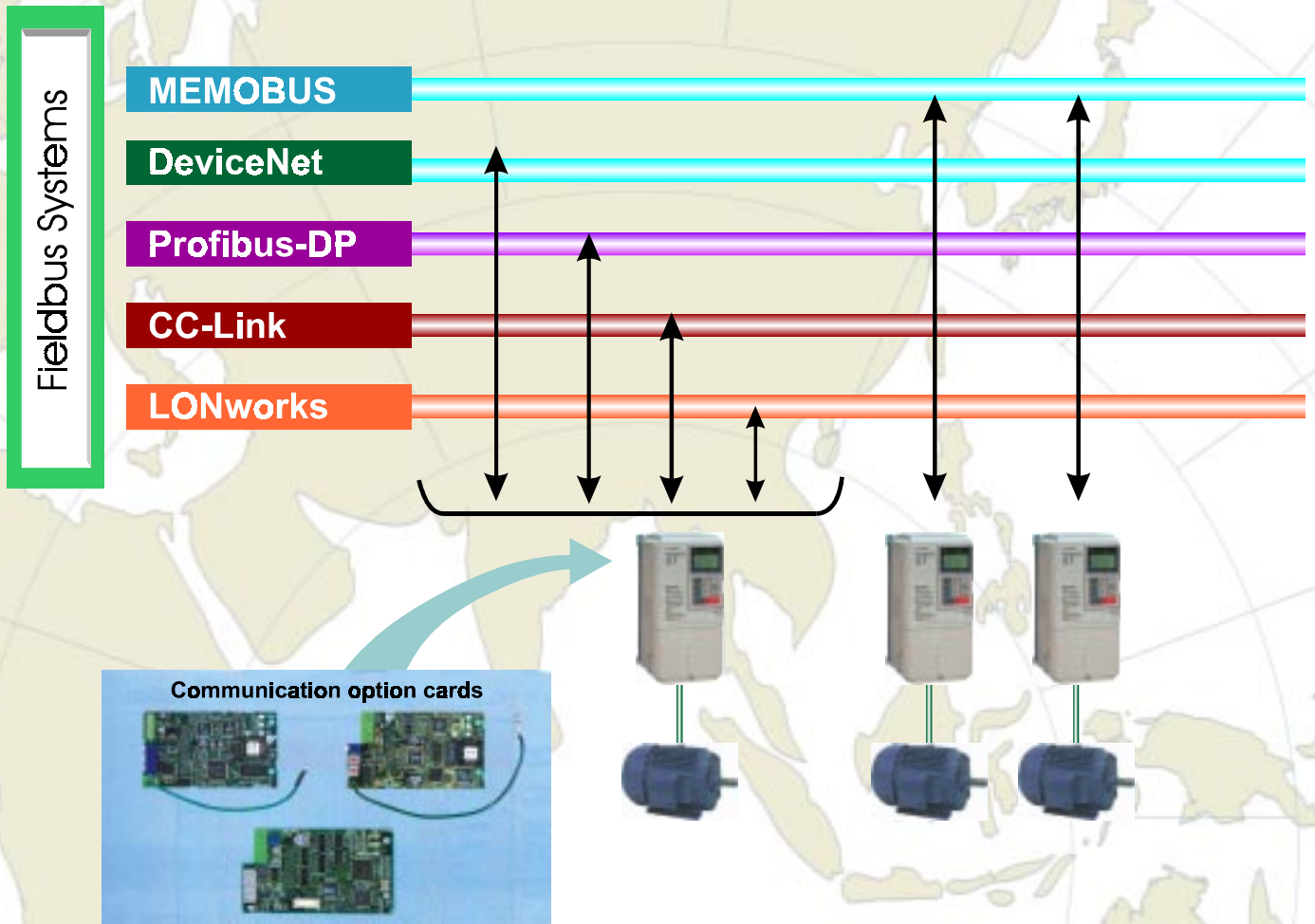
◆ Multi function I/O interfaces

The analog inputs and outputs are supplemented with a pulse train input and a pulse train output. 10 digital multifunction inputs and 5 digital multifunction outputs are available. Positive or negative (NPN/PNP) logic can be chosen for the digital inputs.

Feature 5: Global Specification

◆ Support for global fieldbus standards

All inverters support the Memobus/Modbus protocol via an RS422/485 interface as standard. Optional fieldbus cards can be fitted to allow the Varispeed G7 to communicate with host systems for central control of production with minimum wiring.



◆ Digital operator in seven languages

The illuminated 5 line LCD display allows operation in 7 languages: German, English, French, Italian, Japanese, Portuguese and Spanish.

◆ Conformity with global standards for worldwide use

Certified to UL/cUL and CE



Standard Specifications

Electrical Data 400V inverters

Model CIMR-G7A	40P4	40P7	41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022	4030	4037	4045	4055	4075	4090	4110	4132	4160	4185	4220	4300
Nominal Motor output in kW	0.55	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	300
Rated output in kVA	1.4	2.6	3.7	4.7	6.9	11	16	21	26	32	40	50	61	74	98	130	150	180	210	250	280	340	460
Rated output current in A**	1.8	3.4	4.8	6.2	9	15	21	27	34	42	52	65	80	97	128	165	195	240	270	325	370	450	605
Max output voltage	3 phase 380 / 400 / 415 / 440 / 460 / 480V AC (proportional to input voltage)																						
Max output frequency	400Hz																						
Rated input voltage & frequency	3 phase 380 / 400 / 415 / 440 / 460 / 480V AC +10%, -15%, 50/60Hz ±5%																						
DC bus reactor	optional											Provided											
12 pulse input	not available											available (transformer necessary)											

General Specification

Control	Control method	Sinusoidal PWM with 3-level control (flux vector control with pulse generator feedback; open loop vector control 1 and 2 V/f control, V/f control with pulse generator feedback)
	Speed Response	10Hz (open loop vector control 2), 40Hz (vector control with PG) *1
	Speed Control Range	1:200 (open loop vector control 2) 1:1000 (flux vector control)
	Speed Control Accuracy	±0.2% (open loop vector control), ±0.02% (flux vector control) at 25° C ± 10° C
	Frequency Control Range	0.01 to 400Hz *2
	Frequency Accuracy	Digital reference: ± 0.01%, -10°C to + 40°C; Analog reference: ± 0.1%, 25°C±10°C
	Frequency Setting Resolution	Digital reference: 0.01Hz; Analog reference: 0.03Hz/60Hz (11-bit + sign)
	Output Frequency Resolution	0.001 Hz
	Starting Torque	150% at 0.3Hz (open loop vector control 2) 150% at 0Hz (flux vector control with pulse generator feedback)
	Torque Response	20Hz (open loop vector control 2), 200Hz (vector control with PG) *1
	Torque Control	Possible with open loop vector control 2 and flux vector control
	Overload Capacity	150% for 60 sec, 180% for 14 sec, 200% for 0.5 sec of the inverter rated current
	Accel/Decel Time	0.01 to 6000.0 sec (Accel/Decel time setting independently, 4 steps available)
	Braking Torque	Approx. 20% (Approx. 125% when using braking resistor)*3 Built-in braking transistor provided for inverters of 15kW or less
	Important Functions	Power loss ride through, speed search, overtorque/undertorque detection, torque limits, 17 multi-step speed settings, 4 acceleration and deceleration times with ramp change, S-curve, autotuning (rotating and non-rotating), dwell function, cooling fan ON/OFF control, motor slip compensation, jump frequencies, High Slip Braking, energy saving function, PID controller (with sleep function), MEMOBUS communication (RS422/485), automatic restart after fault, copy function, droop control, torque control, changing between torque and speed control 2 switchable sets of motor parameters, etc
	Analog inputs	2 x -10 to 10V, 1 x 4-20mA, 1 x pulse train input (11 bit + sign)
	Analog outputs	2 x -10 to 10V, 1 x pulse train output
Digital inputs	12 inputs (10 freely Programmable)	
Digital outputs	2 relay contacts, 4 open collector outputs (5 freely Programmable)	
RS422/485	Inbuilt, MEMOBUS protocol	
Digital operator	5 line LCD display with copy function	
Protective functions	Motor protection	Electronic thermal overload relay (PTC evaluation possible)
	Overvoltage protection	Trips if the DC bus circuit voltage exceeds 820V
	Undervoltage protection	Trips if the DC bus circuit voltage falls below 380V
	Earth fault	Protecting by electronic current monitoring
	Overheating protection	Heat sink with thermistor monitoring
	Charging indicator	Comes on if DC bus voltage exceeds 50V
	Stall prevention	Stall prevention during acceleration and deceleration, and operation can be set separately
Braking transistor	Up to 15kW standard, 18.5 to 300kW optional	
Ambient temperature during operation	-10 to +45°C (upto +60°C by deration)	
Relative humidity	Maximum of 95% (non-condensing)	
Installation altitude	Below 1000m (higher on request)	
Vibration	10 bis 20 Hz, 9.8m/s ² max.; 20 to 50 Hz, 1.96 m/s ²	

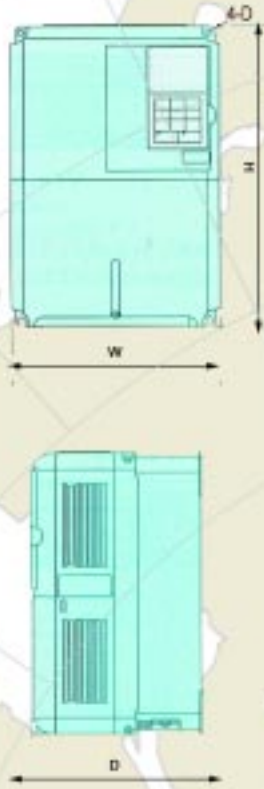
* 1 Specifications for open loop vector control and vector control with PG require dynamic auto-tuning.

* 2 The maximum frequency is 60Hz for open-loop vector control 2.

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

* 4 Current ratings declared at 45°C, Deration of 1.33% per degree above 45°C (Max upto 60°C)

DIMENSIONS
(The Figure shows 400V class, inverters)



Voltage Class	kW	Enclosed Wall-mounted (NEMA 1)					Open Chassis (IP00)												
		W	H	D	Approx. Mass	Mounting Holes d*	W	H	D	Approx. Mass									
(3-phase)	0.4	140	280	157	3	MS													
	0.75																		
	1.5																		
	2.2																		
	3.7																		
	5.5	200	300	197	6	M6													
	7.5																		
	11																		
	15	240	350	207	10	M6					275	450	258	21					
	18.5																		
	22																		
	30										325	550	283	36					
	37										M10	450	725	350	88				
	45														89				
	55														M12	500	850	360	102
	75																		120
	90																		160
	110										M12	575	925	380	263				
	132														280				
160	920						1475	380	415										
185																			
220																			
300																			

• Dimensions in mm • Mass in kg

Sales Offices

Mumbai

Tel.: 022-2858 1191, 2858 1401
Fax: 022-2858 1710, 2858 1112

New Delhi

Tel.: 011-593 1302/8, 541 8624
Fax: 011-546 1939, 543 8624

Chennai

Tel.: 044-846 0141, 846 0069
Fax: 044-846 1788

Bangalore

Tel.: 080-558 3513, 558 3528
Fax: 080-559 6397

Baroda

Tel.: 0265-2334800, 0265-2334799
Fax: 0265-336184

Kolkata

Tel.: 033-282 2301
Fax: 033-282 7587, 1025

Hyderabad

Tel.: 040-323 7400, 323 5078
Fax: 040-324 2356



Control & Automation - Business Unit

LARSEN & TOUBRO LIMITED

Automation Systems Centre, TTC Electronic Zone,
Shil Mahape Road, Navi Mumbai - 400 701

Tel: 91-22-5590 1401/2768 3511

Fax: 91-22-2761 1590

e-mail: cna-marcomm@asc.ltindia.com

www.automation4me.com