GENERAL-PURPOSE INVERTER WITH ADVANCED VECTOR CONTROL

Varispeed G7

200V CLASS 0.4 TO 110kW (1.2 TO 160kVA)
400V CLASS 0.4 TO 300kW (1.4 TO 460kVA)

YASKAWA

Certified for
ISO9001 and
ISO14001

JQA-0422 JQA-EM0498

LITERATURE NO. KAE-S616-60D

It's Common Sense

Introducing the New Global Standard: 3-Level Control

YASKAWA Electric is proud to announce the Varispeed G7,
the first general-purpose inverter in the world to feature
the 3-level control method.
This new control technique solves the problem of microsurges,
and makes it possible to use the Varispeed G7 on existing motors.
The high performance and functionality provided by current vector control means powerful
and high-precision operation for a diverse range of equipment and machinery.
The Varispeed G7 not only lowers your initial cost, but will dramatically slash your running
costs through energy-saving control performance.

World's First

3-Level Control Method

Varispeed G7

YASKAWA INVERTERS
Varispeed
Global Reliability

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FEATURES

An inverter designed for all the usage environments of the world

The Varispeed G7 has significantly reduced possible side effects on motors and power supplies. All of the complexities of switching to an inverter have been resolved, making it possible to quickly and easily upgrade your equipment.
It's compliant with major international standards and networks, so it can be used anywhere.

- The solution to 400V class inverter drive problems
- Global specifications
- Gentle on the environment

Varispeed G7

High-performance inverters designed for ease of use

The Varispeed G7 offers high performance and powerful functions. The quick customize function and the extensive software library handle custom specifications quickly, and the entire system is designed to be user-friendly from setup through maintenance.

- High-level control performance
- User-friendly
- Easy to make exclusive inverter

APPLICATIONS

Industrial machinery

Paper manufacturing machines

High-speed, high-precision newspaper rotary presses

High-precision speed and torque control on winding machines

Transportation

Quick response and high-precision positioning in stacker cranes

Fans and pumps

High-efficiency pump flow control

For intelligent buildings (air conditioners, elevator doors, etc.)

Metal machining Tools

For machining center spindles

Consumer equipment

Public facilities

Accurate water flow control for whirlpool baths

Safe, smooth monorail transport

Medical equipment

X-ray equipment requiring quiet, smooth motion

Living environment

Commercial washing machine

Food processing machines

Improving quality with high torque in filling machines

The solution to 400V class inverter drive problems

The first 400V class general-purpose inverter in the world to use the 3-level control method, to approach sine wave output voltage. It provides the solution to problems like motor insulation damage to surge voltage, and electrolytic corrosion of motor bearings due to shaft voltage. Existing general-purpose motors can be used even without surge suppression filters. The noise and leakage current are greatly reduced (halved in in-house comparison).

Features of the 3-level control method

1 Low surge voltage

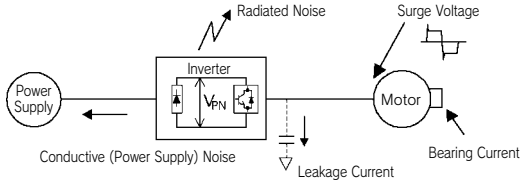
Suppresses surge voltage to the motor, eliminating the need for surge voltage protection for the motor.

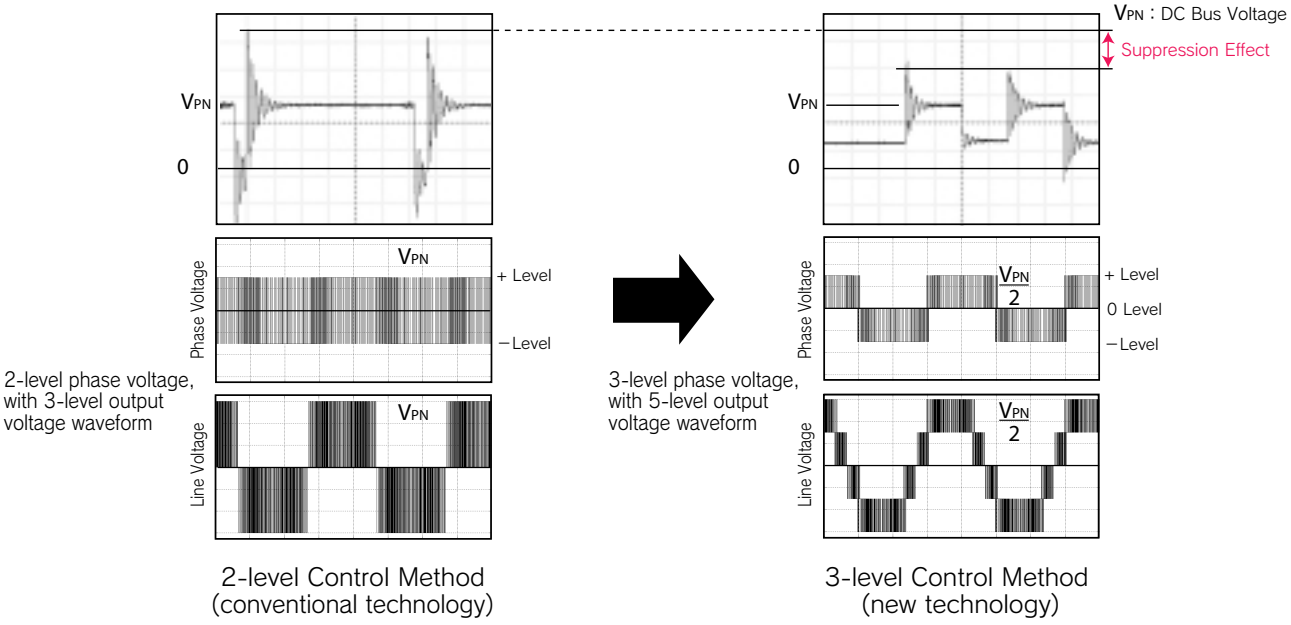
2 Low electrical noise

Significantly reduces conduction (power supply) noise and radiated noise caused by inverter drives, minimizing effects on peripheral devices.

3 Low acoustic noise

Provides low acoustic noise, difficult to achieve with conventional designs.





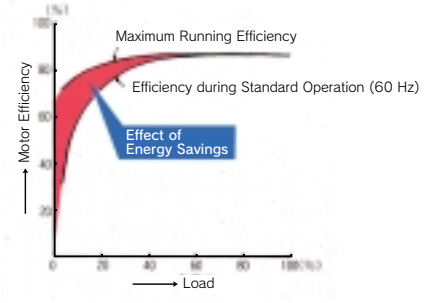
2-level Control Method (conventional technology)

3-level Control Method (new technology)

Gentle on the environment

Extensive energy-saving control

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



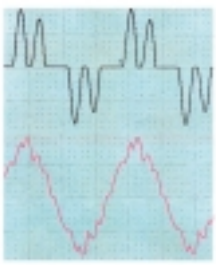
Countermeasures to minimize harmonics current

All models of 18.5 kW or more come equipped with DC reactors to improve the power factor, and support 12-pulse input (Note).

6-pulse input without AC reactor (conventional model)
Current distortion factor: 88%

12-pulse input with optical transformer with a dual star-delta secondary
Current distortion factor: 12%

Note: For 12-pulse input, a transformer with a star-delta secondary is required for the input power supply.

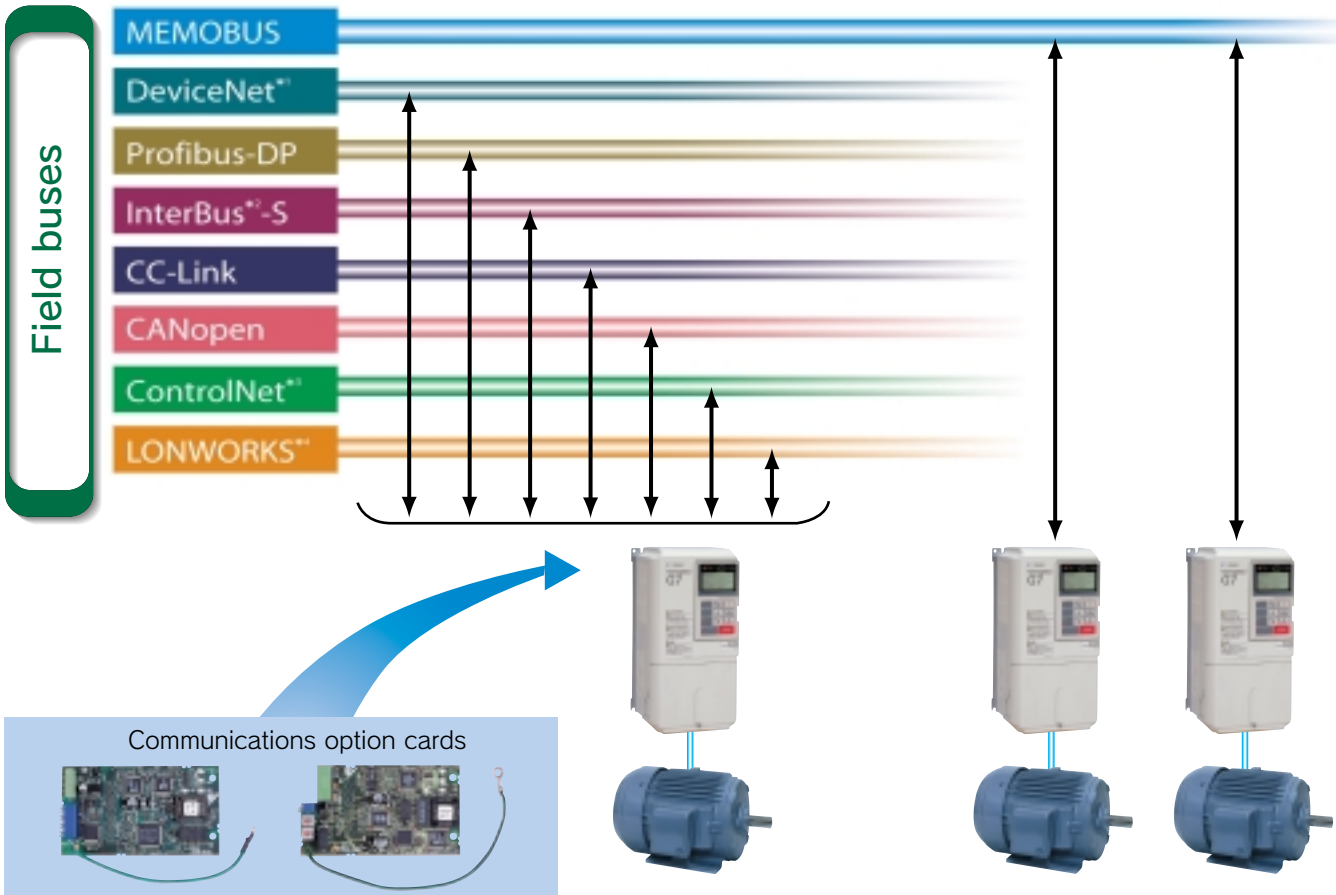


Input Current Waveforms

Global Specifications

Supporting 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 (Note). Now you can connect to hosts and PLC, implement centralized management of production equipment and reduce wiring easily.



Note: InterBus-S, CANopen, and ControlNet communication cards are under development.

*1 Devicenet is a registered trademark of Open DeviceNet Vendors Association.

*2 InterBus is a registered trademark of Phoenix Contact Inc.

*3 ControlNet is a registered trademark of ControlNet International, Ltd.

*4 LONWORKS is a registered trademark of Echelon Corp.

Digital operator with support for seven languages

The LCD panel digital operator that is included as standard equipment supports seven languages: Japanese (katakana), English, German, French, Italian, Spanish and Portuguese.

Global standards

Certified by UL/cUL and CE marking

c UL us LISTED

CE

Various power supplies

Meets a variety of world power supply

Three-phase 200V series (200 to 240V)

Three-phase 400V series (380 to 480V)

DC power supplies such as common converters are also available.

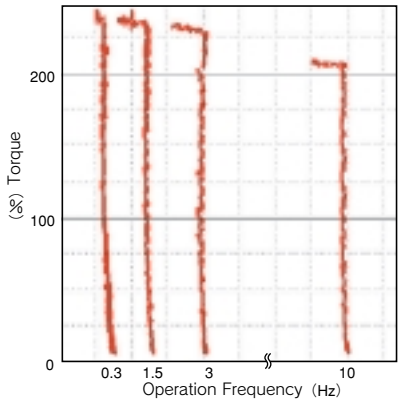
Global service

Our service networks cover U.S.A., Europe, China, South East Asia and other parts of the world, and provide support for your business abroad.

High-level control performance

Outstanding torque characteristics

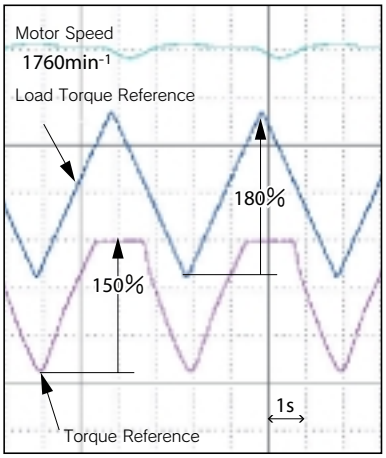
・The new observer (patent pending) improves torque characteristics (150%/0.3 Hz for open loop vector control 2) to provide high power for every machine. With PG, more than 150% high-torque operation is possible even at zero speed.



High torque from 1/200 speed
(Dynamic auto-tuning, open loop vector control)
[speed control range 1:200 with PG 1:1000]

Accurate torque control

・The precision torque limit function allows accurate control of the output torque, protecting your machines from sudden load fluctuations.

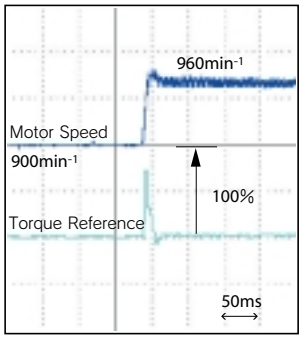


Torque Control (Torque limit set at 150%)

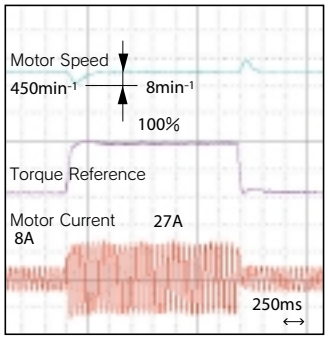
Proven responsiveness

・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 control, rapidly responses speed reference changes (speed response 40 Hz/motor unit). Speed keeps constant even if load fluctuates.



Quick response to reference changes
(Speed reference step response)

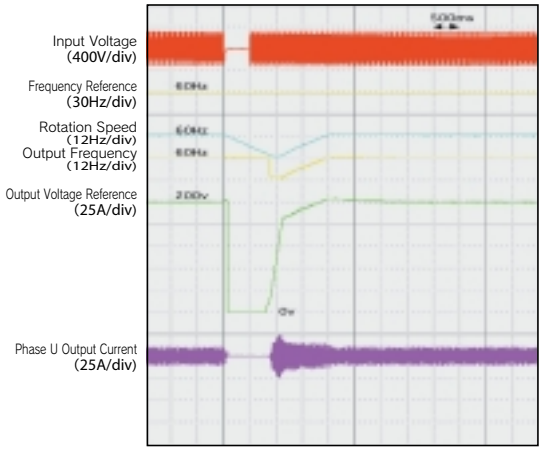


Handles sudden load fluctuations
(Speed recovery characteristics upon load surges)

High-speed search (patent pending)

・The high-speed search function reduces the recovery time after momentary power loss (halved in in-house comparison).

・Recovery is possible regardless of direction of rotation.



Quick, shockless start
(Continued operation after momentary power loss)

Simple auto-tuning

・In addition to conventional dynamic auto-tuning, a new static auto-tuning is available to draw out peak performance from the motors of the world.

Safety and protection functions

・High-speed, high-precision current control functions support continuous operation by suppressing overcurrent trips, restart after momentary power loss, stall prevention and fault retry.

・The PTC thermistor in the motor helps protect it against overheating.

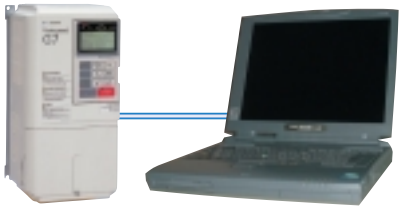
User-friendly

Simple operation

- The 5-line LCD display operator makes it simple to check necessary information. And the copy function simplifies constant upload and download.
- Easy to setup with the quick program mode.
- Changed constants can be checked at once by the verify mode.
- With the optional extension cable, remote operation is available.
- An LED display operator is available for option.

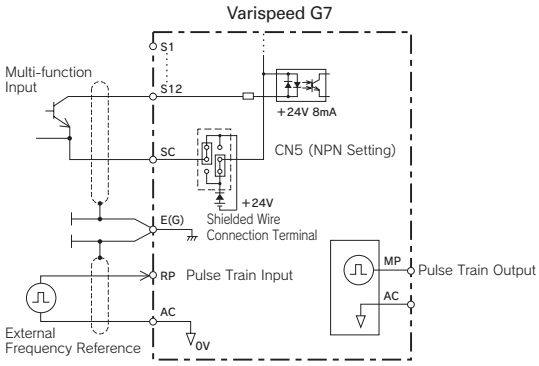
Easy maintenance and inspection

- Detachable terminals make it easy to exchange units fully wired.
- The one-touch detachable cooling fan life is extended with the on/off control function.
- The accumulated operation time and the cooling fan operation time can be recorded and displayed.
- A support tool using a PC is also available. All constants of each inverter can be managed by a PC.



Various I/O interfaces

- In addition to analog command input and analog monitor output, it also supports pulse train command input and pulse train monitor output.
- Offers 10 multi-function inputs and 5 multi-function outputs.
- Input terminal logic can be switched to NPN/PNP type. A +24V external power supply is also available for selecting the signal input.



Easy to make exclusive inverter

- The quick customize function lets you rapidly develop the special functions (custom software) needed for your specific machines, and make your exclusive inverters.
- The rich software library, based on our extensive drive expertise*, helps you upgrade your equipment.

*Crane control, elevator control, energy-saving control (max. motor operation efficiency), PID control, etc.

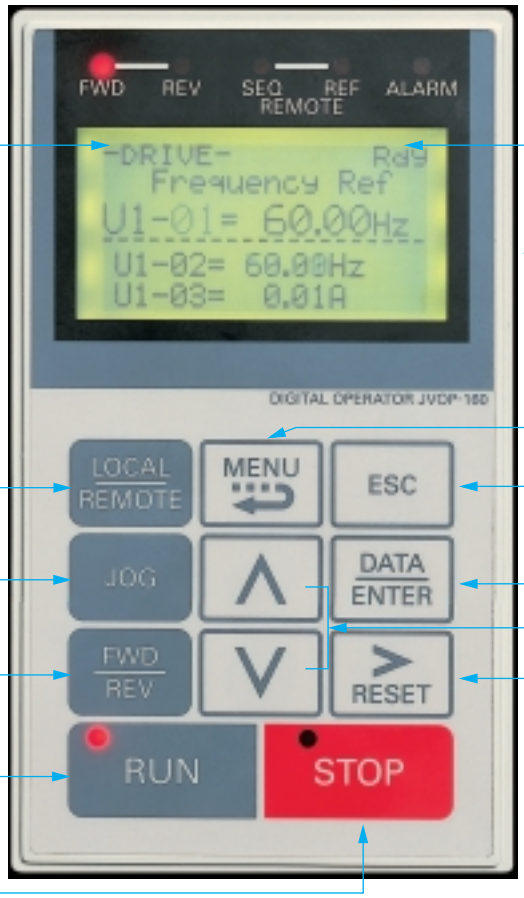
Digital Operator Functions

Rotating Direction Display
FWD : LED lights at forward run.
REV : LED lights at reverse run.

Remote Mode
Lights when selecting input mode from the control circuit terminal.
SEQ : LED lights when selecting run command from control circuit terminal.
REF : LED lights when selecting frequency reference from control circuit terminals A1, A2 and A3.

Alarm Display

Mode Display
DRIVE : LED lights at Drive Mode.
QUICK : LED lights at Quick Programming Mode.
ADV : LED lights at Advanced Programming Mode.
VERIFY : LED lights at Verify Mode.
A. TUNE: LED lights at Auto-tuning Mode.



Rdy Display
Can operate when a drive command is input.

Data Display
Displays data for monitoring, user constants, and set values.
(1 line×13 characters and 3 lines×16 characters)

Operation Mode Selection Key
The operation mode is alternated with REMOTE (control circuit terminal) and LOCAL (digital operator) (When operational command and frequency reference are set at control circuit terminal.)

Menu Key
Changes the display of operation and programming mode.

Escape Key
Returns to the status entered before [DATA/ENTER] key was pressed.

Run Command Keys
Run command keys for use by digital operator. Enabled only in the drive mode.

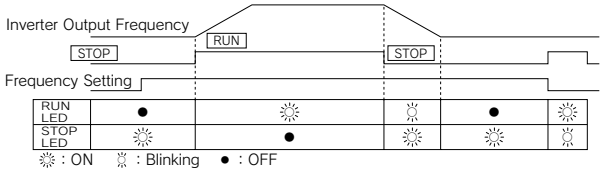
JOG : Jog run is enabled while depressing this key.
FWD/REV: Selects forward or reverse run. Forward and reverse run is alternated.
RUN* : Red LED lights by depressing RUN.
STOP* : Red LED lights by depressing STOP.

DATA/ENTER Key
Selects mode, group, function or constant name. Displays each constant set value while displaying a constant name. By pressing this key again, the set value is written in.

∧: Increment key
∨: Decrement key
Selects mode, group, function, constant name or set value.

Shift/Reset Key
Selects a digit of a set value to be changed. The selected digit blinks.
(Resets operation at faults.)

* RUN or STOP LED turns ON or OFF, or blinks in accordance with each operation.



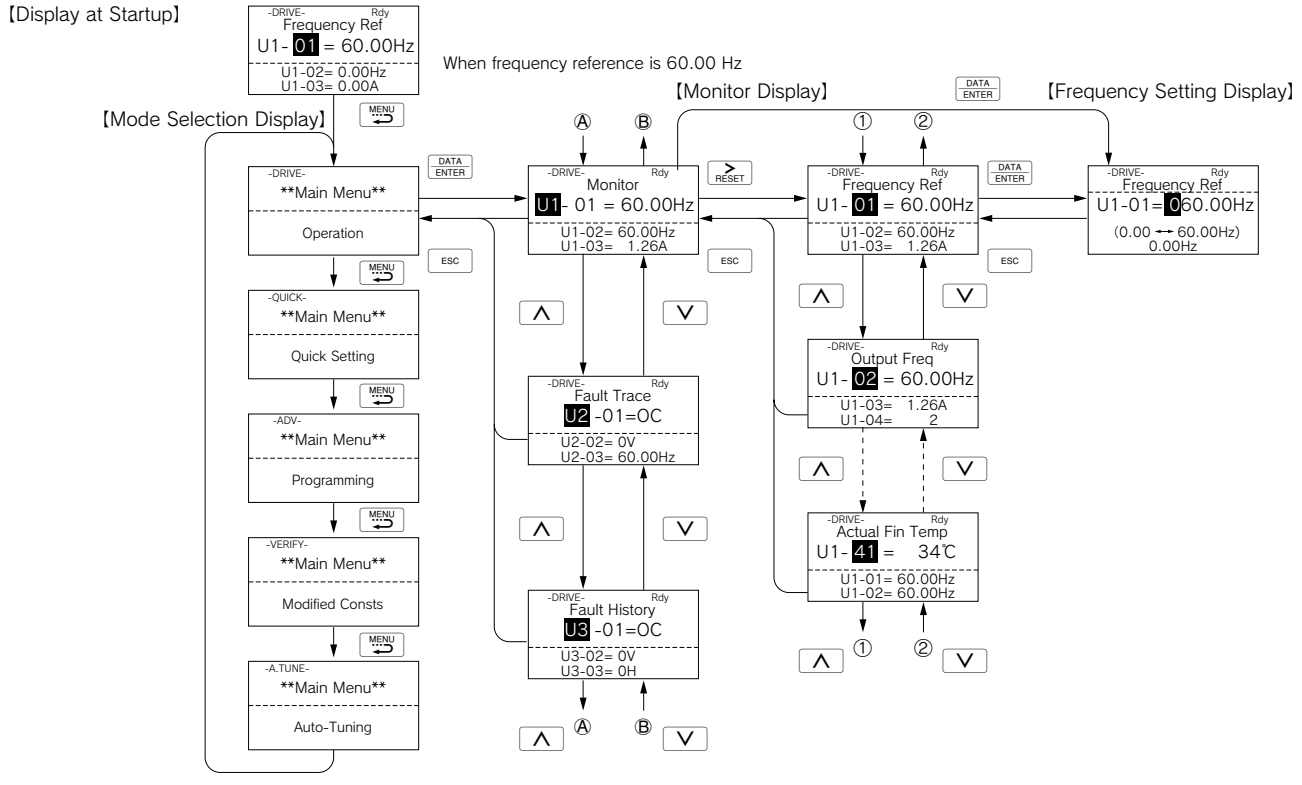
Easy Operation with Digital Operator

Description	Key Operation	Operator Display
①Power ON ・Displays frequency reference value.		-DRIVE- Rdy Frequency Ref U1-01 = 0.00Hz U1-02= 0.00Hz U1-03= 0.00A
②Operation Condition Setting	LOCAL REMOTE	REMOTE(SEQ.REF)LED ON (d1-01=0.00 Hz)
・Select LOCAL mode.		REMOTE(SEQ.REF)LED OFF FWD LED ON
③Forward Jog Run (6 Hz) JOG run procedure (RUNs while depressing JOG key.)	JOG	-DRIVE- Rdy Frequency Ref U1-01 = 6.00Hz U1-02= 6.00Hz U1-03= 1.45A
④Frequency Setting ・Change reference value.	DATA ENTER	-DRIVE- Rdy Frequency Ref U1-01= 000.00Hz (0.00 ↔ 60.00Hz) 0.00Hz
	RESET ∨ ∧	-DRIVE- Rdy Frequency Ref U1-01= 015.00Hz (0.00 ↔ 60.00Hz) 0.00Hz
・Write-in set value.	DATA ENTER	-DRIVE- Rdy Enter Accepted
(cont'd)		-DRIVE- Rdy Frequency Ref U1-01= 015.00Hz (0.00 ↔ 60.00Hz) 0.00Hz

Description	Key Operation	Operator Display
・Select output frequency monitor display.	ESC	-DRIVE- Rdy Frequency Ref U1-01 = 15.00Hz U1-02= 0.00Hz U1-03= 0.00A
	∧	-DRIVE- Rdy Output Freq U1-02 = 0.00Hz U1-03= 0.00A U1-04= 2
⑤Forward Run ・Forward Run (15 Hz)	RUN	-DRIVE- Rdy Output Freq U1-02 = 15.00Hz U1-03= 1.45A U1-04= 2
		RUN LED ON
⑥Reverse Run ・Switch to reverse run.	FWD REV	-DRIVE- Rdy Output Freq U1-02 = 15.00Hz U1-03= 1.05A U1-04= 2
		REV LED ON
⑦Stop ・Decelerates to a stop.	STOP	-DRIVE- Rdy Output Freq U1-02 = 0.00Hz U1-03= 0.00A U1-04= 2
		STOP LED ON (RUN LED blinks during deceleration.)

Note: ■ expresses blinking of numbers

Monitor Display Procedure



Note: ■ expresses blinking of numbers

Specifications

200 V Class*1

Model CIMR-G7A		20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011	2015	2018	2022	2030	2037	2045	2055	2075	2090	2110
Max. Applicable Motor Output*2	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Output Characteristics	Inverter Capacity kVA	1.2	2.3	3.0	4.6	6.9	10	13	19	25	30	37	50	61	70	85	110	140	160
	Rated Current A	3.2	6	8	12	18	27	34	49	66	80	96	130	160	183	224	300	358	415
	Max. Voltage	3-phase, 200/208/220/230/240 V (Proportional to input voltage)																	
	Max. Frequency	400Hz by constant setting*3																	
Power Supply	Rated Input Voltage and Frequency	3-phase 200/208/220/230/240 V, 50/60 Hz*4																	
	Allowable Voltage Fluctuation	+10 %, −15 %																	
	Allowable Frequency Fluctuation	±5 %																	
Harmonic Wave Prevention	DC Reactor	Option									Provided								
	12-Pulse Input	Not available									Available*5								
Environmental Conditions	Vibration	9.8 m/s^2 at 20Hz or below, up to 5.9 m/s^2 at 20Hz to 55Hz									9.8 m/s^2 at 20Hz or below, up to 2.0 m/s^2 at 20Hz to 55Hz								

*1 The main circuit of 200V class inverters uses 2-level control method.
*2 Our standard 4-pole motors are used for max. applicable motor output. Choose the inverter whose rated current is within the motor rated current range.
*3 The maximum frequency is 60 Hz for open-loop vector control 2.
*4 When using the inverter of 200 V 30 kW or more with a cooling fan of 3-phase 230 V 50 Hz or 240 V 50/60 Hz power supply, a transformer for the cooling fan is required.
*5 A 3-winding transformer is required at 12-pulse input.

400 V Class*1

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*1
Max. Applicable Motor Output*2	kW	0.4	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
Output Characteristics	Inverter Capacity 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 Current 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. Voltage	3-phase, 380/400/415/440/460/480 V (Proportional to input voltage)																						
	Max. Frequency	400Hz by constant setting*3																						
Power Supply	Rated Input Voltage and Frequency	3-phase 380/400/415/440/460/480V, 50/60 Hz																						
	Allowable Voltage Fluctuation	+10 %, −15 %																						
	Allowable Frequency Fluctuation	±5 %																						
Harmonic Wave Prevention	DC Reactor	Option									Provided													
	12-Pulse Input	Not available									Available*4													
Environmental Conditions	Vibration	9.8 m/s^2 at 20Hz or below, up to 5.9 m/s^2 at 20Hz to 55Hz									9.8 m/s^2 at 20Hz or below, up to 2.0 m/s^2 at 20Hz to 55Hz											

*1 The main circuit of 400V class inverters uses 3-level control method. 400V 300kW inverter will be available soon.
*2 Our standard 4-pole motors are used for max. applicable motor output. Choose the inverter whose rated current is within the motor rated current range.
*3 The maximum frequency is 60 Hz for open-loop vector control 2.
*4 A 3-winding transformer is required at 12-pulse input.

Enclosures

	Model CIMR-G7A	20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011	2015	2018	2022	2030	2037	2045	2055	2075	2090	2110
200 V Class	Enclosed Type [NEMA1(Type1)]	Available as standard									Available for option							Not available	
	Open Chassis Type (IEC IP00)	Available by removing the upper and lower cover of enclosed type									Available as standard								
	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
400 V Class	Enclosed Type [NEMA1(Type1)]	Available as standard									Available for option											Not available		
	Open Chassis Type (IEC IP00)	Available by removing the upper and lower cover of enclosed type									Available as standard													

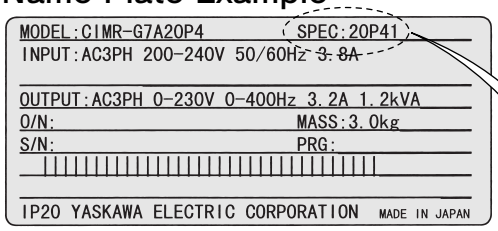
Enclosed type【NEMA1(Type1)】: Provides a clean and ventilated environment within the enclosure. Front and rear panels are firmly secured (e.g. front, rear, right, left, top, bottom).
Open chassis type (IEC IP00) : Designed for mounting in a customer's enclosure. Constructed so that openings do not permit direct or inadvertent access to live parts by personnel.

Model Designation

CIMR − G7 A 2 0P4 0

- Inverter: G7 series
- Specifications: A : Japanese standard specifications
- Voltage: 2 : 200 V class; 4 : 400 V class
- Max. Applicable Motor Output: 0P4 : 0.4 kW ⟆ 022 : 22 kW ⟆ 300 : 300 kW ("P" indicates a decimal point)
- Protective Enclosure: 0 : Open chassis type; 1 : Enclosed type

Name Plate Example



2 0P4 1 □

- Voltage
- Max. Applicable Motor Output
- Enclosure: 0 : Open chassis type (IEC IP00); 1 : Enclosed type【NEMA1(Type1)】
- Revision

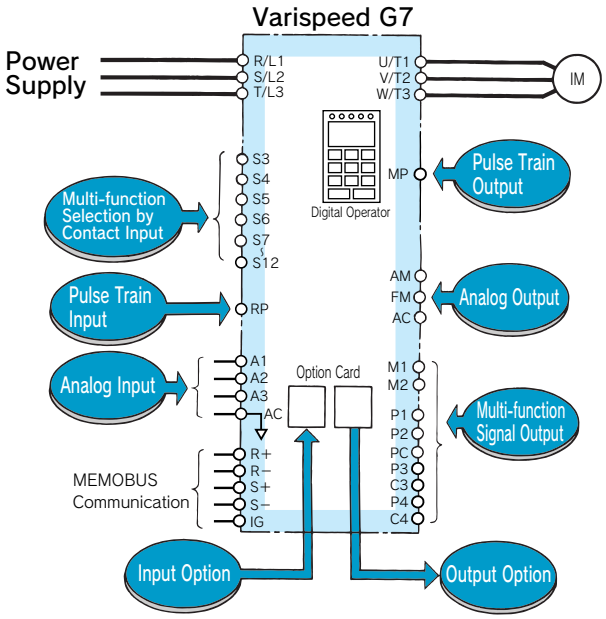
200/400 V Class

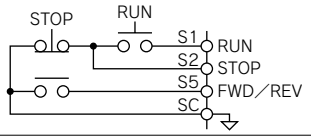
Control Characteristics	Control Method	Sine wave PWM [Vector with PG, open loop vector 1 and 2*1, V/f, V/f with PG (switched by parameter)]
	Starting Torque	150% at 0.3Hz (open loop vector control 2), 150% at 0 min-1 (vector control with PG) *2
	Speed Control Range	1:200 (open loop vector control 2), 1:1000 (vector control with PG) *2
	Speed Control Accuracy	±0.2% (open loop vector control 2 at 25℃±10℃), ±0.02% (vector control with PG at 25℃±10℃) *2
	Speed Response	10Hz (open loop vector control 2), 40Hz (vector control with PG) *2
	Torque Limit	Can be set by parameter: 4 steps available (only when vector control)
	Torque Accuracy	±5 %
	Frequency Control Range	0.01Hz to 400Hz*3
	Frequency Accuracy	Digital reference: ±0.01 %, −10 ℃ to +40 ℃ ; Analog reference: ±0.1 %, 25 ℃±10 ℃
	Frequency Setting Resolution	Digital reference: 0.01Hz; Analog reference: 0.03Hz/60Hz (11-bit + sign)
	Output Frequency Resolution	0.001 Hz
	Overload Capacity	150% rated output current for 1 minute, 200% rated output current for 0.5 sec
	Frequency Setting Signal	−10 to 10 V, 0 to 10 V, 4 to 20 mA, pulse train
	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) *4 Built-in braking transistor provided for inverters of 15kW or less (200/400V)
	Main Control Functions	Momentary power loss restart, Speed search, Overtorque detection, Torque limit, 17-step speed operation (maximum), Accel/decel time changeover, S-curve accel/decel, 3-wire sequence, Auto-tuning (dynamic, static), DWELL, Cooling fan ON/OFF, Slip compensation, Torque compensation, Jump frequency, Frequency upper/lower limit settings, DC injection braking at start/stop, High slip braking, PID control (with sleep function), Energy-saving control, MEMOBUS communication (RS-485/422 max. 19.2 kbps), Fault retry, Constant copy, Droop control, Torque control, Speed/torque control changeover, etc.
Protective Functions	Motor Overload Protection	Electronic thermal overload relay
	Instantaneous Overcurrent	Motor coasts to stop at approx. 200 % rated output current.
	Fuse Protection	Motor coasts to stop at blown fuse.
	Overload	150% rated output current for 1 minute, 200% rated output current for 0.5 sec
	Overvoltage	Motor coasts to stop if the main circuit voltage exceeds approx. 410 VDC (approx. 820 VDC for 400 V class).
	Undervoltage	Motor coasts to stop if the main circuit voltage drops to approx. 190 VDC (approx. 380 VDC for 400 V class) or below.
	Momentary Power Loss	Immediately stop after 15 ms or longer power loss (at factory setting). Continuous operation during power loss less than 2 s (standard).
	Fin Overheat	Thermistor
	Stall Prevention	Stall prevention during acceleration/deceleration and constant speed operation
	Ground Fault	Provided by electronic circuit (overcurrent level)
	Power Charge Indication	Indicates until the main circuit voltage reaches 50 V.
Environmental Conditions	Location	Indoor (Protected from corrosive gasses and dust)
	Humidity	95 %RH (non-condensing)
	Storage Temperature	−20 to 60 ℃ (for short period during shipping)
	Ambient Temperature	−10 to 40 ℃ for NEMA1 (type1), −10 to 45 ℃ for open chassis type
	Altitude	1000 m or below

*1 Contact your YASKAWA representatives when using the open-loop vector control 2 for an application with large regenerative power such as hoisting.
*2 Specifications for open loop vector control and vector control with PG require dynamic auto-tuning.
*3 The maximum frequency is 60 Hz for open-loop vector control 2.
*4 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.

Software Functions

The Varispeed G7 flexible inverter incorporates a variety of application features. Select special functions from a multitude of possibilities to perfectly match your machine requirements.



Function	Target Market	Application	Description of Function	Ref. Page
Energy Saving Control	General	Most efficient automatic operation	Supplies voltage to motor to always be most effective according to load and rotating speed. (Automatic temperature compensation function provided)	55
PID Control	Pumps, air conditionings, etc.	Automatic process control	Processes PID operation in the inverter and the result is used as frequency reference. If controls pressure, air/water amounts.	53
Speed Search Operation	Inertia load drives such as blowers, etc.	Synchronize with the coasting motor	Starts the inverter at the specified frequency, automatically detects the synchronization point, and performs at the operation frequency. No speed detector is required.	40
DC Injection Braking at Start	Blowers, pumps, etc. which have wind-mill effects	Starting the free running motor	When the direction of the free running motor is not fixed, the speed search operation function is difficult to use. The motor can be automatically stopped by DC injection braking, and be restarted by the inverter.	40
Commercial Power Source/Inverter Switchover Operation	Blowers, pumps, mixers, extruders, etc.	Automatic switching between commercial power source and inverter	Switching of commercial power source to inverter or vice versa is done without stopping the motor.	58
Multi-step Speed Operation	Transporting equipment	Schedule operation under fixed speed and positioning	Multi-step operation (up to 17-step) can be set by setting the contact combinations, so the connection with PLC becomes very easy. When combined with jog speed can also allow simple positioning.	36
Accel/Decel Time Changeover Operation	Automatic control panels, transporting equipment, etc.	The accel/decel time changeover with an external signal	The accel/decel times are switched by an external contact signal. Necessary for switching operation of two machines with different functions by a single inverter.	37
Inverter Overheat Prediction	Air conditioners, etc.	Preventive maintenance	When the ambient temperature of the inverter rises to within 10 ℃ of the maximum allowable temperature, warning is given. (Thermoswitch is required as an option.)	47
3-wire Sequence	General	Simple configuration of control circuit	Operation can be accomplished using a spring-loaded push-button switch. 	47
Operating Site Selection	General	Easy operation	Operation and settings can be selected while the inverter is online. (digital operator/external instruction, signal input/output).	—
Frequency Hold Operation	General	Easy operation	Temporarily holds frequencies during acceleration or deceleration.	41
UP/DOWN Command	General	Easy operation	Sets speed by ON/OFF from a distance.	47
Fault Trip Retry Operation	Air conditioners, etc.	Improvement of operation reliability	When the inverter trips, it begins to coast, is immediately diagnosed by computer, resets automatically, and returns to the original operation speed. Up to 10 retries can be selected.	41
Quick Stop without Braking Resistor (DC injection braking stop)	High-speed routers,etc.	DC injection braking stop of induction motor	DC injection braking is performed at top speed. The duty is 5 % or less. Can generate 50 % to 70 % of the braking torque.	46

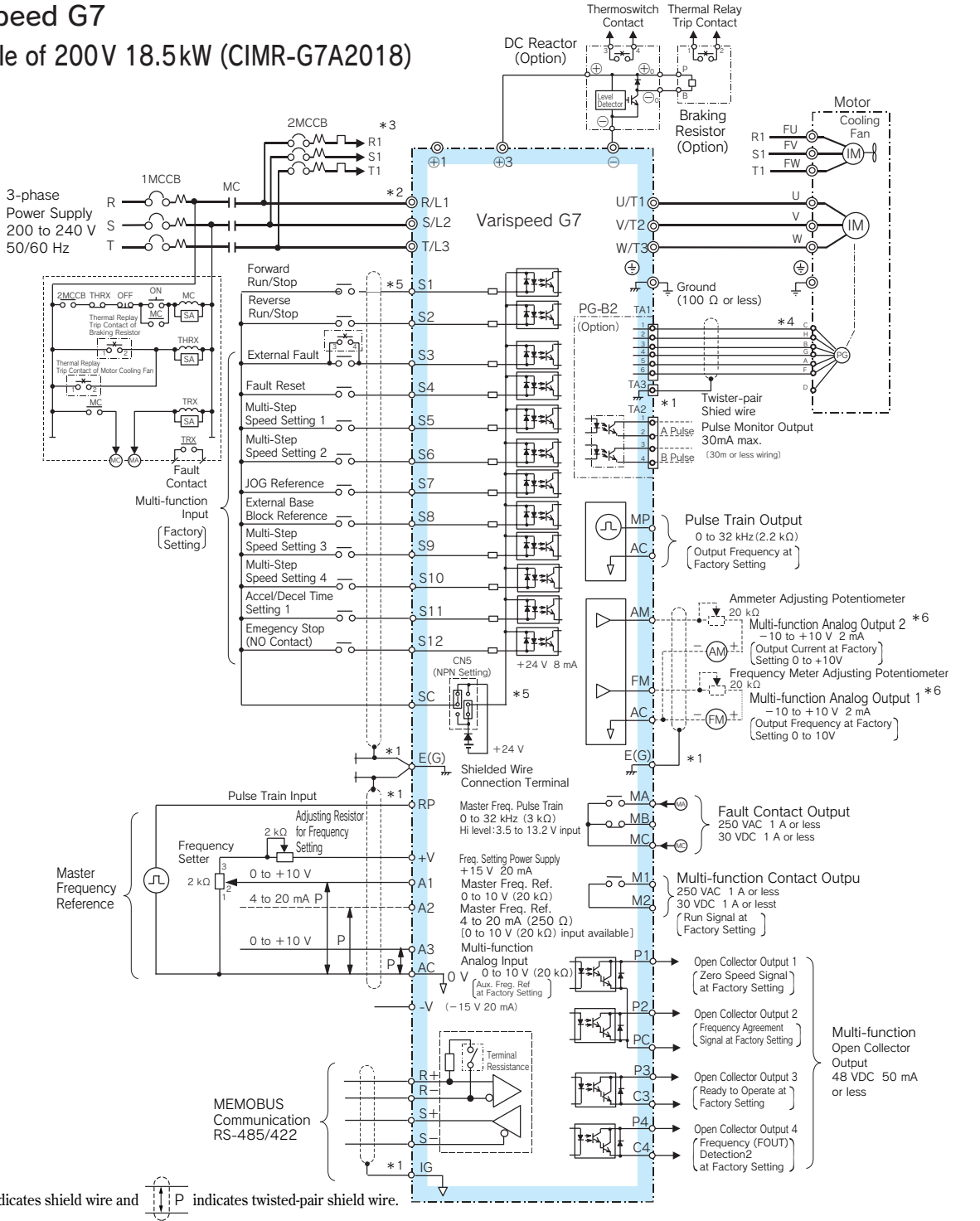
Function	Target Market	Application	Description of Function	Ref. Page
Torque Limit	Blowers, pumps, extruders, etc.	· Protection of machine · Improvement of continuous operation reliability · Torque limit	The inverter can be switched to coasting or motor speed reducing mode as soon as it reaches a certain preset torque level. For pump or blower, the operation frequency can be automatically reduced to the load balancing point, according to the overload condition, and prevent overload tripping.	49
Torque Control*	Winders, extruders, boosters	· Tension constant control · Torque booster	Adjusts motor torque externally. Appropriate for controlling winder tension and the result of torque booster.	—
Droop Control*	Separately-driven conveyors, multi-motor drive, feeders, transporting equipment.	Dividing loads	Arbitrarily set motor speed regulation. High insulation characteristics share multi-motor loads.	—
Upper/Lower Frequency Limit Operation	Pumps, blowers	Motor speed limit	The upper and lower limits of the motor speed, reference signal bias and gain can be set independently without peripheral operation units.	38
Prohibit Setting of Specific Frequency (Frequency Jump Control)	General machines	Prevent mechanical vibration in the equipment	The motor simply passes through the preset speed, but continuous running cannot be done at this speed. This function is used to avoid the mechanical resonance point of the equipment.	38
Carrier Frequency Setting	General machines	Lower noise, elimi-nate resonance	The carrier frequency can be set to reduce the acoustic noise from the motor and machine system.	43
Automatic Continuous Operation When the Speed Reference is Lost	Air conditioners	Improving reliability of continuous operation	When the frequency reference signal is lost, operation is automatically continued at the pre-programmed speed. (If the host computer fails.) This function is important for air conditioning systems in intelligent buildings.	40
Load Speed Display	General	Monitor function enhancement	Can indicate motor speed (min^{-1}), machine speed under load (min^{-1}), line speed (m/min), etc.	35
Run Signal	General	Zero-frequency interlock	"Closed" during operation. "Open" during coasting to a stop. Can be used as interlock contact point during stop.	48
Zero-speed Signal	Machine tools	Zero-frequency interlock	"Closed" when output frequency is under min. frequency. Can be used as tool exchange signal.	48
Frequency (Speed) Agreed Signal	Machine tools	Reference speed reach interlock	The contact closes when inverter output frequency reaches the set value. Can be used as an interlock for lathes, etc.	48
Overtorque Signal	Machine tools, blowers, cutters, extruders, etc.	· Protection of machine · Improvement of operation reliability	"Closed" when overtorque setting operation is accomplished. Can be used as a torque limiter.	42
Low Voltage Signal	General	System protection for undervoltage	"Closed" only when tripped by low voltage. Can be used as a countermeasure power loss detection relay.	48
Free Unintentional Speed Agreement Signal	General	Reference speed agreed interlock	"Closed" when the speed agrees at arbitrary frequency reference.	48
Output Frequency Detection 1	General	Gear change interlock etc.	"Closed" at or over an arbitrary output frequency.	48
Output Frequency Detection 2	General	Gear change interlock etc.	"Closed" at or below the arbitrary output frequency.	48
Base Block Signal	General	Operation interlock, etc.	Always "closed" when the inverter output is OFF.	48
Braking Resistor Protection	General	preventive maintenance	"Closed" when a built-in braking resistor overheats, or a braking transistor error is detected.	48
Frequency Reference Sudden Change Detection	General	Operation stability	"Closed" when the frequency reference suddenly drops to 10 % or below of the set value.	48
Multi-function Analog Input Signal	General	Easy operation	Functions as supplementary frequency reference. Also used for fine control of input reference, output voltage adjustment, external control of accel/decel time, and fine adjustment of overtorque detection level.	—
Multi-function Analog Output Signal	General	Monitor function enhancement	Either a frequency meter, ammeter, voltmeter, or wattmeter can be used.	44
Analog Intput (option)	General	Easy operation	Enables external operation with high resolution instructions (AI-14U, AI-14B). Also enables normal and reverse operation using positive or negative voltage signals (AI-14B).	—
Digital Intput (option)	General	Easy operation	Enables operation with 8-bit or 16-bit digital signals. Easily connects to NC or PC (DI-08, DI-16H2).	—
Analog Output (option)	General	Monitor function enhancement	Monitors output frequency, motor current, output voltage, and DC voltage. (AO-08, AO-12)	44
Digital Output (option)	General	Monitor function enhancement	Indicates errors through discrete output (DO-08).	—
Pulse Train Input	General	Easy operation	PID target and PID feedback values are input with pulse train when PID control as well as frequency reference function.	38
Pulse Train Output	General	Monitor function enhancement	Six items including PID target and PID feedback values can be monitored as well as frequency reference and output frequency.	45
PG Speed Control (option)	General	Enhancement of speed control	Installing PG controller card (PG-A2, PG-B2, PG-D2, PG-X2) considerably enhances speed control accuracy.	51

* Torque control and droop control functions are applicable only for vector control with PG.

Connection Diagram and Terminal Functions

Varispeed G7

Example of 200 V 18.5 kW (CIMR-G7A2018)



∗1 indicates shield wire and P indicates twisted-pair shield wire.

∗2 Terminal symbols: ◎ shows main circuit; ○ shows control circuit.

∗3 When using self-cooled motors, wiring for cooling fan motor is not required.

∗4 When using controls without PG, wiring for PG circuit (PG-B2 card wiring) is not required.

∗5 Connection when sequence input signals (S1 to S12) are no-voltage contacts or sequence connections (0 V common/sink mode) by NPN transistor (factory setting). When sequence connections by PNP transistor (+24 V common/source mode) or preparing a external +24 V power supply, see Typical Connection Diagrams (p64).

∗6 Multi-function analog output is only for use on meters (frequency, current, voltage and watt), and not available for the feedback control system.

Control Circuit and Communication Circuit Terminal Arrangement

E(G)	FM	AC	AM	P1	P2	PC	SC
SC	A1	A2	A3	+V	AC	−V	
S1	S2	S3	S4	S5	S6	S7	S8

MP	P3	C3	P4	C4
RP	R+	R−	S+	S−
S9	S10	S11	S12	IG

MA	MB	MC	
M1		M2	E(G)

Terminal Functions

Main Circuit

Voltage	200 V			400 V		
Model CIMR-G7A	20P4 to 2015	2018, 2022	2030 to 2110	40P4 to 4015	4018 to 4045	4055 to 4300
Max Applicable Motor Output	0.4 to 15 kW	18.5 to 22 kW	30 to 110 kW	0.4 to 15 kW	18.5 to 45 kW	55 to 300 kW
R/L1 S/L2 T/L3	Main circuit input power supply	Main circuit input power supply		Main circuit input power supply	Main circuit input power supply	
R1/L11 S1/L21 T1/L31	—	R-R1, S-S1 and T-T1 have been wired before shipment (See P66).		—	R-R1, S-S1 and T-T1 have been wired before shipment (See P66).	
U/T1 V/T2 W/T3	Inverter output			Inverter output		
B1 B2	Braking resistor unit	—		Braking resistor unit	—	
⊖	·DC reactor (⊕1 — ⊕2) ·DC power supply *1 (⊕1 — ⊖)	·DC power supply (⊕1 — ⊖) *1 ·Braking unit (⊕3 — ⊖)		·DC reactor (⊕1 — ⊕2) ·DC power supply *1 (⊕1 — ⊖)	·DC power supply (⊕1 — ⊖) *1 ·Braking unit (⊕3 — ⊖)	
⊕1 ⊕2						
⊕3	—			—		
⏛/ℓ2	—		Cooling fan power supply *2	—		
r/ℓ1				—		Cooling fan power supply *3
⏛ 200/ℓ2200 ⏛ 400/ℓ2400	—					
⏚	Ground terminal (100 Ω or less)			Ground terminal (10 Ω or less)		

*1 ⊕1 — ⊖ DC power input does not conform to UL/c-UL listed standard.
*2 Cooling fan power supply r/ℓ1—⏛/ℓ2: 200 to 220 VAC 50 Hz, 200 to 230 VAC 60 Hz
(A transformer is required for 230 V 50 Hz or 240 V 50/60 Hz power supply.)
*3 Cooling fan power supply r/ℓ1—⏛ 200/ℓ2 200: 200 to 220 VAC 50 Hz, 200 to 230 VAC 60 Hz, r/ℓ1—⏛ 400/ℓ2 400: 380 to 480 VAC 50/60 Hz

Control Circuit (200 V/400 V Class)

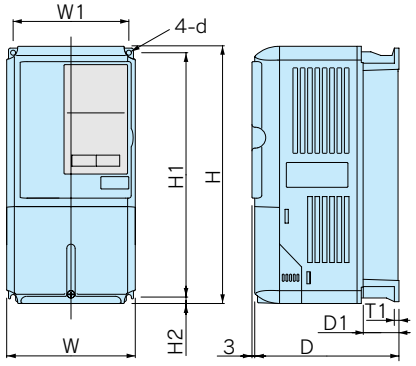
Classification	Terminal	Signal Function	Description	Signal Level
Sequence Input	S1	Forward run-stop signal	Forward run at "closed", stop at "open"	Photo-coupler insulation Input +24 VDC 8 mA
	S2	Reverse run-stop signal	Reverse run at "closed", stop at "open"	
	S3	Multi-function input selection 1	Factory setting: external fault at "closed"	
	S4	Multi-function input selection 2	Factory setting: fault reset at "closed"	
	S5	Multi-function input selection 3	Factory setting: multi-step speed setting 1 is valid at "closed"	
	S6	Multi-function input selection 4	Factory setting: multi-step speed setting 2 is valid at "closed"	
	S7	Multi-function input selection 5	Factory setting: JOG run at "closed"	
	S8	Multi-function input selection 6	Factory setting: external baseblock at "closed"	
	S9	Multi-function input selection 7	Factory setting: multi-speed setting 3 is valid at "closed"	
	S10	Multi-function input selection 8	Factory setting: multi-speed setting 4 is valid at "closed"	
	S11	Multi-function input selection 9	Factory setting: accel/decel time setting 1 is valid at "closed"	
	S12	Multi-function input selection 10	Factory setting: emergency stop (NO contact) is valid at "closed"	
	SC	Sequence control input common	—	
Analog Input	+V	+15 V Power supply output	For analog reference +15 V power supply	+15 V (Allowable current 20 mA max.)
	−V	−15 V Power supply output	For analog reference −15 V power supply	−15 V (Allowable current 20 mA max.)
	A1	Master speed frequency ref.	−10 to +10 V/−100 to +100%, 0 to +10 V/100 %	−10 to +10 V, 0 to +10 V (Input impedance 20 kΩ)
	A2	Murti-function analog input	4 to 20 mA/100 %, −10 to +10 V/−100 to +100%, 0 to +10 V/100 % Factory setting: added to the terminal A1 (H3-09=0)	4 to 20 mA (Input impedance 250 Ω)
	A3	Master speed frequency ref.	−10 to +10V/−100 to +100%, 0 to +10V/100% Factory setting: preset frequency reference	0 to +10 V (Input impedance 20 kΩ)
	AC	Analog common	0 V	—
	E(G)	Connection to shield wire and option ground wire	—	—
Photo-coupler Output	P1	Multi-function PHC output 1	Factory setting: zero speed signal "Closed" at or below zero speed level (b2-01)	+48 VDC 50 mA or less
	P2	Multi-function PHC output 2	Factory setting: frequency agreement "Closed" within ±2 Hz of setting frequency	
	PC	Photo-coupler output common	—	
	P3	Multi-function PHC output 3	Factory setting: ready to operate (READY)	
	C3			
	P4	Multi-function PHC output 4	Factory setting: frequency (FOUT) detection 2	
	C4			
Relay Output	MA	Fault output (NO contact)	Fault at "closed" between terminals MA and MC	Dry contact, contact capacity 250 VAC 1 A or less 30 VDC 1 A or less
	MB	Fault output (NC contact)	Fault at "open" between terminals MB and MC	
	MC	Relay contact output common	—	
	M1	Multi-function contact output (NO contact)	Factory setting: Run signal Running at "closed" between terminals M1 and M2	
	M2			
Analog Monitor Output	FM	Multi-function analog monitor 1	Factory setting: output frequency 0 to 10 V/100 % freq.	0 to ±10 VDC ±5 % 2 mA or less
	AM	Multi-function analog monitor 2	Factory setting: current monitor 5 V/inverter rated current	
	AC	Analog common	—	
Pulse I/O	RP	Multi-function pulse input	Factory setting: frequency reference input (H6-01=0)	0 to 32 kHz (3 kΩ)
	MP	Multi-function pulse monitor	Factory setting: output frequency (H6-06=2)	0 to 32 kHz (2.2 kΩ)

Communication Circuit Terminal (200/400 V Class)

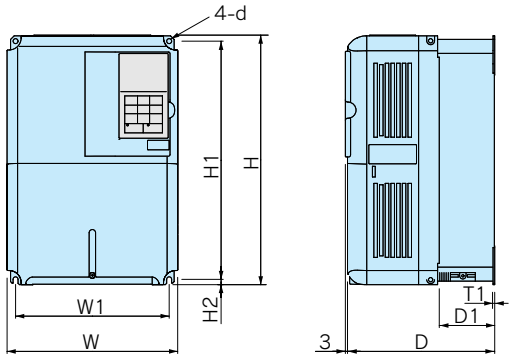
Classification	Terminal	Signal Function	Description	Signal Level
RS-485/422 Transmission	R+	MEMOBUS communication input	When using two RS-485 wires, short-circuit between R+ and S+, R− and S−.	Differential input PHC isolation
	R−			
	S+	MEMOBUS communication output		Differential output PHC isolation
	S−			
	IG	Shielded wire for communication	—	—

Dimensions

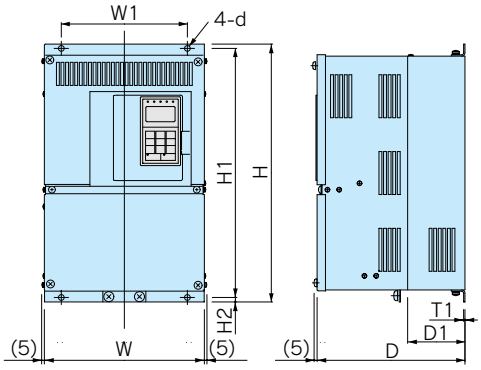
Open Chassis Type (IEC IP00)



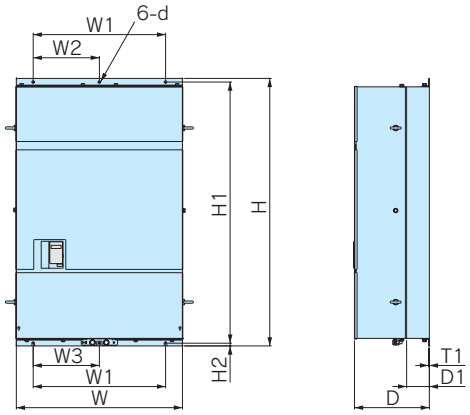
Drawing 1



Drawing 2



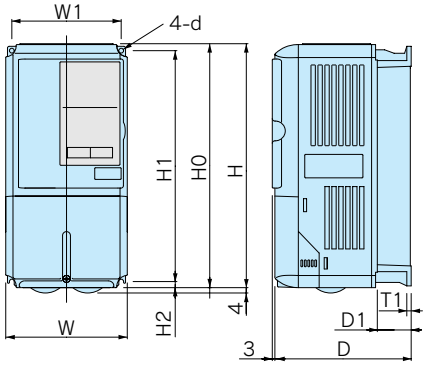
Drawing 3



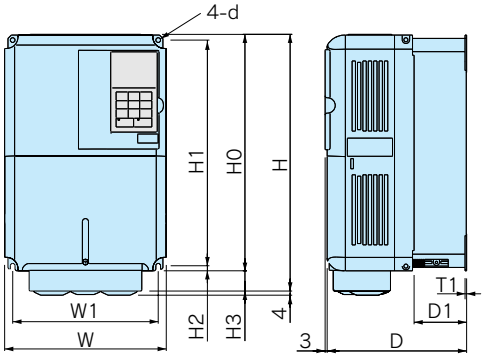
Drawing 4

Voltage	Max. Applicable Motor Output kW	Inverter CIMR-G7A	DWG	Dimensions in mm W	H	D	W1	W2	W3	H1	H2	D1	T1	d	Approx. Mass kg	Cooling Method
200 V Class (3-phase)	0.4	20P4	1	140	280	157	126	–	–	266	7	39	5	M5	3	Self cooled
	0.75	20P7														
	1.5	21P5														
	2.2	22P2		140	280	177	126			266	7	59	5	M5	4	Fan cooled
	3.7	23P7														
	5.5	25P5	2	200	300	197	186			285	8	65.5	2.3	M6	6	
	7.5	27P5													7	
	11	2011		240	350	207	216			335	7.5	78	2.3	M6	11	
	15	2015														
	18.5	2018	3	250	400	258	195			385	7.5	100	2.3	M6	21	
	22	2022		275	450	258	220			435	7.5	100	2.3	M6	24	
	30	2030		375	600	298	250			575	12.5	100	3.2	M10	57	
	37	2037				328						130			63	
	45	2045		450	725	348	325			700	12.5	130	3.2		86	
	55	2055													87	
	75	2075		500	850	358	370			820	15	130	4.5	M12	108	
	90	2090		575	885	378	445			855	15	140	4.5		150	
	110	2110														
400 V Class (3-phase)	0.4	40P4	1	140	280	157	126	–	–	266	7	39	5	M5	3.5	Self cooled
	0.75	40P7														
	1.5	41P5		140	280	177	126			266	7	59	5	M5	4.5	Fan cooled
	2.2	42P2														
	3.7	43P7														
	5.5	45P5	2	200	300	197	186			285	8	65.5	2.3	M6	7	
	7.5	47P5														
	11	4011		240	350	207	216			335	7.5	78	2.3	M6	10	
	15	4015														
	18.5	4018	3	275	450	258	220			435	7.5	100	2.3	M6	26	
	22	4022														
	30	4030		325	550	283	260			535	7.5	105	2.3	M6	37	
	37	4037														
	45	4045														
	55	4055		450	725	348	325			700	12.5	130	3.2	M10	90	
	75	4075													91	
	90	4090		500	850	358	370			820	15	130	4.5	M12	109	
	110	4110													127	
	132	4132		575	916	378	445			855	45.8	140	4.5	M12	165	
	160	4160													175	
	185	4185	4	710	1305	415	540	240	270	1270	15	126	4.5	M12	263	
	220	4220													280	
	300	4300		916	1475		730	365	365	1440					415	

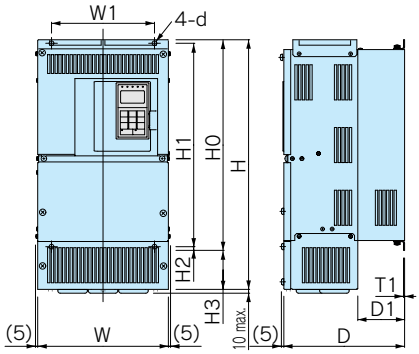
Enclosed Type【NEMA 1 (Type 1)】



Drawing 1



Drawing 2

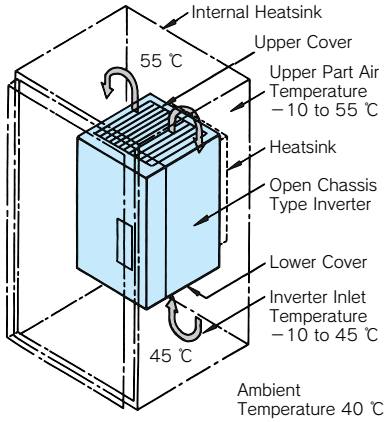


Drawing 3

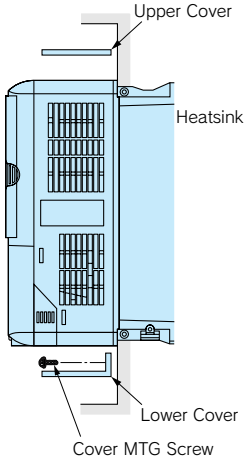
Voltage	Max. Applicable Motor Output kW	Inverter CIMR-G7A	DWG	Dimensions in mm											Approx. Mass kg	Cooling Method
				W	H	D	W1	H0	H1	H2	H3	D1	T1	d		
200 V Class (3-phase)	0.4	20P4	1	140	280	157	126	280	266	7	—	39	5	M5	3	Self cooled
	0.75	20P7														
	1.5	21P5														
	2.2	22P2				177						59			4	Fan cooled
	3.7	23P7														
	5.5	25P5	2	200	300	197	186	300	285	8	0	65.5	2.3	M6	6	
	7.5	27P5													7	
	11	2011		240	350	207	216	350	335	7.5	0	78			11	
	15	2015			380						30					
	18.5	2018	3	254	535	258	195	400	385		135	100			24	
	22	2022		279	615		220	450	435		165				27	
	30	2030		380	809	298	250	600	575	12.5	209		3.2	M10	62	
	37	2037				328						130			68	
	45	2045		453	1027	348	325	725	700		302				94	
	55	2055													95	
	75	2075		504	1243	358	370	850	820	15	393		4.5	M12	114	
400 V Class (3-phase)	0.4	40P4	1	140	280	157	126	280	266	7	—	39	5	M5	3.5	Self cooled
	0.75	40P7														
	1.5	41P5				177						59			4.5	Fan cooled
	2.2	42P2														
	3.7	43P7														
	5.5	45P5	2	200	300	197	186	300	285	8	—	65.5	2.3	M6	7	
	7.5	47P5														
	11	4011		240	350	207	216	350	335	7.5		78			10	
	15	4015														
	18.5	4018	3	279	535	258	220	450	435		85	100			29	
	22	4022														
	30	4030		329	635	283	260	550	535			105			39	
	37	4037														
	45	4045			715						165				40	
	55	4055		453	1027	348	325	725	700	12.5	302	130	3.2	M10	98	
	75	4075													99	
	90	4090		504	1243	358	370	850	820	15	393		4.5	M12	127	
	110	4110													137	
	132	4132		579	1324	378	445	916	855	45.8	408	140			175	
	160	4160													185	

Mounting to a Gasketed Cabinet (Internal Sink)

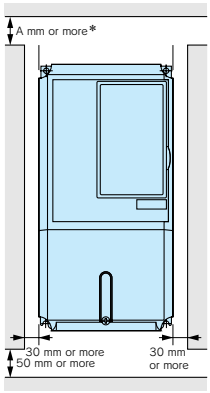
The standard enclosure (with the heatsink mounted internally) can be easily changed to an externally mounted heatsink arrangement, but the enclosure's mounting face must be gasketed.



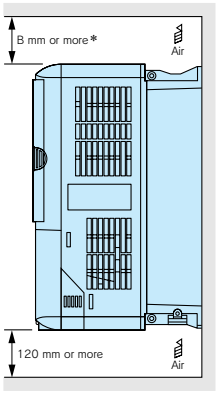
Remove the upper and lower covers for inverters of 200/400 V 15 kW or less .



When using open chassis type inverters of 200/400 V 18.5 kW or more, secure spaces for eyebolts and wiring of the main circuit.



Side Spaces



Top and Bottom Spaces

* Refer to the following specifications for securing spaces.
When using the inverters of 90 kW to 110 kW in the 200V class or 132 kW to 220 kW in the 400V class. A : 120 B : 120
When using the inverter of 300 kW in the 400V class A : 300 B : 300
With a fan on the ceiling of the enclosed cabinet for exhausting A : 120 B : 120

Inverter Heat Loss

200 V Class

Model CIMR-G7A		20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011	2015	2018	2022	2030	2037	2045	2055	2075	2090	2110
Inverter Capacity	kVA	1.2	2.3	3.0	4.6	6.9	10	13	19	25	30	37	50	61	70	85	110	140	160
Rated Current	A	3.2	6	8	12	18	27	34	49	66	80	96	130	160	183	224	300	358	415
Heat Loss W — Fin	W	21	43	58	83	122	187	263	357	473	599	679	878	1080	1291	1474	2009	1660	2389
Heat Loss W — Inside Unit	W	36	42	47	53	64	87	112	136	174	242	257	362	434	510	607	823	871	1194
Heat Loss W — Total Heat Loss	W	57	85	105	136	186	274	375	493	647	839	936	1240	1514	1801	2081	2832	2531	3583
Fin Cooling		Self cooled	Fan cooled																

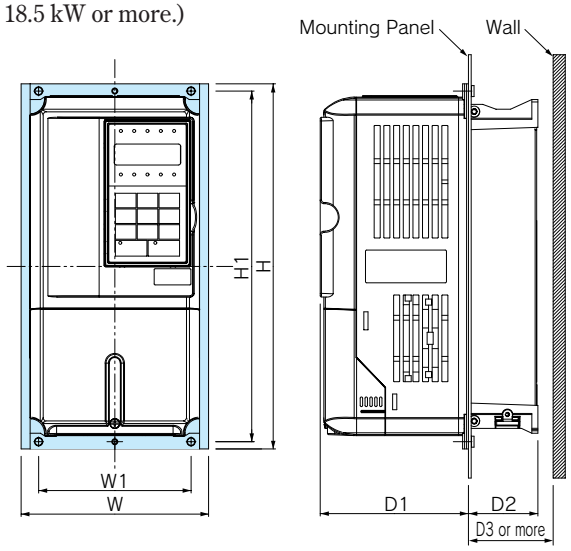
400 V Class

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
Inverter Capacity	kVA	1.4	2.6	3.7	4.7	6.9	11	16	21	26	32	40	50	61	74	98	130	150	180	194	230	280	340	460
Rated Current	A	1.8	3.4	4.8	6.2	9	15	21	27	34	42	52	65	80	97	128	165	195	240	255	302	370	450	605
Heat Loss W — Fin	W	10	21	33	41	76	132	198	246	311	354	516	633	737	929	1239	1554	1928	2299	2612	3614	4436	5329	6749
Heat Loss W — Inside Unit	W	39	44	46	49	64	79	106	116	135	174	210	246	285	340	488	596	762	928	1105	1501	1994	2205	2941
Heat Loss W — Total Heat Loss	W	49	65	79	90	140	211	304	362	446	528	726	879	1022	1269	1727	2150	2690	3227	3717	5115	6430	7534	9690
Fin Cooling		Self cooled	Fan cooled																					

Attachments

■ Heatsink External Mounting Attachment

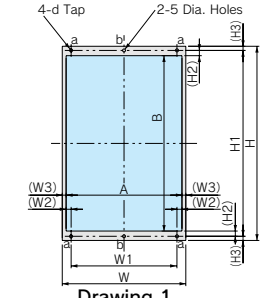
The Varispeed G7 inverters under the 200/400 V class 15 kW or less need this attachment for mounting the heatsink externally. This attachment expands the outer dimensions of the width and height of the inverter. (Attachment is not required for inverters of 18.5 kW or more.)



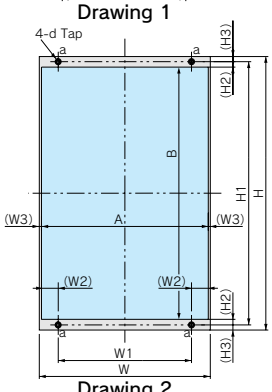
(in mm)

Model CIMR-G7A	Attachment Order Code	W	H	W1	H1	D1	D2	D3
20P4	72616-EZZ08676A	155	302	126	290	122.6	37.4	40
20P7								
21P5								
22P2							57.4	60
23P7								
25P5	72616-EZZ08676B	210	330	180	316	136.1	63.4	70
27P5								
2011	72616-EZZ08676C	250	392	216	372	133.6	76.4	85
2015								
40P4	72616-EZZ08676A	155	302	126	290	122.6	37.4	40
40P7								
41P5							57.4	60
42P2								
43P7								
45P5	72616-EZZ08676B	210	330	180	316	136.1	63.4	70
47P5								
4011	72616-EZZ08676C	250	392	216	372	133.6	76.4	85
4015								

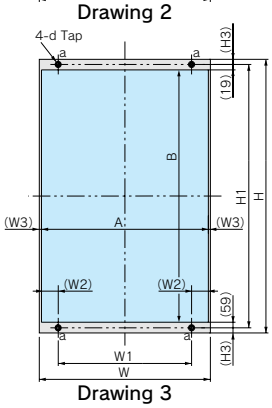
Panel Cut for External Mounting of Cooling Fin (Heatsink)



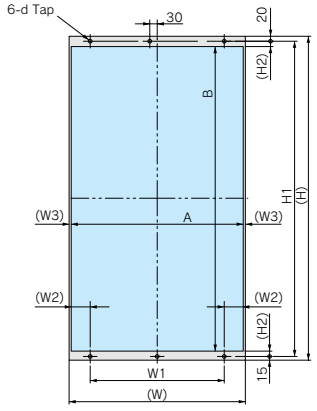
Drawing 1



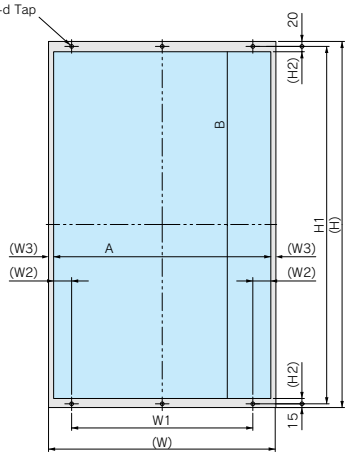
Drawing 2



Drawing 3



Drawing 4



Drawing 5

(in mm)

Model CIMR-G7A	Drawing	W	H	W1	(W2)	(W3)	H1	(H2)	(H3)	A	B	d
20P4	1	155	302	126	6	8.5	290	9.5	6	138	271	M5
20P7												
21P5												
22P2												
23P7												
25P5		210	330	180	8.5	6.5	316	9	7	197	298	M6
27P5												
2011		250	392	216		8.5	372	9.5	10	233	353	
2015												
2018	2	250	400	195	24.5	3	385	8	7.5	244	369	
2022		275	450	220			435			269	419	
2030		375	600	250	54.5	8	575	15	12.5	359	545	M10
2037												
2045		450	725	325			700	13.5		434	673	
2055												
2075		500	850	370	57	8	820	19	15	484	782	M12
2090		575	885	445	55	10	855			555	817	
2100												
40P4	1	155	302	126	6	8.5	290	9.5	6	138	271	M5
40P7												
41P5												
42P2												
43P7												
45P5		210	330	180	8.5	6.5	316	9	7	197	298	M6
47P5												
4011		250	392	216		8.5	372	9.5	10	233	353	
4015												
4018	2	275	450	220	24.5	3	435	8	7.5	269	419	M6
4022												
4030		325	550	260		8	535			309	519	
4037												
4045												
4055		450	725	325	54.5		700	13.5	12.5	434	673	M10
4075												
4090		500	850	370	57		820	19	15	484	782	M12
4110												
4132	3	575	925	445	55	10	895	*		555	817	
4160												
4185	4	710	1305	540	76.5	8.5	1270	21.5	*	693	1227	
4220												
4300	5	916	1475	730	72.5	20.5	1440	21.5	*	875	1397	

* The sizes are different between the top and the bottom. Refer to Drawings 3 to 5.

Constants List

How to read this list
- Constants not described in this list are not displayed in the digital operator.
- Setting constants vary in accordance with password setting (A1-04).
- A, Q and × represent access level and capability.
  A : ADVANCED (when the advanced program mode is selected)
  Q : QUICK (when the quick program mode and the advanced mode are selected)
  × : Cannot be accessed.

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Initialize	A1-00	Language selection for digital operator display	0 to 6	1	1	○	A	A	A	A	A	31
	A1-01	Constant access level	0 to 2	1	2	○	A	A	A	A	A	
	A1-02	Control method selection	0 to 4	1	2	×	Q	Q	Q	Q	Q	
	A1-03	Initialize	0 to 3330	1	0	×	A	A	A	A	A	
	A1-04	Password	0 to 9999	1	0	×	A	A	A	A	A	
	A1-05	Password setting	0 to 9999	1	0	×	A	A	A	A	A	
	A2-01 to A2-32	User setting constant	b1-01 to o3-02	—	—	×	A	A	A	A	A	
Sequence	b1-01	Master frequency reference selection	0 to 4	1	1	×	Q	Q	Q	Q	Q	35
	b1-02	Operation method selection	0 to 3	1	1	×	Q	Q	Q	Q	Q	46
	b1-03	Stopping method selection	0 to 3	1	0	×	Q	Q	Q	Q	Q	
	b1-04	Prohibition of reverse operation	0, 1	1	0	×	A	A	A	A	A	36
	b1-05	Operation for setting of min. output frequency (E1-09) or less	0 to 3	1	0	×	×	×	×	A	×	—
	b1-06	Read sequence input twice	0, 1	1	1	×	A	A	A	A	A	
	b1-07	Operation after switching to remote mode	0, 1	1	0	×	A	A	A	A	A	
	b1-08	Run command selection in programming modes	0, 1	1	0	×	A	A	A	A	A	
DC Braking	b2-01	Zero speed level (DC injection braking start frequency)	0.0 to 10.0	0.1 Hz	0.5 Hz	×	A	A	A	A	A	40
	b2-02	DC injection braking current	0 to 100	1 %	50 %	×	A	A	A	×	×	
	b2-03	DC injection braking time at start	0.00 to 10.00	0.01 s	0.00 s	×	A	A	A	A	A	
	b2-04	DC injection braking time at stop	0.00 to 10.00	0.01 s	0.50 s	×	A	A	A	A	A	
	b2-08	Magnetic flux compensation volume	0 to 500	1 %	0 %	×	×	×	A	×	×	
Speed Search	b3-01	Speed search selection	0 to 3	1	2	×	A	A	A	×	A	—
	b3-02	Speed search operating current	0 to 200	1 %	100 %	×	A	×	A	×	A	
	b3-03	Speed search deceleration time	0.1 to 10.0	0.1 s	2.0 s	×	A	×	A	×	×	
	b3-05	Speed search wait time	0.0 to 20.0	0.1 s	0.2 s	×	A	A	A	A	A	
Timer Functions	b4-01	Timer function ON-delay time	0.0 to 300.0	0.1 s	0.0 s	×	A	A	A	A	A	48
	b4-02	Timer function OFF-delay time	0.0 to 300.0	0.1 s	0.0 s	×	A	A	A	A	A	
PID Control	b5-01	PID control selection	0 to 4	1	0	×	A	A	A	A	A	53
	b5-02	Proportional gain (P)	0.00 to 25.00	0.01	1.00	○	A	A	A	A	A	
	b5-03	Integral (I) time	0.0 to 360.0	0.1 s	1.0 s	○	A	A	A	A	A	
	b5-04	Integral (I) limit	0.0 to 100.0	0.1 %	100.0 %	○	A	A	A	A	A	
	b5-05	Differential (D) time	0.00 to 10.00	0.01 s	0.00 s	○	A	A	A	A	A	
	b5-06	PID limit	0.0 to 100.0	0.1 %	100.0 %	○	A	A	A	A	A	
	b5-07	PID offset adjustment	−100.0 to +100.0	0.1 %	0.0 %	○	A	A	A	A	A	
	b5-08	PID primary delay time constant	0.00 to 10.00	0.01 s	0.00 s	○	A	A	A	A	A	
	b5-09	PID output characteristics selection	0, 1	1	0	×	A	A	A	A	A	
	b5-10	PID output gain	0.0 to 25.0	0.1	1.0	×	A	A	A	A	A	
	b5-11	PID reverse output selection	0, 1	1	0	×	A	A	A	A	A	
	b5-12	Selection of PID feedback command loss detection	0 to 2	1	0	×	A	A	A	A	A	
	b5-13	PID feedback command loss detection level	0 to 100	1 %	0 %	×	A	A	A	A	A	
	b5-14	PID feedback command loss detection time	0.0 to 25.5	0.1 s	1.0 s	×	A	A	A	A	A	
	b5-15	Sleep function braking level	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	
	b5-16	PID sleep braking delay time	0.0 to 25.5	0.1 s	0.0 s	×	A	A	A	A	A	
	b5-17	Acceleration/deceleration time for PID	0.0 to 25.5	0.1 s	0.0 s	×	A	A	A	A	A	
DWELL Functions	b6-01	Dwell frequency at start	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	—
	b6-02	Dwell time at start	0.0 to 10.0	0.1 s	0.0 s	×	A	A	A	A	A	
	b6-03	Dwell frequency at stop	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	
	b6-04	Dwell time at stop	0.0 to 10.0	0.1 s	0.0 s	×	A	A	A	A	A	
Droop Control	b7-01	Droop control gain	0.0 to 100.0	0.1	0.0	○	×	×	×	A	A	—
	b7-02	Droop control delay time	0.03 to 2.00	0.01 s	0.05 s	○	×	×	×	A	A	

* The factory setting will change when the control method is changed. (Open loop vector 1 factory settings are given.)

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Energy-saving Control	b8-01	Energy-saving mode selection	0, 1	1	0	×	A	A	A	A	A	55
	b8-02	Energy-saving control gain	0.0 to 10.00	0.1	0.7 *1	○	×	×	A	A	A	
	b8-03	Energy-saving filter time constant	0.00 to 10.00	0.01 s	0.50 s *2	○	×	×	A	A	A	
	b8-04	Energy-saving coefficient	0.00 to 655.00	0.01	*3	×	A	A	×	×	×	
	b8-05	Power detection filter time constant	0 to 2000	1 ms	20 ms	×	A	A	×	×	×	
	b8-06	Search operation voltage limiter	0 to 100	1 %	0 %	×	A	A	×	×	×	
Zero-servo	b9-01	Zero-servo gain	0 to 100	1	5	×	×	×	×	A	×	—
	b9-02	Zero-servo completion width	0 to 16383	1	10	×	×	×	×	A	×	
Accel/Decel Time	C1-01	Acceleration time 1	0.0 to 6000.0 *4	0.1 s	10.0s	○	Q	Q	Q	Q	Q	34
	C1-02	Deceleration time 1				○	Q	Q	Q	Q	Q	
	C1-03	Acceleration time 2				○	A	A	A	A	A	
	C1-04	Deceleration time 2				○	A	A	A	A	A	
	C1-05	Acceleration time 3				×	A	A	A	A	A	
	C1-06	Deceleration time 3				×	A	A	A	A	A	
	C1-07	Acceleration time 4				×	A	A	A	A	A	
	C1-08	Deceleration time 4				×	A	A	A	A	A	
	C1-09	Emergency stop time				×	A	A	A	A	A	
	C1-10	Accel/decel time setting unit	0, 1	1	1	×	A	A	A	A	A	
	C1-11	Accel/decel time switching frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	
S-curve Characteristics	C2-01	S-curve characteristic time at acceleration start	0.00 to 2.50	0.01 s	0.20 s	×	A	A	A	A	A	37
	C2-02	S-curve characteristic time at acceleration end	0.00 to 2.50	0.01 s	0.20 s	×	A	A	A	A	A	
	C2-03	S-curve characteristic time at deceleration start	0.00 to 2.50	0.01 s	0.20 s	×	A	A	A	A	A	
	C2-04	S-curve characteristic time at deceleration end	0.00 to 2.50	0.01 s	0.00 s	×	A	A	A	A	A	
Motor Slip Compensation	C3-01	Slip compensation gain	0.0 to 2.5	0.1	0.0 *5	○	A	×	A	A	×	51
	C3-02	Slip compensation primary delay time	0 to 10000	1 ms	200 ms*5	×	A	×	A	×	×	—
	C3-03	Slip compensation limit	0 to 250	1 %	200 %	×	A	×	A	×	×	
	C3-04	Slip compensation during regeneration	0, 1	1	0	×	A	×	A	×	×	
	C3-05	Output voltage control limit selection	0, 1	1	0 *5	×	×	×	A	A	×	
Torque Compensation	C4-01	Torque compensation gain	0.00 to 2.50	0.01	1.00	○	A	A	A	×	×	49
	C4-02	Torque compensation primary delay time constant	0 to 10000	1 ms	20 ms *6	×	A	A	A	×	×	
	C4-03	Forward starting torque	0.0 to 200.0	0.1 %	0.0 %	×	×	×	A	×	×	—
	C4-04	Reverse starting torque	-200.0 to 0	0.1 %	0.0 %	×	×	×	A	×	×	
	C4-05	Starting torque time constant	0 to 200	1 ms	10 ms	×	×	×	A	×	×	
Speed Control (ASR)	C5-01	Speed control (ASR) proportional (P) gain 1	0.00 to 300.00	0.01	20.00 *6	○	×	A	×	A	A	51
	C5-02	ASR integral (I) time 1	0.000 to 10.000	0.001 s	0.500 s*6	○	×	A	×	A	A	
	C5-03	ASR proportional (P) gain 2	0.00 to 300.00	0.01	20.00 *6	○	×	A	×	A	A	
	C5-04	ASR integral (I) time 2	0.000 to 10.000	0.001 s	0.500 s*6	○	×	A	×	A	A	
	C5-05	ASR limit	0.0 to 20.0	0.1 %	5.0 %	×	×	A	×	×	×	
	C5-06	ASR primary delay time	0.000 to 0.500	0.001 s	0.004 s*6	×	×	×	×	A	A	
	C5-07	ASR switching frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	×	×	×	×	A	A	
	C5-08	ASR integral (I) limit	0 to 400	1 %	400 %	×	×	×	×	A	A	
Carrier Frequency	C6-02	Carrier frequency	1 to F *7	1	6 *8	×	Q	Q	Q	Q	Q	43
	C6-03	Carrier frequency upper limit	2.0 to 15.0 *9	0.1 kHz	15.0 kHz*8	×	A	A	A	A	×	—
	C6-04	Carrier frequency lower limit	0.4 to 15.0 *9	0.1 kHz	15.0 kHz*8	×	A	A	×	×	×	
	C6-05	Carrier frequency gain	00 to 99	1	0	×	A	A	×	×	×	
	C6-11	Carrier frequency selection for open-loop vector control 2	1 to 4	1	4*10	×	×	×	×	×	Q	

* 1 The factory setting is 1.0 when using vector control with PG.
* 2 The factory setting is 2.00 s when the inverter capacity is 55kW or more.
* 3 The factory settings depend on the motor capacity.
* 4 The setting ranges depend on the setting of C1-10. If 0 is set in C1-10, the setting range of acceleration/deceleration is 0.00 to 600.00 s.
* 5 The factory setting will change when the control method is changed. (Open loop vector 1 factory settings are given.)
* 6 The factory setting will change when the control method is changed. (Vector with PG factory settings are given.)
* 7 The setting range will change when the control method is changed.
* 8 The factory settings depend on the inverter capacity. (The value for inverter of 200V 0.4kW is given.)
* 9 The setting range depends on the inverter capacity.
*10 The factory settings depend on the inverter capacity.

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Preset Reference	d1-01	Frequency reference 1	0 to 400.00	0.01 Hz	0.00 Hz	○	Q	Q	Q	Q	Q	36
	d1-02	Frequency reference 2				○	Q	Q	Q	Q	Q	
	d1-03	Frequency reference 3				○	Q	Q	Q	Q	Q	
	d1-04	Frequency reference 4				○	Q	Q	Q	Q	Q	
	d1-05	Frequency reference 5				○	A	A	A	A	A	
	d1-06	Frequency reference 6				○	A	A	A	A	A	
	d1-07	Frequency reference 7				○	A	A	A	A	A	
	d1-08	Frequency reference 8				○	A	A	A	A	A	
	d1-09	Frequency reference 9				○	A	A	A	A	A	
	d1-10	Frequency reference 10				○	A	A	A	A	A	
	d1-11	Frequency reference 11				○	A	A	A	A	A	
	d1-12	Frequency reference 12				○	A	A	A	A	A	
	d1-13	Frequency reference 13				○	A	A	A	A	A	
	d1-14	Frequency reference 14				○	A	A	A	A	A	
	d1-15	Frequency reference 15				○	A	A	A	A	A	
	d1-16	Frequency reference 16				○	A	A	A	A	A	
	d1-17	Jog frequency reference	0 to 400.00	0.01 Hz	6.00 Hz	○	Q	Q	Q	Q	Q	
Reference Limit	d2-01	Frequency reference upper limit	0.0 to 110.0	0.1 %	100.0 %	×	A	A	A	A	A	38
	d2-02	Frequency reference lower limit	0.0 to 110.0	0.1 %	0.0 %	×	A	A	A	A	A	
	d2-03	Master speed reference lower limit	0.0 to 110.0	0.1 %	0.0 %	×	A	A	A	A	A	
Jump Frequency	d3-01	Jump frequency 1	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	38
	d3-02	Jump frequency 2		0.1 Hz	0.0 Hz	×	A	A	A	A	A	
	d3-03	Jump frequency 3		0.1 Hz	0.0 Hz	×	A	A	A	A	A	
	d3-04	Jump frequency width	0.0 to 20.0	0.1 Hz	1.0 Hz	×	A	A	A	A	A	
Hold Reference	d4-01	Frequency reference hold function selection	0, 1	1	0	×	A	A	A	A	A	41
	d4-02	＋－ Speed limits	0 to 100	1 %	10 %	×	A	A	A	A	A	
Torque Control	d5-01	Torque control selection	0, 1	1	0	×	×	×	×	A	A	—
	d5-02	Torque reference delay time	0 to 1000	1 ms	0 ms *1	×	×	×	×	A	A	
	d5-03	Speed limit selection	1, 2	1	1	×	×	×	×	A	A	
	d5-04	Speed limit	－120 to ＋120	1 %	0 %	×	×	×	×	A	A	
	d5-05	Speed limit bias	0 to 120	1 %	10 %	×	×	×	×	A	A	
	d5-06	Speed/torque control switching timer	0 to 1000	1 ms	0 ms	×	×	×	×	A	A	
Field-weakening Control	d6-01	Field weakening level	0 to 100	1 %	80 %	×	A	A	×	×	×	—
	d6-02	Field frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	×	×	×	
	d6-03	Field forcing function selection	0, 1	1	0	×	×	×	×	A	A	
	d6-05	A ϕ R time constant	0.01 to 10.00	0.01	1.00	×	×	×	×	×	A	
V/f Pattern	E1-01	Input voltage setting	155 to 255 *2	1 V	200 V *2	×	Q	Q	Q	Q	Q	
	E1-03	V/f pattern selection	0 to F	1	F	×	Q	Q	×	×	×	
	E1-04	Max. output frequency	40.0 to 400.0	0.1 Hz	60.0 Hz	×	Q	Q	Q	Q	Q	
	E1-05	Max. voltage	0.0 to 255.0 *2	0.1 V	200.0 V*2	×	Q	Q	Q	Q	Q	
	E1-06	Base frequency	0.0 to 400.0	0.1 Hz	60.0 Hz	×	Q	Q	Q	Q	Q	
	E1-07	Mid. output frequency	0.0 to 400.0	0.1 Hz	3.0 Hz*3	×	A	A	A	×	×	31
	E1-08	Mid. output frequency voltage	0.0 to 255.0 *2	0.1 V	11.0 V*2*3	×	A	A	A	×	×	33
	E1-09	Min. output frequency	0.0 to 400.0	0.1 Hz	0.5 Hz *3	×	Q	Q	Q	A	Q	34
	E1-10	Min. output frequency voltage	0.0 to 255.0 *2	0.1 V	2.0 V*2*3	×	A	A	A	×	×	
	E1-11	Mid. output frequency 2	0.0 to 400.0	0.1 Hz	0.0 Hz*4	×	A	A	A	A	A	
	E1-12	Mid. output frequency voltage 2	0.0 to 255.0 *2	0.1 V	0.0 V *4	×	A	A	A	A	A	
	E1-13	Base voltage	0.0 to 255.0 *2	0.1 V	0.0 V *5	×	A	A	Q	Q	Q	

＊1 The factory setting will change when the control method is changed. (Vector with PG factory settings are given.)

＊2 Setting for 200 V class inverters. For 400 V class inverters, double the value.

＊3 The factory setting will change when the control method is changed. (Open loop vector 1 factory settings are given.)

＊4 The contents are ignored if the setting is 0.0.

＊5 E1-13 will have the same value as E1-05 after auto-tuning.

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Motor Setup	E2-01	Motor rated current	0.32 to 6.40 *1	0.01 A	1.90 A*2	×	Q	Q	Q	Q	Q	32
	E2-02	Motor rated slip	0.00 to 20.00	0.01 Hz	2.90 Hz*2	×	A	A	A	A	A	
	E2-03	Motor no-load current	0.00 to 1.89 *3	0.01 A	1.20 A*2	×	A	A	A	A	A	
	E2-04	Number of motor poles (number of poles)	2 to 48	2	4 pole	×	×	Q	×	Q	Q	
	E2-05	Motor line-to-line resistance	0.000 to 65.000	0.001 Ω	9.842 Ω*2	×	A	A	A	A	A	
	E2-06	Motor leak inductance	0.0 to 40.0	0.1 %	18.2 %*2	×	×	×	A	A	A	—
	E2-07	Motor iron saturaition coefficient 1	0.00 to 0.50	0.01	0.50	×	×	×	A	A	A	
	E2-08	Motor iron saturaition coefficient 2	0.00 to 0.75	0.01	0.75	×	×	×	A	A	A	
	E2-09	Motor mechanical loss	0.0 to 10.0		0.0	×	×	×	×	A	A	
	E2-10	Motor iron loss for torque compensation	0 to 65535	1 W	14 W *2	×	A	A	×	×	×	
	E2-11	Motor rated current	0.40 to 650.00	0.01 kW	0.4 kW*2	×	Q	Q	Q	Q	Q	
Second Motor V/f Pattern	E3-01	Motor 2 control method selection	0 to 4	1	0	×	A	A	A	A	A	
	E3-02	Motor 2 max. output frequency	40.0 to 400.0	0.1 Hz	60.0 Hz	×	A	A	A	A	A	
	E3-03	Motor 2 max. voltage	0.0 to 255.0 *4	0.1 V	200.0 V *5	×	A	A	A	A	A	
	E3-04	Motor 2 base frequency	0.0 to 400.0	0.1 Hz	60.0 Hz	×	A	A	A	A	A	—
	E3-05	Motor 2 mid. output frequency	0.0 to 400.0	0.1 Hz	3.0 Hz*5	×	A	A	A	F	F	
	E3-06	Motor 2 mid, output frequency voltage	0.0 to 255.0 *4	0.1 V	11.0 V*4*5	×	A	A	A	F	F	
	E3-07	Motor 2 min. output frequency	0.0 to 400.0	0.1 Hz	0.5 Hz*5	×	A	A	A	A	A	
	E3-08	Motor 2 min. output frequency voltage	0.0 to 255.0 *4	0.1 V	2.0 V*4*5	×	A	A	A	F	F	
Second Motor Setup	E4-01	Motor 2 rated current	0.32 to 6.40 *1	0.01 A	1.90 A*2	×	A	A	A	A	A	
	E4-02	Motor 2 rated slip	0.00 to 20.00	0.01 Hz	2.90 Hz*2	×	A	A	A	A	A	
	E4-03	Motor 2 no-load current	0.00 to 1.89 *3	0.01 A	1.20 A*2	×	A	A	A	A	A	
	E4-04	Motor 2 number of poles	2 to 48	2	4 poles	×	×	A	×	A	A	—
	E4-05	Motor 2 line-to-line resistance	0.000 to 65.000	0.001 Ω	9.842 Ω*2	×	A	A	A	A	A	
	E4-06	Motor 2 leak inductance	0.0 to 40.0	0.1 %	18.2 %*2	×	×	×	A	A	A	
	E4-07	Motor 2 rated capacity	0.40 to 650.00	0.01 kW	0.40 kW*2	×	A	A	A	A	A	
PG Speed Control Card	F1-01	PG constant	0 to 60000	1	600	×	×	Q	×	Q	×	
	F1-02	Operation selection at PG open circuit (PGO)	0 to 3	1	1	×	×	A	×	A	×	
	F1-03	Operation selection at overspeed	0 to 3	1	1	×	×	A	×	A	A	
	F1-04	Operation selection at deviation	0 to 3	1	3	×	×	A	×	A	A	
	F1-05	PG rotation	0, 1	1	0	×	×	A	×	A	×	
	F1-06	PG division rate (PG pulse monitor)	1 to 132	1	1	×	×	A	×	A	×	
	F1-07	Integral value during accel/decel enable/disable	0, 1	1	0	×	×	A	×	×	×	—
	F1-08	Overspeed detection level	0 to 120	1 %	115 %	×	×	A	×	A	A	
	F1-09	Overspeed detection delay time	0.0 to 2.0	0.1 s	1.0 s	×	×	A	×	A	A	
	F1-10	Excessive speed deviation detection level	0 to 50	1 %	10%	×	×	A	×	A	A	
	F1-11	Excessive speed deviation detection delay time	0.0 to 10.0	0.1 s	0.5 s	×	×	A	×	A	A	
	F1-12	Number of PG gear teeth 1	0 to 1000	1	0	×	×	A	×	×	×	
	F1-13	Number of PG gear teeth 2		1	0	×	×	A	×	×	×	
	F1-14	PG open-circuit detection time	0.0 to 10.0	0.1 s	2.0 s	×	×	A	×	A	×	
Analog Reference Card	F2-01	Operation selection of analog reference card	0, 1	1	0	×	A	A	A	A	A	—
Digital Reference Card	F3-01	Input selection of digital reference card	0 to 7	1	0	×	A	A	A	A	A	—
Analog Monitor Card	F4-01	Channel 1 monitor selection	1 to 46	1	2	×	A	A	A	A	A	
	F4-02	Channel 1 gain	0.00 to 2.50	0.01	1.00	○	A	A	A	A	A	
	F4-03	Channel 2 monitor selection	1 to 46	1	3	×	A	A	A	A	A	
	F4-04	Channel 2 gain	0.00 to 2.50	0.01	0.5	○	A	A	A	A	A	—
	F4-05	Channel 1 output monitor bias	−10.0 to 10.0	0.1	0.0	○	A	A	A	A	A	
	F4-06	Channel 2 output monitor bias	−10.0 to 10.0	0.1	0.0	○	A	A	A	A	A	
	F4-07	Analog output signal level for channel 1	0, 1	1	0	×	A	A	A	A	A	
	F4-08	Analog output signal level for channel 2	0, 1	1	0	×	A	A	A	A	A	

＊1 The setting range is 10 % to 200 % of the inverter rated output. (The value for inverter of 200V 0.4 kW is given.)
＊2 The factory settings depend on the inverter capacity. (The value for inverter of 200V 0.4kW is given.)
＊3 Setting range depends on inverter capacity.(The value for inverter of 200V 0.4kW is given.)
＊4 Setting for 200 V class inverters. For 400 V class inverters, double the value.
＊5 The factory setting will change when the control method is changed. (Open loop vector 1 factory settings are given.)

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Digital Output Card	F5-01	Channel 1 output selection	0 to 37	1	0	×	A	A	A	A	A	—
	F5-02	Channel 2 output selection	0 to 37	1	1	×	A	A	A	A	A	
	F5-03	Channel 3 output selection	0 to 37	1	2	×	A	A	A	A	A	
	F5-04	Channel 4 output selection	0 to 37	1	4	×	A	A	A	A	A	
	F5-05	Channel 5 output selection	0 to 37	1	6	×	A	A	A	A	A	
	F5-06	Channel 6 output selection	0 to 37	1	37	×	A	A	A	A	A	
	F5-07	Channel 7 output selection	0 to 37	1	0F	×	A	A	A	A	A	
	F5-08	Channel 8 output selection	0 to 37	1	0F	×	A	A	A	A	A	
	F5-09	DO-08 output mode selection	0 to 2	1	0	×	A	A	A	A	A	
Communications Option Card	F6-01	Stopping method after communications error	0 to 3	1	1	×	A	A	A	A	A	—
	F6-02	Input level of external error from Communications Option Card	0, 1	1	0	×	A	A	A	A	A	
	F6-03	Stopping method for external error from Communications Option Card	0 to 3	1	1	×	A	A	A	A	A	
	F6-04	Trace sampling from Communications Option Card	0 to 60000	1	0	×	A	A	A	A	A	
	F6-05	Torque reference/torque limit selection from communications option card	0, 1	1	1	×	×	×	×	A	A	
	F6-06	Torque reference/torque limit selection from communications option card	0, 1	1	1	×	×	×	×	A	A	
Multi-function Digital Inputs	H1-01	Multi-function input (terminal S3)	0 to 78	1	24	×	A	A	A	A	A	36 47 48
	H1-02	Multi-function input (terminal S4)	0 to 78	1	14	×	A	A	A	A	A	
	H1-03	Multi-function input (terminal S5)	0 to 78	1	3(0) *	×	A	A	A	A	A	
	H1-04	Multi-function input (terminal S6)	0 to 78	1	4(3) *	×	A	A	A	A	A	
	H1-05	Multi-function input (terminal S7)	0 to 78	1	6(4) *	×	A	A	A	A	A	
	H1-06	Multi-function input (terminal S8)	0 to 78	1	8(6) *	×	A	A	A	A	A	
	H1-07	Multi-function input (terminal S9)	0 to 78	1	5	×	A	A	A	A	A	
	H1-08	Multi-function input (terminal S10)	0 to 78	1	32	×	A	A	A	A	A	
	H1-09	Multi-function input (terminal S11)	0 to 78	1	7	×	A	A	A	A	A	
	H1-10	Multi-function input (terminal S12)	0 to 78	1	15	×	A	A	A	A	A	
Multi-function Digital Outputs	H2-01	Terminal M1-M2 function selection (contact)	0 to 37	1	0	×	A	A	A	A	A	48
	H2-02	Terminal P1 function selection (open collector)	0 to 37	1	1	×	A	A	A	A	A	
	H2-03	Terminal P2 function selection (open collector)	0 to 37	1	2	×	A	A	A	A	A	
	H2-04	Terminal P3 function selection (open collector)	0 to 37	1	6	×	A	A	A	A	A	
	H2-05	Terminal P4 function selection (open collector)	0 to 37	1	5	×	A	A	A	A	A	
Multi-function Analog Inputs	H3-01	Terminal A1 signal level selection	0, 1	1	0	×	A	A	A	A	A	39
	H3-02	Gain (terminal A1)	0.0 to 1000.0	0.1 %	100.0 %	○	A	A	A	A	A	
	H3-03	Bias (terminal A1)	−100.0 to +100.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H3-04	Terminal A3 signal level selection	0, 1	1	0	×	A	A	A	A	A	
	H3-05	Terminal A3 function selection	0 to 1F	1	0	×	A	A	A	A	A	
	H3-06	Terminal A3 input gain	0.0 to 1000.0	0.1 %	100.0 %	○	A	A	A	A	A	
	H3-07	Terminal A3 input bias	−100.0 to +100.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H3-08	Terminal A2 signal level selection	0 to 2	1	2	×	A	A	A	A	A	
	H3-09	Terminal A2 function selection	0 to 1F	1	0	×	A	A	A	A	A	
	H3-10	Gain (terminal A2)	0.0 to 1000.0	0.1 %	100.0 %	○	A	A	A	A	A	
	H3-11	Bias (terminal A2)	−100.0 to +100.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H3-12	Analog input filter time constant	0.00 to 2.00	0.01 s	0.00 s	×	A	A	A	A	A	
Multi-function Analog Outputs	H4-01	Analog monitor selection (terminal FM)	1 to 46	1	2	×	A	A	A	A	A	44
	H4-02	Analog monitor gain (terminal FM)	0.00 to 2.50	0.01	1.00	○	Q	Q	Q	Q	Q	
	H4-03	Analog monitor bias (terminal FM)	−10.0 to +10.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H4-04	Analog monitor selection (terminal AM)	1 to 46	1	3	×	A	A	A	A	A	
	H4-05	Analog monitor gain (terminal AM)	0.00 to 2.50	0.01	0.50	○	Q	Q	Q	Q	Q	
	H4-06	Analog monitor bias (terminal AM)	−10.0 to +10.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H4-07	Analog output 1 signal level selection	0, 1	1	0	×	A	A	A	A	A	
	H4-08	Analog output 2 signal level selection	0, 1	1	0	×	A	A	A	A	A	

* Factory settings in the parentheses are for 3-wire sequence.

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
MEMOBUS Communi-cation	H5-01	Station address	0 to 20 *1	1	1F	×	A	A	A	A	A	54
	H5-02	Transmission speed selection	0 to 4	1	3	×	A	A	A	A	A	
	H5-03	Transmission parity selection	0 to 2	1	0	×	A	A	A	A	A	
	H5-04	Stopping method after transmission error	0 to 3	1	3	×	A	A	A	A	A	
	H5-05	Transmission error detection selection	0, 1	1	1	×	A	A	A	A	A	
	H5-06	Send wait time	5 to 65	1 ms	5 ms	×	A	A	A	A	A	
	H5-07	RTS control ON/OFF	0, 1	1	1	×	A	A	A	A	A	
Pulse I/O	H6-01	Pulse train input function selection	0 to 2	1	0	×	A	A	A	A	A	38
	H6-02	Pulse train input scaling	1000 to 32000	1 Hz	1440 Hz	○	A	A	A	A	A	
	H6-03	Pulse train input gain	0.0 to 1000.0	0.1 %	100.0 %	○	A	A	A	A	A	—
	H6-04	Pulse train input bias	−100.0 to +100.0	0.1 %	0.0 %	○	A	A	A	A	A	
	H6-05	Pulse train input filter time	0.00 to 2.00	0.01 s	0.10 s	○	A	A	A	A	A	
	H6-06	Pulse train monitor selection	1, 2, 5, 20, 24, 31, 36 only	1	2	○	A	A	A	A	A	45
	H6-07	Pulse train monitor scaling	0 to 32000	1 Hz	1440 Hz	○	A	A	A	A	A	
Motor Protection	L1-01	Motor protection selection	0 to 3	1	1	×	Q	Q	Q	Q	Q	49
	L1-02	Motor protection time constant	0.1 to 5.0	0.1 min	1.0 min	×	A	A	A	A	A	
	L1-03	Alarm operation selection during motor overheating	0 to 3	1	3	×	A	A	A	A	A	—
	L1-04	Motor overheating operation selection	0 to 2	1	1	×	A	A	A	A	A	
	L1-05	Motor temperature input filter time constant	0.00 to 10.00	0.01 s	0.20 s	×	A	A	A	A	A	
Momemtary Power Loss Ridethrough	L2-01	Momentary power loss detection	0 to 2	1	0	×	A	A	A	A	A	40
	L2-02	Momentary power loss ridethru time	0 to 2.0	0.1 s	0.1 s *2	×	A	A	A	A	A	
	L2-03	Min. baseblock (BB) time	0.1 to 5.0	0.1 s	0.5 s *2	×	A	A	A	A	A	—
	L2-04	Voltage recovery time	0.0 to 5.0	0.1 s	0.3 s	×	A	A	A	A	A	
	L2-05	Undervoltage (UV) detection level	150 to 210 *3	1 V	190 V *3	×	A	A	A	A	A	
	L2-06	KEB deceleration time	0.0 to 200.0	0.1 s	0.0 s	×	A	A	A	A	A	
	L2-07	Recovery time after momentary power loss	0.0 to 25.5	0.1 s	0 s *4	×	A	A	A	A	A	
	L2-08	Frequency reduction gain at KEB start	0 to 300	1	100	×	A	A	A	A	A	
Stall Prevention	L3-01	Stall prevention selection during accel	0 to 2	1	1	×	A	A	A	×	×	50
	L3-02	Stall prevention level during accel	0 to 200	1 %	150 %	×	A	A	A	×	×	
	L3-03	Stall prevention limit during accel	0 to 100	1 %	50 %	×	A	A	A	×	×	
	L3-04	Stall prevention selection during decel	0 to 3	1	1	×	Q	Q	Q	Q	Q	
	L3-05	Stall prevention selection during run	0 to 2	1	1	×	A	A	×	×	×	
	L3-06	Stall prevention level during run	30 to 200	1 %	160 %	×	A	A	×	×	×	
Frequency Detection	L4-01	Frequency detection level	0.0 to 400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	43
	L4-02	Frequency detection width	0.0 to 20.0	0.1 Hz	2.0 Hz	×	A	A	A	A	A	
	L4-03	Frequency detection level (+/−)	−400.0 to +400.0	0.1 Hz	0.0 Hz	×	A	A	A	A	A	
	L4-04	Frequency detection width (+/−)	0.0 to 20.0	0.1 Hz	2.0 Hz	×	A	A	A	A	A	
	L4-05	Operation when frequency reference is missing	0, 1	1	0	×	A	A	A	A	A	40
Fault Retry	L5-01	Number of auto restart attempts	0 to 10	1	0	×	A	A	A	A	A	41
	L5-02	Auto restart operation selection	0, 1	1	0	×	A	A	A	A	A	
Overtorque Detection	L6-01	Torque detection selection 1	0 to 8	1	0	×	A	A	A	A	A	42
	L6-02	Torque detection level 1	0 to 300	1 %	150 %	×	A	A	A	A	A	
	L6-03	Torque detection time 1	0.0 to 10.0	0.1 s	0.1 s	×	A	A	A	A	A	
	L6-04	Torque detection selection 2	0 to 8	1	0	×	A	A	A	A	A	
	L6-05	Torque detection level 2	0 to 300	1 %	150 %	×	A	A	A	A	A	
	L6-06	Torque detection time 2	0.0 to 10.0	0.1 s	0.1 s	×	A	A	A	A	A	

* 1 If the set value is 0, inverter will not respond to MEMOBUS communication.
* 2 The factory settings depend on the inverter capacity. (The value for inverter of 200V 0.4kW is given.)
* 3 Setting for 200 V class inverters. For 400 V class inverters, double the value.
* 4 If the set value is 0, acceleration will be to the speeds for acceleration times (C1-01 to C1-08).

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Torque Limit	L7-01	Forward torque limit	0 to 300	1 %	200 %	×	×	×	A	A	A	49
	L7-02	Reverse torque limit	0 to 300	1 %	200 %	×	×	×	A	A	A	
	L7-03	Forward regenerative torque limit	0 to 300	1 %	200 %	×	×	×	A	A	A	
	L7-04	Reverse regenerative torque limit	0 to 300	1 %	200 %	×	×	×	A	A	A	
Hardawre Protection	L8-01	Protect selection for internal DB resistor (Type ERF)	0, 1	1	0	×	A	A	A	A	A	—
	L8-02	Overheat pre-alarm level	50 to 130	1 ℃	95 ℃ *	×	A	A	A	A	A	
	L8-03	Operation selection after overheat pre-alarm	0 to 3	1	3	×	A	A	A	A	A	
	L8-05	Input open-phase protection selection	0, 1	1	0	×	A	A	A	A	A	
	L8-07	Output open-phase protection selection	0, 1	1	0	×	A	A	A	A	A	
	L8-09	Ground protection selection	0, 1	1	1	×	A	A	A	A	A	
	L8-10	Cooling fan control selection	0, 1	1	0	×	A	A	A	A	A	
	L8-11	Cooling fan control delay time	0 to 300	1 s	60 s	×	A	A	A	A	A	
	L8-12	Ambient temperature	45 to 60 ℃	1 ℃	45 ℃	×	A	A	A	A	A	
	L8-15	OL2 characteristics selection at low speeds	0, 1	1	1	×	A	A	A	A	A	
	L8-18	Software CLA selection	0, 1	1	1	×	A	A	A	A	A	
Hunting Prevention	N1-01	Hunting-prevention function selection	0, 1	1	1	×	A	A	×	×	×	—
	N1-02	Hunting-prevention gain	0.00 to 2.50	0.01	1.00	×	A	A	×	×	×	
AFR	N2-01	Speed feedback detection control (AFR) gain	0.00 to 10.00	0.01	1.00	×	×	×	A	×	×	—
	N2-02	Speed feedback detection control (AFR) time constant	0 to 2000	1 ms	50 ms	×	×	×	A	×	×	
	N2-03	Speed feedback detection control (AFR) time constant 2	0 to 2000	1 ms	750 ms	×	×	×	A	×	×	
High Slip Braking	N3-01	High-slip braking deceleration frequency width	1 to 20	1 %	5 %	×	A	A	×	×	×	—
	N3-02	High-slip braking current limit	100 to 200	1 %	150 %	×	A	A	×	×	×	
	N3-03	High-slip braking stop dwell time	0.0 to 10.0	1.0 s	1.0 s	×	A	A	×	×	×	
	N3-04	High-slip braking OL time	30 to 1200	1 s	40 s	×	A	A	×	×	×	
Speed Estimation	N4-07	Integral time of speed estimator	0.000 to 9.999	0.001 ms	0.100 ms	×	×	×	×	×	A	—
	N4-08	Proportional gain of speed estimator	0 to 100	1	15	×	×	×	×	×	A	
	N4-17	Torque adjustment gain	0.0 to 5.0	0.1	0.8	×	×	×	×	×	A	
	N4-18	Feeder resistance adjustment gain	0.90 to 1.30	0.01	1.00	×	×	×	×	×	A	
Feed Forward	N5-01	Feed forward control selection	0.1	1	0	×	×	×	×	A	A	—
	N5-02	Motor acceleration time	0.000 to 10.000	0.001 s	0.178 s *	×	×	×	×	A	A	
	N5-03	Load inertia proportion	0.0 to 100.0	0.1	0.0	×	×	×	×	A	A	
Display Setting/ Selection	o1-01	Monitor selection	4 to 33	1	6	○	A	A	A	A	A	—
	o1-02	Monitor selection after power ON	1 to 4	1	1	○	A	A	A	A	A	
	o1-03	Frequency units of reference setting and monitor	0 to 39999	1	0	×	A	A	A	A	A	35
	o1-04	Setting unit for frequency constants related to V/f characteristics	0.1	1	0	×	×	×	×	A	A	
	o1-05	LCD brightness adjustment	0 to 5	1	3	○	A	A	A	A	A	—
Multi-function Selection	o2-01	LOCAL/REMOTE key selection	0, 1	1	1	×	A	A	A	A	A	35
	o2-02	STOP key selection	0, 1	1	1	×	A	A	A	A	A	—
	o2-03	User constant initial value	0 to 2	1	0	×	A	A	A	A	A	
	o2-04	kVA selection	0 to FF	1	0 *	×	A	A	A	A	A	
	o2-05	Frequency reference setting method selection	0, 1	1	0	×	A	A	A	A	A	
	o2-06	Operation selection when digital operator is disconnected	0, 1	1	0	×	A	A	A	A	A	
	o2-07	Cumulative operation time setting	0 to 65535	1 hour	0 hour	×	A	A	A	A	A	
	o2-08	Cumulative operation time selection	0, 1	1	0	×	A	A	A	A	A	
	o2-10	Fan operation time setting	0 to 65535	1 hour	0 hour	×	A	A	A	A	A	
	o2-12	Fault trace/fault history clear function	0.1	1	0	×	A	A	A	A	A	

* The factory settings depend on the inverter capacity. (The value for inverter of 200V 0.4kW is given.)

Function	No.	Name (Display)	Setting Range	Minimum Setting Unit	Factory Setting	Online Changing	Control Mode					Ref. Page
							V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2	
Copy Function	o3-01	Copy function selection	0 to 3	1	0	×	A	A	A	A	A	55
	o3-02	Read permitted selection	0, 1	1	0	×	A	A	A	A	A	
Motor Auto-tuning	T1-00	Motor 1/2 selection*1	1, 2	1	1	×	A	A	A	A	A	—
	T1-01	Auto-tuning mode selection	0 to 2	1	0*2	×	A	A	A	A	A	
	T1-02	Motor rated output	10 to 200 % of inverter rated output*5	0.1 kW	Same as inverter rated output	×	A	A	A	A	A	
	T1-03	Motor rated voltage*3*4	0 to 255.5 V*7	0.1 V	200.0 V*7	×	×	×	A	A	A	
	T1-04	Motor rated current*3	10 to 200 % of inverter rated current*5	0.01 A	Value of general motor whose output is same as inverter	×	A	A	A	A	A	
	T1-05	Motor rated frequency*3*4	0 to 400.00*6	0.01 Hz	60.00 Hz	×	×	×	A	A	A	
	T1-06	Number of motor poles	2 to 48	1	4	×	×	×	A	A	A	
	T1-07	Motor rated speed*3	0 to 24000*6	1 min^{-1}	1750 min^{-1}	×	×	×	A	A	A	
	T1-08	Number of PG pulses when tuning	0 to 60000	1	600	×	×	○	×	○	×	

* 1 Not displayed normally. Displayed only when motor switch command is set to the multi-function digital input (either H1-01 to H1-05 is set to 16).
* 2 Only 2 (line resistor auto-tuning) is available for V/f with or without PG control.
* 3 When using constant output motors, set the base speed value.
* 4 Do not fail to verify the rated frequency by the name plate or test report when using inverter motors or vector motors. If possible, set the no-load voltage T1-03 and no-load frequency to T1-05 to secure the control accuracy.
* 5 The setting range for stable vector control is 50 to 100%.
* 6 Setting range depends on inverter capacity.(The value for inverter of 200V 0.4kW is given.)
* 7 Setting for 200 V class inverters. For 400 V class inverters, double the value.

Constant Descriptions

The Varispeed G7 provides various functions to upgrade machine functions and performances.
Refer to each sample.

Objective	Function Settings	Used Constants	Ref. Page
1. Items to be Confirmed before Operation	Set Environment of Inverter	A1-00, A1-01	31
	Initialize Constants	A1-03, o2-03	
	Set, Reset Password	A1-04, A1-05	
	Select Control Method	A1-02	
	Set Input Voltage	E1-01	
	Set Motor Rated Current	E2-01	32
	Set V/f (Fixed V/f Pattern)	E1-03	33
	Set V/f (Optional V/f Pattern)	E1-04～13	34
	Set Accel/Decel Time	C1-01～08	
	Select Operation Method	b1-01, b1-02	35
	Select Operator Key Functions	o2-01, o2-02	
	Set Frequency Reference/Monitor Setting Unit Freely	o1-03	
2. Set Operation Conditions	Limit the Direction of Rotation	b1-04	36
	Run at Low Speed	d1-17, H1-01～10	
	Multi-Step Speed Selection	A1-01, b1-01, b1-02, d1-01～17	
	Use Four Types of Accel/Decel Time	C1-01～08, C1-10, H1-01～10	37
	Soft Start	C2-01～04	
	Limit the Speed	d2-01～03	38
	Operation to Avoid Resonance	d3-01～04	
	Frequency Reference by Pulse Train Input	b1-01, H6-01, H6-02	
	Adjust the Speed Setting Signal	H3-02, H3-03, H3-08～11	39
	Automatic Restart after Momentary Power Loss	L2-01, L2-02	40
	Continue Operation at Constant Speed when Frequency Reference Missing	L4-05	
	Operate Coasting Motor without Trip	b2-01～03, H1-01～10	
	Continue Operation by Automatic Fault Reset	L5-01, L5-02	41
	Temporary Hold of Accel/Decel	H1-01～10, d4-01	
	Torque Detection	L6-01～06	42
	Frequency Detection	H2-01～03, L4-01～04	43
	Reduce Motor Noise or Leakage Current	C6-02	
	Use Frequency Meter or Ammeter	H4-01, H4-04, H4-07, H4-08	44
	Calibrate Indications of Frequency Meter or Ammeter	H4-02, H4-03, H4-05, H4-06	
	Use Pulse Monitor	H6-06, H6-07	45
3. Select Stopping Method	Select Stopping Method	b1-03	46
4. Build Interface Circuits with External Devices	Use Input Signals	H1-01～10	47
	Use Output Signals	H2-01～05	48
5. Adjust Motor Torque	Compensate for Torque at Start/Low-speed Operation	C4-01	49
	Limit Motor Torque	L7-01～04	
	Prevent Motor from Stalling	L3-01～06	50
6. Reduce Motor Speed Fluctuation	Control Motor Slip	C3-01, C5-01～04	51
7. Motor Protection	Motor Overload Detection	E2-01, L1-01, L1-02	52
8. PID Control	—	b1-01, b5-01～10, H3-08	53
9. Control by MEMOBUS Communication	—	b1-01, b1-02, H5-01～07, U1-39	54
10. Energy-saving Control	Use Energy-saving Mode	b8-01, b8-04	55
11. Use Constant Copy Function	Copy or Compare Constants	o3-01, o3-02	

1. Items to be Confirmed before Operation

Set Environment of Inverter

Language selection for digital operator display A1-00
Constant access level A1-01

The factory settings are: A1-00 = 1 and A1-01 = 2. Change the settings according to your application.

(1) Digital operator language display
A1-00 = 0 : English, 1 : Japanese, 2 : German, 3 : French, 4 : Italian, 5 : Spanish, 6 : Portuguese

(2) Constant access level
This inverter classifies the constants reference level according to the significance, as follows.
0 : For monitoring only (Possible to read in drive mode, set/read A1-01 and A1-04)
1 : User selected constants only (Possible to set/read only the constants that are set to A2-01 to 32)
2 : ADVANCED (Possible to set/read the constants that can be changed in the advanced program mode and quick program mode)

To switch to the quick program mode, press the MENU key and then press the DATA ENTER key while the QUICK is blinking.

Select Control Method

Control method selection A1-02

This inverter selects the control methods according to the machines applied. V/f control is suitable for the fluid machines such as fans, blowers or pumps while open loop vector control is suitable for machines that require high torque at low speed such as feeding machines.
The factory setting is: A1-02 = 2 (Open loop vector control 1).
0 : V/f control without PG
1 : V/f control with PG (Either of the following PG control cards is required.)
2 : Open loop vector control 1
3 : Vector control with PG
4 : Open loop vector control 2
[Specifications of PG control cards]
PG-A2 : For single-pulse open collector type PG
PG-B2 : For 2-phase (A, B) type, complementary type PG
PG-D2 : For single pulse, RS-422 (line driver) PG
PG-X2 : For 2-phase (A, B) type or RS-422 (line driver) PG with origin point (A, B, Z)

Initialize Constants

Initialize A1-03
User constant initial value o2-03

Initializing indicates that the set value is returned to the factory setting. When replacing the control board, or when returning the constants to the initial setting for test operation, set A1-03 to the following value to initialize the constant.
・Initialize to user-defined constants using o2-03 : 1110
・Initialize to factory-set constants (2-wire sequence) : 2220
・Initialize to factory-set constants (3-wire sequence) : 3330

Constant o2-03 stores or clears the initial value used for the user constant initialization. By using this constant, the user-set constants can be stored in the inverter as the user initial values.

Setting Value	Description
0	Memory held/not set
1	Starts memory. (Stores the constants that have been set when o2-03 was set to 1, as user-set initial values.)
2	Clears memory. (Clears stored user-set initial values.)

Set, Reset Password

Password A1-04
Password setting A1-05

When a password is set to A1-05, any constants of A1-01 to 03 and A2-01 to 32 cannot be read or changed unless the set values of A1-04 and A1-05 coincide with each other. By using the password function and the constant access level 0 [Monitoring Only] together, you can prohibit setting and reading of all the constants except A1-00 so that your know-how can be secured.

A1-05 is not displayed by normal operation.
Pressing the RESET key and MENU key simultaneously displays A1-04.

Set Input Voltage

Input voltage setting E1-01

Set the inverter input voltage value.
This value will be the reference value for the protective functions.

200 V class : setting range 155 to 255 V (initial value: 200 V)
400 V class : setting range 310 to 510 V (initial value: 400 V)

Set Motor Rated Current

Motor rated current E2-01

Set the rated current value on the motor nameplate.
This value will be the reference value for the motor protection by electronic thermal overload relay or torque limit.
The following tables show the standard set values of each motor output.
If the rated current value of the applicable motor differs from the value in the following table, change the set value.

Note: If the motor rated current value is larger than the inverter rated output current, change the inverter so that the inverter rated output current will exceed the motor rated current.

200 V Class

Inverter Model CIMR-G7A□	20P4	20P7	21P5	22P2	23P7	25P5	27P5	2011	2015
Maximum Applicable Motor Output kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Inverter Rated Output Current A	3.2	6.0	8.0	12.0	18.0	27.0	34.0	49.0	66.0
Motor Current A (Factory Setting)	1.9	3.3	6.2	8.5	14.0	19.6	26.6	39.7	53.0

Inverter Model CIMR-G7A□	2018	2022	2030	2037	2045	2055	2075	2090	2110
Maximum Applicable Motor Output kW	18.5	22	30	37	45	55	75	90	110
Inverter Rated Output Current A	80.0	96.0	130.0	160.0	183.0	224.0	300.0	358.0	415.0
Motor Current A (Factory Setting)	65.8	77.2	105.0	131.0	160.0	190.0	260.0		

400 V Class

Inverter Model CIMR-G7A□	40P4	40P7	41P5	42P2	43P7	45P5	47P5	4011	4015	4018	4022	4030
Maximum Applicable Motor Output kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30
Inverter Rated Output Current A	1.8	3.4	4.8	6.2	9.0	15.0	21.0	27.0	34.0	42.0	52.0	65.0
Motor Current A (Factory Setting)	1.0	1.6	3.1	4.2	7.0	9.8	13.3	19.9	26.5	32.9	38.6	52.3

Inverter Model CIMR-G7A□	4037	4045	4055	4075	4090	4110	4132	4160	4185	4220	4300
Maximum Applicable Motor Output kW	37	45	55	75	90	110	132	160	185	220	300
Inverter Rated Output Current A	80.0	97.0	128.0	165.0	195.0	240.0	255.0	302.0	370.0	450.0	605.0
Motor Current A (Factory Setting)	65.6	79.7	95.0	130.0	156.0	190.0	223.0	270.0	310.0	370.0	500.0

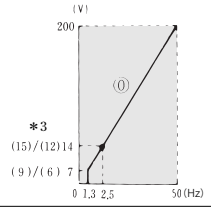
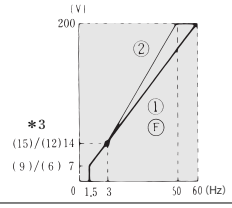
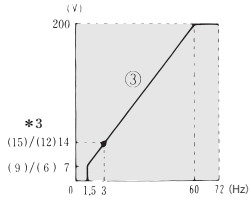
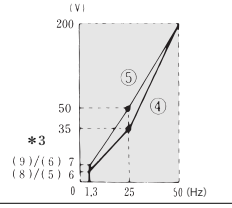
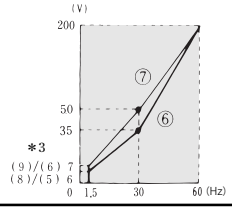
Set V/f (Fixed V/f Pattern)

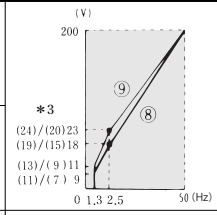
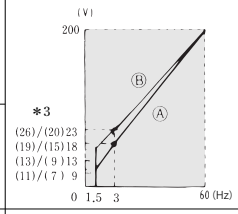
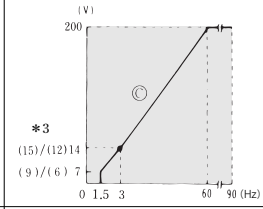
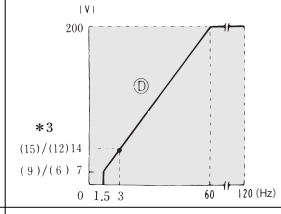
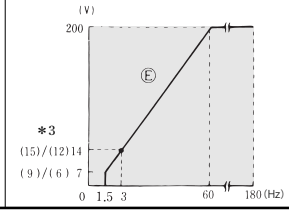
V/f pattern selection E1-03

Set the V/f pattern by E1-03.
The fixed V/f pattern in the following table can be selected by setting data 0 to E of E1-03.
The data of E1-03 can be set at F to change the data to optional V/f pattern.
＊Factory setting: E1-03 = F

Fixed V/f Pattern (200 V class 2.2 to 45 kW V/f pattern)

(The voltage doubles for 400 V class.)

Application	Specification		E1-03	V/f Pattern＊1
Constant Torque Characteristics (general-purpose)	50 Hz		⓪	
	60 Hz	60 Hz saturation	① Ⓕ	
		50 Hz saturation	②	
	72 Hz		③	
Variable Torque Characteristics (wind/water force machines)	50 Hz	Variable torque 3	④	
		Variable torque 2	⑤	
	60 Hz	Variable torque 3	⑥	
		Variable torque 2	⑦	

Application	Specification		E1-03	V/f Pattern＊1
High Starting Torque＊2	50 Hz	Medium starting torque	⑧	
		High starting torque	⑨	
	60 Hz	Medium starting torque	Ⓐ	
		High starting torque	Ⓑ	
Constant Output Operation (machine tools)	90 Hz		Ⓒ	
	120 Hz		Ⓓ	
	180 Hz		Ⓔ	

＊1 Consider the following items as the conditions for selecting a V/f pattern. They must be suitable for:
(1) The motor voltage and frequency characteristics.
(2) The maximum motor speed.

＊2 Select high starting torque only in the following conditions. Normally, this selection is not required since sufficient starting torque is secured by full-automatic torque boost function.
(1) The wiring distance is long (approx. 150 m or more).
(2) The voltage drop at startup is large.
(3) AC reactor is inserted in the input or output of the inverter.
(4) A motor smaller than the nominal output of the inverter is used.

＊3 The V/f characteristics (A)/(B) value is A: 1.5 kW or less, B: 55 kW or more.

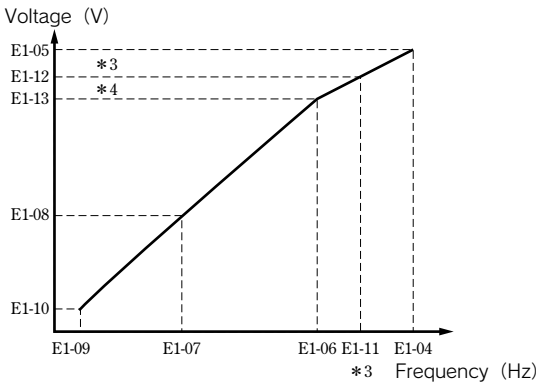
Set V/f (Optional V/f Pattern)

Max. output frequency	E1-04
Max. voltage	E1-05
Max. voltage output frequency	E1-06
Mid. output frequency	E1-07
Mid. output frequency voltage	E1-08
Min. output frequency	E1-09
Min. output frequency voltage	E1-10
Mid. output frequency 2	E1-11
Mid. output frequency voltage 2	E1-12
Base voltage	E1-13

Set the following when using special motor (high-speed motor, etc.), or when the torque of the machine is especially required. The motor torque increases by increasing the V/f pattern voltage, but, too high voltage can cause the following failure.

- Excessive current flows into the motor to cause failure of the inverter.
- The motor heats and vibrates excessively.

Increase the voltage gradually, while checking the motor current.



Set E1-04 to 11 so that E1-04≧E1-11≧E1-06≧E1-07≧E1-09. To make the line of the V/f characteristics straight, set E1-07 and E1-09 to the same value. At this time, the set value of E1-08 is disregarded.

E1-11, 12 and 13 must be set only at V/f minute adjustment in the constant output area. Normally, they do not have to be set.

Constant No.	Name	Unit	Setting Range	Factory Setting
E1-04	Max. output frequency	0.1 Hz	40.0-400.0 Hz	60.0 Hz
E1-05	Max. voltage	0.1 V	0.0-255.0 V*1	200.0 V*1
E1-06	Max. voltage output frequency	0.1 Hz	0.0-400.0 Hz	60.0 Hz
E1-07	Mid. output frequency	0.1 Hz	0.0-400.0 Hz	3.0 Hz*2
E1-08	Mid. output frequency voltage	0.1 V	0.0-255.0 V*1	15.0 V*1*2
E1-09	Min. output frequency	0.1 Hz	0.0-400.0 Hz	1.5 Hz*2
E1-10	Min. output frequency voltage	0.1 V	0.0-255.0 V*1	9.0 V*1*2
E1-11	Mid. output frequency 2*3	0.1 Hz	0.0-400.0 Hz	0.0 Hz*3
E1-12	Mid. output frequency voltage 2*3	0.1 V	0.0-255.0 V*1	0.0 V*3
E1-13	Base voltage*4	0.1 V	0.0-255.0 V*1	0.0 V*4

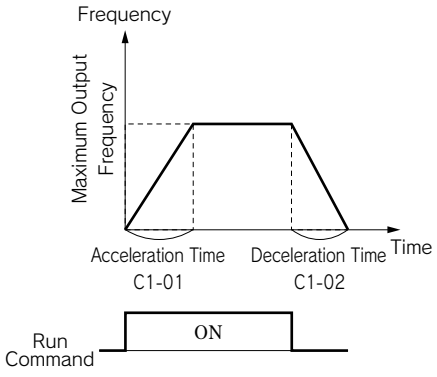
*1 The value doubles for 400 V class.
*2 The factory setting differs according to the control method. The setting of this table is for V/f control without PG.
*3 When "0.0" is set, the setting in E1-11, -12 is disregarded.
*4 When "0.0" is set, E1-13 = E1-05.

Set Accel/Decel Time

Acceleration time 1, 2, 3, 4
C1-01, C1-03, C1-05, C1-07
Deceleration time 1, 2, 3, 4
C1-02, C1-04, C1-06, C1-08

Set the time from when the motor stops to when the motor accelerates up to the maximum output frequency (E1-04), and the time from when the motor runs at the maximum output frequency to when it stops (or deceleration time).

* Factory setting: Acceleration time C1-01 = 10.0 s
Deceleration time C1-02 = 10.0 s



Select Operation Method

Master frequency reference selection b1-01
Operation method selection b1-02

Select whether operation is to be performed by the digital operator, by the control circuit terminal or by communications, using master frequency reference b1-01 and operation method b1-02.
Factory setting is: b1-01 = 1, b1-02 = 1.

Set Value	Master Frequency Reference b1-01
0	Digital operator
1	Control circuit terminal (analog input)
2	MEMOBUS communications
3	Option card
4	Pulse train input

Set Value	Operation Method b1-02
0	Digital operator
1	Control circuit terminal (sequence input)
2	MEMOBUS communications
3	Option card

(1) By setting b1-01 to 0, frequency reference can be input from the digital operator.

(2) By setting b1-01 to 1, frequency reference can be input from control circuit terminal A1 (voltage input) or control circuit terminal A2 (voltage/current input).

Note: To input a current signal (4 to 20 mA) to terminal A2, turn ON "2" of dip switch S1 (factory setting: ON). Then set H3-08 to 2 (factory setting: 2). To input a voltage signal (0 to 10 V) to terminal A2, turn OFF "2" of dip switch S1. Finally, set H3-08 to 0 or 1.

(3) By setting b1-01 to 2, frequency reference can be input from the master controller at MEMOBUS communications.

(4) By setting b1-01 to 4, the pulse train input which is input to control circuit terminal RP becomes the frequency reference.

Select Operator Key (LOCAL/REMOTE, STOP) Functions

LOCAL/REMOTE key selection o2-01
STOP key selection o2-02

o2-01=0 : LOCAL/REMOTE changeover disabled
1 : LOCAL/REMOTE changeover enabled

o2-02=0 : Operator STOP key disabled during control circuit terminal operation (b1-02=1)
1 : Operator STOP key always enabled during control circuit terminal operation (b1-02=1)

Set Frequency Reference/Monitor Setting Unit Freely

Frequency units of reference setting and monitor o1-03

Frequency can be set in the unit suitable for rotation speed, flow rate or line speed of the actual machines.

Operator Display Mode

o1-03	Frequency Setting Mode	
	d1-□□	Display Mode at Power ON
0	d1-01 to 17: Set in the units of 0.01 Hz	
1	d1-01 to 17: Set in the units of 0.01 % (maximum output frequency: 100 %)	
2 to 39	Set in the units of min^{-1}. min^{-1} = 120×frequency reference (Hz) / o1-03 (o1-03 sets the number of motor poles.)	
40 to 39999	Set the number of displayed digits below the decimal point with the value in the fifth digit of o1-03. 5th digit value = 0 : Displayed as ×××× 5th digit value = 1 : Displayed as ×××.× 5th digit value = 2 : Displayed as ××.×× 5th digit value = 3 : Displayed as ×.××× The set value of 100 % frequency is specified with the first to fourth digits of o1-03. (Example) 1 Set o1-03 to 12000 when the set value of 100 % speed is 200.0. 2 Set o1-03 to 26500 when the set value of 100 % speed is 65.00.	

o1-03	Frequency Monitor Mode	
	d1-□□, U1-□□	Display Mode at Power ON
0	d1-01 to 17 : Displayed in the units of 0.01 Hz.	
1	d1-01 to 17 : Displayed in the units of 0.01 %.	
2 to 39	Set in the units of min^{-1}. min^{-1} = 120×frequency reference (Hz) / o1-03 (o1-03 sets the number of motor poles.)	
40 to 39999	Displayed with numerical value and accuracy specified by the set value of o1-03. (Example) 1 100 % speed and 60 % speed are displayed as 200.0 and 120.0, respectively when o1-03 is set to 12000. 2 60 % speed is displayed as 39.00 when o1-03 is set to 26500.	

2. Set Operation Conditions

Limit the Direction of Rotation

Prohibition of reverse operation b1-04

When reverse run disabled is set, reverse run command from the control circuit terminal or digital operator cannot be enabled. Use this setting for applications where reverse run will not be used (fans, pumps, etc.).

b1-04 Setting Value	Description
0	Reverse run enabled
1	Reverse run disabled

Note: When an inverter forward run command is given, the motor output shaft rotates in the counterclockwise (CCW) direction viewed from the motor at the load side (output shaft side).

Run at Low Speed

Jog frequency reference d1-17
Multi-function input H1-01 to 05

Set Jog frequency in Multi-function contact input terminals S3 to S12. Next, input the Jog frequency reference and the forward (reverse) run command. Jogging can be performed with the jogging frequency set in d1-17. When multi-speed reference 1 to 4 is set along with Jog reference, the Jog reference has priority.

Name	Constant No.	Setting Value
Jog reference	d1-17	(Factory setting: 6.0 Hz)
Multi-function input (terminals S3 to S12)	H1-01 to H1-10	Set 6 in one of the terminals (JOG frequency selection).

The same operation can be also accomplished by the digital operator.

Press the LOCAL/REMOTE key, and check that the remote LED (SEQ. REF) is OFF. When the remote LED (SEQ. REF) is ON, press the key LOCAL/REMOTE again to turn the light OFF.

Press the JOG key on the digital operator for jogging, and release the key to stop the jogging.

Multi-Step Speed Selection

Master frequency reference selection	b1-01
Operation method selection	b1-02
Constant access level	A1-01
Frequency reference	d1-01 to 16
Jog frequency reference	d1-17
Multi-function input	H1-02 to 10
Terminal A2 function selection	H3-09
Terminal A3 function selection	H3-05

By combining 16-step frequency references, one jog frequency reference and multi-function terminal function selection, up to 17 steps of speed variations can be set step by step. (The following shows an example of 9-step speed.)

Operation method selection b1-01=0, b1-02=1

Constant access level A1-01=2

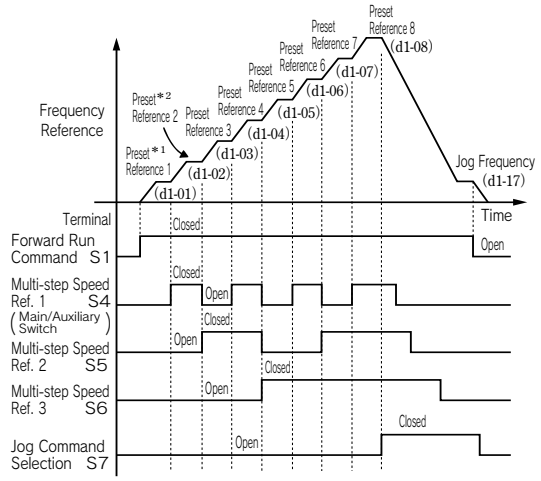
The range where multi-step speed frequency reference can be set or read depends on the program mode as follows:

QUICK : Up to 5 steps of speed variations can be set or read.
d1-01, 02, 03, 04, 17

ADVANCED: Up to 17 steps of speed variations can be set or read.
d1-01 to 17

Multi-function input terminals	S4 (function selection)	H1-02
	S5	H1-03
	S6	H1-04
	S7	H1-05
Frequency reference	1 to 8	d1-01 to 08
Jog frequency reference		d1-17

Terminal	Constant No.	Factory Setting	Setting Value	Name
S4	H1-02	14	3	Multi-step speed reference 1
S5	H1-03	3	4	Multi-step speed reference 2
S6	H1-04	4	5	Multi-step speed reference 3
S7	H1-05	6	6	Jog reference selection



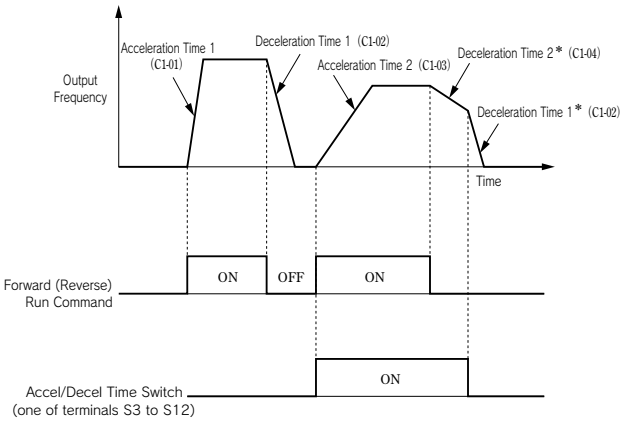
* 1 When the preset reference 1 is b1-01= 0, constant setting value (d1-01) is applied; when b1-01 = 1, the analog command set by control circuit terminal A1 is applied.

* 2 When the preset reference 2 is H3-09 = 2, the analog frequency reference input through terminal A2 is applied; when the setting is H3-09 = 1F, constant setting value (d1-02) is applied.

* 3 When the preset reference 3 is H3-05 = 3, the analog frequency reference input through terminal A3 is applied; when the setting is H3-05 = 1F, constant setting value (d1-03) is applied.

Use Four (4) Types of Accel/Decel Time

Acceleration time 1 to 4 C1-01, C1-03, C1-05, C1-07
Deceleration time 1 to 4 C1-02, C1-04, C1-06, C1-08
Accel/decel time setting unit C1-10
Multi-function input H1-01 to 05



* When stopping method is deceleration to stop (b1-03=0).

Set "07" or "1A" (accel/decel time switch 1 or 2) in multi-function input (H1-01 to 10), to allow selection of 4 sets of accel/decel times by the ON/OFF of the accel/decel time switch (one of terminals S3 to S12).

Accel/decel Time Selection 1 Multi-function Input Setting = 07	Accel/decel Time Selection 2 Multi-function Input Setting = 1A	Accel Time	Decel Time
Open or not set	Open or not set	C1-01	C1-02
Closed	Open or not set	C1-03	C1-04
Open or not set	Closed	C1-05	C1-06
Closed	Closed	C1-07	C1-08

Constant No.	Name	Unit*	Setting* Range	Factory Setting
C1-01	Accel time 1	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-02	Decel time 1	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-03	Accel time 2	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-04	Decel time 2	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-05	Accel time 3	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-06	Decel time 3	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-07	Accel time 4	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s
C1-08	Decel time 4	0.1 s (1s for 1000s or more)	0.0 to 6000.0 s	10.0 s

* C1-10 = 0 : Units of 0.01 sec. (Max. 600.00 seconds)
C1-10 = 1 : Units of 0.1 sec. (Max. 6000.00 seconds)

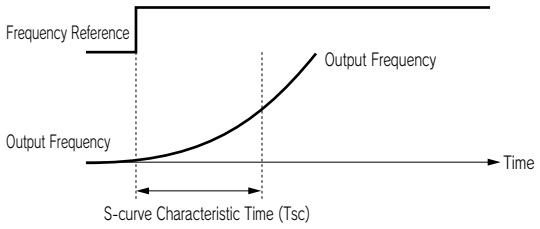
Soft Start

S-curve characteristic time C2-01 to 04

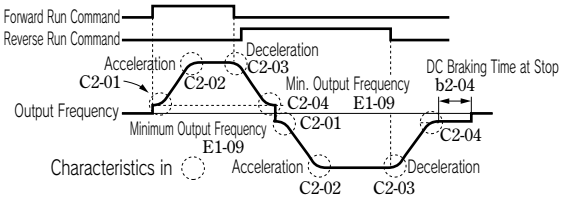
Accel/decel by S-curve pattern can be accomplished to prevent shock at start, or stop of the machine.

Constant No.	Function	Setting Range	Factory Setting
C2-01	S-curve characteristic time at acceleration start	0.00 to 2.50 s	0.20 s
C2-02	S-curve characteristic time at acceleration end	0.00 to 2.50 s	0.20 s
C2-03	S-curve characteristic time at deceleration start	0.00 to 2.50 s	0.20 s
C2-04	S-curve characteristic time at deceleration end	0.00 to 2.50 s	0.00 s

Note: S-curve characteristic time is the time required for the 0 accel/decel rate to reach the formal accel/decel rate determined by the preset accel/decel time.



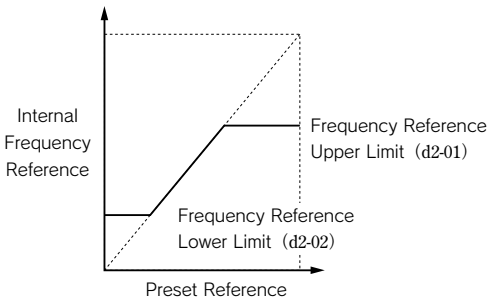
Setting the S-curve characteristic time, the acceleration or deceleration time will be longer by 1/2 of the S-curve characteristic time at start or end.



Time Chart when Switching Forward Run and Reverse Run at Deceleration to Stop (V/f control mode example)

Limit the Speed

Frequency reference upper limit d2-01
Frequency reference lower limit d2-02
Master speed reference lower limit d2-03



(1) Limiting maximum frequency

Use d2-01 when the motor is to be rotated at certain min^{-1} or less.

Set the frequency reference upper limit value (d2-01) in the units of 0.1 %.

(E1-04 maximum output frequency is 100%.)

* Factory setting: d2-01 = 100 %

(2) Limiting minimum frequency

Use d2-02 or d2-03 when the motor is to be rotated at certain min^{-1} or more.

There are two methods to limit the minimum frequency as follows:

- Adjust the lower limit levels of all frequencies (d2-02)
- Adjust the lower limit level of the master speed frequency (d2-03)

(The lower limit levels of the jog frequency, multi-step speed frequencies or auxiliary frequency are not adjusted.)

When running at frequency reference 0, operation continues at the lower limit value of the frequency reference. However, operation is not performed if the frequency lower limit value is set to less than the minimum output frequency (E1-09).

* Factory setting: d2-02 = 0.0 %, d2-03 = 0.0 %

Operation to Avoid Resonance

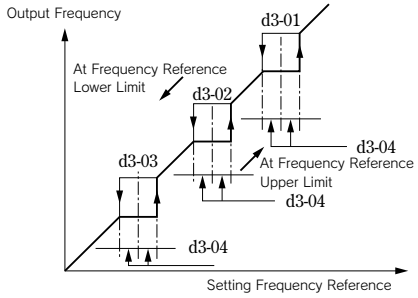
Jump frequency 1, 2, 3 d3-01 to 03
Jump frequency width d3-04

The frequency that causes resonance can be jumped, to avoid resonance characteristics of the machine system. This function can also be applied to dead band control.

Set 0.0 Hz to disable this function.

Set jump frequencies 1 to 3 as follows.

d3-01 ≧ d3-02 ≧ d3-03



Note: Frequency varies smoothly without jumping during acceleration or deceleration.

Frequency Reference by Pulse Train Input

Reference selection b1-01
Pulse train input function selection H6-01
Pulse train input scaling H6-02

By setting reference selection b1-01 to 4, frequency reference can be set by pulse train input from the control circuit terminal RP.

(1) Input pulse specifications

- Low level voltage 0.0 to 0.8 V
- High level voltage 3.5 to 13.2 V
- H duty 30 to 70 %
- Pulse frequency 0 to 32 kHz

(2) How to give frequency reference

The value obtained by multiplying the maximum output frequency by the ratio of the set maximum value of input pulse frequency and the actual input pulse frequency makes reference frequency.

$$\text{Frequency reference} = \frac{\text{Input pulse frequency}}{\text{Pulse train maximum frequency (H6-02)}} \times \text{Maximum output frequency (E1-04)}$$

Constant No.	Name	Setting Value	Initial Value
b1-01	Reference selection	4	1
H6-01	Pulse train input function selection	0	0
H6-02	Pulse train input scaling	Pulse frequency to be 100 % reference	1440 Hz

Adjusting the Speed Setting Signal

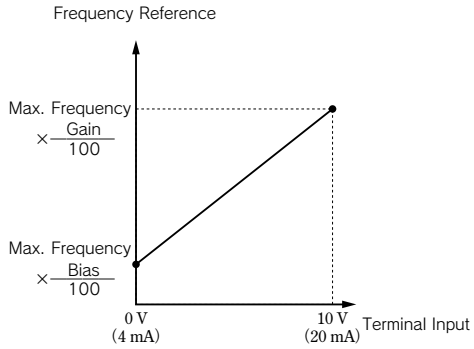
Frequency reference input gain H3-02, H3-06, H3-10
Frequency reference input bias H3-03, H3-07, H3-11
Terminal A1 signal level selection H3-01
Terminal A2 signal level selection H3-08
Terminal A2 function selection H3-09
Terminal A3 signal level selection H3-04
Terminal A3 function selection H3-05

When the frequency reference is to be performed by analog input from control circuit terminals A1, A2, and A3 the relation between the analog input and frequency reference can be adjusted.
Terminal A1 and A3 are voltage input of 0 to +10 V.
Terminal A2 can switch voltage or current input by setting H3-08.
The initial value of H3-08 is 2; a current input of 4 to 20 mA.
When terminal A2 is used as a voltage input of 0 to +10 V, set dip switch S1-2 on the control board to OFF (factory setting: ON), and set the signal level of H3-08 to 0.

Name	Description
Frequency reference level selection	Selects 0 to 10V, 0 to±10V or 4 to 20mA input. 0 to±10V input reverses with negative input.
Frequency % gain	Sets the ratio (%) against the Maximum frequency (E1-04) of the virtual output frequency when terminal input is 10 V (20 mA).
Reference ±% bias	Sets the ratio (%) against the Maximum frequency (E1-04) of the output frequency when terminal input is 0 V (4 mA).

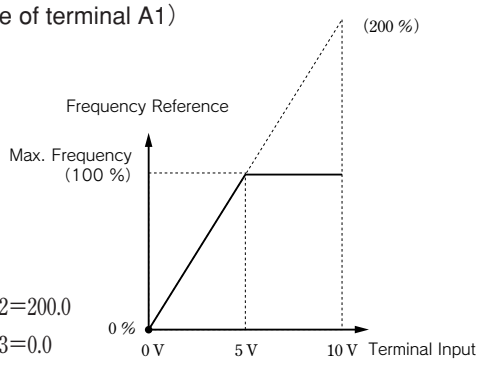
Name	For Terminal A1	For Terminal A2	For Terminal A3	Setting Range	Factory Setting
Frequency reference level selection	H3-01	H3-08	H3-04	0 : 0 to +10V 1 : −10 to +10V 2 : 4 to 20mA	H3-01, 04 =0 H3-08=2
Frequency % gain	H3-02	H3-10	H3-06	0.0 to 1000.0	100.0 %
Reference ±% bias	H3-03	H3-11	H3-07	−100.0 to +100.0	0.0 %

Note: 4 to 20 mA input is not accepted in terminal A1 and A3.



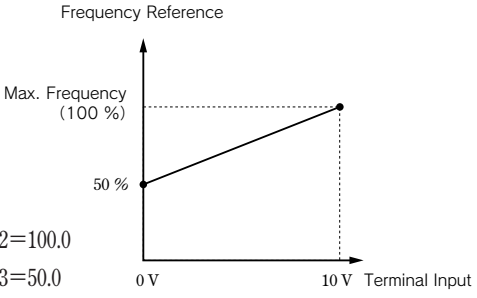
( ) is when current reference input is selected.

(1) 0 to 100 % frequency reference operation by 0 to 5 V input (Example of terminal A1)



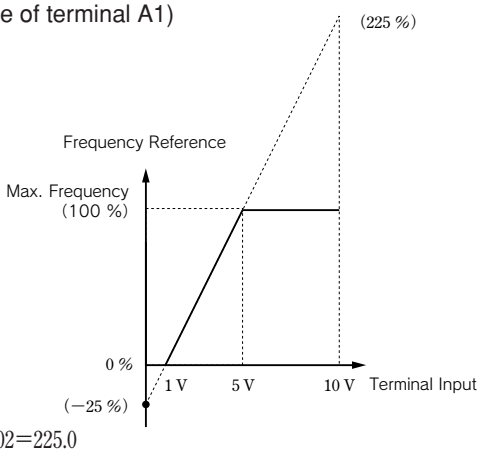
Gain H3-02=200.0
Bias H3-03=0.0

(2) 50 to 100 % frequency reference operation by 0 to 10 V input (Example of terminal A1)



Gain H3-02=100.0
Bias H3-03=50.0

(3) 0 to 100 % frequency reference operation by 1 to 5 V input (Example of terminal A1)



Gain H3-02=225.0
Bias H3-03=−25.0

Automatic Restart after Momentary Power Loss

Momentary power loss detection L2-01
Momentary power loss ridethru time L2-02

Momentary power loss detection

If momentary power loss occurs, the operation can be restarted automatically.

L2-01 Setting	Description
0	Operation not continued (Factory setting)
1 *1	Operation continued after power recovery within momentary power loss ridethru time (L2-02).
2 *2	Operation continued after power recovery (no fault signal). (However, restarts only within the time established by the control power.)

*1 Hold the run command to continue the operation after recovery from momentary power loss.
*2 When 2 is selected, the operation restarts if power supply voltage reaches its normal level. No fault signal is indicated.

Momentary power loss ridethru time

Set the ridethru time to L2-02 when L2-01 is set to 1. The initial values depend on the inverter capacities as follows.

Inverter Model CIMR-G7A□	L2-02 Initial Value
20P4 to 2011	0.1 to 1.0 s
2015 to 2110	2.0 s
40P4 to 4011	0.1 to 1.0 s
4015 to 4300	2.0 s

Continue Operation at Constant Speed when Frequency Reference Missing

Operation when frequency reference is missing L4-05

Detection of missing frequency reference continues operation at 80 % speed of the frequency reference before the frequency reference missed if the frequency reference by analog input is reduced by 90 % or more in 400 ms.

Setting Value	Description
0	Stop (Operation following with the frequency reference.)
1	Operation continued at 80 % speed of frequency reference before it missed

Operate Coasting Motor without Trip

Speed Search Reference "61", "62", "64"
Multi-function input H1-01 to 10
Zero speed level (DC injection braking start frequency) b2-01
DC injection braking current b2-02
DC injection braking time at start b2-03

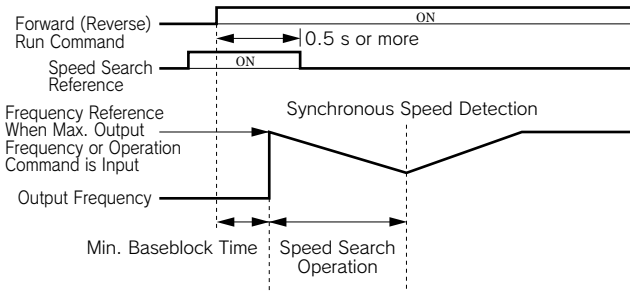
Speed search reference or DC injection braking (at start) can be used to continue operation without tripping the motor during coasting.

(1) Speed search reference

This function is used to restart the motor during coasting without stopping the motor. This allows smooth switching of the motor from commercial power operation to inverter operation. Set (search reference from max. output frequency) or (search command from preset frequency) in the multi-function input terminal (H1-01 to H1-10).

Arrange the sequence so that the forward (reverse) run command is input at the same time or after the search reference.

If the run command enters before the search reference, the search reference is disabled.

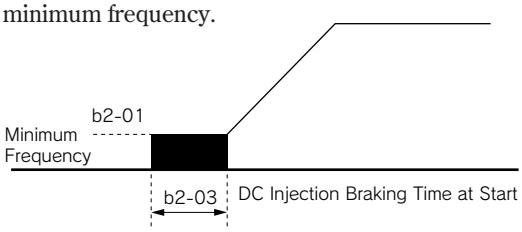


Time Chart at Search Reference Input

(2) DC injection braking at start

This function is used to restart the motor after applying DC injection braking current to the coasting motor. The time for direct current injection braking at start can be set unit of 0.1 sec in b2-03.

The DC injection braking is set in b2-02. When setting of b2-03 is 0, direct current injection braking is not performed, and acceleration is performed from the minimum frequency.



Continue Operation by Automatic Fault Reset (Fault Restart)

Number of auto restart attempts L5-01
Auto restart operation selection L5-02

If a failure occurs in the inverter, the inverter performs self-diagnosis and automatically restarts operation.
The self-diagnosis and restart count can be set in constant L5-01 (up to 10 times). Fault retry signal can be set to be output (L5-02 : 1) or no output (L5-02 : 0).

The following faults are dealt with by this function.

- OC (overcurrent)
- OV (DC main circuit overvoltage)
- PUF (fuse blown)
- RH (braking resistor overheat)
- GF (ground fault)
- RR (braking transistor failure)
- LF (output open-phase)
- PF (main circuit voltage fault)
- OL1 (motor overload)
- OL2 (inverter overload)
- OL3 (overtorque)
- OL4 (overtorque)
- OH1 (heatsink overheating)
- UV1* (main circuit undervoltage, main circuit MC malfunction)

* Retry enabled when main circuit undervoltage (L2-01) is set to 1 or 2 (operation continues after power recovery).

The accumulated error retry count is cleared in the following cases.

- When no error occurred for 10 minutes after retry
- When error set signal is input after defining the error
- When power is turned OFF

If any fault other than the above faults occurs, a fault contact output operates to shut off the output and the motor coasts to a stop.

Note: Do not use this function for any lifting loads.

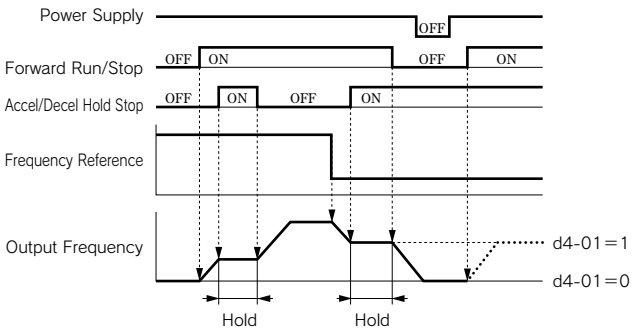
Temporary Hold of Accel/Decel

Accel/decel hold "OA"
Multi-function input H1-01 to 10
Frequency reference hold function selection d4-01

When accel/decel hold command is input during accel/decel, accel/decel is held while the command is enabled, holding the existing output frequency.
When the stop command is input, the accel/decel hold status is reset, and it enters the stop status.

Set (Accel/decel hold command) in the input terminal function (H1-01 to H1-10).By setting H1-01 to H1-10 [Multi-function input (terminals S3 to S12)] to A (accel/decel hold), acceleration or deceleration is stopped when the terminal turns ON and then the output frequency is held. Acceleration or deceleration starts again when the terminal turns OFF.
Use d4-01 to specify whether the frequency reference during hold is to be stored.

d4-01=0 : Disabled (Restarts from zero.)
d4-01=1 : Enabled (Restarts at frequency that was held previous time.)



Time Chart when Accel/decel Hold Command Used

Torque Detection

Torque detection selection 1, 2	L6-01, L6-04
Torque detection level 1, 2	L6-02, L6-05
Torque detection time 1, 2	L6-03, L6-06

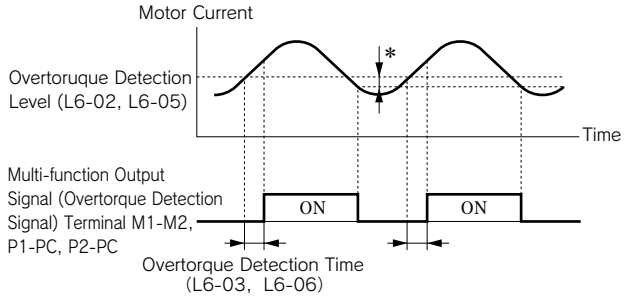
If excessive load is applied on the machine, alarm signals are output to the multi-function terminals M1-M2, P1-PC and P2-PC. The Varispeed G7 has two kinds of overtorque/undertorque detection.

Overtorque/undertorque detection signal is activated by setting torque detection selection 1 (NO contact: 0B, NC contact: 17) or torque detection selection 2 (NO contact: 18, NC contact: 19) in output terminal function selection H2-01, H2-02 or H2-03.

Torque detection level is the current level (inverter rated output current 100 %) at V/f control and the motor torque level (motor rated torque 100 %) at vector control.

•Detection of overtorque

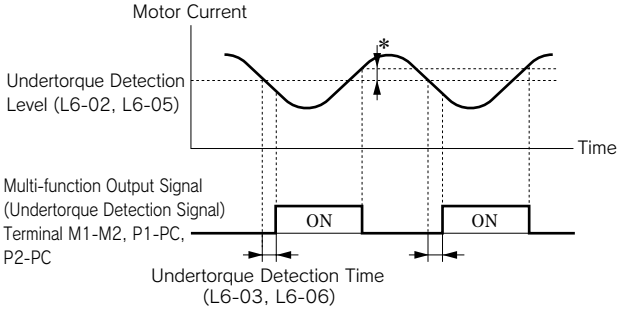
To detect overtorque, select 1, 2, 3 or 4 for the set value of L6-01 or L6-04. L6-02 or L6-05 becomes the overtorque detection level.



* The releasing width of overtorque detection is approx. 10 % of the inverter rated current (or motor rated torque).

•Detection of undertorque

To detect undertorque, select 5, 6, 7 or 8 for the set value of L6-01 or L6-04. L6-02 or L6-05 becomes the undertorque detection level.



* The releasing width of undertorque detection is approx. 10 % of the inverter rated current (or motor rated torque).

Setting for Overtorque/Undertorque Detection Function

Constant No.	Function	Setting Range	Factory Setting
L6-01	Torque detection 1 selection	0 to 8	0
L6-02	Torque detection 1 level	0 to 300 %	150 %
L6-03	Torque detection 1 time	0.0 to 10.0 s	0.1 s
L6-04	Torque detection 2 selection	0 to 8	0
L6-05	Torque detection 2 level	0 to 300 %	150 %
L6-06	Torque detection 2 time	0.0 to 10.0 s	0.1 s

Setting Values of L6-01 and L6-04

The following table shows relations between setting values of L6-01 or L6-04 and alarms at overtorque/undertorque detection.

Setting Value	Function
0	Overtorque/undertorque detection disabled
1	Overtorque detection only during speed agree/operation continued after detection (warning)
2	Overtorque detection at any time during operation/operation continued after detection (warning)
3	Overtorque detection only during speed agree/output shut off at detection (protective operation)
4	Overtorque detection at any time during operation/output shut off at detection (protective operation)
5	Undertorque detection only during speed agree/operation continued after detection (warning)
6	Undertorque detection at any time during operation/operation continued after detection (warning)
7	Undertorque detection only during speed agree/output shut off at detection (protective operation)
8	Undertorque detection at any time during operation/output shut off at detection (protective operation)

Frequency Detection

Multi-function terminal function selection H2-01 to 03
Frequency detection level L4-01, L4-03
Frequency detection width L4-02, L4-04

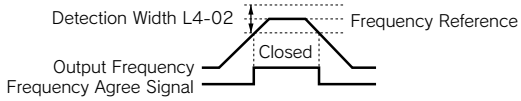
Various frequencies can be detected by setting the following values in terminal M1-M2, P1 and P2 function selection (H2-01, 02 and 03).

Setting Value	Description	Frequency (Speed) Agree Detection Level Setting Constant No.	Frequency (Speed) Agree Detection Width Setting Constant No.
01	Zero-speed	—	—
02	Frequency (speed) agree 1	L4-01 without sign	L4-02
03	Optional frequency (speed) agree 1		
04	Optional frequency (speed) agree detection 1 (Less than preset value)		
05	Optional frequency (speed) agree detection 1 (More than preset value)		
13	Frequency (speed) agree 2	L4-03 with sign	L4-04
14	Optional frequency (speed) agree 2		
15	Optional frequency (speed) agree detection 2 (Less than preset value)		
16	Optional frequency (speed) agree detection 2 (More than preset value)		

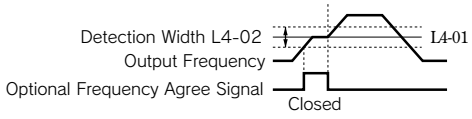
As shown above, select the detection with or without sign in the Varispeed G7.

The following is the frequency (speed) agree timing chart. The figure shows the case of forward rotation; the direction for reverse rotation without sign is the same. When detection with sign is selected, detection signal against the specified direction of rotation is detected according to the direction of rotation.

(1) Setting = 02: Frequency (speed) agree detection

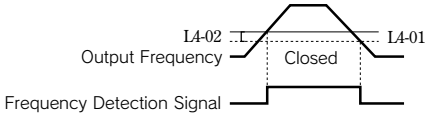


(2) Setting = 03: Medium frequency (speed) agree detection



(3) Setting = 04: Frequency (speed) detection under setting value

(4) Setting = 05: Frequency (speed) detection above setting value



Reduce Motor Noise or Leakage Current

Carrier frequency C6-02

If the wiring between the inverter and the motor is excessively long, the inverter output current will be increased because of the increased leakage current of harmonics from the cable, which may affect the peripheral devices.

Refer to the following table to adjust the inverter output transistor switching frequency (carrier frequency). Reducing such carrier frequency is effective for reduction of radio noise.

Wiring Distance between Inverter and Motor	50 m or less	100 m or less	More than 100 m
Carrier Frequency	15 kHz or less	10 kHz or less	5 kHz or less
C6-02 Value	1 to 6	1 to 4	1 to 2

* Factory setting: C6-02 = 6 (15 kHz: 200 V class 22 kW or less, 400 V class 22 kW or less)

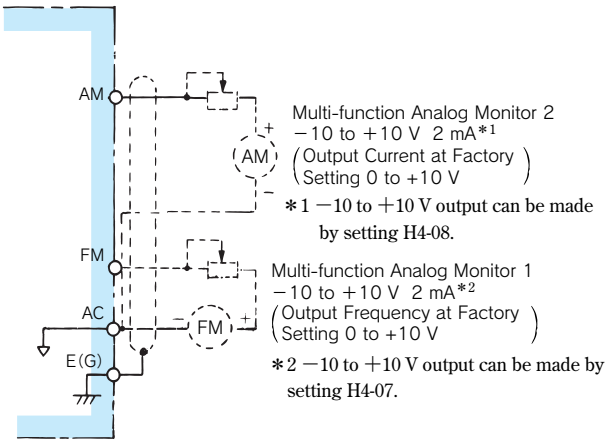
C6-02 Setting Value	Carrier Frequency* (kHz)	Metallic Noise from Motor	Noise and Leakage Current
1	2.0	Large	Less
↕	↕	↕	↕
6	15.0	Small	More

* 2kHz or more frequency recommended

Use Frequency Meter or Ammeter

Monitor selection (terminal FM) H4-01, H4-04
Analog output signal level selection H4-07, H4-08

Select whether output frequency or output current is to be output to analog monitor output terminals FM-AC or AM-AC.

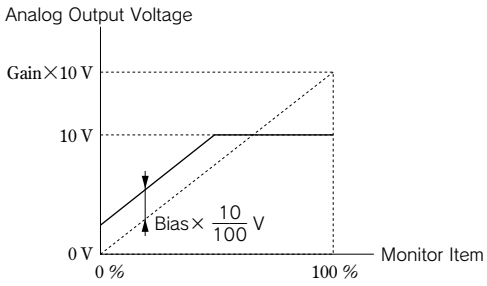


Constant No.	Name	Description
H4-01	Monitor selection (terminal FM)	Set the number of the monitor item to be output from terminal FM or AM. (Number in the part □□ of U1-□□.) 4, 10 to 14, 25, 28, 34, 39 to 42 cannot be set. Do not use 17, 23, 29 to 31 and 35.
H4-04	Monitor selection (terminal AM)	
H4-07	Signal level selection (terminal FM)	Set the signal level of terminal FM or AM. 0 : 0 to +10 V output 1 : 0 to ±10 V output
H4-08	Signal level selection (terminal AM)	

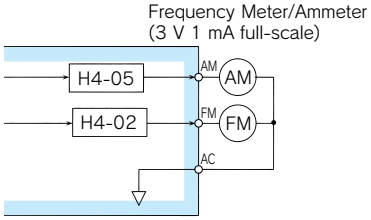
Calibrate Indications of Frequency Meter or Ammeter

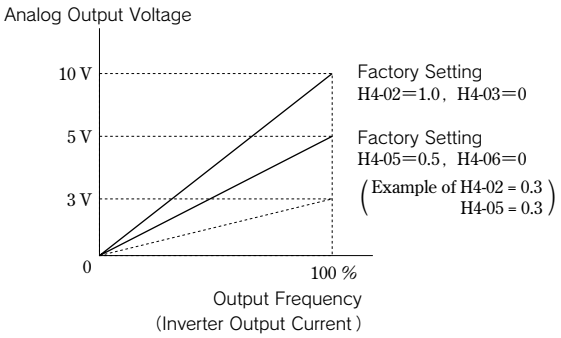
Analog Monitor Gain H4-02, H4-05
Analog Monitor Bias H4-03, H4-06

Used when analog output terminals FM-AC and AM-AC output voltage with gain and bias.
For gain, set how many times of 10V the monitor item 100 % output is to be made. Set the bias in the units of % assuming that the amount to move the output characteristics upward and downward in parallel is to be 10 V/100 %.



Bias can be set in the range from −10 to +10 %.





For frequency meter that displays 0 to 60 Hz at 0 to 3 V
10 V × (H4-02 = 0.3) = 3 V
This is the voltage when the output frequency is 100 %.

Note: Set 1.00 when using a 10 V full-scale meter.

Use Pulse Monitor

Pulse train monitor selection H6-06
Pulse train monitor scaling H6-07

Outputs the monitor items [U1-□□ (status monitor)] of the digital operator from pulse monitor terminals MP-SC.
Set H6-06 to the numerical value in □□ of U1-□□ (status monitor). (Only the following 6 items can be output.)

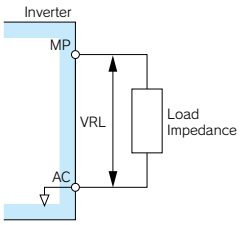
H6-06 Setting Value	Output Item
1	Frequency reference (U1-01)
2	Output frequency (U1-02)
5	Motor speed (U1-05)
20	Output frequency after soft-start (U1-20)
24	PID feedback (U1-24)
36	PID input (U1-36)

When the value of an output item is 100 %, set H6-07 to the number of pulses to be output in the units of Hz.

To use the pulse monitor, connect the peripheral devices according to the following load conditions.
If any of the following load conditions is not met, sufficient characteristics may not be obtained or the devices may be damaged.

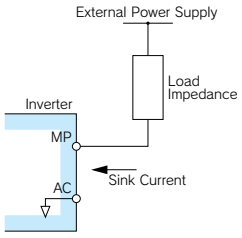
Used as source output

Output Voltage (Insulation Type) VRL (V)	Load Impedance (kΩ)
+5 V or more	1.5 kΩ or more
+8 V or more	3.5 kΩ or more
+10 V or more	10 kΩ or more



Used as sink input

External Power Supply (V)	12 VAC±10 %, 15 VDC±10 %
Sink Current (mA)	Up to 16 mA



3. Select Stopping Method

Select Stopping Method

Stopping method selection b1-03

To stop the inverter when a stop command is given, select one of the following four methods according to the application.

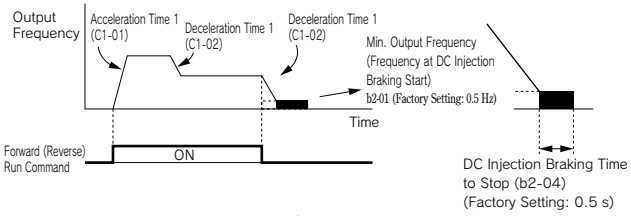
Setting	Stopping Method
0	Deceleration stop
1	Coasting to stop
2	Entire area DC injection braking at stop
3	Coasting to stop with timer

However, when using vector control with PG, Entire area DC injection braking at stop (setting=3) and Coasting to stop with timer (setting=4) cannot be selected.

(1) Deceleration stop

By setting b1-03 to 0, the motor decelerates to stop according to the selected deceleration time.

When output frequency is less than b2-01 at deceleration to a stop, DC injection braking is applied for the time set to b2-04.

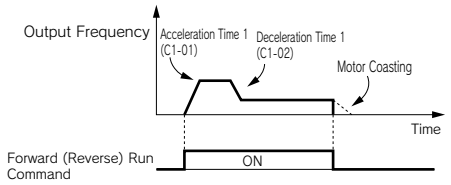


Example when Accel/Decel Time 1 is Selected

Note: When using vector control with PG, the stopping method varies according to Operation selection for setting of min. output frequency (E1-09) or less (b1-05).

(2) Coasting to stop

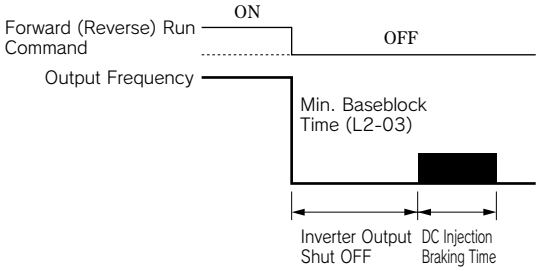
By setting b1-03 to 1, the inverter output voltage is shut off at the same time as run command OFF. The motor coasts to a stop in the deceleration ratio suitable for the inertia and machine loss including the load. Restart is accepted immediately after the run command is turned OFF, but restart command during rotation of the motor may cause alarms for OV or OC.



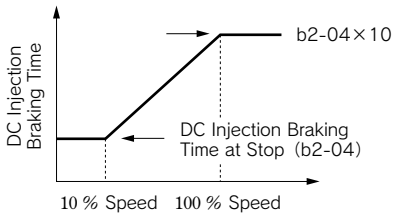
Example when Accel/Decel Time 1 is Selected

(3) Entire area DC injection braking to stop

By setting b1-03 to 2, the inverter stops by applying DC injection braking when L2-03 (minimum baseblock time) elapses after turning OFF the run command.



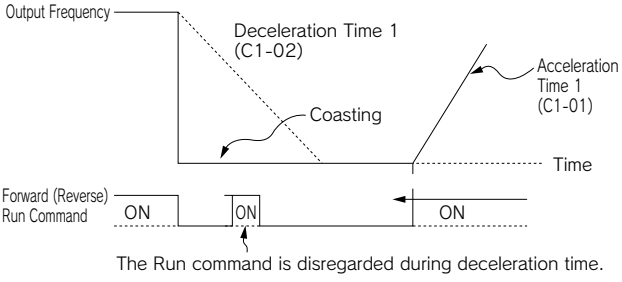
The DC injection braking time is as follows, according to the output frequency when stop command is input.



Output Frequency when Run Command in Turned OFF

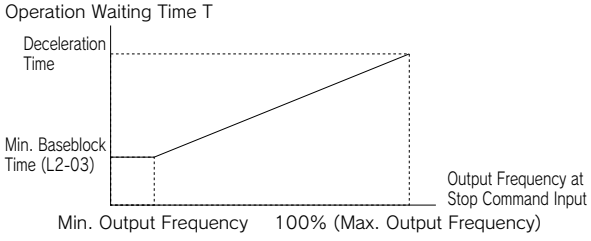
(4) Coasting to stop with timer

By setting b1-03 to 3, the inverter output voltage is shut off at the same time as run command OFF and the motor coasts to a stop. At this time, the run command is disregarded until operation waiting time T elapses.



Example when Accel/Decel Time 1 is Selected

Operation waiting time T is as follows according to the output frequency and deceleration time at run command OFF.



4. Build Interface Circuits with External Devices

Use Input Signals

Multi-function input H1-01 to 10

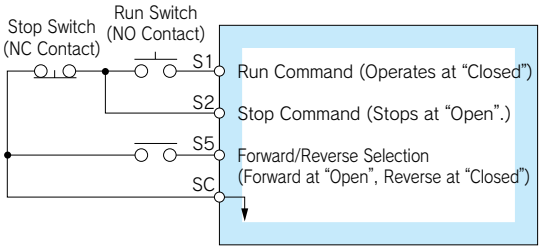
Functions of the multi-function input terminals S3 to S12 can be changed as necessary by setting constants H1-01 to H1-10. The same values cannot be set in each constant.

- Function of terminal S3 : Set in H1-01.
- Function of terminal S4 : Set in H1-02.
- Function of terminal S5 : Set in H1-03.
- Function of terminal S6 : Set in H1-04.
- Function of terminal S7 : Set in H1-05.
- Function of terminal S8 : Set in H1-06.
- Function of terminal S9 : Set in H1-07.
- Function of terminal S10 : Set in H1-08.
- Function of terminal S11 : Set in H1-09.
- Function of terminal S12 : Set in H1-10.

Select the function of the input signal by control circuit terminals S3 to S12.

Setting	Function	Control Mode				
		V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2
00	3-wire control, forward/reverse selection	○	○	○	○	○
01	Local/remote selection	○	○	○	○	○
02	Option/inverter selection	○	○	○	○	○
03	Multi-step reference 1	○	○	○	○	○
04	Multi-step reference 2	○	○	○	○	○
05	Multi-step reference 3	○	○	○	○	○
06	Jog frequency reference	○	○	○	○	○
07	Accel/decel time selection 1	○	○	○	○	○
08	External baseblock NO	○	○	○	○	○
09	External baseblock NC	○	○	○	○	○
0A	Accel/decel stop hold	○	○	○	○	○
0B	Overheat 2 alarm signal	○	○	○	○	○
0C	Multi-function analog input selection	○	○	○	○	○
0D	No speed V/f control with PG	×	○	×	×	×
0E	ASR integral reset	×	○	×	○	○
0F	Terminal not used	—	—	—	—	—
10	UP command	○	○	○	○	○
11	DOWN command	○	○	○	○	○
12	Forward jog	○	○	○	○	○
13	Reverse jog	○	○	○	○	○
14	Fault reset	○	○	○	○	○
15	Emergency stop (NO contact)	○	○	○	○	○
16	Motor changeover	○	○	○	○	○
17	Emergency stop (NC contact)	○	○	○	○	○
18	Timer function input	○	○	○	○	○
19	PID disable	○	○	○	○	○
1A	Accel/decel time selection 2	○	○	○	○	○
1B	Program enable	○	○	○	○	○
1C	+ speed frequency	○	○	○	○	○
1D	− speed frequency	○	○	○	○	○
1E	Analog frequency reference sample/hold	○	○	○	○	○
20~2F	External fault (can be set freely)	○	○	○	○	○
30	PID integral reset	○	○	○	○	○
31	PID integral hold	○	○	○	○	○
32	Multi-step speed reference 4	○	○	○	○	○
34	PID SFS ON/OFF	○	○	○	○	○
35	PID input characteristics changeover	○	○	○	○	○
60	DC injection activate	○	○	○	○	○
61	External search command 1 : maximum output frequency	○	×	○	○	○
62	External search command 2 : frequency reference	○	×	○	○	○
63	Field weakening command	○	○	×	×	×
64	External search command 3	○	○	○	○	○
65	KEB (deceleration at momentary power loss) command (NC contact)	○	○	○	○	○
66	KEB (deceleration at momentary power loss) command (NO contact)	○	○	○	○	○
67	Communication test mode	○	○	○	○	○
68	HSB (high-slip braking)	○	○	×	×	×
71	Speed/torque control change (ON: torque control)	×	×	×	○	○
72	Zero-servo command (ON: zero-servo)	×	×	×	○	×
77	ASR proportional gain switch (ON: C5-03)	×	×	×	○	○
78	Polarity reversing command for external torque reference	×	×	×	○	○

(1) For 3-wire sequence (Operation by automatic return contact)
(Example of H1-03 = 00 setting)



(2) Local (digital operator)/Remote (control circuit terminal) selection (setting: 01)

Select digital operator or control circuit terminal to operate. Local/remote can be switched only while the motor is held.

Open : Operates according to the setting of REMOTE operation mode (b1-01, b1-02).

Closed : Operates in LOCAL mode by the frequency reference, run command from the digital operator.

(Example) It can be switched between the digital operator and control circuit terminal by setting b1-01 = 1 or b1-02 = 1

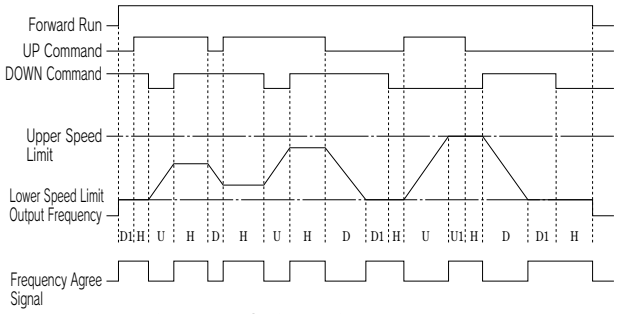
Open : Can accept frequency reference (terminal A1), run command (terminals S1, S2) from control circuit terminal.

Closed : Can accept frequency reference, run command from digital operator.

(3) UP/DOWN command (setting: 10, 11)

Accel/decel to the desired speed can be accomplished while the forward (reverse) run command is enabled, without changing the frequency reference, by inputting the UP/DOWN by remote signal.

UP Command	Closed	Open	Open	Closed
DOWN Command	Open	Closed	Open	Closed
Operation	Accel	Decel	HOLD	HOLD



Time Chart UP/DOWN Command is Used

〔Symbols〕

U : UP (acceleration) status

D : DOWN (deceleration) status

H : HOLD (constant speed) status

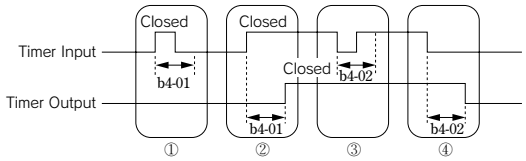
U1 : UP status, but clamped at upper speed limit

D1 : DOWN status, but clamped at lower speed limit

Notes: 1. When using the UP/DOWN command, always set b1-01 at (frequency reference).
Setting value = 1 : enables the UP/DOWN command.
Setting value = other than 1 : disables the UP/DOWN command.
2. The upper speed limit is: Max. output frequency (E1-04)× frequency reference upper limit (d2-01).
3. The lower speed limit is: Max. output frequency×frequency reference lower limit (d2-02) and the largest of main frequency references inputs via the control circuit terminal A1.
4. When frequency reference command storage function is provided (d4-01 = 1), the output frequency is stored even after the power is turned OFF with the accel/decel hold (HOLD) command input.
5. When JOG command is input during operation by UP/DOWN command, JOG command is prioritized.
6. Setting error (OPE03) occurs if the UP/DOWN command is not set at the same time.
7. Setting error (OPE03) occurs if multi-function input accel/decel hold (HOLD) command is set at the same time.

(4) Timer function (setting: 18)

The external inverter timer can be combined with the timer input (setting = 18) and the multi-function output terminal timer output (setting = 12), to set the internal inverter timer.
Set the ON side delay time in 0.1-second unit.
Set the OFF side delay time in 0.1-second unit.



〔Operation〕

① When the timer input "closed" time is shorter than b4-01, the timer output stays "open".
② When the timer input becomes "closed", the timer output closes after the time set in b4-01.
③ When the timer input "open" time is shorter than b4-02, the timer output stays "closed".
④ When the timer input becomes "open", the timer output closes after the time set in b4-02.

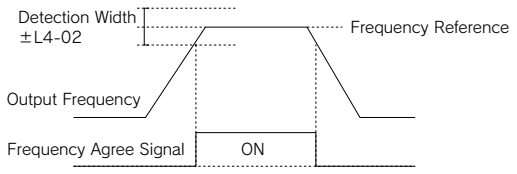
Use Output Signals

Multi-function terminal selection H2-01 to 05

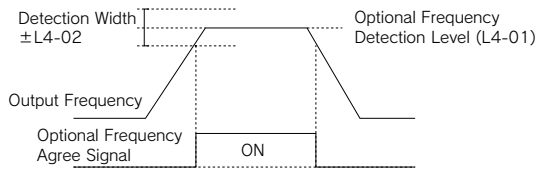
Constants H2-01 to -03 can be used to change the functions of the multi-function output terminals M1-M2, P1-PC and P2-PC as necessary.

- Terminal M1-M2 function: Set in H2-01.
- Terminal P1-PC function: Set in H2-02.
- Terminal P2-PC function: Set in H2-03.
- Terminal P3-C3 function: Set in H2-04.
- Terminal P4-C4 function: Set in H2-05.

Setting	Function	Control Mode				
		V/f without PG	V/f with PG	Open Loop Vector1	Vector with PG	Open Loop Vector2
00	During run	○	○	○	○	○
01	Zero speed	○	○	○	○	○
02	Frequency (speed) agree 1	○	○	○	○	○
03	Optional frequency (speed) agree 1	○	○	○	○	○
04	Frequency (FOUT) detection 1	○	○	○	○	○
05	Frequency (FOUT) detection 2	○	○	○	○	○
06	Inverter ready (READY)	○	○	○	○	○
07	Main circuit undervoltage (UV) detection	○	○	○	○	○
08	Baseblock (NO contact)	○	○	○	○	○
09	Frequency reference selection status	○	○	○	○	○
0A	Run command status	○	○	○	○	○
0B	Overtorque/undertorque detection 1 (NO contact)	○	○	○	○	○
0C	Frequency reference loss	○	○	○	○	○
0D	Mounted-type braking resistor fault	○	○	○	○	○
0E	Fault	○	○	○	○	○
0F	Not used	—	—	—	—	—
10	Minor fault (ON: when warning displayed)	○	○	○	○	○
11	Reset command active	○	○	○	○	○
12	Timer function output	○	○	○	○	○
13	Frequency (speed) agree 2	○	○	○	○	○
14	Optional frequency (speed) agree 2	○	○	○	○	○
15	Frequency (FOUT) detection 3	○	○	○	○	○
16	Frequency (FOUT) detection 4	○	○	○	○	○
17	Overtorque/undertorque detection 1 (NC contact)	○	○	○	○	○
18	Overtorque/undertorque detection 2 (NO contact)	○	○	○	○	○
19	Overtorque/undertorque detection 2 (NC contact)	○	○	○	○	○
1A	Reverse direction	○	○	○	○	○
1B	Baseblock 2 (NC contact)	○	○	○	○	○
1C	Motor selection (second motor selected)	○	○	○	○	○
1D	Not used	○	○	○	○	○
1E	Fault restart enabled	○	○	○	○	○
1F	Motor overload OL1 (including OH3) alarm prediction	○	○	○	○	○
20	Inverter overheat prediction, OH alarm prediction	○	○	○	○	○
30	Torque limit (current limit)	×	×	○	○	○
31	During speed limit (ON: during speed limit)	×	×	×	○	×
32	Speed control circuit operating for torque control (except when stopped).	×	×	×	○	○
33	Zero-servo end (ON: zero-servo function completed)	×	×	×	○	×
37	During run 2	○	○	○	○	○



Frequency Agree Signal Setting Example (Setting = 2)



Optional Frequency Agree Signal Setting Example (Setting = 3)

5. Adjust Motor Torque

Compensate for Torque at Start/Low-speed Operation

Torque compensation gain C4-01

Torque compensation is a function to detect the increase of the motor load and increase output torque.
If control method selection (A1-02) is set to 0 (V/f control without PG) or 1 (V/f control with PG), this function compensates for insufficient torque at start or low-speed operation using the entire area full-automatic torque boost function according to output voltage.
When control method selection (A1-02) is set to 2 (open-loop vector control), motor torque is automatically controlled according to the load by calculating motor primary current to compensate for undertorque.

Automatic torque offset gain normally does not need adjustment. The factory setting is C4-01 = 1.0

Make necessary adjustments when the wiring distance between the inverter and motor is long, or when the motor vibrates excessively.
The motor torque can be increased by increasing the torque offset gain, but may also cause the following failures.

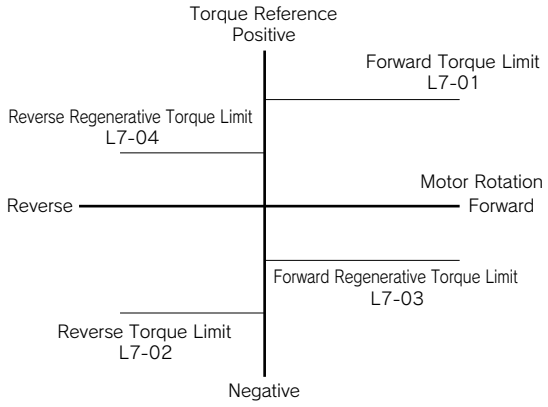
- Excessive motor current may cause failure of the inverter.
- The motor may heat or vibrate excessively.

Increase the torque offset gain little by little, while observing the motor current.

Limit Motor Torque

Forward torque limit	L7-01
Reverse torque limit	L7-02
Forward regenerative torque limit	L7-03
Reverse regenerative torque limit	L7-04

The motor torque limit function is enabled at vector control with PG and open-loop vector control.
Since torque that is output from the motor is calculated internally in the vector control with PG and the open-loop vector control mode, torque limit can be applied with any value. This function is effective when torque exceeding a certain amount is not to be applied to the load or when the regenerative value is not to be generated at a certain amount or more.
Set the torque limit value in the % for the motor rated torque.
It can be set individually in each quadrant.



Notes:
- Since torque control has a priority when the torque limit function operates, the motor revolution control or compensation will be disabled. Therefore, accel/decel time may increase or the motor revolutions may reduce.
- When torque limit is used for lifting load applications, set such a torque limit value that the load may not drop or slip.
- To increase the torque limit value, the inverter capacity may have to be increased.

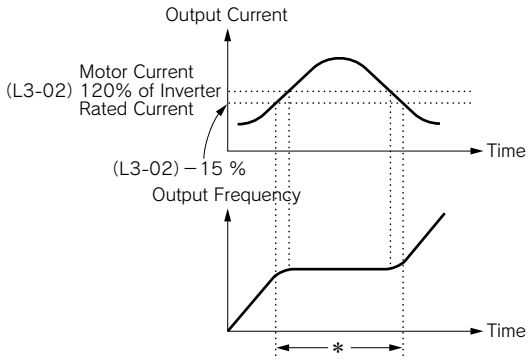
Prevents Motor from Stalling

Stall prevention selection during accel	L3-01
Stall prevention level during accel	L3-02
Stall prevention limit during accel	L3-03
Stall prevention selection during decel	L3-04
Stall prevention selection during run	L3-05
Stall prevention level during run	L3-06

(1) Stall prevention during acceleration

A function to prevent the motor from stalling when an excessive load is applied to the motor during acceleration or at rapid acceleration.

By setting L3-01 to 1, the motor stops acceleration and holds the frequency if inverter output current exceeds 120 % (L3-02 set value) of inverter rated current. When output current is 120 % (L3-02 set value) or less, acceleration starts again. Inverter rated output current is regarded as 100 %.



* Output frequency is controlled so that stall status may not be caused in the meantime.

(Factory setting of L3-02 is 120 %. By setting L3-01 to 0, the stall prevention during acceleration will be disabled.)

Stall prevention level during acceleration is automatically reduced by the following equation in the constant output area (output frequency ≧ max. voltage frequency E1-06).

Stall prevention level during acceleration in constant output area

$$= \text{Stall prevention level during accel (L3-02)} \times \frac{\text{Max. voltage frequency (E1-06)}}{\text{Output frequency}}$$

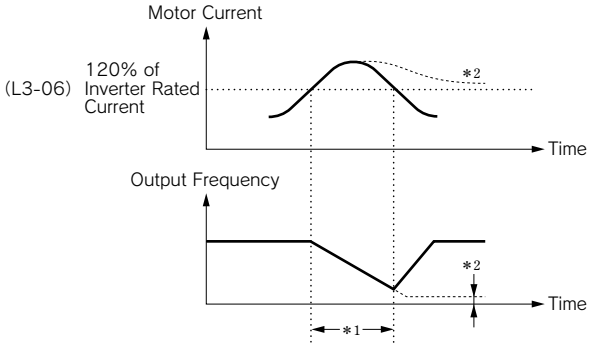
However, in order to avoid this stall prevention level in the constant output area from being reduced more than necessary, use L3-03 to set the limit.

* Factory setting: L3-03 = 50 %

(2) Stall prevention during run

A function to prevent the motor from stalling reducing inverter output frequency automatically when a transient overload occurs while the motor is running at a constant speed.

By setting L3-05 to 1 or 2, the stall prevention during running is enabled only in the V/f control mode. Deceleration starts when inverter output current exceeds 120 % (L3-06 set value) of inverter rated current during constant speed operation. While output current exceeds 120 % (L3-06 set value), the motor continues decelerating in the set deceleration time. When inverter output current is 118 % (L3-06 set value −2 %) or less, the motor accelerates up to the set frequency in the set acceleration time.



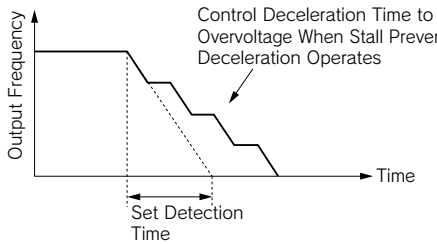
*1 Frequency is reduced to prevent stalling in the meantime.
*2 Unless output current is less than the set level, output frequency is held at the minimum value.

(Factory setting is 120 %. By setting L3-05 to 0, the stall prevention during running will be disabled.)

(3) Stall prevention during deceleration

A function to extend the deceleration time automatically according to the size of main circuit DC voltage so that overvoltage may not occur during deceleration. When a braking resistor (optional) is used, be sure to set L3-04 to 0 or 3.

The following shows an example of the stall prevention during deceleration when 1 is set to L3-04.



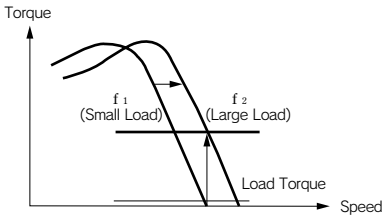
L3-04 Setting	Stall Prevention during Deceleration
0	Disabled
1	Enabled (Stops deceleration when main circuit DC voltage is closed to the overvoltage level. Starts deceleration again after recovery of voltage.)
2	Optimum adjustment (Decelerates in the shortest time according to main circuit DC voltage. Setting of deceleration time is disregarded.)
3	Enabled (when braking resistor is mounted)

6. Reduce Motor Speed Fluctuation

Control Motor Slip

Slip compensation gain	C3-01
Speed control (ASR) proportional (P) gain 1	C5-01
ASR proportional (P) gain 2	C5-03
ASR integral (I) time 1, 2	C5-02, C5-04

As the load becomes larger, the motor slip amount becomes larger, resulting in reduction of the motor speed. The slip offset function controls the motor speed at a constant rate even when the load changes.
The inverter adds frequency equivalent to the slip of the motor to the output frequency according to the load.
Control with PG is accomplished by directly detecting the motor speed by the PG (detector), thus allowing higher precision in the operation.



・Control without PG

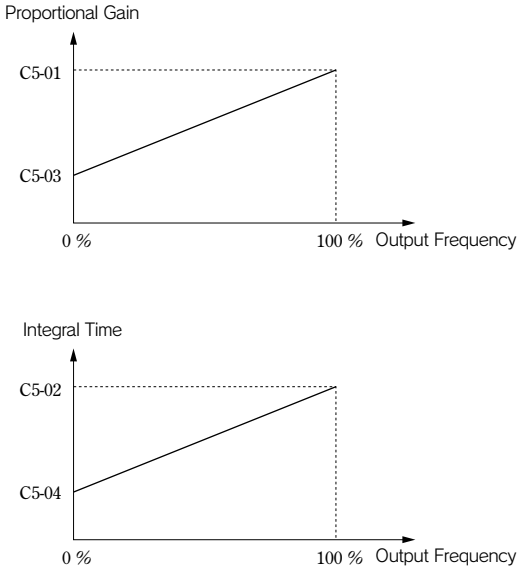
Constant No.	Name	Setting Range	Initial Value
C3-01	Slip compensation gain	0 to 2.5	1.0 *1
E2-01	Motor rated current	0.00 to 1500.0 A	*2
E2-02	Motor rated slip	0.00 to 20.00 Hz	*2
E2-03	Motor no-load current	0.00 to 1500.0 A	*2

・Control with PG

Constant No.	Name	Setting Range	Initial Value
C5-01	ASR proportional gain 1	1.00 to 300.00 *3	20.00 *4
C5-02	ASR integral time 1	0.000 to 10.000 s	0.500 *4
C5-03	ASR proportional gain 2	1.00 to 300.00 *3	20.00 *4
C5-04	ASR integral time 2	0.000 to 10.000 s	0.500 *4
E2-04	Number of motor poles	2 to 48	4
F1-01	PG constant (P/R)	0 to 60000	600

*1 When using V/f control without PG, the initial value is 0.0 (without slip compensation).
*2 Initial value differs according to the inverter kVA setting or motor selection.
*3 When using V/f control with PG, the setting range is 0.00 to 300.00.
*4 Initial values of V/f control with PG are C5-01=0.20, C5-02=0.20 s, C5-03=0.02, C5-04=0.05 s.

Set the speed control proportional gain (C5-01) and integral time (C5-02) at the maximum output frequency.
Set the speed control proportional gain (C5-03) and integral time (C5-04) at the minimum output frequency.
Normally, C5-03 and C5-04 do not have to be set.



Relation between Output Frequency and Proportional Gain or Integral Time

7. Motor Protection

Motor Overload Detection

Motor rated current E2-01
Motor protection selection L1-01
Motor protection time constant L1-02

The inverter protects against motor overload with a built-in electronic thermal overload relay.
Make the correct settings as follows.

Constant No.	Name	Setting Range	Initial Value
E2-01	Motor rated current	Setting range is from 10 to 200 % of the inverter rated output current.	*
L1-01	Motor protection selection	0 to 3 0=Disabled (No motor protection) 1=Protects general-purpose motors. 2=Protects inverter exclusive-use motors. 3=Protects vector control motors.	1
L1-02	Motor protection time constant	0.1 to 5.0 min	1.0 min

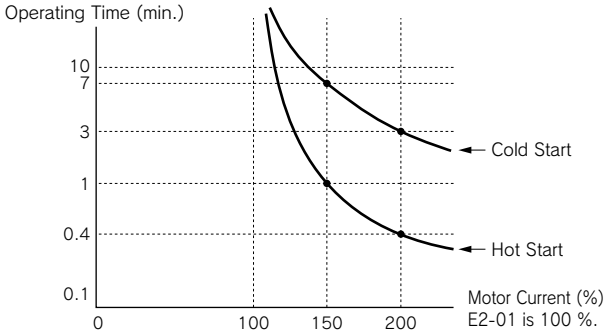
* Initial value differs according to the inverter kVA setting or motor selection.

(1) Set E2-01 to the rated current value on the motor nameplate. This set value becomes electronic thermal overload relay reference value.

(2) According to the applicable motor, set L1-01 for the overload protective function.
Motor has different cooling capacity depending on the speed control range. Therefore, it is necessary to select the protective characteristics of the electronic thermal overload relay according to the allowable load characteristics of the applicable motor.
The table below shows motor types and their allowable load characteristics.

(3) Set L1-02 to the motor protective operation time. (Normally, this setting is not needed.)
Set the electronic thermal overload relay protective operation time when 150 % overload is applied after continuous operation at rated current (hot-start).
* Factory setting: L1-02 = 1.0 min (150 % yield stress)

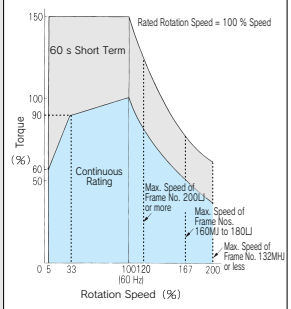
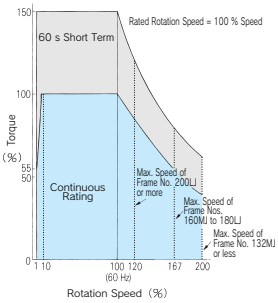
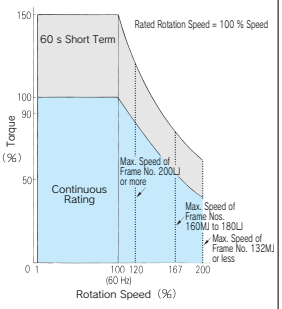
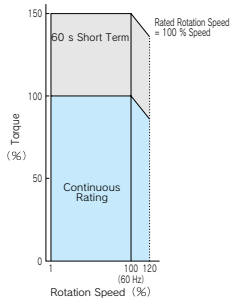
The following diagram shows an example of protective operation time characteristics of the electronic thermal overload relay [L1-02 = 1.0 minute, operation at 60 Hz, general-purpose motor characteristics (when L1-01 is set to 1)].



Motor Protective Operation Time

- The electronic thermal overload function monitors motor temperature, based on the inverter output current, frequency and time, to protect the motor from overheating. When electronic thermal overload relay is enabled, an "OL1" error occurs, shutting OFF the inverter output and preventing excessive overheating in the motor. When operating with one inverter connected to one motor, an external thermal relay is not needed.
- When operating several motors with one inverter, install a thermal relay on each motor. In this case, set constant L1-01 to 0.
- Thermal overload calculated value is reset when the power supply is turned OFF so that protection may not be enabled in applications where the power supply is frequently turned ON and OFF even if L1-01 is set to either 1, 2 or 3.

Motor Type and Allowable Load Characteristics

L1-01 Setting	1	2	3	
Motor type	General-purpose Motor (Standard Motor)	Constant Torque Inverter Exclusive-use Motor(1:10)	Vector Exclusive-use Motor (1:100)	Vector with PG Exclusive-use Motor (1:1000)
Allowable Load Characteristics				
Cooling	Motor to operate with commercial power supply. Has motor configuration where cooling effect can be obtained when operating at 50/60 Hz.	Has motor configuration where cooling effect can be obtained even if operating in low-speed area (approx. 6 Hz).	Has motor configuration where cooling effect can be obtained even if operating at super low-speed area (approx. 0.6 Hz).	Has motor configuration where cooling effect can be obtained even if operating at super low-speed area (approx. 0.6 Hz).
Electronic Thermal Overload Relay Operation (at 100% Motor Load)	Detects motor overload protection (OL1) at continuous operation at less than 50/60 Hz. Inverter outputs a fault contact and the motor coasts to a stop.	Performs continuous operation at 6 to 50/60 Hz.	Performs continuous operation at 0.6 to 60 Hz.	Performs continuous operation at 0.06 to 60 Hz.

8. PID Control

PID Control

PID control selection	b5-01
Reference selection	b1-01
Terminal A2 signal level selection	H3-08
PID constant	b5-02 to 10

PID control makes the set reference selection coincide with the feedback value (detected value). By combining proportional control (P), integral control (I) and differential control (D), PID control is enabled even for applications (machine systems) having idle time.

Each control feature of PID control is as follows:

P control : Outputs the operation amount in proportion with the deviation. However, the deviation cannot be made zero only by P control.

I control : Outputs the operation amount obtained by integrating the deviation. Effective to make the feedback value coincide with the reference selection. However, cannot follow up with rapid variation.

D control: Outputs the operation amount obtained by differentiating the deviation.

b5-01 Setting	PID Control Function
0	No PID control
1	With PID control (D-control of deviation)
2	With PID control (D-control of feedback value)
3	With PID control (D-control of frequency reference + PID output or deviation)
4	With PID control (D-control of frequency reference + PID output or feedback value)

(1) Reference selection setting

The frequency reference selected by b1-01 or the frequency reference selected by multi-step speed reference 1, 2 or 3 will be the reference selection for PID control. However, the reference selection can be set as shown in the following table.

How to Set PID Reference Selection	Setting Conditions
Input from Multi-function Analog Terminal A2 and A3*	Set b1-01 to 1 and H3-09 or H3-05 to C (PID reference selection). At this time, set H6-01 to 1 (PID feedback value) and input the detected value to pulse train input terminal RP.
Input from MEMOBUS Communication Register 0006H	Set b1-01 to 2 and bit of MEMOBUS register 000FH to 1, and register 0006H can be input as the PID reference selection through communications.
Input from Pulse Train Input Terminal RP	Set b1-04 to 4 and H6-01 to 2 (PID reference selection)

* Terminal A2 current signal (4 to 20mA) or voltage signal (0 to 10V) can be used.
Terminal A2 current signal: H3-08 = 2
Terminal A2 voltage signal: H3-08 = 0
(When the voltage signal is used, turn OFF dip switch S1-2 on the control board.)

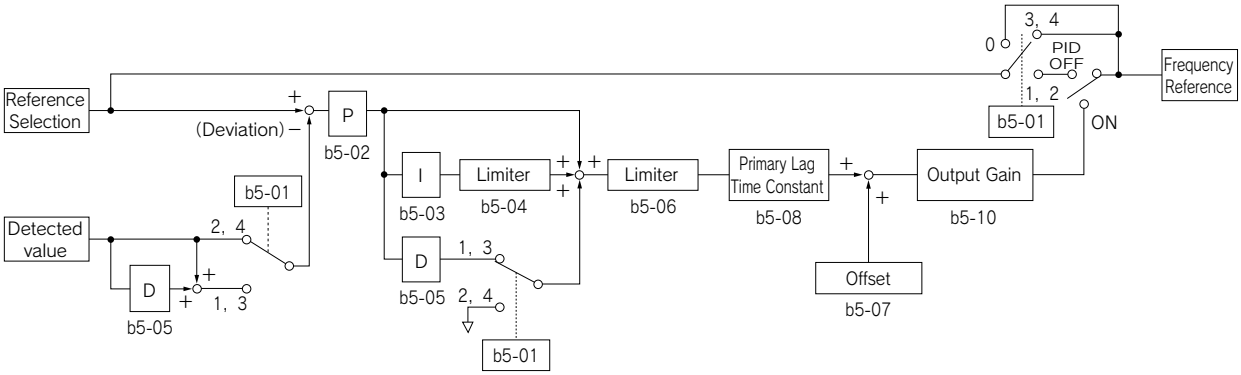
(2) Detected value setting

The setting of the detected value can be selected from the following table.

How to Input	Setting Conditions
Input from Multi-function Analog Terminal A2 and A3*	Set H3-09 or H3-05 to B (PID feedback value).
Input from Pulse Train Input Terminal RP	Set H6-01 to 1 (PID feedback value).

* Same as the description for the above table.

- The integral value is reset to 0 in the following cases:
  - When stop command is input or during stop
  - When multi-function input PID control cancel (set value: 19) is selected, and terminal PID is set as "PID control cancel" when "closed"
- The upper limit of I can be set by b5-04.
  When upgrading the control capacity by integration, increase the value of b5-04.
  If the control system vibrates and cannot be corrected by adjusting the integral time or primary delay time constant, decrease the b5-04 value.
- The PID control can be canceled by the multi-function input signal. The PID control is canceled by setting 19 in one of H1-01 to 10, and closing the contact; the reference selection signal is directly used as the frequency reference signal.



PID Control Block Diagram

9. Control by MEMOBUS Communication

Reference selection	b1-01
Operation method selection	b1-02
Station address	H5-01
Transmission speed selection	H5-02
Transmission parity selection	H5-03
Stopping method after transmission error	H5-04
Transmission error detection selection	H5-05
Send wait time	H5-06
RTS control ON/OFF	H5-07
MEMOBUS communication error code	U1-39

The Varispeed G7 can perform serial communication through the programmable controller (hereafter referred to as PLC) and the MEMOBUS communication. MEMOBUS is composed of one master (PLC) and 1 to 31 slaves (Varispeed G7). In the signal transmission (serial communication) between the master and the slave (s), the master always starts signal transmission and the slaves respond to it.

The master performs signal transmission simultaneously with one slave. Therefore, set address number for each slave in advance, and the master can specify the number for signal transmission. The slave that receives the command from the master executes the specified function, and returns a response to the master.

〔Communication specifications〕

- Interface：RS-485/422
- Synchronization：Non-synchronous (start stop synchronization)
- Communication parameter：
  - Can be selected from baud rate 2400, 4800, 9600 or 19200 bps (constant H5-02).
  - Data length 8-bit fixed
  - Parity with/without parity, odd/even parity selectable (constant H5-03)
  - Stop bit 1 bit fixed
- Protocol：MEMOBUS or equivalent (RTU mode only)
- Max. connection：31 units (when RS-485 is used)

〔Data that can be transmitted/received on-line〕

Data that can be transmitted/received on-line are the run command, frequency reference, fault, inverter status, constant setting/reference.

(1) Operation mode selection (b1-01, b1-02)

Select the run command and frequency reference input method in constants b1-01 and b1-02, respectively. To provide a run command and frequency reference by communication, set these constants to setting 2. Also without regard to this selection, monitoring of running status, constant setting/reference, fault reset and multi-function input command from the PLC are enabled. The multi-function input command becomes OR with the command input from control circuit terminals S3 to S12.

Cont'd

(2) MEMOBUS frequency reference unit (o1-03)

The frequency reference units from the PLC and in the frequency reference and output frequency monitors (by communication) are selected.

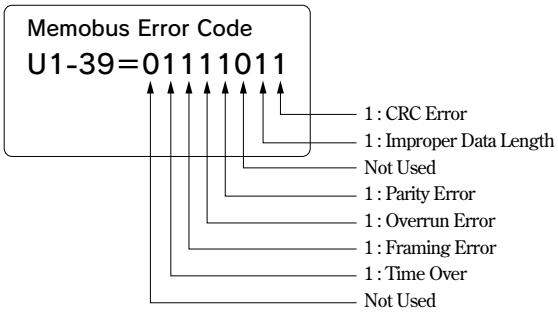
(3) MEMOBUS slave address (H5-01)

The slave address number is set. It is necessary to set the address number so that it will not overlap with the address number of another slave connected on the same transmission line.

Note: To change the values set in constant H5-01 to H5-07 and enable new settings, it is necessary to turn OFF the power supply, and then turn it ON again.

(4) MEMOBUS communication error code (U1-39)

If an error occurs in the MEMOBUS communication, the error contents can be displayed on the digital operator.



10. Energy-saving Control

Use Energy-saving Mode

Energy-saving mode selection b8-01
Energy-saving coefficient b8-04

Set b8-01 (energy-saving mode selection) to 1, and energy-saving control is enabled.

b8-01 Setting	Energy-saving Mode
0	Energy-saving disabled
1	Energy-saving enabled

For the constants used in the energy-saving mode, the optimum values have been set at factory. They do not have to be adjusted under normal operation.
If the motor has very different characteristics from those of YASKAWA standard motors, refer to the following description of the constants and change them. The following describes the case where constant A1-02 is set to 0 (V/f control without PG) or 1 (V/f control with PG).

Energy-saving coefficient (b8-04)

In the energy-saving mode, the voltage at which the motor efficiency will be the maximum is calculated using this energy-saving coefficient, which is regarded as output voltage reference. This value has been set to the YASKAWA standard motors as the factory setting. Increasing the energy-saving coefficient makes output voltage larger.

When using any motor other than YASKAWA standard motors, change the value by approx. 5 % from the factory setting so that you can find the optimum value in which output power will be the minimum.

11. Use Constant Copy Function

Copy or Compare Constants

Copy function selection o3-01
Read permitted selection o3-02

The Varispeed G7 standard digital operator (JVOP-161) can store the inverter constants.
The constant capacity to be stored is for one unit.
Since EEPROM (non-volatile memory) is used as the data memory elements, any backup power supply is not needed.

Copy function selection (o3-01)

Constants can be written (copied) only between the Varispeed G7 units with the same product code, software number, capacity and control mode (V/f control without PG, V/f control with PG, open-loop vector control or vector control with PG). However, some constants cannot be copied. If the conditions are not met, the digital operator displays an error such as CPE (ID unmatched), vAE (inverter capacity unmatched) or CrE (control mode unmatched).
The digital operator uses the incorporated EEPROM to perform the following three functions:

- Stores inverter constant set values in the digital operator (READ).
- Writes in the constant set values stored in the digital operator to the inverter (COPY).
- Compares the inverter constants with the constants stored in the digital operator (VERIFY).

(Factory setting: o3-01)

o3-01 Setting	Contents
0	Normal operation
1	READ (from inverter to operator)
2	COPY (from operator to inverter)
3	VERIFY (comparison)

(1) READ
Set o3-01 to 1 so that the inverter constant set values will be stored in the digital operator.

(2) COPY
Set o3-01 to 2 so that the constant set values stored in the digital operator will be written in to the inverter.

(3) VERIFY
Set o3-01 to 3 so that the inverter constants will be compared with the constant set values in the digital operator.

Read permitted selection (o3-02)

Prohibition of constant read-out form the inverter can be set. By using this function, you can prevent the constant stored in the EEPROM of the digital operator from being changed by mistake.

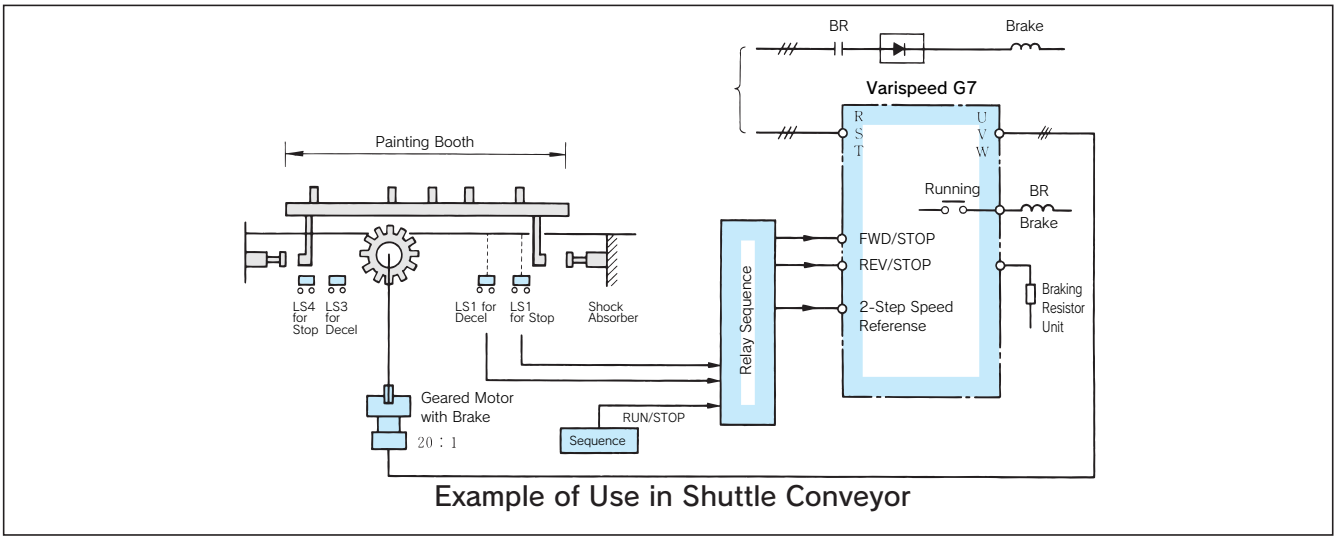
(Factory setting: o3-02 = 0)

o3-02 Setting	Contents
0	READ prohibited
1	READ permitted

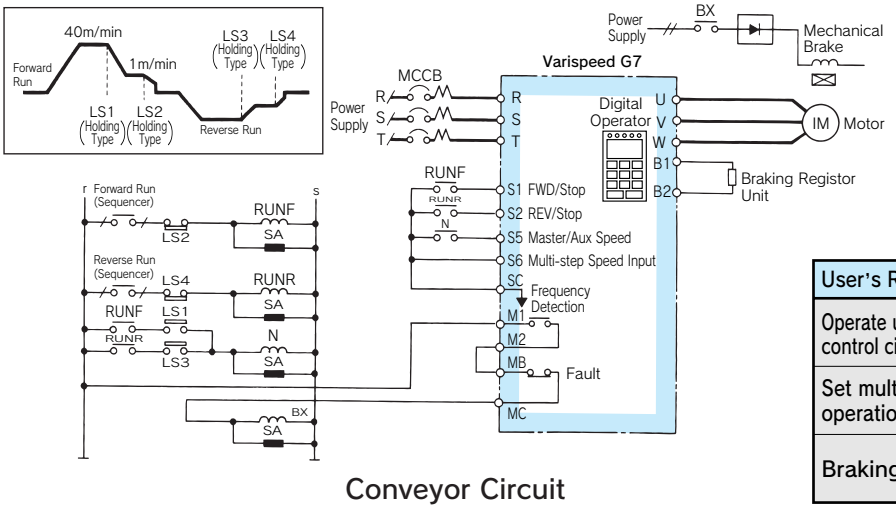
By setting o3-02 to 0, reading operation is disabled so that the constant data stored in EEPROM of the digital operator can be protected.

Application Examples

Conveyor and Lifter (Insures Safe and Optimum Performance)



Example of Use in Shuttle Conveyor



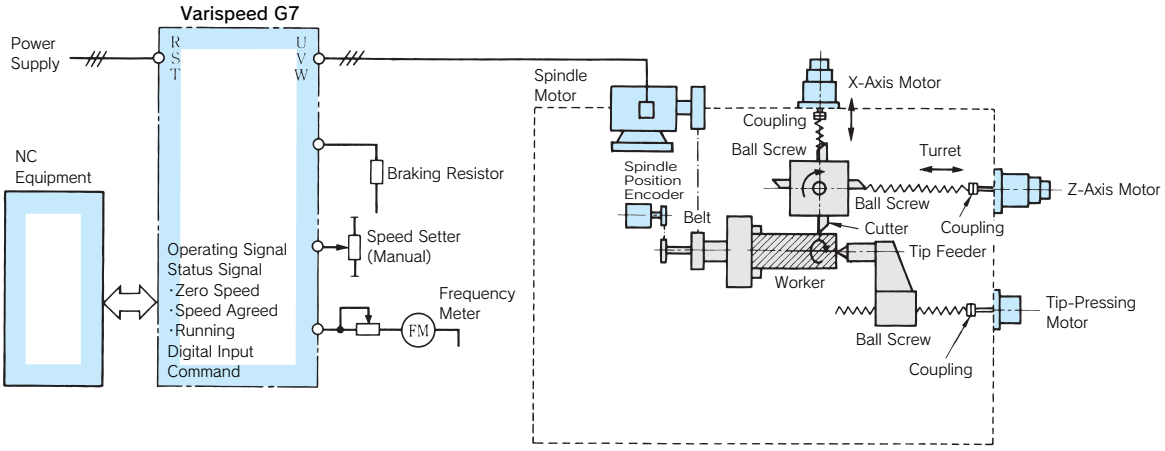
Conveyor Circuit

User's Requirements	Function and Parameter Settings	
Operate using control circuit terminals	Operation method selection	b1-02=1
Set multi-step speed operation	Frequency reference	d1-03=0 to 400Hz d1-04=0 to 400Hz
Braking signal	Frequency detection	H2-01=05 L4-01=0 to 400Hz

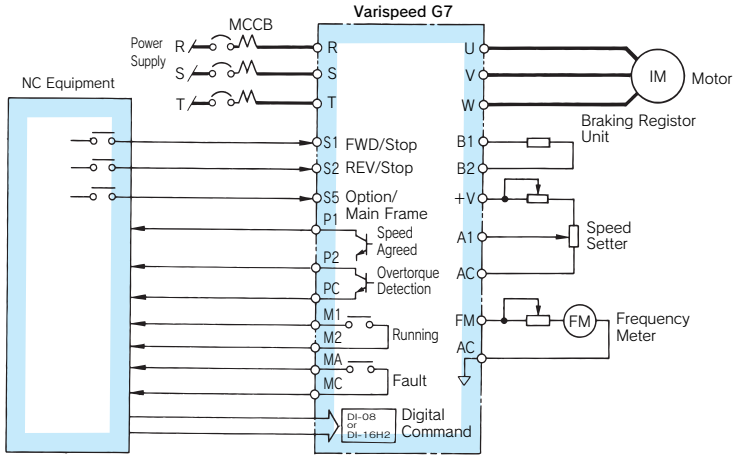
Application Example	User's Requirements	Applicable Varispeed G7 Function	Function and Parameter Settings	
Shuttle Conveyor	Increase precision of positioning stop.	Control the braking motor using contact output from terminals M1 and M2.	Operation method selection Slip prevention	b1-02=1, H2-01=05, L4-01=0 to 400Hz
	Perform 2-step speed operation.	Use the multi-step speed function.	Frequency reference	d1-01 to 04=0 to 400Hz
	Smooth accel/decel	Apply S-curve accel/decel.	S-curve accel/decel	C2-01 to 04=0.0 to 2.5 sec.
	Variable accel/decel time	Use the accel/decel time setting function.	Accel/decel time switching	H1-01 to -10=07
	Select stop procedure according to degree of emergency.	Select stop procedures.	External fault	H1-01 to -10=20 to 2F
Raw Material Input Conveyor	Increase starting torque (with a constant-torque motor).	Increase torque limit value.	Torque limit	L7-01 to -04=0 to 300%*2
Steel Pipe Conveyor	Drive more than one motor with a single inverter.	The function is provided. (Select V/f mode)	Control method selection	A1-02=0
Lifter	Simple slip compensation function.	Check the motor generation torque using the torque detection function.	Over torque detection Over torque detection level Over torque detection time	L6-01, 04=0-4 L6-02, 05=0 to 300% L6-03, 06=0 to 10.0 sec.
	Use non-excitation operating type braking motor.	Use the free V/f setting function to turn the motor without excess excitation.	Control method selection V/f selection Free V/f setting	A1-02=0 E1-03=0F E1-04 to 10=Setting

* Inverter capacity cannot be exceeded. Choose larger inverter capacity for the maximum torque required.

Lathe (Improves Accel/Decel Speed Performance)



Example of Use with CNC Lathe



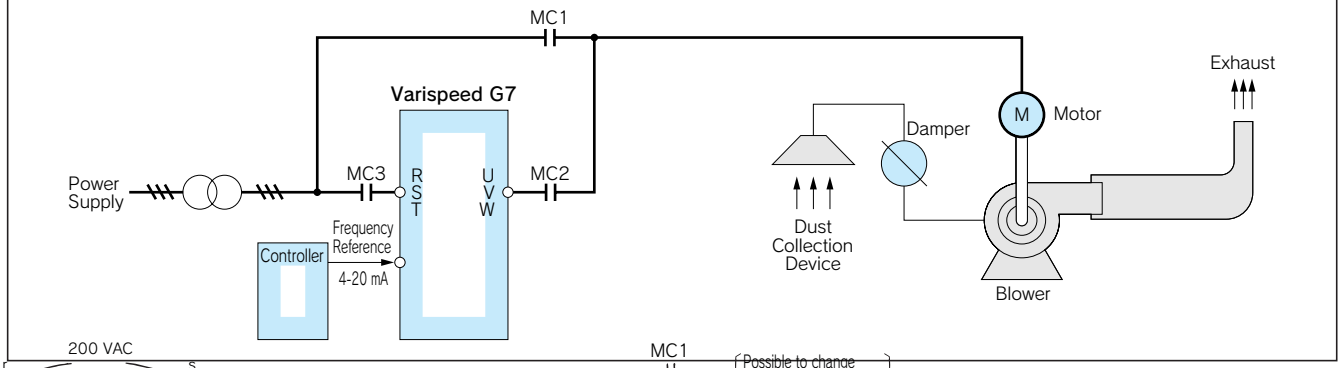
Interface Circuit to NC

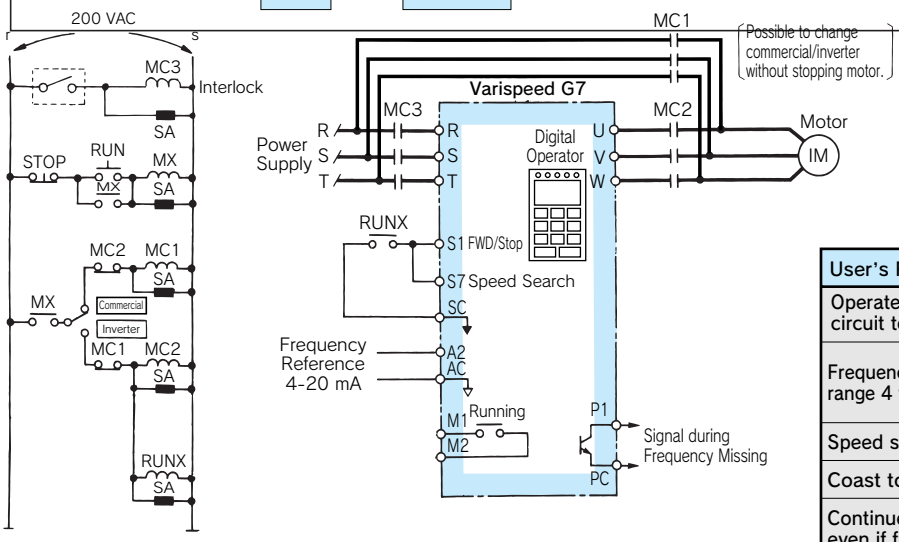
User's Requirements	Function and Parameter Settings
Operate using digital command.	DI-08 (option) DI-16H2 (option)
Cutter edge abrasion detection function	Overtorque detection selection L6-01=0 to 4 Overtorque detection level L6-02=0 to 300% Overtorque detection time L6-03=0 to 10.0 sec. Multi-function digital output H2-03=0B
Speed agreed signal	Multi-function contact output H2-02=02

Application Example	User's Requirements	Applicable Varispeed G7 Function	Function and Parameter Settings
CNC Lathe	Cutting loss detection function	Apply the overtorque detection function.	Overtorque detection selection L6-01, 04=0 to 4 Overtorque detection level L6-02, 05=0 to 300% Overtorque detection time L6-03, 06=0 to 10.0 sec. Multi-function digital output H2-01 to 03=0B
	Drive the motor with digital input.	Use the digital speed command cards.	Connect DI-08 or -DI-16H2. Frequency reference setting mode F3-01=0 to 7
	Interface to NC	Apply the zero-speed function.	Multi-function contact output H2-01 to 03=01
		Apply the speed agreed function.	Multi-function contact output H2-01 to 03=02
		Apply the overtorque detection function. (Cutting loss)	Multi-function contact output H2-01 to 03=0B
	Large constant-output range	Use the winding selection motor.	Option
Super High-Precision Lathe and Grinder	Reduce vibration.	Apply the energy-saving mode.	Energy-saving operation H1-01 to 10=63 b8-01=0 to 100% b8-02=0 to 400Hz

Fans and Blowers (Contributes to Energy-saving and Improved Performance)

Example of the Use of Inverter with Air Scrubber





Commercial/Inverter Selector Circuit

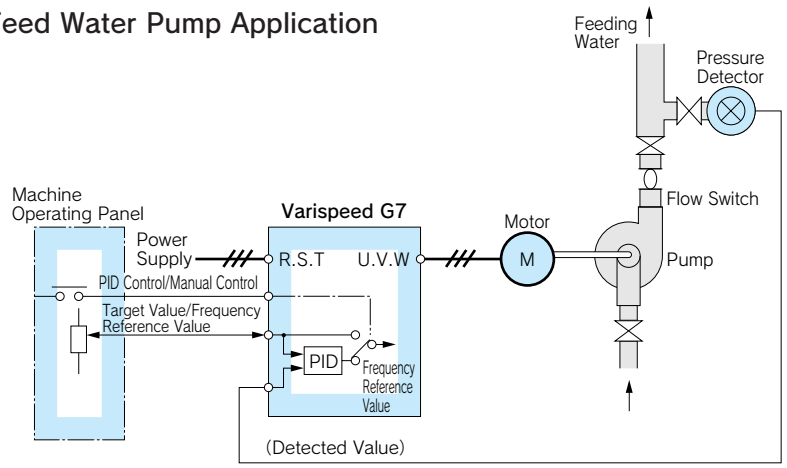
User's Requirements	Function and Parameter Settings
Operate using control circuit terminals	Operation method selection b1-01, 02=1
Frequency reference range 4 to 20mA	Terminal A2 signal level selection H3-08=2 Terminal A2 function selection H3-09=2 Terminal A1 and A2 switching H3-13=1
Speed search function	Multi-function input H1-05=61 or 62
Coast to stop	Stopping method selection b1-03=1
Continue operation even if failure occurs in frequency reference	Operation when frequency reference is missing L4-05=1 Reference loss signal H2-02=0 C

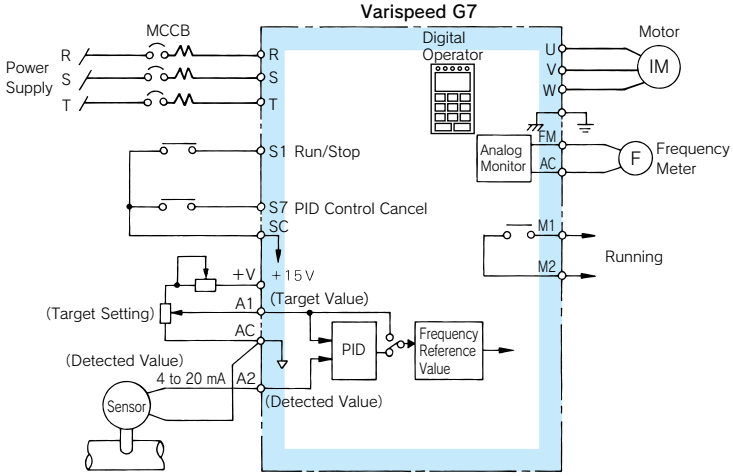
Note: In this case, be sure to select coast to stop for inverter stopping method.

Application Example	User's Requirements	Applicable Varispeed G7 Function	Function and Parameter Settings
Dust Collection System Blower, Fan for Boilers Fan for Cooling Towers	Switch commercial power supply and inverter drive without stopping the motor.	Use the speed search operation.	Multi-function input H1-01 to 05=61 or 62
	Inverter start from coasting stop status without stopping the motor.		
	Save energy since the load is not heavy at low-speed operation.	Apply the variable load V/f.	V/f selection E1-03=05 or 07
	Avoid overload tripping.	Apply the torque limit function.	Torque limit L7-01=0-300 %
	Continue operation even when momentary power loss not longer than 2 seconds occur.	Select the momentary power loss reset and restart mode.	Momentary power loss protection L2-01=0 to 2
	Continue operation even if a failure occures in higher-order frequency reference equipment.	Select the automatic continuous operation mode when frequency reference is missing.	Operating signal selection L4-05=0 to 1 Frequency reference is missing H2-01 to 03=0 C
	Monitor output power.	Turn the monitor to the output power indication.	Monitor display U1-08
	min^{-1} lower limit for lubricating the gear bearing.	Use the frequency reference lower limit.	Frequency reference lower limit d2-02=0 to 110 %
	Avoid mechanical resonance. (The resonance point will be passed, and continuous operation is eliminated at this point.)	Use the preset frequency band prohibition function (frequency jump control). Up to 3 frequencies prohibited.	Jump frequency d3-01 to 03=0 to 400 Hz
			Jump frequency width d3-04=0 to 20.0 Hz
	Wants to prevent machine stop page caused by inverter tripping.	Use the fault retry function.	Fault retry count L5-01=0 to 10 times

Pumps (Ease of Automatic Control Insures Performance Consistancy)

Block Diagram of Feed Water Pump Application





User's Requirements	Function and Parameter Settings
PID control	PID control selection b5-01=1 or 2
PID control characteristics adjustment	PID adjustment b5-02 to 10
	PID control cancel H1-01 to 05=19
Feedback signal 4 to 20 mA	Terminal A2 signal level selection H3-08=2 Terminal A2 function selection H3-09=0B
Meter indication of motor current or output frequency	Analog monitor selection H4-01, 04=1 to 38

Note: Be sure to set the PID feedback signal at terminal A2 or RP.

Application	User's Requirements	Applicable Varispeed G7 Function	Function and Parameter Settings
General Pump	Easy automatic control	Use PID function inside the inverter. (External PID control is not required.)	PID adjustment b5-01 to 11
Chemical-Feeding Pump	Save energy since the load is not heavy at low-speed operation.	Available with standard function (open loop vector control)	Control method selection A1-02=2
	Keep the mixed water ratio constant.	Directly input PID output (4 to 20 mA)	Operating signal selection b1-01, 02=1
	Manual/Auto switching function.	Use the Master/Aux. switching function. Two toggle switches do the job.	Master/Aux. switching H1-01 to 05=03
	Ammeter for monitoring load conditions.	Use an analog monitor (2 CN provided as standard)	Output selection function H4-01, 04=02, 03
Warm/Cold Water Circulation Pump	Drive the pump directly using 4-20 mA signal.	Use external terminals A2 and AC.	Run signal selection b1-01, 02=1
	Function to maintain minimum speed.	Use the lower-limit of the reference frequency.	Frequency reference lower limit d2-02=0 to 110 %
	Run the system using the commercial power supply when an emergency occurs, then return to inverter.	Use a selector circuit together with the speed search function to restart turning motor.	Speed search function selection H1-01 to 05=61 or 62
	Function that can keep the system working without resetting it even when a momentary power loss occurs.	Use the continuous operation function to restart after momentary power loss within two seconds. Use a toggle switch for start and stop.	Momentary power loss protection L2-01=0 to 2
Discharge Pump	Keep a constant water level inside a tank using a water gauge.	Read signals directly sent from the water-level adjusting unit. (4 to 20 mA).	Run signal selection b1-01, 02=1
		Control the water level by PID control.	PID control b5-01 to 11 setting
	Keep the motor min^{-1} above the minimum because if the min^{-1} is too low, water flows in the reverse direction.	Use the lower-limit of the frequency reference.	Frequency reference lower limit d2-02=0 to 110 %

Fault Detection

When the inverter detects a fault, the fault contact output operates, and the inverter is shut OFF causing the motor to coast to stop. (The stopping method can be selected for some faults, and the selected stopping method will be used with these faults.)
A fault code is displayed on the digital operator.
Use one of following methods to reset after restarting the inverter.

- Set a multi-function input (H1-01 to H1-10) to 14 (Fault Reset) and turn ON the error reset signal.
- Press the RESET key on the digital operator.
- Turn the main circuit power supply OFF and then ON again.

Fault	Display	Meaning
Overcurrent (OC)	OC Over Current	The inverter output current exceeded the overcurrent detection level. (200 % of rated current)
Ground Fault (GF)	GF Ground Fault	The ground fault current at the inverter output exceeded approx. 50 % of the rated output current.
Fuse Blown (PUF)	PUF Main IBGT Fuse Blown	The fuse in the main circuit is blown.
Main Circuit Overvoltage (OV)	OV DC Bus Fuse Open	The main circuit DC voltage exceeded the overvoltage detection level. 200 V class: approx. 410 V, 400 V class: approx. 820 V
Main Circuit Undervoltage Main Circuit MC Operation Fault (UV1)	UV1 DC Bus Undervolt	The maincircuit DC voltage detection level setting (L2-05). 200 V class: approx. 190 V, 400 V calss: approx. 380 V
Control Power Fault (UV2)	UV2 CLT PS Undervolt	The control power supply voltage dropped.
Inrush Prevention Circuit Fault (UV3)	UV3 MC Answerback	The MC did not respond for 10 s even though the MC-ON signal has been output. (200 V class: 30 to 110 kW, 400 V class: 55 to 300 kW)
Main Circuit Voltage Fault (PF)	PF Input Pha Loss	The main circuit DC voltage oscillates unusually. (Detected when L8-05 = 1)
Output Open-phase (LF)	LF Output Pha Loss	An open-phase occurred at the inverter output. (Detected when L8-07 = 1)
Cooling Fin Overheating (OH, OH1)	OH(OH1) Heatsnk Overtemp	The temerature of the inverter's cooling fins exceeded the setting in L8-02 or 105 ℃. (OH: Exceeded the setting in L8-02 [L8-03 = 0 to 2], OH1: Exceeded 105 ℃) Inverter's cooling fan stopped.
Motor Overheating Alarm (OH3)	OH3 Motor Overheat 1	The inverter will stop or continue to operate according to the setting of L1-03.
Motor Overheating Fault (OH4)	OH4 Motor Overheat 2	The inverter will stop according to the setting of L1-04.
Mounting Type Braking Transistor Overheating (RH)	RH DynBrk Resistor	The protection function has operated if it has been enabled in L8-01.
Built-in Braking Resistor Fault (RR)	RR DynBrk Trasistr	The braking transistor in not operating properly.
Motor Overload (OL1)	OL1 Motor Overloaded	The motor overload protection function has operated based on the internal electronic thermal value.
Inverter Overload (OL2)	OL2 Inv Overloaded	The inverter overload protection function has operated based on the internal electronic thermal value.
Overtorque Detected 1 (OL3)	OL3 Overtorque Det 1	There has been a current greater than the setting in L6-02 for longer than the time set in L6-03.
Overtorque Detected 2 (OL4)	OL4 Overtorque Det 2	There has been a current greater than the setting in L6-05 for longer than the time set in L6-06.
High-slip Braking OL (OL7)	OL7 HSB-OL	The output frequency did not change for longer than the time set in N3-04.
Undertorque Detected 1 (UL3)	UL3 Undertorq Det 1	There has been a current less than the setting in L6-02 for longer than the time set in L6-03.
Undertorque Detected 2 (UL4)	UL4 Undertorq Det 2	There has been a current less than the setting in L6-05 for longer than the time set in L6-06.
Overspeed (OS)	OS Overspeed Det	The speed has been higher than the setting in F1-08 for longer than the time set in F1-09.
PG Disconnection Detected (PGO)	PGO PG Open	PG pulses were not input when the inverter was outputting a frequency (soft start output ≧ E1-09).
Excessive Speed Deviation (DEV)	DEV Speed Deviation	The speed deviation has been greater than the setting in F1-10 for longer than the time set in F1-11.
Control Fault (CF)	CF Out of Control	The torque limit was reached continuously for 3 seconds or longer during a deceleration stop at open-loop vector control 1. A speed estimation fault is detected at open-loop vector control 2.

Fault	Display	Meaning
PID Feedback Reference Lost (FbL)	FbL Feedback Loss	A PID feedback reference loss was detected (b5-12 = 2) and the PID feedback input was less than b5-13 (PID feedback loss detection level) for longer than the time set in b5-14 (PID feedback loss detection time).
External Fault Input from Communications Option Card (EF0)	EF0 Opt External Flt	An "external fault" was input from a communications option card.
External Fault (Input Terminal S3) (EF3)	EF3 Ext Fault S3	An "external fault" was input from a multi-function input terminal.
External Fault (Input Terminal S4) (EF4)	EF4 Ext Fault S4	
External Fault (Input Terminal S5) (EF5)	EF5 Ext Fault S5	
External Fault (Input Terminal S6) (EF6)	EF6 Ext Fault S6	
External Fault (Input Terminal S7) (EF7)	EF7 Ext Fault S7	
External Fault (Input Terminal S8) (EF8)	EF8 Ext Fault S8	
External Fault (Input Terminal S9) (EF9)	EF9 Ext Fault S9	
External Fault (Input Terminal S10) (EF10)	EF10 Ext Fault S10	
External Fault (Input Terminal S11) (EF11)	EF11 Ext Fault S11	
External Fault (Input Terminal S12) (EF12)	EF12 Ext Fault S12	
Zero Servo Fault (SVE)	SVE Zero Servo Fault	The rotation position moved during zero servo operation
Digital Operator Connection Fault (OPR)	OPR Oper Disconnect	The connection to the digital operator was broken during operation for a run command from the digital operator.
MEMOBUS Communications Error (CE)	CE Memobus Com Err	A normal reception was not executed for 2 seconds or longer after control data was received once.
Option Communications Error (BUS)	BUS Option Com Err	A communications error was detected during a run command or a frequency reference mode from a communications option card.
Digital Operator Communications Error 1 CPU External RAM Fault (CPF00)	CPF00 CPF	Communications with the digital operator were not established within 5 seconds after the power was turned on. CPU external RAM fault.
Digital Operator Communications Error 2 (CPF01)	CPF01 CPF01	After communications were established, there was a communications error with the digital operator for more than 2 seconds.
Baseblock Circuit Error (CPF02)	CPF02 BB Circuit Err	A control part fault.
EEPROM Error (CPF03)	CPF03 EEPROM Error	
CPU Internal A/D Converter Error (CPF04)	CPF04 Internal A/D Err	
CPU External A/D Converter Error (CPF05)	CPF05 External A/D Err	
Option Card Connection Error (CPF06)	CPF06 Option error	The option card is not connected properly.
ASIC Internal RAM Fault (CPF07)	CPF07 RAM-Err	The control circuit is damaged.
Watchdog Timer Fault (CPF08)	CPF08 WAT-Err	
CPU-ASIC Mutual Diagnosis Fault (CPF09)	CPF09 CPU-Err	
ASIC Version Fault (CPF10)	CPF10 ASIC-Err	The control circuit is faulty.
Option Card Error (CPF20)	CPF20 Option A/D error	The option card's A/D converter is faulty.
Communications Option Card Self Diagnosis Error (CPF21)	CPF21 Option CPU down	Communications option card fault.
Communications Option Card Model Code Error (CPF22)	CPF22 Option Type Err	
Communications Option Card DPRAM Error (CPF23)	CPF23 Option DPRAM Err	

Alarm Detection

Alarms are detected as a type of inverter protection function that do not operate the fault contact output. The system will automatically returned to its original status once the cause of the alarm has been removed.

Alarm	Display	Meaning
Foward/Reverse Run Commands Input Together (EF)	EF (blinking) External Fault	Both the forward and reverse run commands have been ON for more than 5 seconds.
Main Circuit Undervoltage (UV)	UV (blinking) DC Bus Undervolt	The following conditions occurred when there was no Run signal. • The main circuit DC voltage was below the undervoltage detection level setting (L2-05). • The inrush current limit contactor opened. • The control power supply voltage was below the CUV level.
Main circuit Overvoltage (OV)	OV (blinking) DC Bus Overvolt	The main circuit DC voltage exceeded the overvoltage detection level. 200 V class: approx. 410 V, 400 V class: approx. 820 V
Cooling Fin Overheating (OH)	OH (blinking) Heatsink Overtemp	The temperature of cooling fins exceeded the setting in L8-02. (Factory setting: L8-03)
Inverter Overheating Pre-alarm (OH2)	OH2 (blinking) Over Heat 2	An OH2 alarm signal (inverter overheating alarm signal) was input from a multi-function input terminal (S3 to S12).
Motor Overheating (OH3)	OH3 (blinking) Motor Overheat 1	E was set in H3-09 and the motor temperature thermistor input exceeded the alarm detection level.
Overtorque 1 (OL3)	OL3 (blinking) Overtorque Det 1	There has been a current greater than the setting in L6-02 for longer than the time set in L6-03.
Overtorque 2 (OL4)	OL4 (blinking) Overtorque Det 2	There has been a current greater than the setting in L6-05 for longer than the time set in L6-06.
Undertorque 1 (UL3)	UL3 (blinking) Undertorq Det 1	There has been a current less than the setting in L6-02 for longer than the time set in L6-03.
Undertorque 2 (UL4)	UL3 (blinking) Undertorq Det 2	There has been a current less than the setting in L6-05 for longer than the time set in L6-06.
Overspeed (OS)	OS (blinking) Overspeed Det	The speed has been greater than the setting in F1-08 for longer than the time set in F1-09.
PG Disconnected (PGO)	PGO (blinking) PG Open	PG pulses were not input when the inverter was outputting a frequency.
Excessive Speed Deviation (DEV)	DEV (blinking) Speed Deviation	The speed deviation has been greater than the setting in F1-10 for longer the time set in F1-11.
External Fault (Input Terminal S3) (EF3)	EF3 (blinking) Ext Fault S3	An “external fault” was input from a multi-function input terminal.
External Fault (Input Terminal S4) (EF4)	EF4 (blinking) Ext Fault S4	
External Fault (Input Terminal S5) (EF5)	EF5 (blinking) Ext Fault S5	
External Fault (Input Terminal S6) (EF6)	EF6 (blinking) Ext Fault S6	
External Fault (Input Terminal S7) (EF7)	EF7 (blinking) Ext Fault S7	
External Fault (Input Terminal S8) (EF8)	EF8 (blinking) Ext Fault S8	
External Fault (Input Terminal S9) (EF9)	EF9 (blinking) Ext Fault S9	
External Fault (Input Terminal S10) (EF10)	EF10 (blinking) Ext Fault S10	
External Fault (Input Terminal S11) (EF11)	EF11 (blinking) Ext Fault S11	
External Fault (Input Terminal S12) (EF12)	EF12 (blinking) Ext Fault S12	
PID Feedback Reference Lost (FbL)	FBL (blinking) Feedback Loss	A PID feedback reference loss was detected (b5-12 = 2) and the PID feedback input was less than b5-13 (PID feedback loss detection level) for longer than the time set in b5-14 (PID feedback loss detection time).
MEMOBUS Communications Error (CE)	CE (blinking) MEMOBUS Com Err	A normal reception was not possible for 2 seconds or longer after control data was received once.
Option Card Communications Error (BUS)	BUS (blinking) Option Com Err	A communications error was detected during a run command or a frequency reference mode from a communications option card.
Communications on Standby (CALL)	CALL (blinking) Com Call	Data was not received properly when the power supply was turned on.

Operation Errors

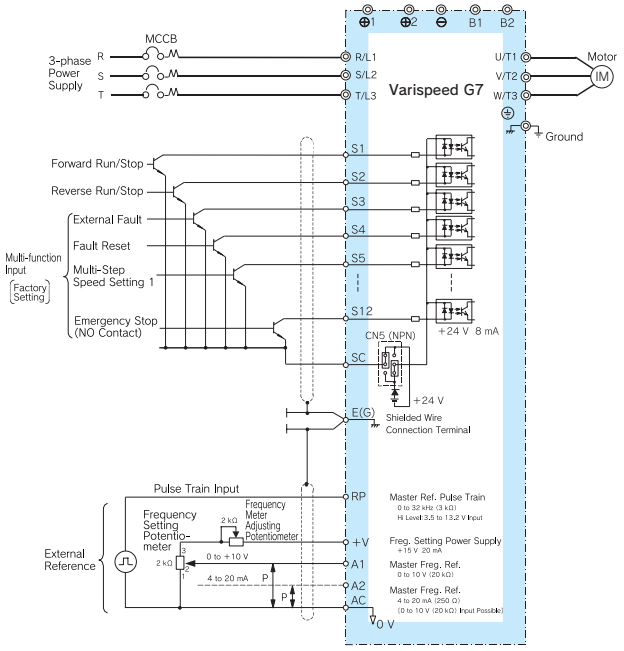
An operation error will occur if there is an invalid setting or a contradiction between two constant settings. The inverter will not start until the constants have been set correctly. (The alarm output and fault contact outputs will not operate wither.)

Error	Display	Meaning
Incorrect Inverter Capacity Setting (OPE01)	OPE01 kVA Selection	The inverter capacity setting doesn't match the unit. (Contact your YASKAWA representative.)
Constant Setting Range Error (OPE02)	OPE02 Limit	The constant setting is out of the valid setting range.
Multi-function Input Selection Error (OPE03)	OPE03 Terminal	The same setting has been selected for two or more multi-function inputs (H1-01 to 05) or UP or DOWN command was selected independently, etc.
Option Card Reference Selection Error (OPE05)	OPE05 Sequence Select	An option card is not connected when the option card was selected as the frequency reference source by setting b1-01 to 3.
Control Mode Selection Error (OPE06)	OPE06 PG Opt Missing	A PG speed control card is not connected when V/f control with PG was selected by setting A1-02 to 1.
Multi-function Analog Input Selection Error (OPE07)	OPE07 Analog Selection	The same setting has been selected for the analog input selection and the PID function selection.
Constant Selection Error (OPE08)	OPE08	A setting not required in the control mode has been selected.
PID Control Selection Error (OPE09)	OPE09	PID sleep function is valid (b5-01 ≠ 0 and b5-15 ≠ 0) and stop method has been set to 2 or 3.
V/f Data Setting Error (OPE10)	OPE10 V/f Ptrn Setting	Constants E1-04, E1-06, E1-07, and E1-09 do not satisfy the conditions.
Constant Setting Error (OPE11)	OPE11 Carr Freq/On-Delay	Constant setting error occurred.
EEPROM Write Error (ERR)	ERR EEPROM R/W Err	A verification error occurred when writing EEPROM.

Typical Connection Diagrams

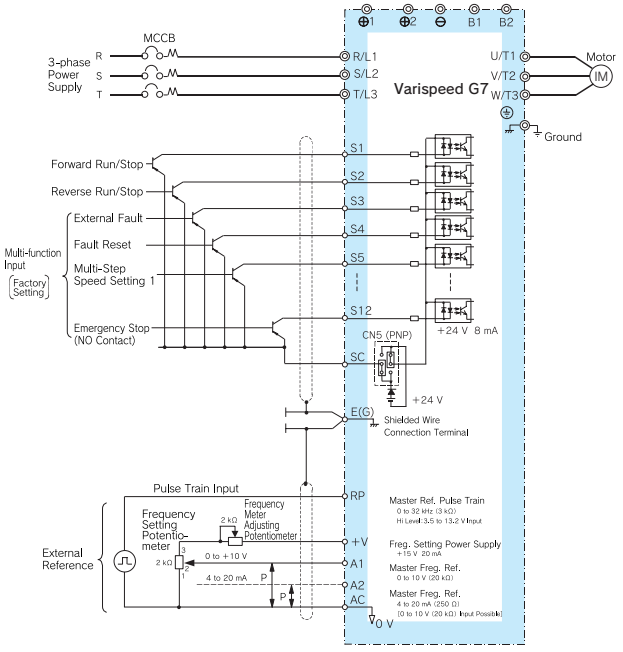
With Transistor at 0V Common/Sink Mode

When input signal is a sequence connection (0 V common/sink mode) by NPN transistor using +24 V internal power supply, set CN5 (shunt connector) on the control board to NPN.



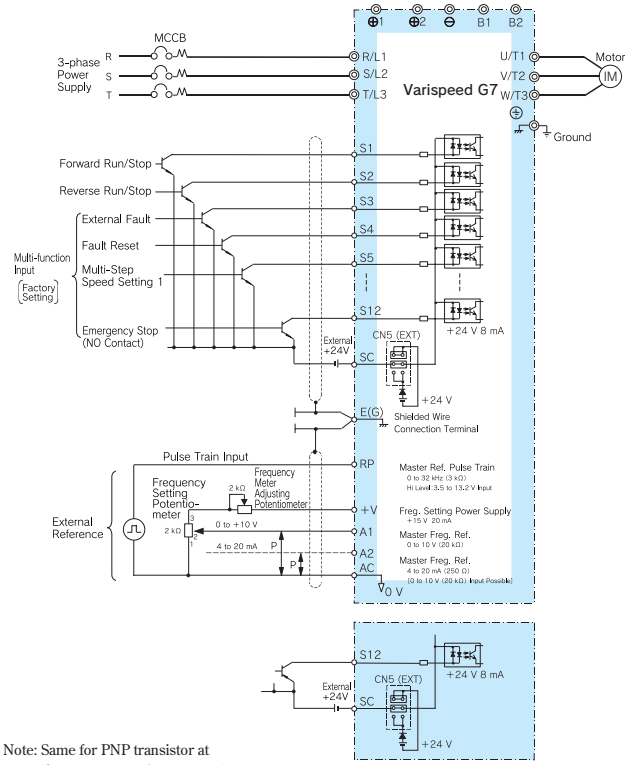
With Transistor at +24 V Common/Source Mode

When input signal is a sequence connection (+24 V common/source mode) by PNP transistor using +24 V internal power supply, set CN5 (shunt connector) on the control board to PNP.



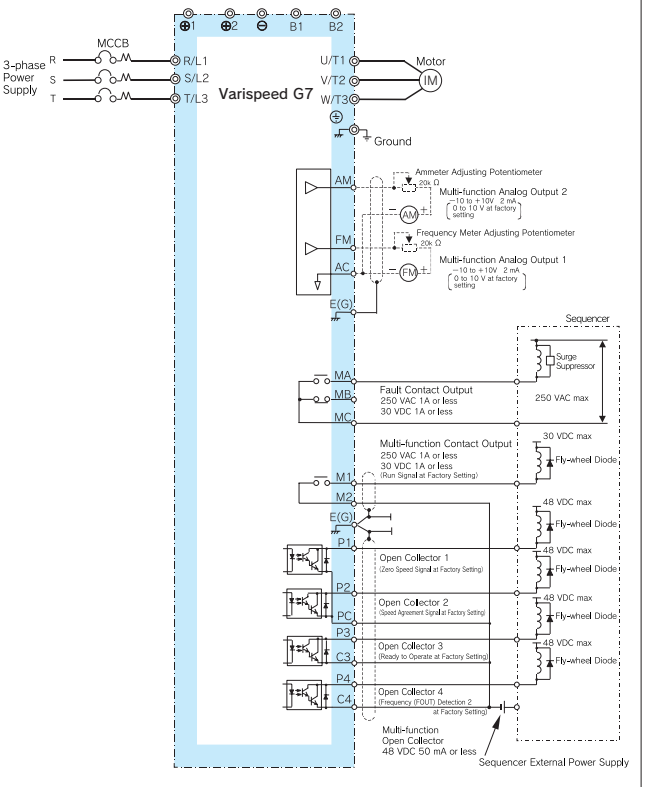
With Transistor at 0 V Common/Sink Mode from External Power Supply

When input signal is a sequence connection (0 V common/sink mode) by NPN transistor using +24 V external power supply, set CN5 (shunt connector) on the control board to EXT.

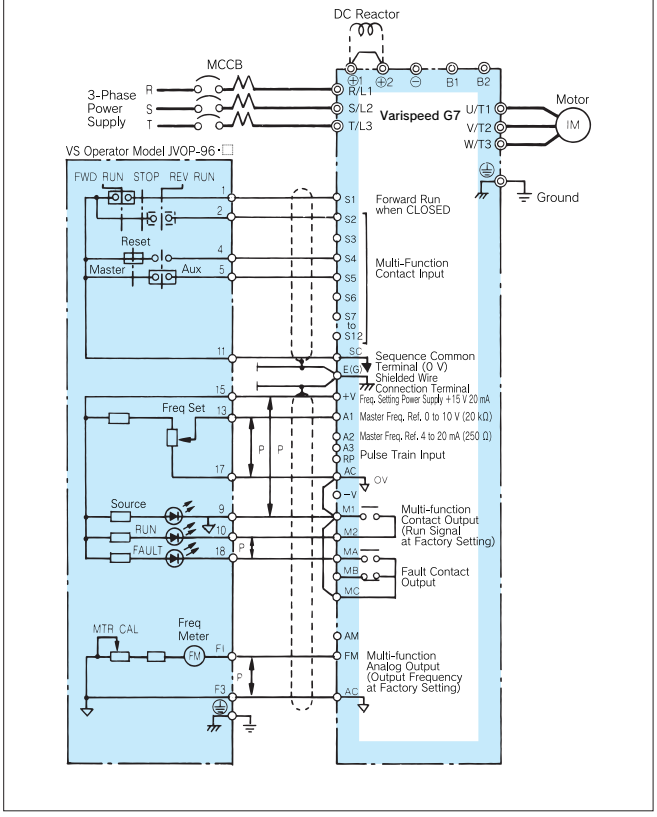


Note: Same for PNP transistor at +24 V common/source mode

With Contact Output, Open Collector Output

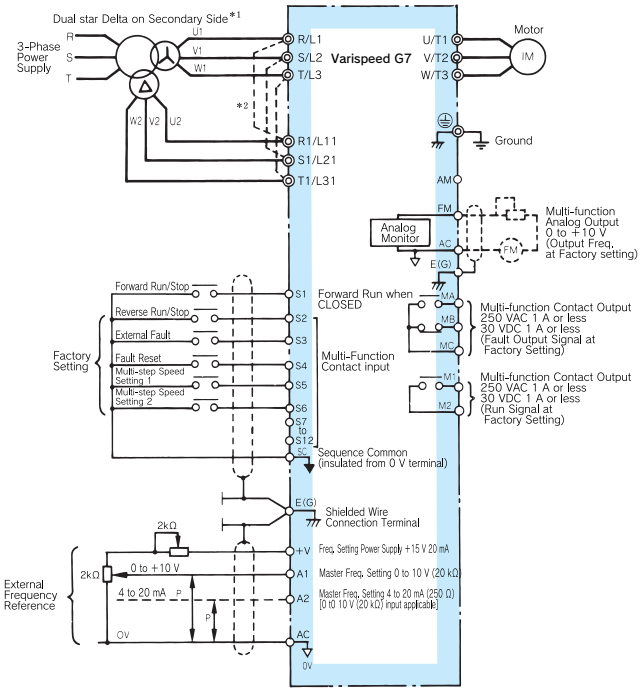


VS Operator Models JVOP-95·□ and JVOP-96·□



12-pulse Input (Transformer with a Dual Star-delta Secondary) Wiring Example

Model CIMR-G7A2018 to -G7A2110
Model CIMR-G7A4018 to -G7A4300



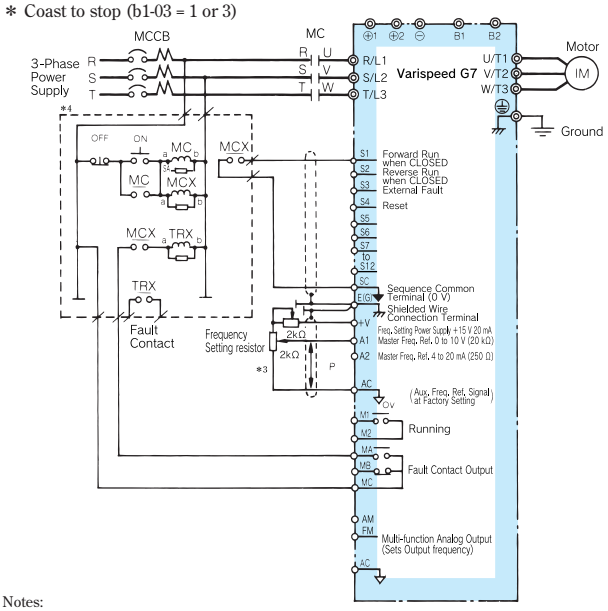
*1 Use the phase difference 30° el transformer with a dual star delta on secondary side and tertiary side.

*2 Make sure to remove the wiring between R—R1, S—S1, T—T1 (wired at shipment). If connecting a transformer with a dual star delta secondary with wiring, transformer may burn out.

RUN/STOP by MC for Main Circuit Power Line

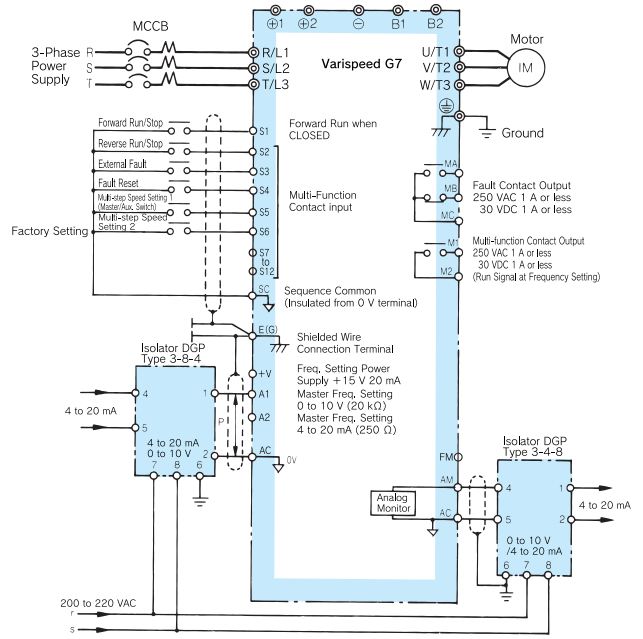
Constant Setting

* Frequency reference selection
  Sets by frequency setting resistor (b1-01 = 1)
  Sets by digital operator (b1-01 = 0), reference value (d1-01)
* Coast to stop (b1-03 = 1 or 3)

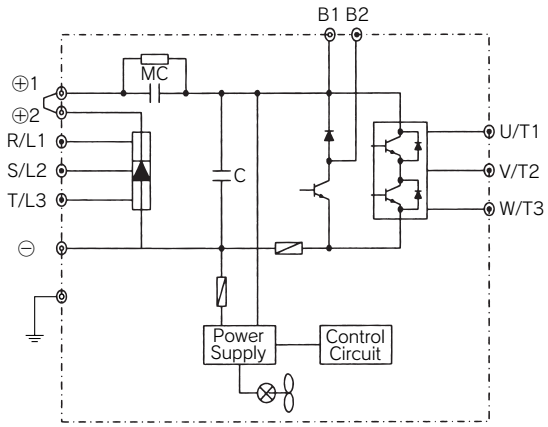
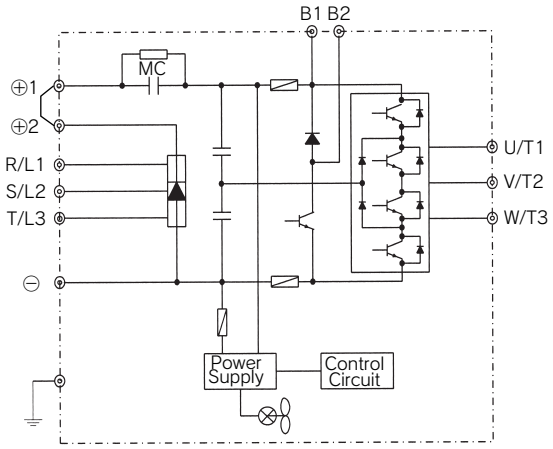
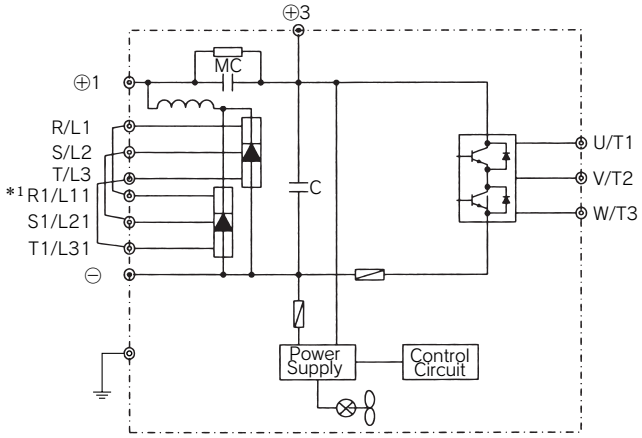
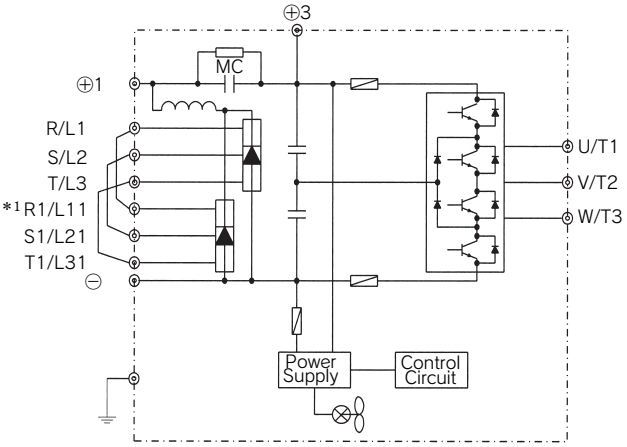
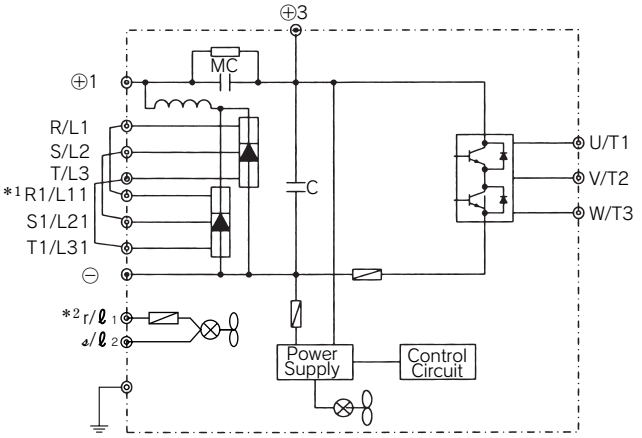
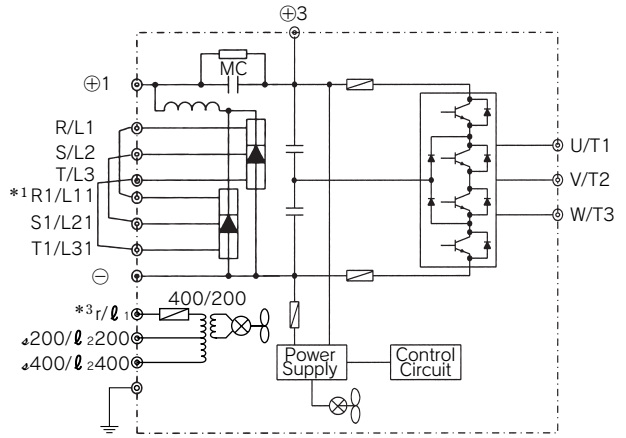


Notes:
1 Braking function is not activated at stop. (Motor coasts to a stop.)
2 Use delay release type MC and MCX when restart function is required upon momentary power loss.
3 When using digital operator setting value as frequency reference, frequency setting resistor is not required.
4 Turn OFF the switch after motor completely stops.

Isolator Connected (4 to 20 mA Received, 4 to 20 mA Output)



Main Circuit Configuration

200 V Class (Main Circuit: 2-level Control Method)	400 V Class (Main Circuit: 3-level Control Method)
CIMR-G7A20P4 to 2015	CIMR-G7A40P4 to 4015
	
CIMR-G7A2018, 2022	CIMR-G7A4018 to 4045
	
CIMR-G7A2030 to 2110	CIMR-G7A4055 to 4300*4
	

*1 When using 12-pulse input, contact your YASKAWA representative.

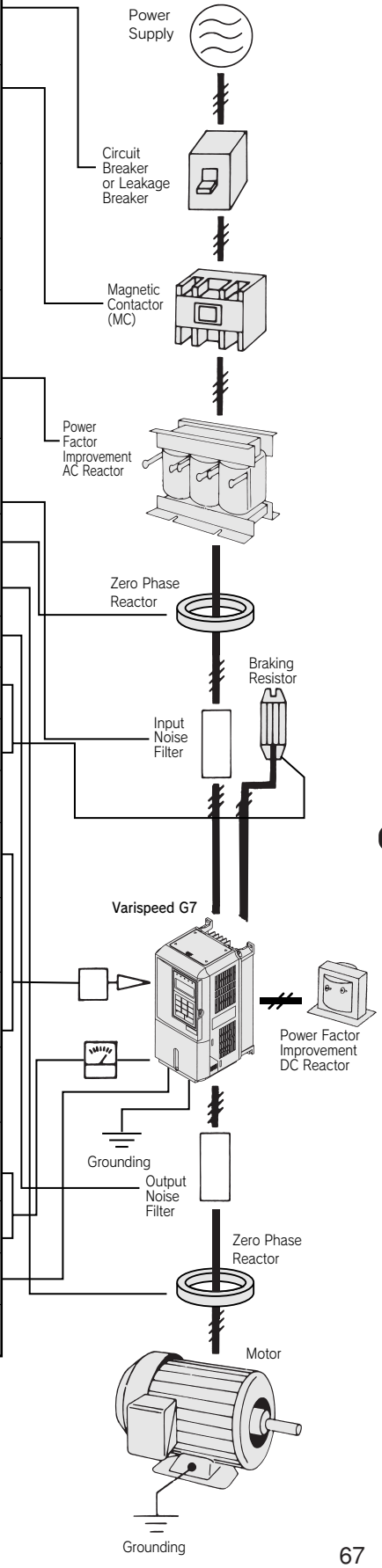
*2 r/ℓ_1—R and ℓ_2—S are short circuited at shipment. When using a DC power supply for the main circuit of models CIMR-G7A2030 to G7A2110 or using a separate power supply for cooling fin and MC operator, remove the wiring for the short circuits and input 200 V power supply to r/ℓ_1 and ℓ_2.
For 230 V 50 Hz or 240 V 50/60 Hz power supply, a transformer for cooling fin and MC are required.

*3 r/ℓ_1—R and $\ell_2$400—S are short circuited at shipment. When using a DC power supply for the main circuit of models CIMR-G7A4055 to G7A4300 or using a separate power supply for cooling fin and MC operator, remove the wiring for the short circuits and input 200 V power supply to r/ℓ_1 and $\ell_2$400 or r/ℓ_1 and $\ell_2$200.

*4 Models CIMR-G7A4055 to G7A4300 will be available soon.

Options, Peripheral Devices

Objective	Name	Model (Code number)	Details
To protect inverter wiring	Circuit breaker or * leakage breaker	NF□	Always install the braker on the power supply side to protect the inverter wiring. The leakage braker must be of high frequency specifications.
To prevent burning (with braking resistor)	Magnetic contactor	HI-□J	When braking resistor is attached, install the contactor to prevent the braking resistor from burning. Also inset a surge suppressor on the coil.
To prevent open/ close surge to the exterior	Surge suppressor	DCR2-□	Absorbs the open / close surge of electro-magnetic contactors and control relays. Always insert the surge suppressor on magnetic contactors and relays near the inverter.
To isolate input/ output signal	Isolator	DGP□	Isolates the inverter input / output signal, and is effective to prevent inductive noise.
To improve the inverter input rate	DC reactor AC reactor	UZDA-□ UZBA-□	Applied to improve the input power ratio of the inverter. The Varispeed G7 incorporates DC reactor on model of 18.5 kW or more (option for model 15 kW or less). When using large power supply capacity (600 kVA or more), also install the DC reactor or AC reactor.
To reduce effect of noise interference to radios and control devices	Input side noise filter	Three-phase LNFD-□ FN□□□	Reduces noise circulating to the inverter input power system, or originating from the wiring. Insert the filter as near the inverter as possible.
	Finemet zero-phase reactor to reduce radio noise	F6045GB (FIL001098) F11080GB (FIL001097)	Reduces noise from the line that sneaks into the inverter input power system. Insert as close to the inverter as possible. Can be used on both the input side and output side.
	Output side noise filter	LF-□□□	Reduces noise originating from the output side wiring of the inverter. Insert the filter as near the inverter as possible.
To stop the machine within the preset time	Braking resistor	ERF-150WJ□□ (R00□□□□)	Shortens the deceleration time by consuming the regenerative energy of the motor by the resistor. (Use rate 3 % ED)
	Braking resistor unit	LKEB-□ (75600-K□□□0)	Shortens the deceleration time by consuming the regenerative energy of the motor by the resistor. (Use rate 10 % ED)
	Braking unit	CDBR-□ (72600-R□□□0)	Used in combination with the braking resistor unit to reduce the deceleration time of the motor.
To operate the inverter by external control	VS operator (Small plastic)	JVOP-95・□ (73041-0905X-□)	Control panel that allows remote (50 m max.) frequency setting and start/stop operation by analog reference. Frequency meter scale: 60/120 Hz, 90/180 Hz
	VS operator (Standard sheet metal)	JVOP-96・□ (73041-0906X-□)	Control panel that allows remote (50 m max.) frequency setting and start/stop operation by analog reference. Frequency meter scale: 75 Hz, 150 Hz, 220 Hz
To operate the inverter by system control	VS system module	JGSM-□	System controller that allows optimum system integration by combining with the necessary VS system module according to the automatic control system.
To secure inverter momentary power loss recovery time	Momentary power loss compensation unit	P00□0 (73600-P00□0)	For momentary power loss of the control power supply (Power holding time : 2 sec.)
To set and monitor frequency and voltage from external devices	Frequency meter	DCF-6A	External device to set or monitor the frequency.
	Frequency setter	RV30YN20S (2kΩ)	
	Frequency setter knob	CM-3S	
	Output voltmeter	SCF-12NH	External device to monitor the output voltage. Exclusively for the PWM inverter.
To calibrate frequency input and frequency meter, ammeter	Variable resistor board for frequency reference	2 kΩ (ETX003270) 20 kΩ (ETX003120)	Installed on the control ciruit terminal to input frequency reference.
	Frequency meter scale calibration resistor	(RH000850)	Calibrates the frequency meter and ammeter.



* When applying the leak breaker, use those with 200 mA or more current sensitivity, operation time 0.1 seconds or more, to prevent malfunction. Or, use those with high-frequency adaptation.
(Example) Mitsubishi Electric Ltd. NV series (those produced after 1988)
Fuji Electric Ltd. EG, SG series (those produced after 1984)

Option Cards

Type		Name	Code No.	Function	Manual No.
Built-in type (connected to connector)	Speed (frequency) reference card	Analog reference card AI-14U	73600-C001X	Allows high precision, high resolution analog speed reference setting. • Input signal level: 0 to +10 VDC (20 kΩ) 1 channel 4 to 20 mADC (250 Ω) 1 channel • Input resolution: 14 bits (1/16384)	TOE-C736-30·13
		Analog reference card AI-14B	73600-C002X	Allows bipolar high precision, high resolution analog speed reference setting. • Input signal level: 0 to ±10 VDC (20 kΩ) 4 to 20 mADC (500 Ω) 3 channels • Input resolution: 13 bits + code (1/8192)	TOE-C736-30·14
		Digital reference card DI-08	73600-C003X	Allows 8-bit digital speed reference setting. • Input signal: Binary 8 bits/BCD 2 digits + SIGN signal + SET signal • Input voltage: +24 V (isolated) • Input current: 8 mA	TOE-C736-30·14
		Digital reference card DI-16H2	73600-C016X	Allows 16-bit digital speed reference setting. • Input signal: Binary 16 bits/BCD 2 digits + SIGN signal + SET signal • Input voltage: +24 V (isolated) • Input current: 8 mA With 16-bit/12-bit select function	TOE-C736-40·7
	Communications option card	DeviceNet communications I/F card SI-N1	73600-C021X	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through DeviceNet communication with the host controller.	Contact your YASKAWA representative.
		Profibus-DP communications I/F card SI-P1*1	73600-C022X	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through Profibus-DP communication with the host controller.	TOBZ-C736-70.3
		InterBus-S communications I/F card SI-R	Under development	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through InterBus-S communication with the host controller.	—
		CANopen communications I/F card SI-S	Under development	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through CANopen communication with the host controller.	—
		ControlNet communicaitons I/F card SI-U	Under development	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through ControlNet communication with the host controller.	—
		CC-Link communications I/F card SI-C	73600-C032X	Used for running or stopping the inverter, setting or referencing parameters, and monitoring output frequency, output current, or similar items through CC-Link communication with the host controller.	TOBZ-C736-70.6
		LONWORKS communications I/F card SI-J	73600-C035X	Used for HVAC control, running or stopping the inverter,setting or referencing parameters, and monitoring output current,watt-hours, or similar items through LONWORKS communications with the host controller.	Contact your YASKAWA representative.
	Monitor option card	Analog monitor card AO-08	73600-D001X	Outputs analog signal for monitoring inverter output state (output freq., output current etc.) after absolute value conversion. • Output resolution: 8 bits (1/256) • Output voltage: 0 to +10 V (non isolated) • Output channel: 2 channels	TOE-C736-30·21
		Analog monitor card AO-12	73600-D002X	Outputs analog signal for monitoring inverter output state (output freq., output current etc.) • Output resolution: 11 bits (1/2048) + code • Output voltage: −10 to +10 V (non isolated) • Output channel: 2	TOE-C736-30·22
		Digital output card DO-08	73600-D004X	Outputs isolated type digital signal for monitoring inverter run state (alarm signal, zero speed detection etc.) . Output channel: Photo coupler 6 channels (48 V, 50 mA or less) Relay contact output 2 channels (250 VAC, 1 A or less / 30 VDC, 1 A or less)	TOE-C736-30·24
		2C-relay output card DO-02C	73600-D007X	• Two multi-function contact outputs (2C-relay) can be used other than those of the inverter proper unit.	TOE-C736-40·8
	PG speed controller card*2	PG-A2	73600-A012X	Pulse generator on motor performs speed feedback to correct speed fluctuations caused by slipping (for V/f control with PG). • Phase A pulse (single pulse) inputs (voltage, complementary, open collector input) • PG frequency range: Approx. 30 kHz max. [Power supply output for PG: +12 V, max. current 200 mA] • Pulse monitor output: +12 V, 20 mA	TOE-C736-40·1
		PG-B2	73600-A013X	Used for vector control with PG or V/f control with PG • Phase A and B pulse inputs (exclusively for complementary input) • PG frequency range: Approx. 30 kHz max. [Power supply output for PG: +12 V, Max. current 200 mA] • Pulse monitor output: Open collector, +24 V, Max. current 30 mA	TOE-C736-40·2

Type	Name	Code No.	Function	Manual No.
Built-in type (connected to connector) PG speed controller card*2	PG-D2	73600-A014X	Used for V/f control with PG ・Phase A pulse (differential pulse) input for V/f control (RS-422 input) ・PG frequency range: Approx. 300 kHz max. [Power supply output for PG: +5 V or +12 V, Max. current 200 mA] ・Pulse monitor output: RS-422	TOE-C736-40・3
	PG-X2	73600-A015X	Used for vector control with PG or V/f control with PG ・Phase A, B and Z pulse (differential pulse) inputs (RS-422 input) ・PG frequency range: Approx. 300 kHz max. [Power supply output for PG: +5 V or +12 V, Max. current 200 mA] ・Pulse monitor output: RS-422	TOE-C736-40・4

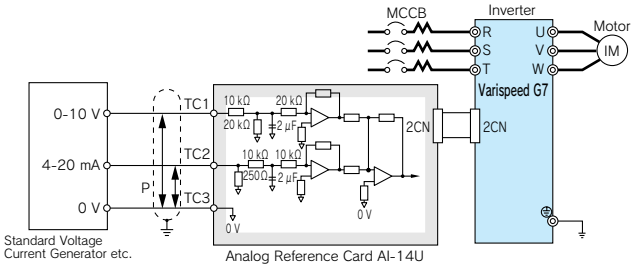
*1 When an SI-P1 card is used as a Profibus-DP slave, a GSD file is required separately. The SI-P1 card is available when registered in Profibus-DP master using a GSD file. For obtaining a GSD file, contact your YASKAWA representative.

*2 PG speed controller card is required for PG control.

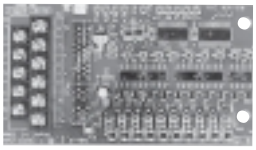
Built-in Type Option Card and Wiring Schematic

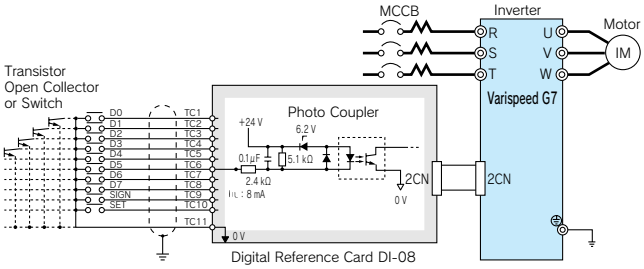
Input (2 CN)

Analog Reference Card AI-14U



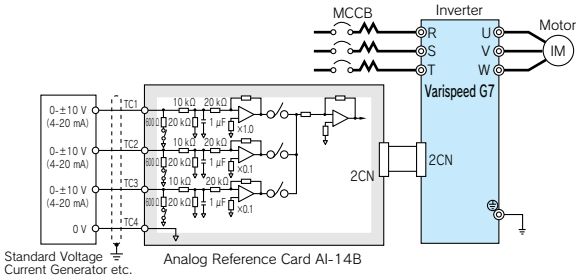
Digital Reference Card DI-08



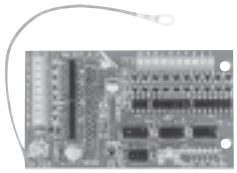


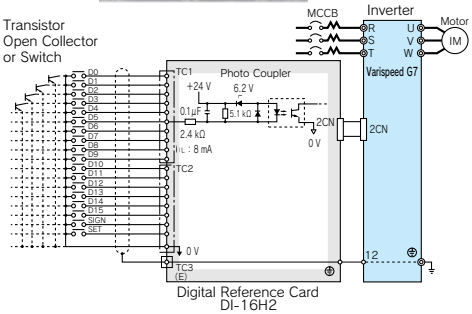
Notes: 1 All TC1 to TC10 input circuits are common.
2 TC6 input circuit is represented.

Analog Reference Card AI-14B



Digital Reference Card DI-16H2



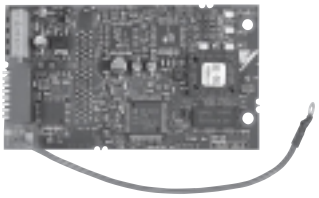


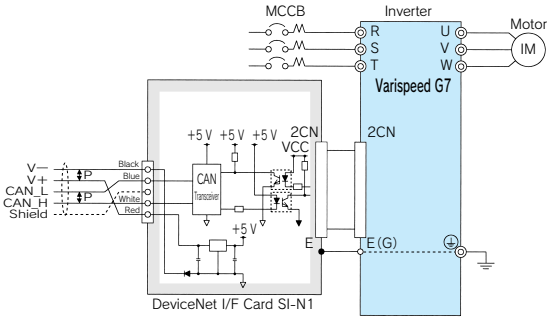
Notes: 1 TC1-1 to -10, TC2-1 to -9 input circuits are common.
2 TC1-6 input circuit is represented.

Input（2 CN）

DeviceNet Communications I/F Card

SI-N1

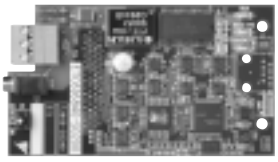


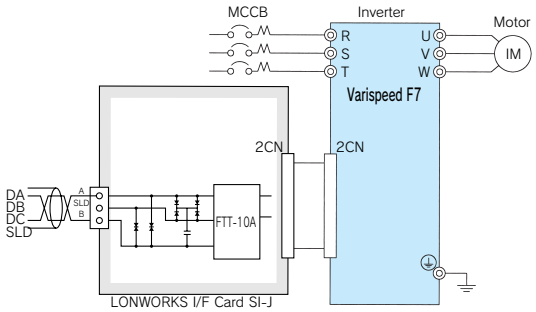


DeviceNet I/F Card SI-N1

LONWORKS Communications I/F Card

SI-J

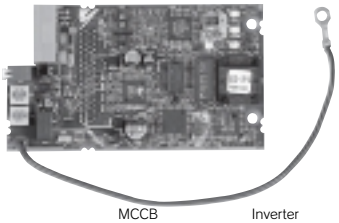


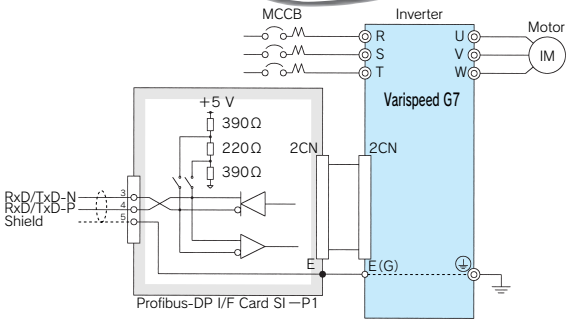


LONWORKS I/F Card SI-J

Profibus-DP Communications I/F Card

SI-P1

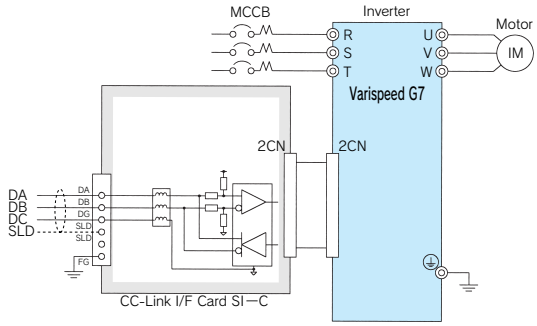




Profibus-DP I/F Card SI－P1

CC-Link Communications I/F Card

SI-C



CC-Link I/F Card SI－C

InterBus-S Communications I/F Card

SI-R

Under development

ControlNet Communications I/F Card

SI-U

Under development

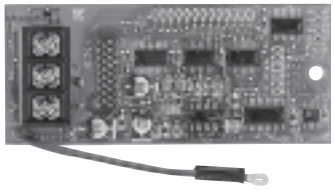
CANopen Communications I/F Card

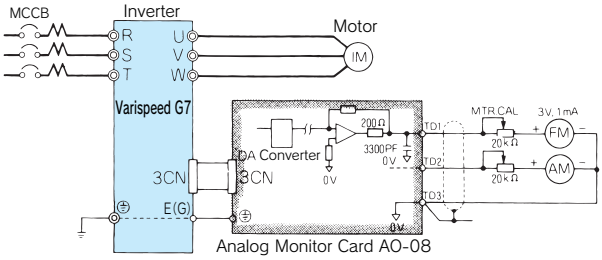
SI-S

Under development

Output（3 CN）

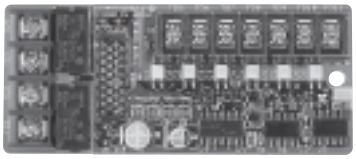
Analog Monitor Card
AO-08

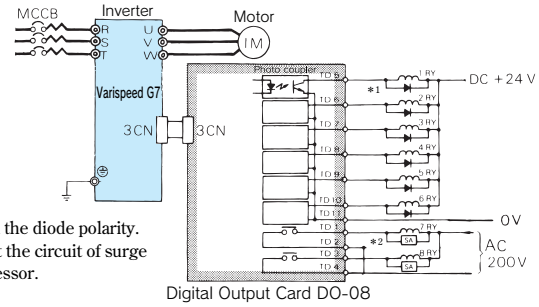




Analog Monitor Card AO-08

Digital Output Card
DO-08

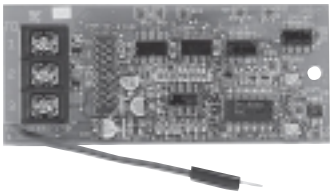


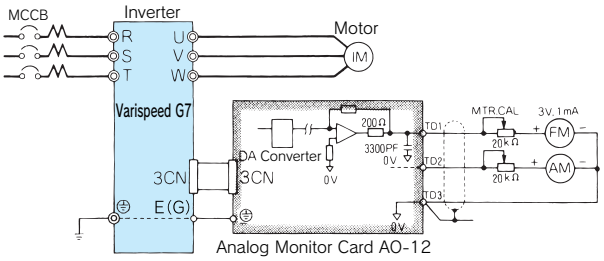


*1 Check the diode polarity.
*2 Mount the circuit of surge suppressor.

Digital Output Card DO-08

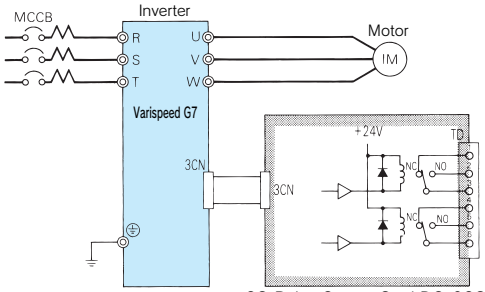
Analog Monitor Card
AO-12





Analog Monitor Card AO-12

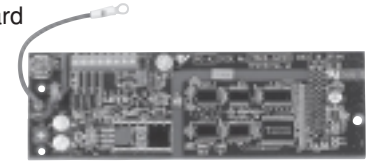
Digital Output Card
DO-02C

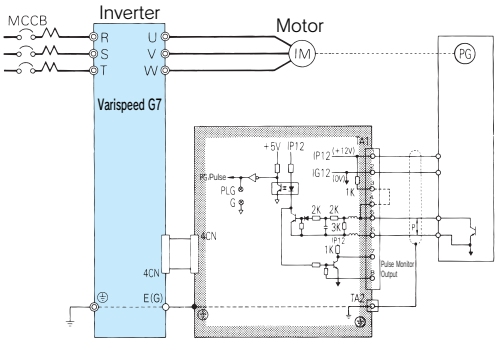


2C-Relay Output Card DO-02C

Output（4 CN）

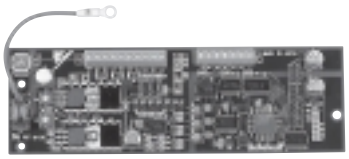
PG Speed Controller Card PG-A2

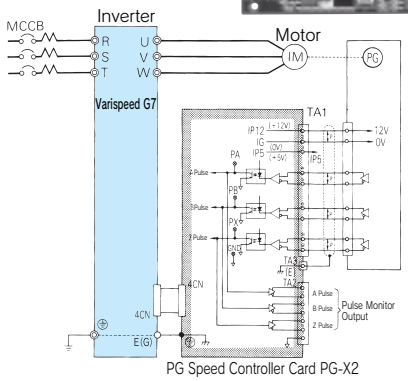




PG Speed Controller Card PG-A2

PG Speed Controller Card PG-X2

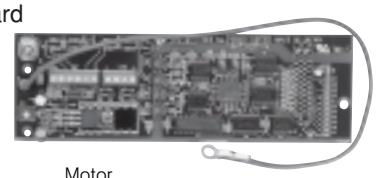


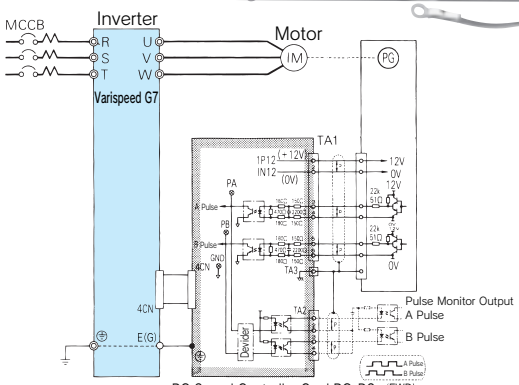


PG Speed Controller Card PG-X2

Pulse Z correspondence: under development (Phase A, B control is possible)

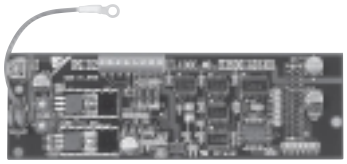
PG Speed Controller Card PG-B2

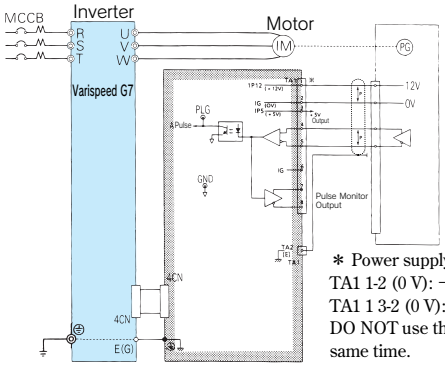




PG Speed Controller Card PG-B2

PG Speed Controller Card PG-D2





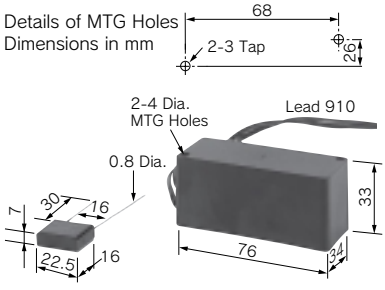
PG Speed Controller Card PG-D2

＊ Power supply for PG (from PG-D2)
TA1 1-2 (0 V): +12 V 200 mA max
TA1 1 3-2 (0 V): +5 V 200 mA max
DO NOT use the both supplies at the same time.

Surge Suppressor (Manufactured by Marcon Electronics)

Surge suppressors used for coils in electromagnetic contactors, control relays, electromagnetic valves, and electromagnetic brakes used as the Varispeed G7 peripheral units.

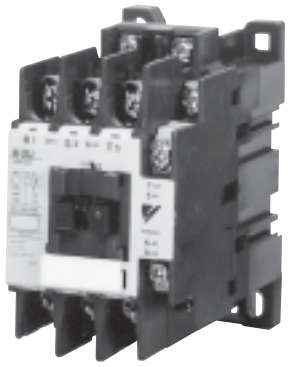
Coils of Magnetic Contactor and Control Relay			Surge Suppressor		
			Model	Specifications	Code No.
200 V to 230 V	Large-size Magnetic Contactors		DCR2-50A22E	220 VAC 0.5 μF+200 Ω	C002417
	Control Relay	LY-2, -3 HH-22, -23 MM-2, -4	DCR2-10A25C	250 VAC 0.1 μF+100 Ω	C002482
380 to 460 V Units			RFN3AL504KD	1000 VDC 0.5 μF+220 Ω	C002630



Molded-Case Circuit Breaker (MCCB) and Magnetic Contactor (MC)

Be sure to connect MCCBs between power supply and Varispeed G7 input terminals R, S, T. Recommended MCCBs are listed as follows. Connect MC if required.

Molded-Case Circuit Breaker (MCCB)



Power Supply Magnetic Contactor (MC)

200 V Class

Motor Capacity kW	Varispeed G7 Model CIMR-G7A□	Molded-case Circuit Breaker				Magnetic Contactor	
		Without DC Reactor		With DC Reactor		Without DC Reactor	With DC Reactor
		Model	Rated Current (A)	Model	Rated Current (A)	Model	Model
0.4	20P4	NF30	5	NF30	5	HI-11J	HI-11J
0.75	20P7	NF30	10	NF30	10	HI-11J	HI-11J
1.5	21P5	NF30	15	NF30	10	HI-15J	HI-11J
2.2	22P2	NF30	20	NF30	15	HI-20J	HI-15J
3.7	23P7	NF30	30	NF30	20	HI-35J	HI-25J
5.5	25P5	NF50	50	NF50	40	HI-50J	HI-35J
7.5	27P5	NF100	60	NF50	50	HI-65J	HI-50J
11	2011	NF100	75	NF100	75	HI-80J	HI-80J
15	2015	NF225	125	NF100	100	HI-125J	HI-100J
18.5	2018	—	—	NF225	125	—	HI-125J
22	2022	—	—	NF225	150	—	HI-150J
30	2030	—	—	NF225	175	—	HI-180J
37	2037	—	—	NF225	225	—	HI-220J
45	2045	—	—	NF400	250	—	HI-300J
55	2055	—	—	NF400	300	—	HI-300J
75	2075	—	—	NF400	400	—	HI-400J
90	2090	—	—	NF600	500	—	HI-600J
110	2110	—	—	NF600	600	—	HI-600J

Note: Models of 18.5 to 110 kW are equipped with built-in DC reactor to improve power factor. When using inverter with 240 V power supply, wide range coil type magnetic contactor (HI-□JV) is required for small-capacity magnetic contactor (HI-65J or less).

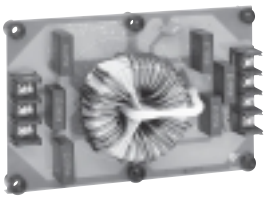
400 V Class

Motor Capacity kW	Varispeed G7 Model CIMR-G7A□	Molded-case Circuit Breaker				Magnetic Contactor	
		Without DC Reactor		With DC Reactor		Without DC Reactor	With DC Reactor
		Model	Rated Current (A)	Model	Rated Current (A)	Model	Model
0.4	40P4	NF30	3	NF30	3	HI-11J	HI-11J
0.75	40P7	NF30	5	NF30	5	HI-11J	HI-11J
1.5	41P5	NF30	10	NF30	10	HI-11J	HI-11J
2.2	42P2	NF30	15	NF30	10	HI-15J	HI-11J
3.7	43P7	NF30	20	NF30	15	HI-20J	HI-15J
5.5	45P5	NF30	30	NF30	20	HI-35J	HI-20J
7.5	47P5	NF30	30	NF30	30	HI-35J	HI-35J
11	4011	NF50	50	NF50	40	HI-50J	HI-35J
15	4015	NF100	60	NF50	50	HI-65J	HI-50J
18.5	4018	—	—	NF100	60	—	HI-65J
22	4022	—	—	NF100	75	—	HI-80J
30	4030	—	—	NF100	100	—	HI-100J
37	4037	—	—	NF225	125	—	HI-125J
45	4045	—	—	NF225	150	—	HI-150J
55	4055	—	—	NF225	175	—	HI-180J
75	4075	—	—	NF225	225	—	HI-220J
90	4090	—	—	NF400	250	—	HI-300J
110	4110	—	—	NF400	300	—	HI-300J
132	4132	—	—	NF400	350	—	HI-400J
160	4160	—	—	NF400	400	—	HI-400J
185	4185	—	—	NF600	500	—	HI-600J
220	4220	—	—	NF600	600	—	HI-600J
300	4300	—	—	NF800	800	—	HU-4893

Note: Models of 18.5 to 300 kW are equipped with built-in DC reactor to improve power factor. When using inverter with 480 V power supply, wide range coil type magnetic contactor (HI-□JV) is required for small-capacity magnetic contactor (HI-65J or less).

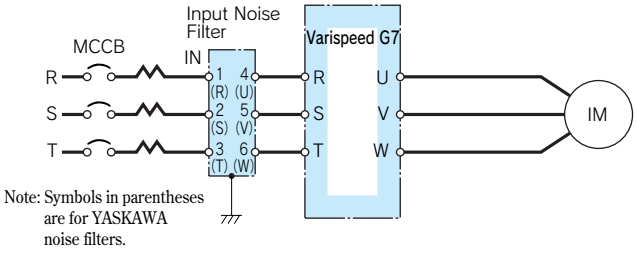
Noise Filter

Input Noise Filter



Manufactured by YASKAWA

Manufactured by Schaffner Electronik AG



Note: Symbols in parentheses are for YASKAWA noise filters.

Example of Noise Filter Connection

Note: Be sure to connect input noise filter on inverter input side (U, V, W).

200 V Class

Inverter Model CIMR-G7A□	Max Applicable Motor Output kW	Noise Filter without Case				Noise Filter with Case				Noise Filter by Schaffner Electronik AG			
		Model	Code No.	Qty.	Rated Current A	Model	Code No.	Qty.	Rated Current A	Model	Code No.	Qty.	Rated Current A
20P4	0.4	LNFD-2103 DY	72600-D2103 DY	1	10	LNFD-2103 HY	72600-D2103 HY	1	10	—	—	—	—
20P7	0.75	LNFD-2103 DY	72600-D2103 DY	1	10	LNFD-2103 HY	72600-D2103 HY	1	10	—	—	—	—
21P5	1.5	LNFD-2103 DY	72600-D2103 DY	1	10	LNFD-2103 HY	72600-D2103 HY	1	10	—	—	—	—
22P2	2.2	LNFD-2153 DY	72600-D2153 DY	1	15	LNFD-2153 HY	72600-D2153 HY	1	15	—	—	—	—
23P7	3.7	LNFD-2303 DY	72600-D2303 DY	1	30	LNFD-2303 HY	72600-D2303 HY	1	30	—	—	—	—
25P5	5.5	LNFD-2203 DY	72600-D2203 DY	2	40	LNFD-2203 HY	72600-D2203 HY	2	40	FN258L-42-07	FIL001065	1	42
27P5	7.5	LNFD-2303 DY	72600-D2303 DY	2	60	LNFD-2303 HY	72600-D2303 HY	2	60	FN258L-55-07	FIL001066	1	55
2011	11	LNFD-2303 DY	72600-D2303 DY	3	90	LNFD-2303 HY	72600-D2303 HY	3	90	FN258L-75-34	FIL001067	1	75
2015	15	LNFD-2303 DY	72600-D2303 DY	3	90	LNFD-2303 HY	72600-D2303 HY	3	90	FN258L-100-35	FIL001068	1	100
2018	18.5	LNFD-2303 DY	72600-D2303 DY	4	120	LNFD-2303 HY	72600-D2303 HY	4	120	FN258L-130-35	FIL001069	1	130
2022	22	LNFD-2303 DY	72600-D2303 DY	4	120	LNFD-2303 HY	72600-D2303 HY	4	120	FN258L-130-35	FIL001069	1	130
2030	30	—	—	—	—	—	—	—	—	FN258L-180-07	FIL001070	1	180
2037	37	—	—	—	—	—	—	—	—	FN359P-250-99	FIL001071	1	250
2045	45	—	—	—	—	—	—	—	—	FN359P-250-99	FIL001071	1	250
2055	55	—	—	—	—	—	—	—	—	FN359P-300-99	FIL001072	1	300
2075	75	—	—	—	—	—	—	—	—	FN359P-400-99	FIL001073	1	400
2090	90	—	—	—	—	—	—	—	—	FN359P-500-99	FIL001074	1	500
2110	110	—	—	—	—	—	—	—	—	FN359P-600-99	FIL001075	1	600

∗ When two filters or more are required, connect them in parallel. (See Parallel Installation Example on P76.)

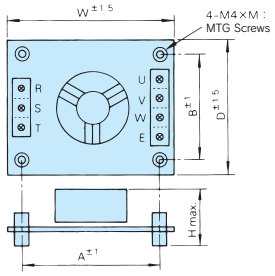
400 V Class

Inverter Model CIMR-G7A□	Max Applicable Motor Output kW	Noise Filter without Case				Noise Filter with Case				Noise Filter by Schaffner Electronik AG			
		Model	Code No.	Qty.	Rated Current A	Model	Code No.	Qty.	Rated Current A	Model	Code No.	Qty.	Rated Current A
40P4	0.4	LNFD-4053 DY	72600-D4053 DY	1	5	LNFD-4053 HY	72600-D4053 HY	1	5	—	—	—	—
40P7	0.75	LNFD-4053 DY	72600-D4053 DY	1	5	LNFD-4053 HY	72600-D4053 HY	1	5	—	—	—	—
41P5	1.5	LNFD-4103 DY	72600-D4103 DY	1	10	LNFD-4103 HY	72600-D4103 HY	1	10	—	—	—	—
42P2	2.2	LNFD-4103 DY	72600-D4103 DY	1	10	LNFD-4103 HY	72600-D4103 HY	1	10	—	—	—	—
43P7	3.7	LNFD-4153 DY	72600-D4153 DY	1	15	LNFD-4153 HY	72600-D4153 HY	1	15	—	—	—	—
45P5	5.5	LNFD-4203 DY	72600-D4203 DY	1	20	LNFD-4203 HY	72600-D4203 HY	1	20	—	—	—	—
47P5	7.5	LNFD-4303 DY	72600-D4303 DY	1	30	LNFD-4303 HY	72600-D4303 HY	1	30	—	—	—	—
4011	11	LNFD-4203 DY	72600-D4203 DY	2	40	LNFD-4203 HY	72600-D4203 HY	2	40	FN258L-42-07	FIL001065	1	42
4015	15	LNFD-4303 DY	72600-D4303 DY	2	60	LNFD-4303 HY	72600-D4303 HY	2	60	FN258L-55-07	FIL001066	1	55
4018	18.5	LNFD-4303 DY	72600-D4303 DY	2	60	LNFD-4303 HY	72600-D4303 HY	2	60	FN258L-55-07	FIL001066	1	55
4022	22	LNFD-4303 DY	72600-D4303 DY	3	90	LNFD-4303 HY	72600-D4303 HY	3	90	FN258L-75-34	FIL001067	1	75
4030	30	LNFD-4303 DY	72600-D4303 DY	3	90	LNFD-4303 HY	72600-D4303 HY	3	90	FN258L-100-35	FIL001068	1	100
4037	37	LNFD-4303 DY	72600-D4303 DY	4	120	LNFD-4303 HY	72600-D4303 HY	4	120	FN258L-130-35	FIL001069	1	130
4045	45	LNFD-4303 DY	72600-D4303 DY	4	120	LNFD-4303 HY	72600-D4303 HY	4	120	FN258L-130-35	FIL001069	1	130
4055	55	—	—	—	—	—	—	—	—	FN258L-180-07	FIL001070	1	180
4075	75	—	—	—	—	—	—	—	—	FN359P-250-99	FIL001071	1	250
4090	90	—	—	—	—	—	—	—	—	FN359P-300-99	FIL001072	1	300
4110	110	—	—	—	—	—	—	—	—	FN359P-300-99	FIL001072	1	300
4132	132	—	—	—	—	—	—	—	—	FN359P-400-99	FIL001073	1	400
4160	160	—	—	—	—	—	—	—	—	FN359P-400-99	FIL001073	1	400
4185	185	—	—	—	—	—	—	—	—	FN359P-500-99	FIL001074	1	500
4220	220	—	—	—	—	—	—	—	—	FN359P-600-99	FIL001075	1	600
4300	300	—	—	—	—	—	—	—	—	FN359P-900-99	FIL001076	1	900

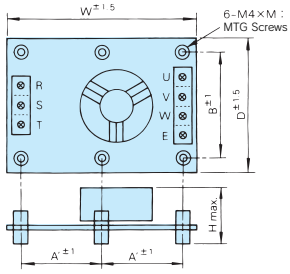
∗ When two filters or more are required, connect them in parallel. (See Parallel Installation Example on P76.)

Dimensions in mm

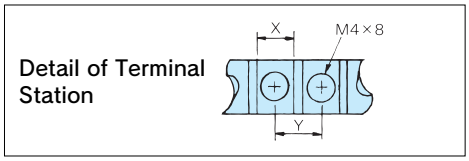
Without Case



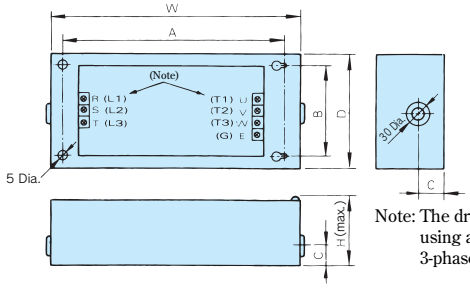
Drawing 1



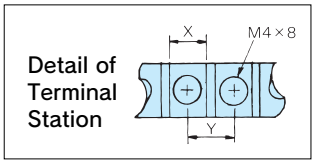
Drawing 2

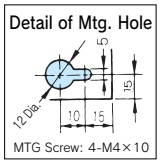


With Case



Note: The drawing shows when using a noise filter for 3-phase power supply.



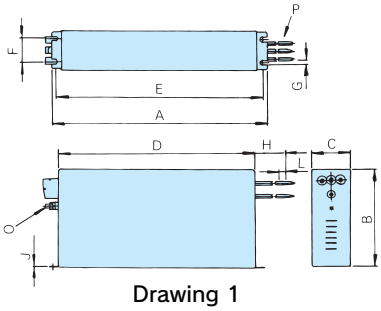


Model LNFD-□	Code No. 72600-	DWG	Noise Filter W	D	H	A(A')	B	M	Terminal X	Y	Mass kg
2103DY	D2103DY	1	120	80	55	108	68	20	9	11	0.2
2153DY	D2153DY	1	120	80	55	108	68	20			0.2
2203DY	D2203DY	1	170	90	70	158	78	20			0.4
2303DY	D2303DY	2	170	110	70	(79)	98	20	10	13	0.5
4053DY	D4053DY	2	170	130	75	(79)	118	30	9	11	0.3
4103DY	D4103DY	2	170	130	95	(79)	118	30			0.4
4153DY	D4153DY	2	170	130	95	(79)	118	30			0.4
4203DY	D4203DY	2	200	145	100	(94)	133	30			0.5
4303DY	D4303DY	2	200	145	100	(94)	133	30	10	13	0.6

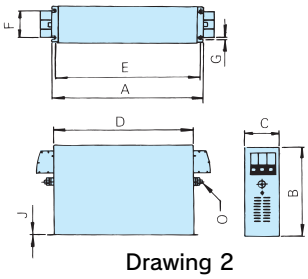
Model LNFD-□	Code No. 72600-	Noise Filter W	D	H	A	B	C	Terminal X	Y	Mass kg
2103HY	D2103HY	185	95	85	155	65	33	9	11	0.9
2153HY	D2153HY	185	95	85	155	65	33			0.9
2203HY	D2203HY	240	125	100	210	95	33			1.5
2303HY	D2303HY	240	125	100	210	95	33	10	13	1.6
4053HY	D4053HY	235	140	120	205	110	43	9	11	1.6
4103HY	D4103HY	235	140	120	205	110	43			1.7
4153HY	D4153HY	235	140	120	205	110	43			1.7
4203HY	D4203HY	270	155	125	240	125	43			2.2
4303HY	D4303HY	270	155	125	240	125	43	10	13	2.2

Manufactured by Schaffner Electronik AG

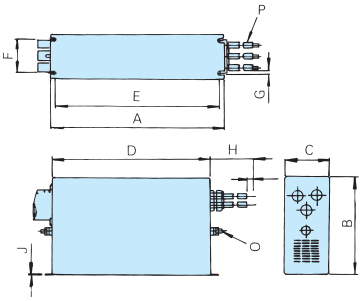
Model	DWG	A	B	C	D	E	F	G	H	J	L	O	P	Mass kg
FN258L-42-07	1	329	185±1	70	300	314	45	6.5	500	1.5	12	M6	AWG8	2.8
FN258L-55-07	1	329	185±1	80	300	314	55	6.5	500	1.5	12	M6	AWG6	3.1
FN258L-75-34	2	329	220	80	300	314	55	6.5	—	1.5	—	M6	—	4.0
FN258L-100-35	2	379±1.5	220	90±0.8	350±1.2	364	65	6.5	—	1.5	—	M10	—	5.5
FN258L-130-35	2	439±1.5	240	110±0.8	400±1.2	414	80	6.5	—	3	—	M10	—	7.5
FN258L-180-07	3	438±1.5	240	110±0.8	400±1.2	413	80	6.5	500	4	15	M10	50 mm²	11
FN359P-□-□	4	See dimensions in the drawing.												See the table below.



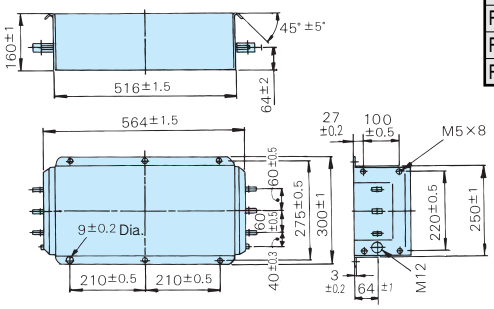
Drawing 1



Drawing 2



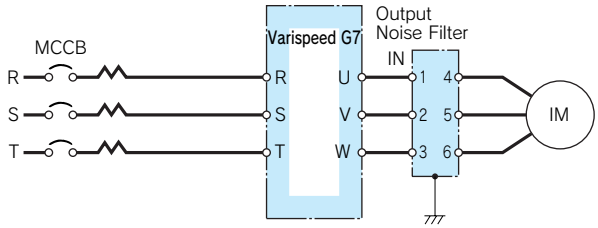
Drawing 3



Drawing 4

Model	Mass kg
FN359P-250-99	16
FN359P-300-99	16
FN359P-400-99	18.5
FN359P-500-99	19.5
FN359P-600-99	20.5
FN359P-900-99	33

Output Noise Filter (Tohoku Metal Industries Co., Ltd.)



Example of Noise Filter Connection

200 V Class

Inverter CIMR-G7A	Max Applicable Motor Output kW	Output Noise Filter			
		Model	Code No.	Qty.	Rated Current A
20P4	0.4	LF-310 KA	FIL 000068	1	10
20P7	0.75	LF-310 KA	FIL 000068	1	10
21P5	1.5	LF-310 KA	FIL 000068	1	10
22P2	2.2	LF-310 KA	FIL 000068	1	10
23P7	3.7	LF-320 KA	FIL 000069	1	20
25P5	5.5	LF-350 KA	FIL 000070	1	50
27P5	7.5	LF-350 KA	FIL 000070	1	50
2011	11	LF-350 KA	FIL 000070	2	100
2015	15	LF-350 KA	FIL 000070	2	100
2018	18.5	LF-350 KA	FIL 000070	2	100
2022	22	LF-350 KA	FIL 000070	3	150
		LF-3110 KB	FIL 000076	1	110
2030	30	LF-350 KA	FIL 000070	3	150
		LF-375 KB	FIL 000075	2	150
2037	37	LF-3110 KB	FIL 000076	2	220
2045	45				
2055	55	LF-3110 KB	FIL 000076	3	330
2075	75	LF-3110 KB	FIL 000076	4	440
2090	90	LF-3110 KB	FIL 000076	4	440
2110	110	LF-3110 KB	FIL 000076	5	550

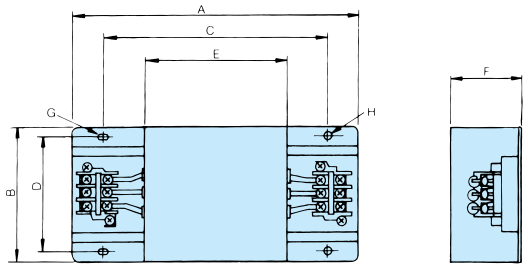
* When two filters or more are required, connect them in parallel.

400 V Class

Inverter CIMR-G7A	Max Applicable Motor Output kW	Output Noise Filter			
		Model	Code No.	Qty.	Rated Current A
40P4	0.4	LF-310KB	FIL 000071	1	10
40P7	0.75	LF-310KB	FIL 000071	1	10
41P5	1.5	LF-310KB	FIL 000071	1	10
42P2	2.2	LF-310KB	FIL 000071	1	10
43P7	3.7	LF-310KB	FIL 000071	1	10
45P5	5.5	LF-320KB	FIL 000072	1	20
47P5	7.5	LF-320KB	FIL 000072	1	20
4011	11	LF-335KB	FIL 000073	1	35
4015	15	LF-335KB	FIL 000073	1	35
4018	18.5	LF-345KB	FIL 000074	1	45
4022	22	LF-375KB	FIL 000075	1	75
4030	30	LF-375KB	FIL 000075	1	75
4037	37	LF-3110KB	FIL 000076	1	110
4045	45	LF-3110KB	FIL 000076	1	110
4055	55	LF-375KB	FIL 000075	2	150
4075	75	LF-3110KB	FIL 000076	2	220
4090	90	LF-3110KB	FIL 000076	3	330
4110	110				
4132	132	LF-3110KB	FIL 000076	4	440
4160	160				
4185	185				
4220	220	LF-3110KB	FIL 000076	5	550
4300	300	LF-3110KB	FIL 000076	6	660

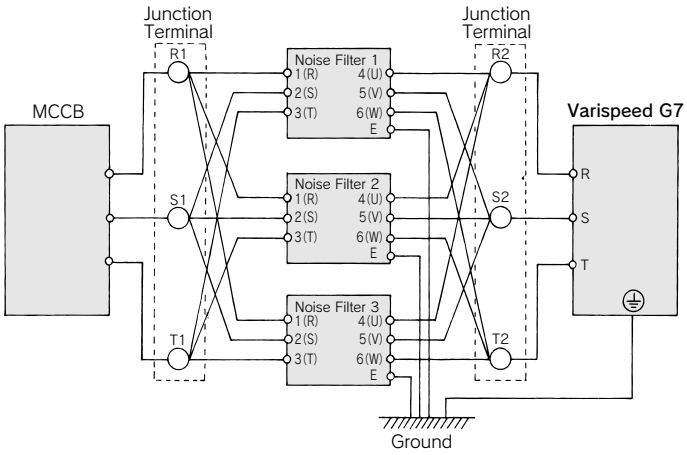
* When two filters or more are required, connect them in parallel.

Dimensions in mm



Model	Terminal Plate	A	B	C	D	E	F	G	H	Mass kg
LF-310 KA	TE-K5.5 M4	140	100	100	90	70	45	7×ϕ4.5	ϕ 4.5	0.5
LF-320 KA	TE-K5.5 M4	140	100	100	90	70	45	7×ϕ4.5	ϕ 4.5	0.6
LF-350 KA	TE-K22 M6	260	180	180	160	120	65	7×ϕ4.5	ϕ 4.5	2.0
LF-310 KB	TE-K5.5 M4	140	100	100	90	70	45	7×ϕ4.5	ϕ 4.5	0.5
LF-320 KB	TE-K5.5 M4	140	100	100	90	70	45	7×ϕ4.5	ϕ 4.5	0.6
LF-335 KB	TE-K5.5 M4	140	100	100	90	70	45	7×ϕ4.5	ϕ 4.5	0.8
LF-345 KB	TE-K22 M6	260	180	180	160	120	65	7×ϕ4.5	ϕ 4.5	2.0
LF-375 KB	TE-K22 M6	540	320	480	300	340	240	9×ϕ 6.5	ϕ 6.5	12.0
LF-3110 KB	TE-K60 M8	540	340	480	300	340	240	9×ϕ 6.5	ϕ 6.5	19.5

Input/Output Side Noise Filter Parallel Installation Example

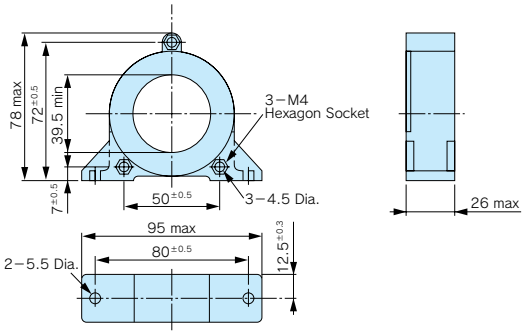


When connecting noise filters in parallel, install junction terminals to equalize ground return. Ground wires for noise filter and inverter should be thick and as short as possible.

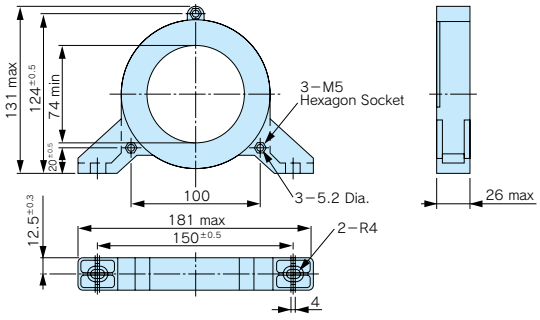
Zero Phase Reactor

Finemet Zero Phase Reactor to Reduce Radio Noise (Made by Hitachi Metals, Ltd.)

Note: Finemet is a registered trademark of Hitachi Metals, Ltd.



Model F6045GB



Model F11080GB

200 V Class

Inverter		Finemet Zero Phase Reactor			
Model	Recommended Wire Size (mm^2)	Model	Code No.	Qty.	Wiring Method (Connection Diagram)
CIMR-G7A20P4	2 to 5.5	F6045GB	FIL001098	1	3 winds Diagram (a)
CIMR-G7A20P7					
CIMR-G7A21P5					
CIMR-G7A22P2	3.5 to 5.5				
CIMR-G7A23P7	5.5				
CIMR-G7A25P5	8	F11080GB	FIL001097	1	3 winds Diagram (a)
CIMR-G7A27P5					
CIMR-G7A2011	22	F6045GB	FIL001098	4	4 series Diagram (b)
CIMR-G7A2015	30				
CIMR-G7A2018					
CIMR-G7A2022	38				
CIMR-G7A2030	38 to 100	F11080GB	FIL001097	4	4 series Diagram (b)
CIMR-G7A2037					
CIMR-G7A2045	60 to 100				
CIMR-G7A2055	100				
CIMR-G7A2075	100 to 200				

Note: Not available for models of 90 kW or more.

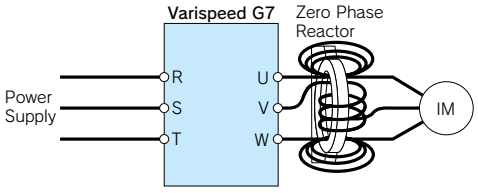
400 V Class

Inverter		Finemet Zero Phase Reactor			
Model	Recommended Wire Size (mm^2)	Model	Code No.	Qty.	Wiring Method (Connection Diagram)
CIMR-G7A40P4	2 to 5.5	F6045GB	FIL001098	1	3 winds Diagram (a)
CIMR-G7A40P7					
CIMR-G7A41P5					
CIMR-G7A42P2					
CIMR-G7A43P7					
CIMR-G7A45P5	3.5 to 5.5				
CIMR-G7A47P5	5.5				
CIMR-G7A4011	8 to 14	F6045GB	FIL001098	4	4 series Diagram (b)
CIMR-G7A4015					
CIMR-G7A4018	14				
CIMR-G7A4022	22				
CIMR-G7A4030					
CIMR-G7A4037	30				
CIMR-G7A4045	50	F11080GB	FIL001097	4	4 series Diagram (b)
CIMR-G7A4055	38 to 100				
CIMR-G7A4075					
CIMR-G7A4090	60 to 100				
CIMR-G7A4110					
CIMR-G7A4132	100 to 200				
CIMR-G7A4160					

Note: Not available for models of 185 kW or more.

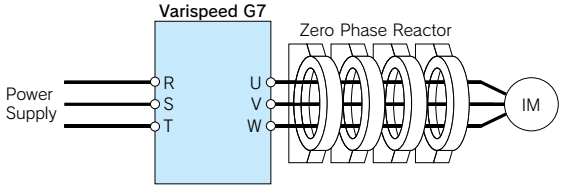
Can be used both for input and output sides of the inverter and effective on noise reduction.

Connection Diagram (a)



Wind each wire (R, S, T or U, V, W) 3 times around the core.

Connection Diagram (b)



Put all wires (R, S, T or U, V, W) through 4 cores in series without winding.

Braking Unit, Braking Resistor Unit

To supply braking for inverter, a braking unit and braking resistor unit are needed. 0.4 to 15 kW (200 V/400 V) inverters are equipped with braking units as standard. Connect inverter-mounted or separately-installed type units according to inverter applications and output.

Braking Unit

Inverter-mounted Type Braking Resistor

Separately-installed Type Braking Resistor Unit

Inverter			Braking unit		Braking Registor Unit*1											
					Inverter-mounted Type (3 %ED,10 sec. max.)*2						Separately-installed Type (10 %ED,10 sec. max.)*3					
Voltage	Max. Applicable Motor Output kW	Model CIMR-G7A□	Model CDBR □□	No. of Used	Model ERF-150WJ□	Resistance	Code No.	No. of Used	Braking Torque*5 %	Diagram	Model LKEB □□	Specifications of Resistor	No. of Used	Braking Torque*5 %	Connectable Min. Resistance Value*4 Ω	Diagram
200V Class	0.4	20P4	Built-in		201	200 Ω	R007505	1	220	A	20P7	70 W 200 Ω	1	220	48	B
	0.75	20P7			201	200 Ω	R007505	1	125	A	20P7	70 W 200 Ω	1	125	48	B
	1.5	21P5			101	100 Ω	R007504	1	125	A	21P5	260 W 100 Ω	1	125	48	B
	2.2	22P2			700	70 Ω	R007503	1	120	A	22P2	260 W 70 Ω	1	120	16	B
	3.7	23P7			620	62 Ω	R007510	1	100	A	23P7	390 W 40 Ω	1	125	16	B
	5.5	25P5			—	—	—	—	—	—	25P5	520 W 30 Ω	1	115	16	B
	7.5	27P5			—	—	—	—	—	—	27P5	780 W 20 Ω	1	125	9.6	B
	11	2011			—	—	—	—	—	—	2011	2400 W 13.6 Ω	1	125	9.6	B
	15	2015			—	—	—	—	—	—	2015	3000 W 10 Ω	1	125	9.6	B
	18.5	2018	2022B	1	—	—	—	—	—	—	2018	4800 W 8 Ω	1	125	6.4	C
	22	2022	2022B	1	—	—	—	—	—	—	2022	4800 W 6.8 Ω	1	125	6.4	C
	30	2030	2015B	2	—	—	—	—	—	—	2015	3000 W 10 Ω	2	125	9.6	D
	37	2037	2015B	2	—	—	—	—	—	—	2015	3000 W 10 Ω	2	100	9.6	D
	45	2045	2022B	2	—	—	—	—	—	—	2022	4800 W 6.8 Ω	2	120	6.4	D
	55	2055	2022B	2	—	—	—	—	—	—	2022	4800 W 6.8 Ω	2	100	6.4	D
	75	2075	2110B	1	—	—	—	—	—	—	2022	4800 W 6.8 Ω	3	110	1.6	E
	90	2090	2110B	1	—	—	—	—	—	—	2022	4800 W 6.8 Ω	4	120	1.6	E
	110	2110	2110B	1	—	—	—	—	—	—	2018	4800 W 8 Ω	5	100	1.6	E
400V Class	0.4	40P4	Built-in		751	750 Ω	R007508	1	230	A	40P7	70 W 750 Ω	1	230	96	B
	0.75	40P7			751	750 Ω	R007508	1	130	A	40P7	70 W 750 Ω	1	130	96	B
	1.5	41P5			401	400 Ω	R007507	1	125	A	41P5	260 W 400 Ω	1	125	64	B
	2.2	42P2			301	300 Ω	R007506	1	115	A	42P2	260 W 250 Ω	1	135	64	B
	3.7	43P7			201	200 Ω	R007505	1	110	A	43P7	390 W 150 Ω	1	135	32	B
	5.5	45P5			—	—	—	—	—	—	45P5	520 W 100 Ω	1	135	32	B
	7.5	47P5			—	—	—	—	—	—	47P5	780 W 75 Ω	1	130	32	B
	11	4011			—	—	—	—	—	—	4011	1040 W 50 Ω	1	135	20	B
	15	4015			—	—	—	—	—	—	4015	1560 W 40 Ω	1	125	20	B
	18.5	4018	4030B	1	—	—	—	—	—	—	4018	4800 W 32 Ω	1	125	19.2	C
	22	4022	4030B	1	—	—	—	—	—	—	4022	4800 W 27.2 Ω	1	125	19.2	C
	30	4030	4030B	1	—	—	—	—	—	—	4030	6000 W 20 Ω	1	125	19.2	C
	37	4037	4045B	1	—	—	—	—	—	—	4037	9600 W 16 Ω	1	125	12.8	C
	45	4045	4045B	1	—	—	—	—	—	—	4045	9600 W 13.6 Ω	1	125	12.8	C
	55	4055	4030B	2	—	—	—	—	—	—	4030	6000 W 20 Ω	2	135	19.2	D
	75	4075	4045B	2	—	—	—	—	—	—	4045	9600 W 13.6 Ω	2	145	12.8	D
	90	4090	4220B	1	—	—	—	—	—	—	4030	6000 W 20 Ω	3	100	3.2	E
	110	4110	4220B	1	—	—	—	—	—	—	4030	6000 W 20 Ω	3	100	3.2	E
	132	4132	4220B	1	—	—	—	—	—	—	4045	9600 W 13.6 Ω	4	140	3.2	E
	160	4160	4220B	1	—	—	—	—	—	—	4045	9600 W 13.6 Ω	4	140	3.2	E
	185	4185	4220B	1	—	—	—	—	—	—	4045	9600 W 13.6 Ω	4	120	3.2	E
	220	4220	4220B	1	—	—	—	—	—	—	4037	9600 W 16 Ω	5	110	3.2	E
	300	4300	4220B	2	—	—	—	—	—	—	4045	9600 W 13.6 Ω	6	110	3.2	—

*1 When connecting a mounting type resistor or braking resistor unit, set system constant L3-04 to 0 (stall prevention disabled during deceleration). If operating without changing the constant, motor does not stop at set deceleration time.

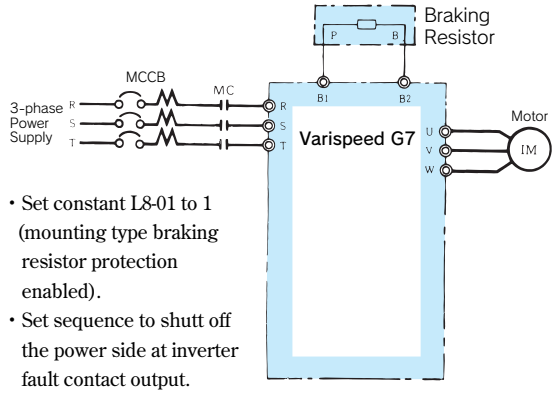
*2 When connecting mounting type braking resistor, set system constant L8-01 to 1 (braking resistor protection enabled).

*3 Load factor during deceleration to stop a load with constant torque. With constant output or continuous regenerative braking, the load factor is smaller than the specified value.

*4 Resistance value per one braking unit. Select a resistance value that is larger than connectable minimum resistance value to obtain enough braking torque.

*5 For an application with large regenerative power such as hoisting, the braking torque or other items may exceed the capacity of a braking unit with a braking resistor in a standard combination (and result in capacity overload). Contact your YASKAWA representatives when the braking torque or any other item exceeds the values in the table.

Connections



- Set constant L8-01 to 1 (mounting type braking resistor protection enabled).
- Set sequence to shutt off the power side at inverter fault contact output.

Diagram A

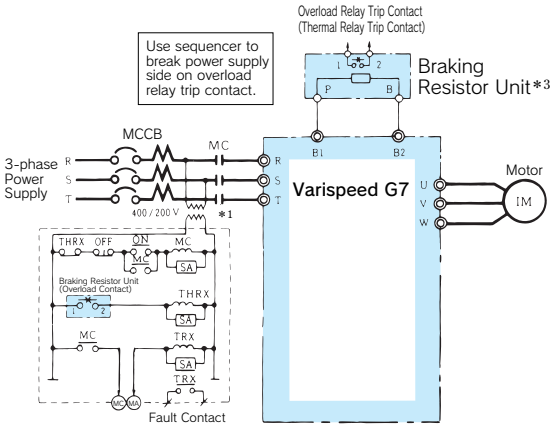


Diagram B

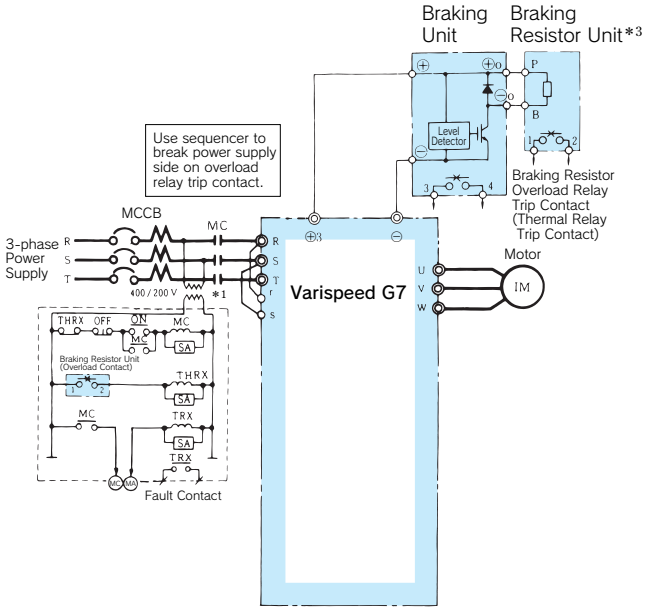


Diagram C

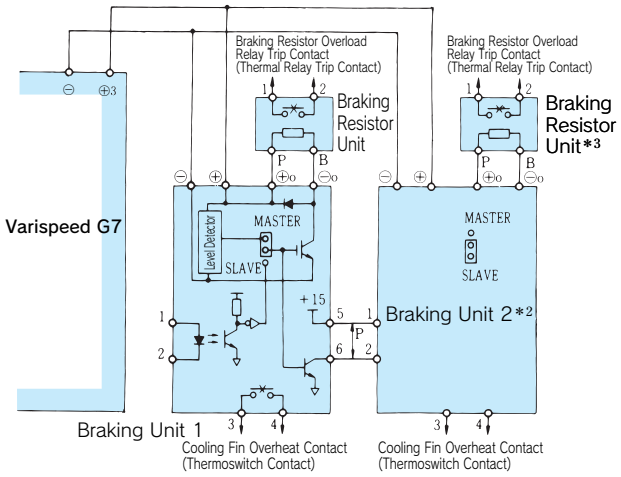


Diagram D

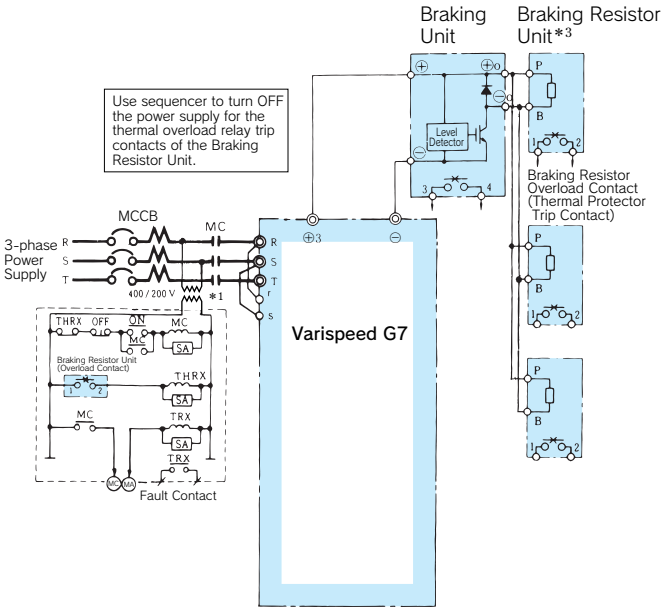


Diagram E

*1 200 V class inverters do not require control circuit transformer.

*2 When using more than one parallel-connected braking unit, connect and select connectors: Braking units have a MASTER/SLAVE selection connector. Select MASTER side only for braking unit 1 and select SLAVE sides for other braking units.

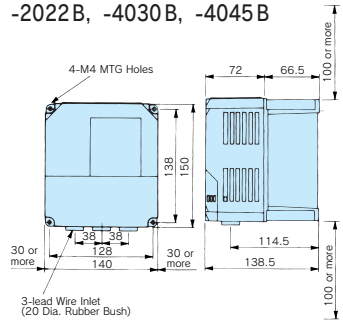
*3 Disable stall prevention during deceleration by setting L3-04 to 0 when using a braking resistor unit. The motor may not stop within the deceleration time if this setting is not changed.

*4 When connecting an separately-installed type braking resistor unit (model CDBR) to inverters with built-in braking transistor (200 V/400 V 15 kW or less), connect the B1 terminal of the inverter to the + terminal of the braking resistor unit and connect the −terminal of the inverter to the−terminal of the braking resistor unit. The B2 terminal is not used in this case.

Dimensions in mm

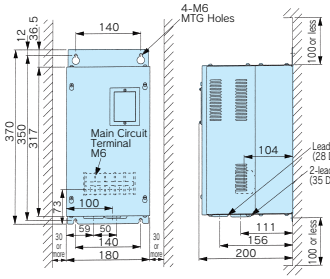
■ Braking Unit

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



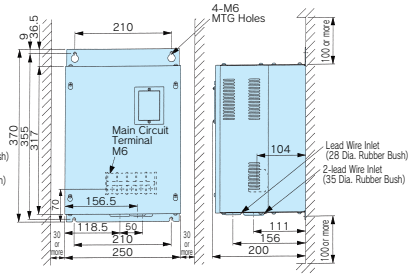
Mass : 1.8 kg

Model CDBR-2110B



Mass : 8.5 kg

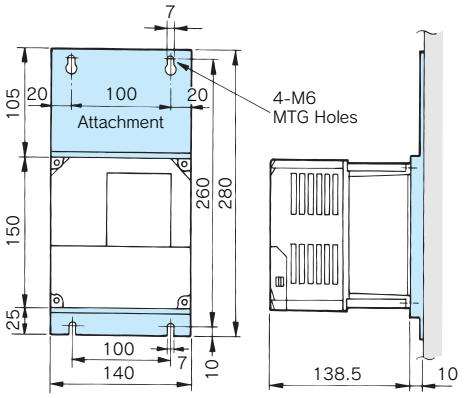
Model CDBR-4220B



Mass : 12 kg

Replacement of Conventional Braking Units with New Units

To replace conventional braking units (models CDBR-2015, -2022, -4030, -4045) with new units (CDBR-2015B, -2022B, -4030B, -4045B), an exclusive-use attachment is required. order it separately.

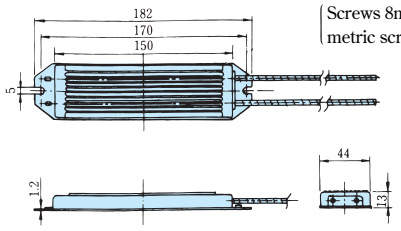


Order Code : DACT32732 - AD

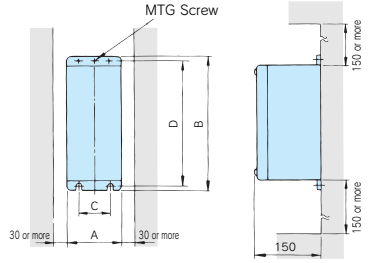
■ Braking Resistor Unit (Inverter-mounted Type)

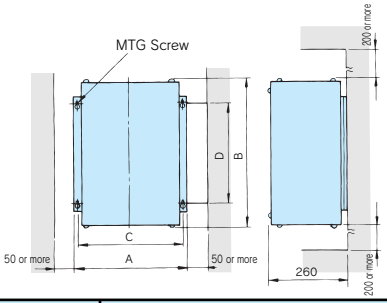
Mass : 0.2 kg
(Model ERF-150WJ□)

Note: Prepare mounting screws
(2-M4×8 tapped screws).
(Screws 8mm or more and general metric screws cannot be used.)



■ Braking Resistor Unit (Separately-installed Type)

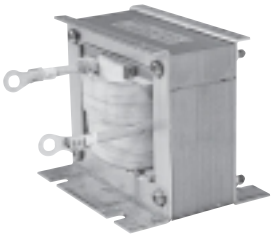




Voltage	Model LKEB-□	Dimensions in mm					Mass kg
		A	B	C	D	MTG Screw	
200 V Class	20P7	105	275	50	260	M5×3	3.0
	21P5	130	350	75	335	M5×4	4.5
	22P2	130	350	75	335	M5×4	4.5
	23P7	130	350	75	335	M5×4	5.0
	25P5	250	350	200	335	M6×4	7.5
	27P5	250	350	200	335	M6×4	8.5
400 V Class	40P7	105	275	50	260	M5×3	3.0
	41P5	130	350	75	335	M5×4	4.5
	42P2	130	350	75	335	M5×4	4.5
	43P7	130	350	75	335	M5×4	5.0
	45P5	250	350	200	335	M6×4	7.5
	47P5	250	350	200	335	M6×4	8.5

Voltage	Model LKEB-□	Dimensions in mm					Mass kg
		A	B	C	D	MTG Screw	
200 V Class	2011	266	543	246	340	M8×4	10
	2015	356	543	336	340	M8×4	15
	2018	446	543	426	340	M8×4	19
	2022	446	543	426	340	M8×4	19
400 V Class	4011	350	412	330	325	M6×4	16
	4015	350	412	330	325	M8×4	18
	4018	446	543	426	340	M8×4	19
	4022	446	543	426	340	M8×4	19
	4030	356	956	336	740	M8×4	25
	4037	446	956	426	740	M8×4	33
	4045	446	956	426	740	M8×4	33

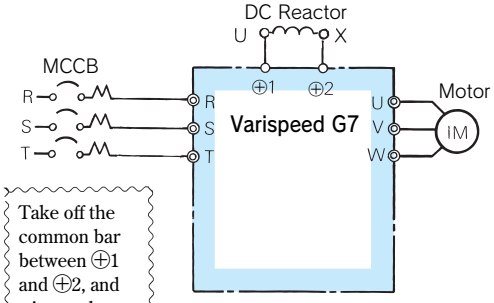
DC Reactor (UZDA-B for DC circuit)

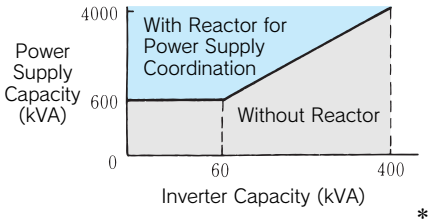


When power capacity is significantly greater when compared to inverter capacity, or when the power-factor needs to be improved, connect the AC or DC reactor.

DC reactor is built in models of 200 V class 18.5 to 110 kW 18.5 to 300 kW.

AC reactor can be used at the same time for harmonic measure.





200 V Class

*

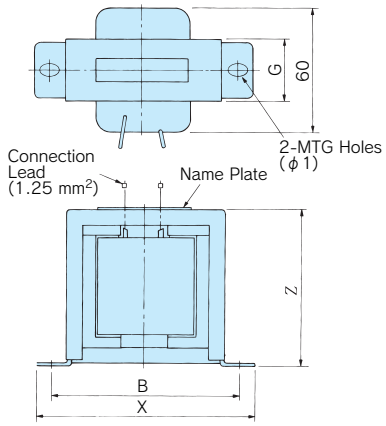
Max. Applicable Motor Output kW	Current Value A	Inductance mH	Code No.	Drawing	Dimensions in mm										Approx. Mass kg	Loss W	Wire Size mm²
					X	Y_2	Y_1	Z	B	H	K	G	φ1	φ2			
0.4	5.4	8	X010048	1	85	—	—	53	74	—	—	32	M4	—	0.8	8	2
0.75																	
1.5	18	3	X010049	2	86	80	36	76	60	55	18	—	M4	M5	2.0	18	5.5
2.2																	
3.7																	
5.5	36	1	X010050		105	90	46	93	64	80	26	—	M6	M6	3.2	22	8
7.5																	
11	72	0.5	X010051		105	105	56	93	64	100	26	—	M6	M8	4.9	29	30
15																	
18.5 to 110	Built-in																

400 V Class

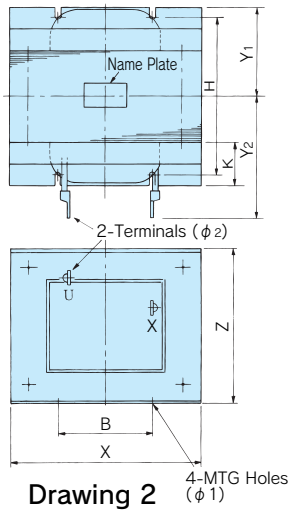
*

Max. Applicable Motor Output kW	Current Value A	Inductance mH	Code No.	Drawing	Dimensions in mm										Approx. Mass kg	Loss W	Wire Size mm²
					X	Y_2	Y_1	Z	B	H	K	G	φ1	φ2			
0.4	3.2	28	X010052	1	85	—	—	53	74	—	—	32	M4	—	0.8	9	2
0.75																	
1.5	5.7	11	X010053		90	—	—	60	80	—	—	32	M4	—	1.0	11	2
2.2																	
3.7	12	6.3	X010054	2	86	80	36	76	60	55	18	—	M4	M5	2.0	16	2
5.5	23	3.6	X010055		105	90	46	93	64	80	26	—	M6	M5	3.2	27	5.5
7.5																	
11	33	1.9	X010056		105	95	51	93	64	90	26	—	M6	M6	4.0	26	8
15																	
18.5 to 300	Built-in																

* 75 ℃, IV wire, ambient temperature 45 ℃, bundle of max. 3 wires

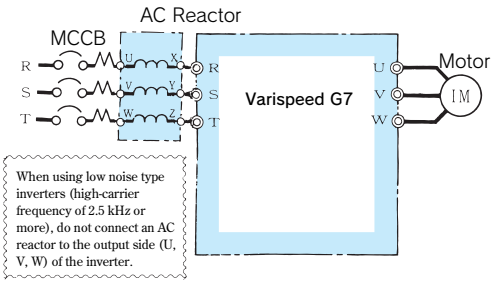


Drawing 1



Drawing 2

AC Reactor (UZBA-B for Input 50/60 Hz)



When power capacity is significantly greater when compared to inverter capacity, or when the power-factor needs to be improved, connect the AC or DC reactor.

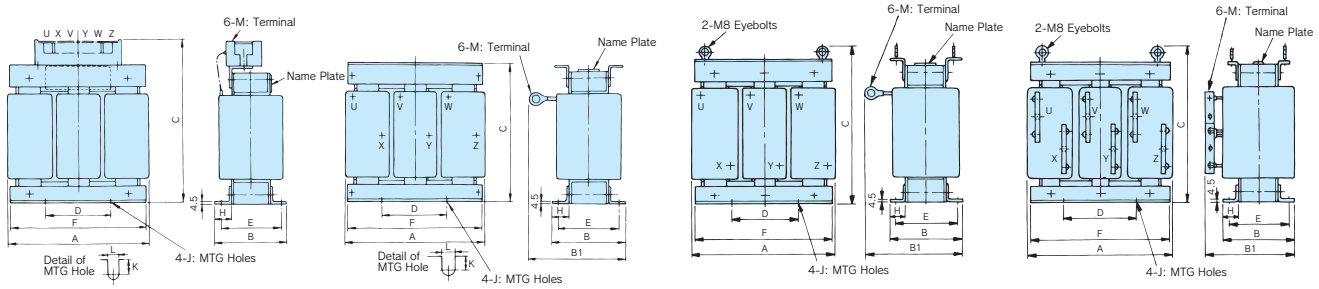
Select an AC reactor according to the motor capacity. Standard Varispeed G7 is a DC reactor. It has built-in models of 200V class 18.5 to 110 kW and 400 V class 18.5 to 300 kW.

200 V Class

Max. Applicable Motor Output kW	Current Value A	Inductance mH	Code No.	Drawing	Dimensions in mm													Mass kW	Loss W
					A	B	B1	C	D	E	F	H	J	K	L	M			
0.4	2.5	4.2	X 002553	1	120	71	—	120	40	50	105	20	M 6	10.5	7	M 4		2.5	15
0.75	5	2.1	X 002554		120	71	—	120	40	50	105	20	M 6	10.5	7	M 4		2.5	15
1.5	10	1.1	X 002489		130	88	—	130	50	65	130	22	M 6	11.5	7	M 4		3	25
2.2	15	0.71	X 002490		130	88	—	130	50	65	130	22	M 6	11.5	7	M 4		3	30
3.7	20	0.53	X 002491	2	130	88	114	105	50	65	130	22	M 6	11.5	7	M 5		3	35
5.5	30	0.35	X 002492		130	88	119	105	50	70	130	22	M 6	9	7	M 5		3	45
7.5	40	0.265	X 002493		130	98	139	105	50	75	130	22	M 6	11.5	7	M 6		4	50
11	60	0.18	X 002495		160	105	147.5	130	75	85	160	25	M 6	10	7	M 6		6	65
15	80	0.13	X 002497		180	100	155	150	75	80	180	25	M 6	10	7	M 8		8	75
18.5	90	0.12	X 002498		180	100	150	150	75	80	180	25	M 6	10	7	M 8		8	90
22	120	0.09	X 002555		180	100	155	150	75	80	180	25	M 6	10	7	M 10		8	90
30	160	0.07	X 002556		210	100	170	175	75	80	205	25	M 6	10	7	M 10		12	100
37	200	0.05	X 002557		210	115	182.8	175	75	95	205	25	M 6	10	7	M 10		15	110
45	240	0.044	X 002558		240	126	218	215±5	150	110	240	25	M 6	8	7	M 10		23	125
55	280	0.038	X 002559		240	126	218	215±5	150	110	240	25	M 8	8	10	M 12		23	130
75	360	0.026	X 002560		270	162	241	230±5	150	130	260	40	M 8	16	10	M 12		32	145
90	500	0.02	X 010145	3	330	162	286	315±5	150	130	320	40	M 10	16	10	M 12		55	200
110	500	0.02	X 010145		330	162	286	315±5	150	130	320	40	M 10	16	10	M 12		55	200

400 V Class

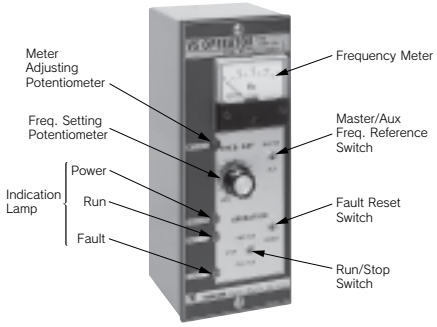
Max. Applicable Motor Output kW	Current Value A	Inductance mH	Code No.	Drawing	Dimensions in mm													Mass kW	Loss W
					A	B	B1	C	D	E	F	H	J	K	L	M			
0.4	1.3	18.0	X 002561	1	120	71	—	120	40	50	105	20	M 6	10.5	7	M 4		2.5	15
0.75	2.5	8.4	X 002562		120	71	—	120	40	50	105	20	M 6	10.5	7	M 4		2.5	15
1.5	5	4.2	X 002563		130	88	—	130	50	70	130	22	M 6	9	7	M 4		3	25
2.2	7.5	3.6	X 002564		130	88	—	130	50	70	130	22	M 6	9	7	M 4		3	35
3.7	10	2.2	X 002500		130	88	—	130	50	70	130	22	M 6	11.5	7	M 4		3	43
5.5	15	1.42	X 002501		130	98	—	130	50	80	130	22	M 6	11.5	7	M 4		4	50
7.5	20	1.06	X 002502	2	160	90	115	130	75	70	160	25	M 6	10	7	M 5		5	50
11	30	0.7	X 002503		160	105	132.5	130	75	85	160	25	M 6	10	7	M 5		6	65
15	40	0.53	X 002504		180	100	140	150	75	80	180	25	M 6	10	7	M 6		8	90
18.5	50	0.42	X 002505		180	100	145	150	75	80	180	25	M 6	10	7	M 6		8	90
22	60	0.36	X 002506		180	100	150	150	75	75	180	25	M 6	10	7	M 6		8.5	90
30	80	0.26	X 002508		210	100	150	175	75	80	205	25	M 6	10	7	M 8		12	95
37	90	0.24	X 002509		210	115	177.5	175	75	95	205	25	M 6	10	7	M 8		15	110
45	120	0.18	X 002566		240	126	193	205±5	150	110	240	25	M 8	8	10	M 10		23	130
55	150	0.15	X 002567		240	126	198	205±5	150	110	240	25	M 8	8	10	M 10		23	150
75	200	0.11	X 002568		270	162	231	230±5	150	130	260	40	M 8	16	10	M 10		32	135
90/110	250	0.09	X 002569		270	162	231	230±5	150	130	260	40	M 8	16	10	M 10		32	135
132/160	330	0.06	X 002570		320	165	253	230±5	150	130	320	40	M 10	17.5	12	M 12		55	200
185 220	490	0.04	X 002690	3	330	176	293	315±5	150	150	320	40	M 10	13	12	M 12		60	340
300	660	0.03	X 002691	4	330	216	353	315±5	150	185	320	40	M 10	15.5	18	M 16		80	310



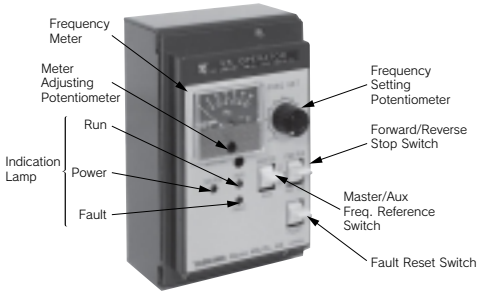
Drawing 1 Drawing 2 Drawing 3 Drawing 4

VS Operator

Standard Steel Plate Type



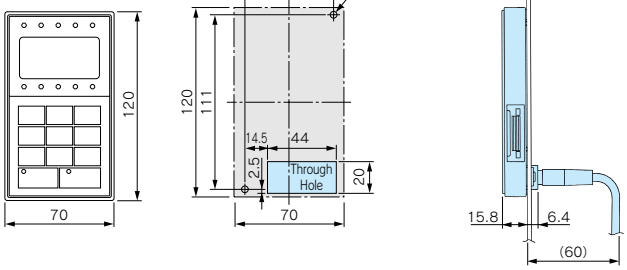
Small Plastic Type



Digital Operator

LCD Monitor
(Model JVOP-160)
Attached as Standard

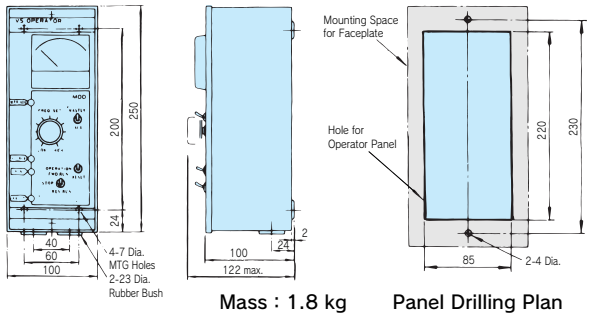
LED Monitor
(Model JVOP-161)



Product Series

Model JVOP	Code No.	Frequency Meter Specifications
JVOP-96 · 1	73041-0906X-01	DCF-6A 3 V 1 mA 75 Hz
JVOP-96 · 2	73041-0906X-02	DCF-6A 3 V 1 mA 150 Hz
JVOP-96 · 3	73041-0906X-03	DCF-6A 3 V 1 mA 220 Hz

Dimensions in mm



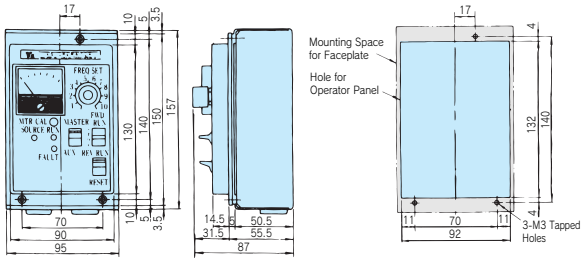
Mass : 1.8 kg

Panel Drilling Plan

Product Series

Model JVOP	Code No.	Frequency Meter Specifications
JVOP-95 · 1	73041-0905X-01	TRM-45 3 V 1 mA 60/120 Hz
JVOP-95 · 2	73041-0905X-02	TRM-45 3 V 1 mA 90/180 Hz

Dimensions in mm



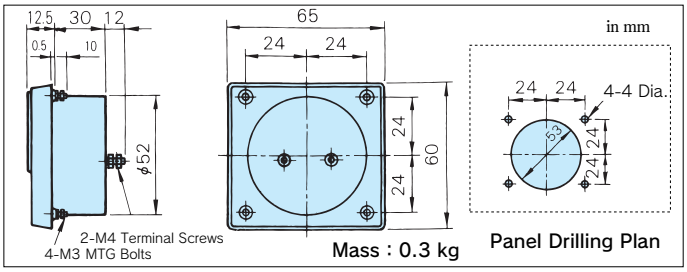
Mass : 0.8 kg

Panel Drilling Plan

Digital Operator Extension Cable

Length	Code No.
1 m	72606- WV001
3 m	72606- WV003

Frequency Meter/Ammeter (Model DCF-6A*, 3 V 1mA full-



Scale

75 Hz full-scale: Code No. FM000065

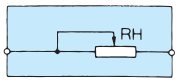
60/120 Hz full-scale: Code No. FM000085

Note: For scale of ammeter, contact your YASKAWA representative.

* DCF-6A is 3 V, 1 mA, 3 kΩ. For Varispeed G7 multi-function analog monitor output, set frequency meter adjusting potentiometer or constant H4-02, -05 (analog monitor output gain) within the range of 0 to 3 V (initial setting is 0 to 10 V).

Potentiometer (Attach to inverter terminal)

- 2 kΩ for frequency reference control
- 20 kΩ for scale adjusting



Resistance	Code No.
2 kΩ	ETX 003270
20 kΩ	ETX 003120

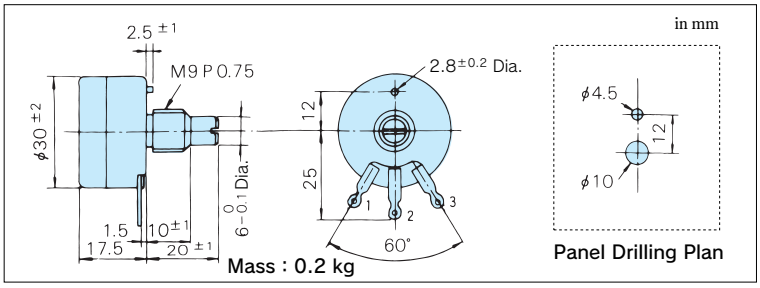
Mass : 20 g

Frequency Setting Potentiometer (Model RV30YN20S, 2 kΩ Code No.

Adjusts motor frequency through use of frequency setting knob located over the potentiometer.

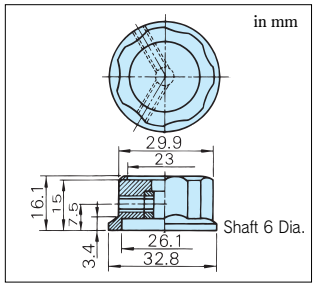
Frequency Meter Adjusting Potentiometer (Model RV30YN20S 20 kΩ Code No. RH000850)

Corrects frequency meter reading.



Frequency Setting Knob (Type CM-3S)

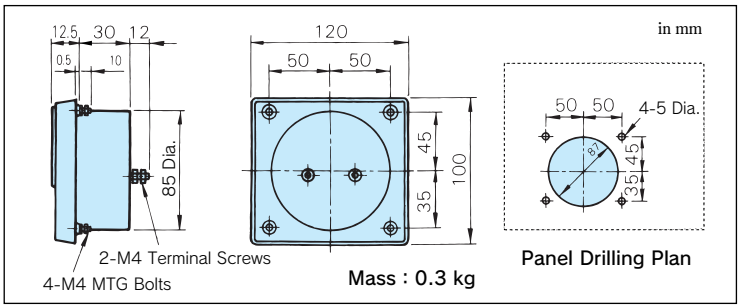
Used to adjust potentiometer frequency setting.



Output Voltmeter (Model SCF-12NH Rectification Type Class 2.5)

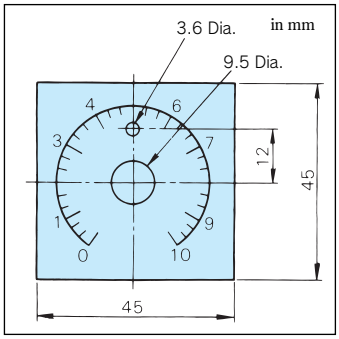
200 V Class: 300 V Full-scale (Code No. VM000481)

400 V Class: 600 V Full-scale (Output Voltmeter: Code No. VM000502; Transformer for Instrument: Code No. PT000084)



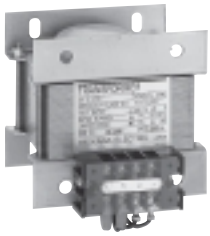
Scale Plate

(Code No. NPJT41561-1)

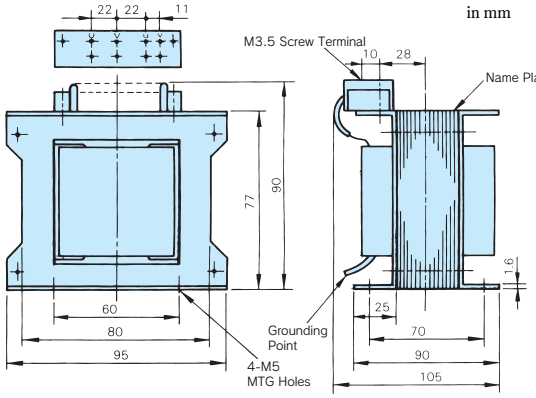


Potential Transformer (Model UPN-15B)

15 VA 440/110 V (400/100 V) 50/60 Hz



Mass : 2.3 kg

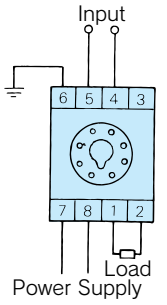


Isolator (Insulation Type DC Transmission Converter)

Performance

(1) Allowance	±0.25 % of output span (Ambient temp.: 23 ℃)	(6) Response Time	0.5 sec. or less (Time to settle to ±1 % of final steady value)
(2) Temperature Influence	With ±0.25 % of output span (The value at ±10 ℃ of ambient temp.)	(7) Withstand Voltage	2000 VAC for one min. (between each terminal of input, output, power supply, and enclosure)
(3) Aux. Power Supply Influence	With ±0.1 % of output span (The value at ±10 % of aux. power supply.)	(8) Insulation Resistance	20 MΩ and above (by 500 VDC megger). (between each terminal of input, output, power supply, and enclosure)
(4) Load Resistance Influence	With ±0.05 % of output span (In the range of load resistance)		
(5) Output Ripple	With ±0.5 % P-P of output span		

Wiring Connections



Terminal	Description
1	Output +
2	Output −
3	—
4	Input +
5	Input −
6	Grounding
7	Power supply
8	

Product Line

Model	Input Signal	Output Signal	Power Supply	Code No.
DGP2-4-4	0 to 10 V	0 to 10 V	100 VAC	CON 000019.25
DGP2-4-8	0 to 10 V	4 to 20 mA	100 VAC	CON 000019.26
DGP2-8-4	4 to 20 mA	0 to 10 V	100 VAC	CON 000019.35
DGP2-3-4	0 to 5 V	0 to 10 V	100 VAC	CON 000019.15
DGP3-4-4	0 to 10 V	0 to 10 V	200 VAC	CON 000020.25
DGP3-4-8	0 to 10 V	4 to 20 mA	200 VAC	CON 000020.26
DGP3-8-4	4 to 20 mA	0 to 10 V	200 VAC	CON 000020.35
DGP3-3-4	0 to 5 V	0 to 10 V	200 VAC	CON 000020.15

Cable Length

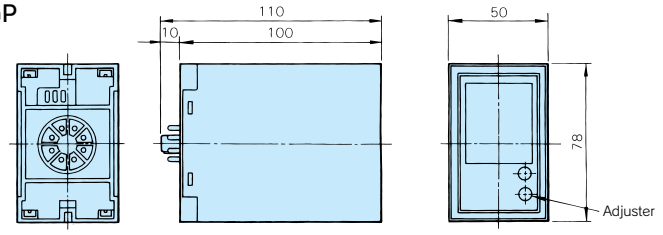
- 4 to 20 mA : Within 100 m
- 0 to 10 V : Within 50 m

Mass

- Isolator : 350 g
- Socket : 60 g

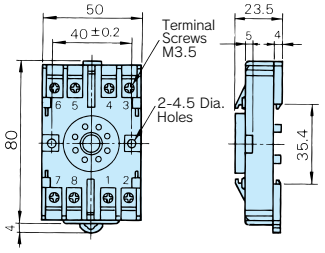
Dimensions in mm

Model DGP Series

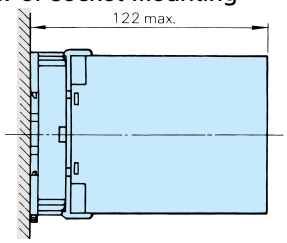


Potentiometer's adjuster position varies according to the model.

Socket



View of socket mounting



Backup Capacitor Unit for Momentary Power Loss (Applicable to models of 0.4 to 7.5 kW (200 V/400 V Class))

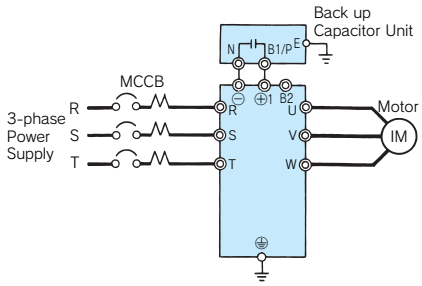
Use this unit for 7.5 kW or less to extend the inverter's power loss ride-thru ability to 2 seconds. *

200 to 230 V Model P0010

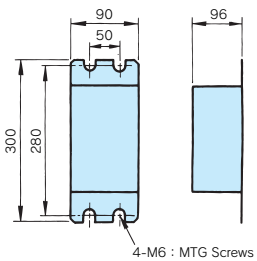
380 to 460 V Model P0020

Mass : 2 kg

● Connection with Inverter

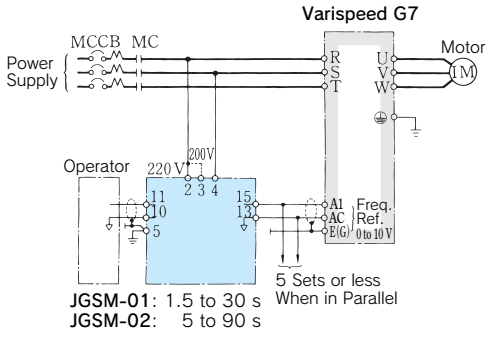
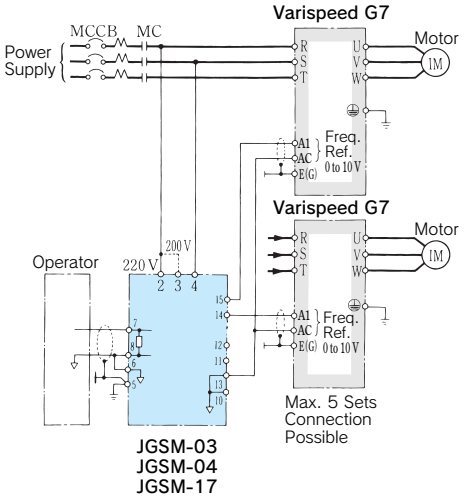
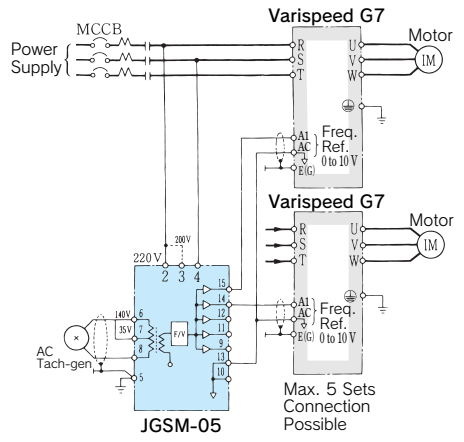


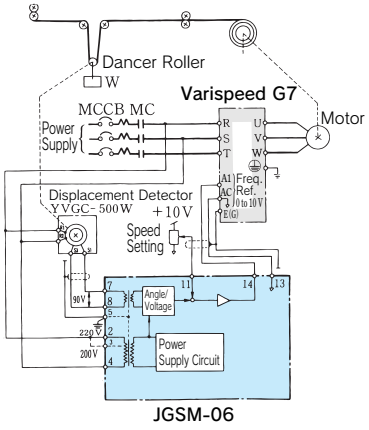
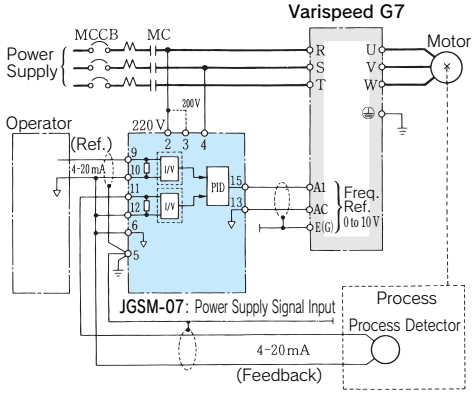
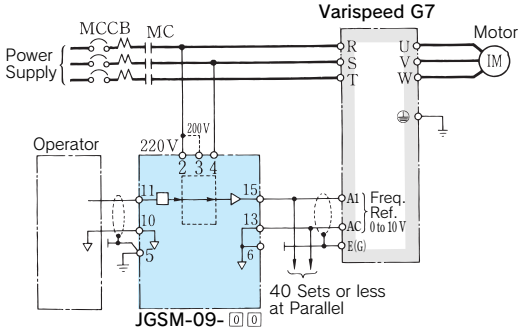
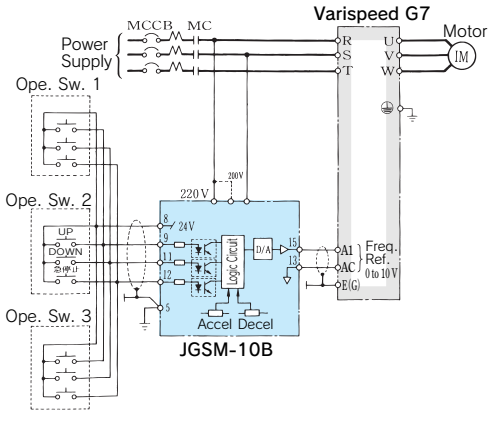
● Dimensions in mm

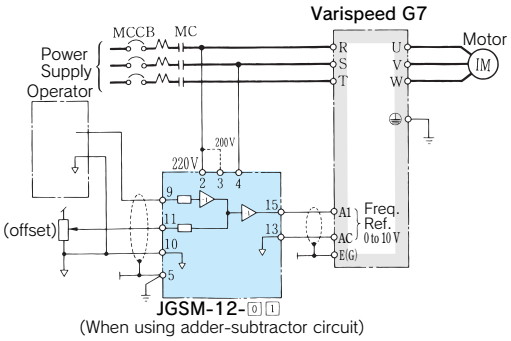
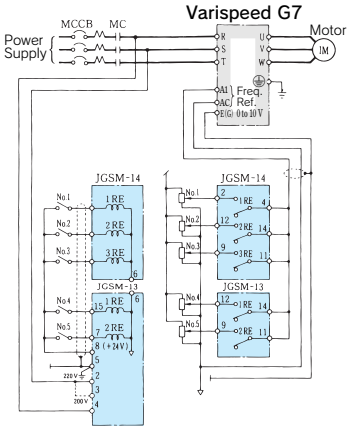
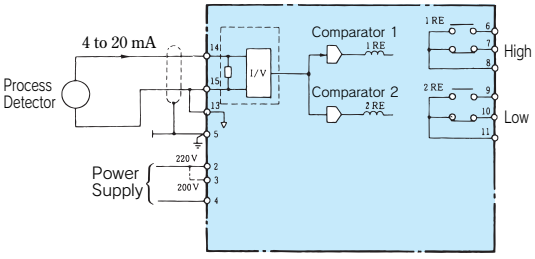
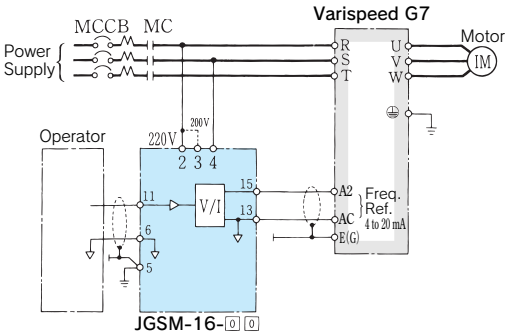


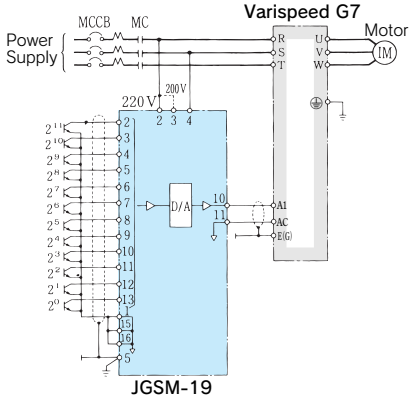
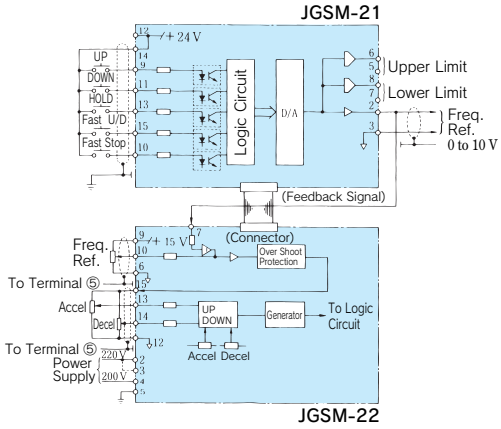
* When this unit is not used, the inverter's power loss ride-thru ability is 0.1 to 1 second.

VS System Model (Power Supply Capacity 6 VA or less)

Name (Model)	Appearance	Function	Application
Soft Starter A (JGSM-01) Soft Starter B (JGSM-02)		Linear acceleration/deceleration control provides smooth, uniform speed change during starting and stopping and during speed increase and decrease. Accel/decel time adjustable in 1.5 to 30 sec with A and 5 to 90 sec with B.	
Ratio Setter A (JGSM-03)		Converts the current signal 4 to 20 mA of master setter JVOP-03*1 to voltage signal and sets five types of ratios and biases.	
Ratio Setter B (JGSM-04)		Transforms the frequency signal 0 to 2 kHz of master setter JVOP-04*1 to voltage signal and sets five types of ratios and biases.	
Ratio Setter C (JGSM-17)		Transforms master speed signals such as AC voltage signal (200 VAC), AC tach-gen signal (30 VAC) or DC voltage signal (10 VDC) to DC voltage. It can set five types of ratios and biases.	
Follower Ratio Setter (JGSM-05)		Transforms frequency signal from AC tach-gen to voltage signal and sets five types of ratios and biases.	

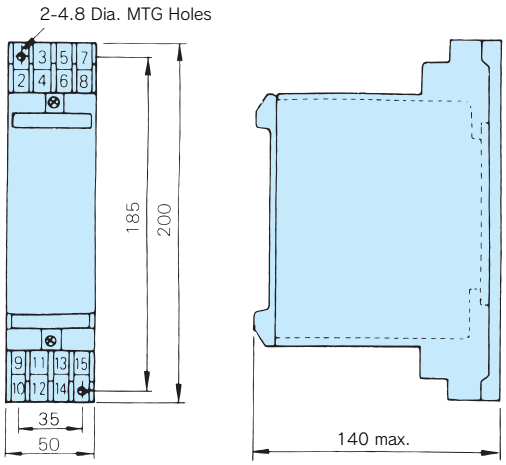
Name (Model)	Appearance	Function	Application
Position Controller (JGSM-06)		Synchronizes displacement detector YVGC-500W*1 in proportion to rotary angle to permit change to DC voltage signal. Signal mixing function to take out deviation signal is available.	
PID Controller (JGSM-07)		Independently sets ratio gain, integral and differential time for the simple process control. Integral reset, stepless operation, and wind-up functions are available.	
Preamplifier (JGSM-09-□)*2		Amplifies both the power of DC input signal and output of snap-in function modules JZSP-11 to 16*1 when inserted.	
UP/DOWN Setter (JGSM-10B)		Executes "UP" or "DOWN" command from remote control type VS operator model JVOP-10*1 by lowering or raising reference voltage.	

Name (Model)	Appearance	Function	Application
Operational Amplifier (JGSM-12-□□)*3		Required operational circuits are provided through a range of operational impedances.	 JGSM-12-01 (When using adder-subtractor circuit)
Signal Selector A (JGSM-13)		Consists of power supply circuit and two relay circuits. Used as a selector circuit of control signals.	
Signal Selector B (JGSM-14)		Contains three relay circuits. Used as a selector circuit of control signals. Power supply from model JGSM-13.	
Comparator (JGSM-15-□□)*2		Compares DC voltage, current, AC tach-gen, frequency, or reference signals with two preset levels. It drived relays and output contact signal (1NO, NC contact.)	 JGSM-15-13 (When using I/V converter)
V/I Converter (JGSM-16-□□)*2		Converts DC voltage input signal to current signal of 4 to 20 mA which can be connected to instrument. Insertion of snap-in module can determine input signals such as frequency or tach-gen.	 JGSM-16-00

Name (Model)	Appearance	Function	Application
D/A Converter (JGSM-18) (JGSM-19)		Converts BCD 3-digit or 12 bits binary digital signals to 0 to ±10 V analog signals with high accuracy. Model JGSM-18: BCD 3-digit input type Model JGSM-19: 12 bits binary type	
Static Potentiometer (D/A Converter: JGSM-21 (Controller: JGSM-22		In addition to the functions of model JGSM-10B (remote setting device), wide application is offered through the command value maintenance function at power failure, the variable acceleration/deceleration function that allows external setting times, and the analog tracking function. The two system modules must always be used together to configure the static potentiometer.	

*1 Available as Yaskawa standard.
*2 □□ shows model of VS snap-in function modules.
*3 □□ indicates model of impedance.
Note: Both 200/220 V at 50/60 Hz are available as standard. Use a transformer for other power supplies.

■ VS System Module Dimensions in mm



Mass : 0.8 kg

■ VS Snap-in Module List

Application	Name	Model
Short-circuit of mounting connector of VS snap-in module	Short-circuit PC board	JZSP-00
Buffer accel/decel operation	Soft starter	JZSP-12
Operation by signal of either process adjusting meter or VS operator JVOP-03.	I/V converter	JZSP-13
Operation by signal of VS operator JVOP-04	F/V converter	JZSP-14
Sequence operation with main unit	Tach-gene follower	JZSP-15
Adding/subtracting operation of each signal	Signal mixer	JZSP-16 □□
		JZSP-16-01
		JZSP-16-02
		JZSP-16-03

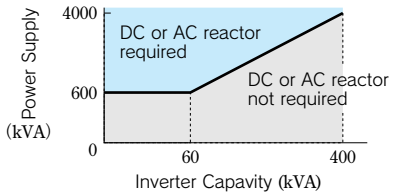
Notes

Application of Inverter

Selection

■ Setting Reactor

Use a DC reactor or AC reactor (option) on the inverter input side when the inverter is connected directly to a large-capacity power transformer (600 kVA and more within 10 m distance) or when a power factor improvement capacitor is switched. Otherwise excess peak current may occur in the power feed circuit and the converter section may be damaged. DC reactor is built in 18.5 to 110 kW, 200 V class inverters and 18.5 to 300 kW, 400 V class inverters. A DC or AC reactor is also required when a thyristor converter such as a DC drive is connected to the same power system.



■ Inverter Capacity

When a special motor is used or more than one motor are driven in parallel with a single inverter, select the inverter capacity so that 1.1 times of the total motor rated current does not exceed the inverter rated output current.

■ Initial Torque

The starting and accelerating characteristics of the motor driven by an inverter are restricted by the overload current ratings of the inverter. Compared to running with commercial power supply, lower torque output should be expected. If high starting torque is required, use an inverter of higher capacity or increase the capacities of both the motor and the inverter.

■ Emergency Stop

When an error occurs, a protective circuit is activated and the inverter output is turned OFF. However, the motor cannot be stopped immediately. Use a mechanical brake and hold the equipment for a fast stop if necessary.

■ Options

Terminals B1, B2, ⊖, ⊕1, ⊕2, ⊕3 are for YASKAWA options. Do not connect equipment other than YASKAWA options.

Installation

■ Installation in Enclosures

Avoid oil mist or dust. Place the inverter in a clean area or house it in a totally-enclosed case so that no contamination enters. To use the totally-enclosed case, select the cooling method and panel dimensions so the inverter ambient temperature will be within the allowable range.
Do not install the inverter on flammable material, such as wood.

■ Installation Direction

Install the inverter on a wall with the longer side in the vertical position.

Setting

■ Upper Limits

The inverter can be driven at an output frequency of up to 400 Hz with the digital operator. Setting errors may create a dangerous situation. Set the upper limit with the upper limit frequency setting function. (Maximum output frequency in external input signal operation is preset to 60 Hz at the factory.)

■ DC Injection Braking

Large DC injection braking operating currents and times may cause motor overheating.

■ Accel/Decel Times

Motor accel/decel time is determined by the motor generating torque, load torque, and load inertia $GD^2/4$. If the stall prevention function is activated during accel/decel, set the accel/decel time longer. After the stall prevention function is activated, the accel/decel time is extended to a length that the inverter can handle. To shorten the accel/decel time, increase the capacity of the inverter and possibly the motor.

Operation

■ Wiring Check

Applying power to inverter output terminals U, V, or W will damage the inverter. DOUBLE CHECK WIRING AND SEQUENCE BEFORE TURNING THE POWER ON.

■ Magnetic Contactor Installation

If magnetic contactor (MC) is used on the primary side of the inverter, do not use the MC for starting and stopping the inverter frequently. Otherwise, the inverter life may be reduced.

■ Maintenance and Inspections

After turning power to the inverter OFF, electric charges in the internal capacitors are retained temporarily. Wait until the charge LED goes off before touching the inside of the inverter.

■ Wiring

Use round pressure terminal when wiring UL and C-UL listed inverters. Caulking should be done by the caulking tools specified by terminal manufactures.

Application of Peripheral Unit

■ Installation and Selection of Molded-Case Circuit Breaker

On the input power side, a molded-case circuit breaker (MCCB) should be installed to protect inverter primary wiring. The inverter power-factor (depending on power voltage, output frequency, and load) must be taken into account for selecting MCCB. For standard settings, see P73. If a full electromagnetic MCCB is to be used, select a larger capacity because the operating characteristics are altered by harmonic current. A leakage current breaker or of inverter use is recommended.

■ Use of Power Supply Side Magnetic Contactor

The inverter can be used without an input side magnetic contactor (MC). An input MC can be used to prevent an automatic restart after recovery from an external power loss during remote control operation. However, do not use the MC frequently for start/stop operation, or it will lead to a reduced reliability. When the digital operator is used, automatic restart after power failure is disabled so that MC starting is impossible. Although the MC can stop the inverter, regeneration braking is disabled and the motor coasts to a stop. When braking resistor unit is used, build a sequence where MC is turned OFF at the braking resistor unit thermal relay contact.

■ Use of Motor Side Magnetic Contactor

In general magnetic contactors on the output of the inverter, for motor control should not be used. Starting a motor with the inverter running will cause large surge currents and the inverter overcurrent protector to trigger. If an MC is used for switching to commercial power supply, switch MC after the inverter and the motor stop. To switch during motor rotation, use the speed search function. (See P40.)

■ Use of Overload Relay

The inverter includes an electronic thermal protective function to protect the motor from overheating. However, when multi-drive by one inverter is used, place a overload relay between the inverter and the motor. Set 0 in L1-01, and set the overload relay to the current nameplate value at 50 Hz, or 1.1 times of that at 60 Hz.

■ Power-factor Improvement (Elimination of Phase Advance Capacitor)

To improve the power-factor, install an AC reactor or DC reactor on the inverter's primary side. DC reactor is built in 18.5 to 110 kW, 200 V class inverters and 18.5 to 300 kW, 400 V class inverters. Power-factor improvement capacitor or surge suppressors on the inverter output side will be damaged by the harmonic component in the inverter output. Also, the overcurrent caused in the inverter output will trigger the overcurrent protection. To avoid this, do not use capacitors or surge suppressors in the inverter's output.

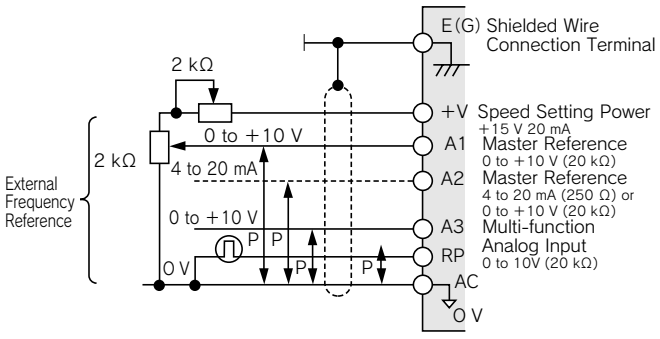
■ Radio Frequency Interference

Because the inverter input and output (main circuit) contains a higher harmonics component, it may emit RFI noise to communication equipment (AM radio, etc.) near the inverter. Use a noise filter to decrease the noise. Use of a metalic conduit between the inverter and motor or grouding the conduit is also effective. Proper routing of input and output lead is also recommended.

■ Wire Thickness and Cable Length

If a long cable is used between the inverter and a motor (especially when low frequency is output), motor torque decreases because of voltage drop in the cable. Use sufficiently thick wire.

When a digital operator is to be installed separately from the inverter, use the YASKAWA remote interface and special connection cable (option). For remote control with analog signals, connect the operating pot or operating signal terminal to the inverter within 50 m. The cable must be routed separately from power circuits (main circuit and relay sequence circuit) so that it is not subjected to inductive interference by other equipment. If frequencies are set not only from the digital operator but also with external frequency controller, use twisted-pair shielded wire as shown in the following figure and connect the shielding to terminal E.

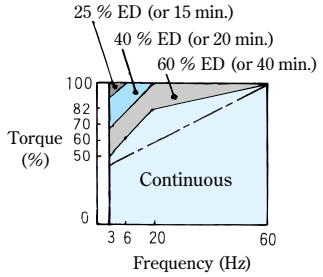


Application of Motors

Application to Existing Standard Motors

■ Low Speed Range

A standard motor driven by the inverter generates slightly less power than it does when it is driven with commercial power supply.
Also, the cooling effect deteriorates in low speed range so that the motor temperature rise increases, and load torque reduces in the low speed range.
Allowable load characteristics of the standard motor are shown in the figure. If 100 % continuous torque is required in the low speed range, use an inverter duty motor.



Allowable Load Characteristics of Standard Motor

■ Insulation Withstand Voltage

Because of the 3-level control method in the Varispeed G7 series, the insulation for motors is not damaged. Special care is required if older motors with deteriorated insulation are used. Contact your YASKAWA representative for details.

■ High Speed Operation

When the motor is used above 60 Hz, motor type should be verified. Contact your motor source.

■ Torque Characteristics

Motor torque characteristics vary when the motor is driven by an inverter instead of commercial power supply. Check the load torque characteristics of the equipment to be connected. (For torque characteristics of inverter operation.)

■ Vibrations

Because of the high carrier modulation technique for PWM control, the Varispeed G7 series reduces motor vibration to a level equal to operating with a commercial power supply. Greater vibrations may occur under the following conditions:

(1) Response at resonant frequency of the mechanical system.

Special care is required if a machine which has previously been driven at a constant speed, is to be driven at varying speeds. Installation of anti-vibration rubber padding under the motor base and frequency jump control are recommended.

(2) Rotator residual imbalance should be evaluated.

Special care is required for operation at 60 Hz or higher frequencies.

■ Noise

Inverter operation is as quiet as when operating with commercial power supply. At above rated speeds (60 Hz), motor noise may increase when cooling fan is operating.

Application to Special Purpose Motors

■ Pole Change Motors

Select the inverter with a capacity exceeding the rated current of each pole. Pole change should be made after the motor stops. If a pole is changed while the motor is rotating, the regenerative overvoltage or overcurrent protection circuit is activated and the motor then coasts to a stop.

■ Submersible Motors

Since the rated current of underwater motors is large compared with general purpose motors, select an inverter with a larger capacity. If the distance between the inverter and the motor is great, use cables with sufficiently large diameters.

■ Explosion-proof Motors

Explosion-proof motors which are applied to an inverter, must be currently rated and approved as explosion-proof equipment. The inverter and pulse coupler (pulse signal repeater) are not explosion-proof and should not be located where explosive gases exist. The PG attached to flame-proof type inverter is safety explosion-proof type. Be sure to connect an exclusive pulse coupler when wiring between the PG and inverter.

■ Geared Motors

Lubrication method and continuous rotation limit differ with manufacturers. When oil lubrication is employed, continuous operation in low speed range may cause burnout. Before operating the motor at more than 60 Hz you should consult the motor manufacturer.

■ Synchronous Motors

Synchronous motor is not suitable for inverter control. If a group of synchronous motor is individually turned ON and OFF, synchronism may be lost.

■ Single-phase Motors

Single-phase motors are not suitable for variable speed operation with an inverter. If the inverter is applied to a motor using a capacitor stack, a high harmonic current flows and the capacitor may be damaged. For split-phase start motors and repulsion start motors, the internal centrifugal switch will not be actuated and the starting coil may burn out. Therefore, use only 3-phase motors.

■ Uras Vibrators

Uras vibrator is a vibration motor which gets power from centrifugal force by rotating unbalance weights on both ends of the shaft. When driving by inverter, select inverter capacity considering followings. For details, contact your YASKAWA representative.

(1) Uras vibrator should be used at inverter rated frequency or less.
(2) V/f control should be used.
(3) Set acceleration time 5 to 15 sec because load inertia of uras vibrator is 10 to 20 times of motor inertia.
(4) Inverter might not start due to undertorque because eccentric moment torque (static friction torque at start) is too large.

■ Motors with Brakes

Use brake-equipped motors with an independent power supply. Connect the brake power supply to the inverter primary side. When the brake operates (motor stops) it turns the inverter output OFF. Some types of brakes may make abnormal sounds in low speed range.

Power Transmission Mechanism (Gear Reduction, Belt, Chain, etc.)

When gear boxes and change/reduction gears lubricated with oil are used in power transmission systems, continuous low speed operation decreases the benefits of oil lubrication function. Also, operation at more than 60 Hz may result in noise, reduced life, etc.

Inverter Capacity Selection

● Inverter Capacity Check Points

Classification	Item		Related Specification: Speed and Torque Characteristics	Time Ratings	Overload Capacity	Starting Torque
Load Characteristics	Load type	Friction load and weight load Liquid (viscous) load Inertia load Load with power transmission and accumulation	○			○
	Load speed and torque characteristics	Constant torque Constant output Decreasing torque Decreasing output	○		○	
	Load characteristics	Motoring Braking or overhauling load Constant load Shock load Repetitive load High-start torque Low-start torque	○	○	○	○
Operation	Continuous operation Long-time operation at midium or low speeds Short-time operation			○	○	
Rated Output	Maximum required output (instantaneous) Constant output (continuous)		○		○	
Rated min^{-1}	Maximum min^{-1} Rated min^{-1}		○			
Power Supply	Power supply transformer capacity percentage impedance Voltage fluctuations Number of phases, single phase protection Frequency				○	○
Deterioration of Load Capacity due to Age	Mechanical friction, losses in wiring				○	○
	Duty cycle modification			○		

● Inverter Capacity Required for Continuous Operation

Item	Calculation formula
Required output for the load within the allowable range	$\frac{k \times P_M}{\eta \times \cos\phi} \leqq$ Inverter capacity [kVA]
Motor capacity within the inverter ratings	$k \times \sqrt{3} \times V_M \times I_M \times 10^{-3} \leqq$ Inverter capacity [kVA]
Current within the inverter ratings	$k \times I_M \leqq$ Inverter capacity [A]

● Inverter Capacity Required for Group Drive

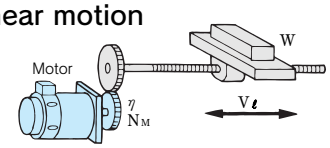
Item	Calculation formula (with overload capacity of 150 % for 1 minute)	
	Motor acceleration of 1 minute or less	Motor acceleration of 1 minute or more
Starting requirements are within the inverter capacity	$\frac{k \times P_M}{\eta \times \cos\phi}\{n_T + n_S(k_S - 1)\}$ $= P_{CI}\left\{1 + \frac{n_S}{n_T}(k_S - 1)\right\}$ $\leqq$ 1.5 × Inverter capacity [kVA]	$\frac{k \times P_M}{\eta \times \cos\phi}\{n_T + n_S(k_S - 1)\}$ $= P_{CI}\left\{1 + \frac{n_S}{n_T}(k_S - 1)\right\}$ $\leqq$ Inverter capacity [kVA]
Current within the inverter capacity	$n_T \times I_M\left\{1 + \frac{n_S}{n_T}(k_S - 1)\right\}$ $\leqq$ 1.5 × Inverter capacity [A]	$n_T \times I_M\left\{1 + \frac{n_S}{n_T}(k_S - 1)\right\}$ $\leqq$ Inverter capacity [kVA]

● Inverter Capacity Required for Starting

Item	Calculation formula [t_A < 60 s]
Total starting capacity within the inverter capacity	$\frac{k \times N}{974 \times \eta \times \cos\phi}\left(T_L + \frac{GD^2}{375} \times \frac{N}{t_A}\right) \leqq 1.5 \times$ Inverter capacity [kVA]

Formula for Calculating Motor Capacity

● Linear motion



$$T_M = \frac{60 \cdot P_M}{2\pi \cdot N_{MO}} \times 10^3 \quad [N \cdot m]$$

$$T_L = \frac{9.8\mu \cdot W \cdot V_\ell}{2\pi \cdot N_M \cdot \eta} \quad [N \cdot m]$$

$$P_O = \frac{\mu \cdot W \cdot V_\ell}{6120 \cdot \eta} \quad [kW]$$

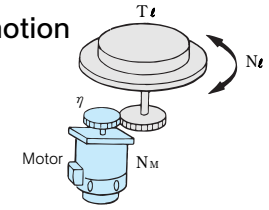
$$t_a = \frac{2\pi}{60} \cdot \frac{(J_M + J_L) \cdot N_M}{(\alpha \cdot T_M - T_L)} \quad [s]$$

$$t_d = \frac{2\pi}{60} \cdot \frac{(J_M + J_L) \cdot N_M}{(\beta \cdot T_M + T_L)} \quad [s]$$

$$J_L = \left(\frac{N_\ell}{N_M}\right)^2 \cdot J_\ell \quad [kg \cdot m^2]$$

$$= \frac{1}{4} W \left(\frac{V_\ell}{\pi \cdot N_M}\right)^2$$

● Rotary motion



$$T_M = \frac{60 \cdot P_M}{2\pi \cdot N_{MO}} \times 10^3 \quad [N \cdot m]$$

$$T_L = \frac{N_\ell}{N_M \cdot \eta} T_\ell \quad [N \cdot m]$$

$$P_O = \frac{2\pi}{60} \cdot \frac{T_\ell \cdot N_\ell}{\eta} \times 10^{-3} \quad [kW]$$

$$t_a = \frac{2\pi}{60} \cdot \frac{(J_M + J_L) \cdot N_M}{(\alpha \cdot T_M - T_L)} \quad [s]$$

$$t_d = \frac{2\pi}{60} \cdot \frac{(J_M + J_L) \cdot N_M}{(\beta \cdot T_M + T_L)} \quad [s]$$

$$J_L = \left(\frac{N_\ell}{N_M}\right)^2 \cdot J_\ell \quad [kg \cdot m^2]$$

P_O	: Running power	kW
T_M	: Motor rated torque	N · m
T_L	: Load torque (reflected to motor shaft)	N · m
T_ℓ	: Load torque (load axis)	N · m
P_M	: Motor rated output	kW
N_{MO}	: Motor rated speed	min^{-1}
N_ℓ	: Load axis rotation speed	min^{-1}
N_M	: Motor axis rotation speed	min^{-1}
V_ℓ	: Load speed	m/min
W	: Mass of load	kg
η	: Gear efficiency	
μ	: Friction factor	
J_M	: Motor moment of inertia	kg · m^2
J_L	: Load moment of inertia (motor axis)	kg · m^2
J_ℓ	: Load moment of inertia (load axis)	kg · m^2
t a	: Acceleration time	s
t d	: Deceleration time	s
α	: Accel torque factor (0.8 to 1.2)	
β	: Regenerative braking factor (0.2)	

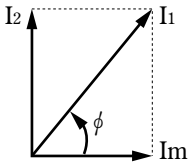
Symbols

P_M ; Motor shaft output required for the load [kW]
η ; Motor efficiency (normally, approx. 0.85)
$\cos\phi$; Motor power factor (normally, approx. 0.75)
V_M ; Motor voltage [V]
I_M ; Motor current [A]
(current with commercial power supply)
k ; Correction factor calculated from current distortion factor (1.05 to 1.1, depending on the PWM method.)
P_{CI} ; Continuous capacity [kVA]
k_S ; Motor starting current/motor rated current
n_T ; Number of motors in parallel
n_S ; Number of simultaneously started motors
(GD^2) ; Total (GD^2) reflected into motor shaft (kg·m^2)
T_L ; Load torque (N·m)
t_A ; Motor acceleration time

Terminology

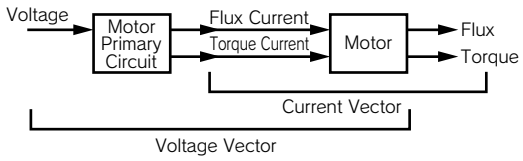
(1) Vector Controls

Current vector: Directly controls the flux current and torque current that generates motor flux and torque.



The primary current size I_1 and phase ϕ and controlled simultaneously.
Flux current $Im = I_1 \cos \phi$
Torque current $I_2 = I_1 \sin \phi$
(Motor torque = kIm・I_2)
Since this control directly affects the final target torque, response is fast and precision is high.

Voltage vector: Indirectly controls the motor flux and torque via the voltage.



This control can be equivalent to the current vector if the primary circuit of the motor is known completely, but this is actually difficult since the temperature of the resistance also changes.

(2) Auto-tuning

Auto-tuning in the Varispeed G7, allows automatic measurement of motor constant necessary for vector control. As a result, this function changes the vector control drive not only for YASKAWA motors but for any other existing motor into an outstanding performance drive.

(3) Automatic Torque Boost

Torque boost is to compensate for the drop by primary resistance to the V/f constant voltage to supplement the decrease of the flux due to voltage drop within the motor at V/f constant control.
The V/f mode of the Varispeed G7 incorporates automatic torque boost for automatic compensation according to the load, accommodating the vector control principle.

(4) Regenerative Braking

The motor is operated as a generator, converting mechanical energy into electric energy, to generate braking force while feeding back energy to the inverter or power supply.
The energy is fed back to the smoothig capacitor within the inverter under regeneration status (the motor is under regenerative braking status), where it its absorbed or consumed as motor loss.

(5) 12-pulse Input Control

It is a circuit method to provide a 30-degree deflected phase power supply to two converters by star delta wiring of the transformer. Fifth and seventh components of high harmonics of power supply side current can be significantly reduced.
12-pulse input control using a transformer with a dual star delta secondary will reduce the effects on peripheral devices caused by a high harmonic power supply.

(6) High Harmonics

Harmonic input distortion can be minimized by attaching AC reactor to the input side or DC reactor in the main circuit. The Varispeed G7 models of 18.5 kW or more come equipped with a built-in DC reactor. When 12-pulse input option is utilized, current distortion is much more improved.

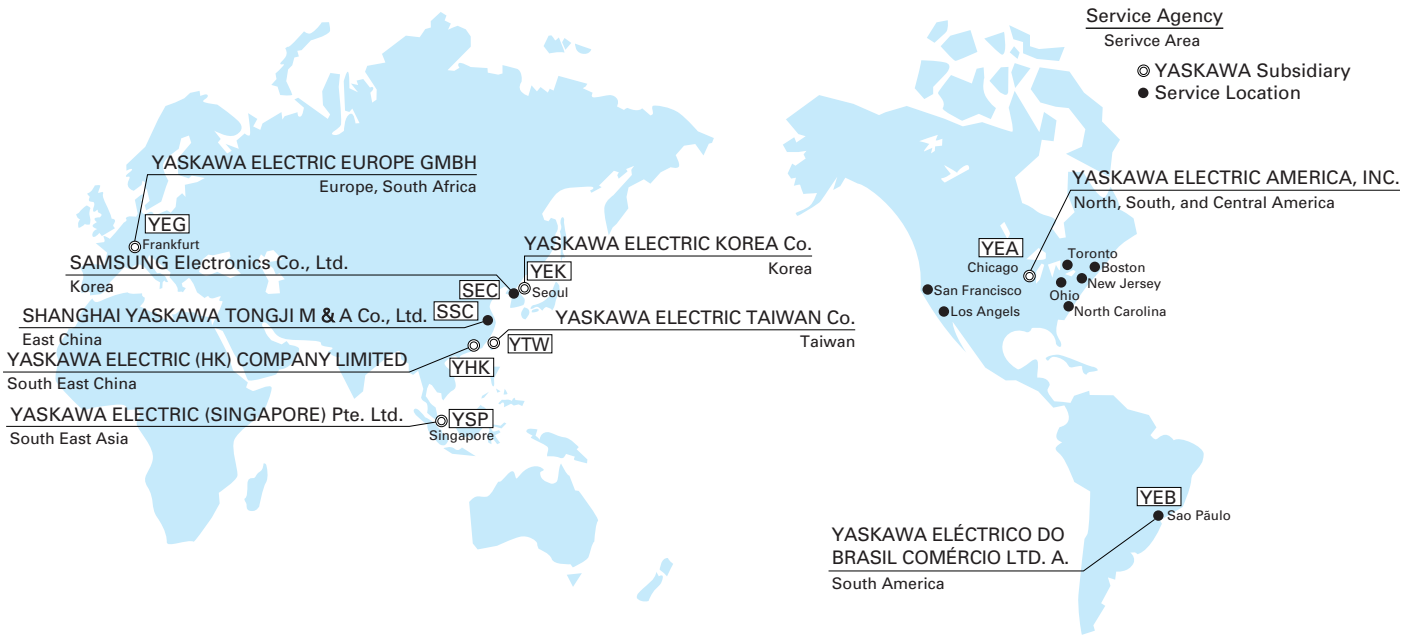
(7) Leakage Current

Current leak always occurs when voltage is applied to any component, even if it is insulated. The PWM inverter includes high frequency components in the output voltage, especially increasing the leak current that flows through the floating capacity of the circuit. However, leakage current of high frequency (of some kHz) presents no hazard to personnel.

(8) Noise

Noise may be generated when the inverter operates, affecting peripheral electronic devices. The transmission mediums of this noise are air (as electric wave), induction from the main circuit wiring, power source lines, etc.
The noise that is transmitted through the air, affecting surrounding electronic devices is called radio noise.
The noise can mostly be prevented by enclosing each inverter in a metallic cabinet, ensuring adequete grounding, or separating electronic circuits from the magnetic cabinet. However, a noise filter may sometimes be required to reduce noise interference to an acceptable level.

Service Network



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