Sumitomo Drive Technologies

Sensorless Vector Inverter

HF-520 series

Sumitomo Heavy Industries, Ltd.

No.D2301E-2

HF-520 series : The user friendly Sensorless Vector Control Drive!

Powerful Inverter suitable for SUMITOMO Gearmotor

Sensorless vector control allows for high starting torque (150% or more).
Deceleration time can be shortened by the overexcitation operation of braking function.
This inverter is ideal for SUMITOMO Gearmotor operation.

Easy Parameter Setting for the Application

The most suitable parameters are pre-set automatically by choosing the type of applications such as conveyor, lifter and etc.
This will help to reduce testing and commissioning time.

Easy Parameter Management

A copy of the parameter values settings by the LED operator can be used to transfer to other inverters.
Parameter setting file can be managed using Engineering Tool for PC.

Long Lifetime Inverter

The capacitor and cooling fan are designed for long lifetime operation (10 years).
Maintenance time can be checked by LED operator.

Corresponds to major standards of the world

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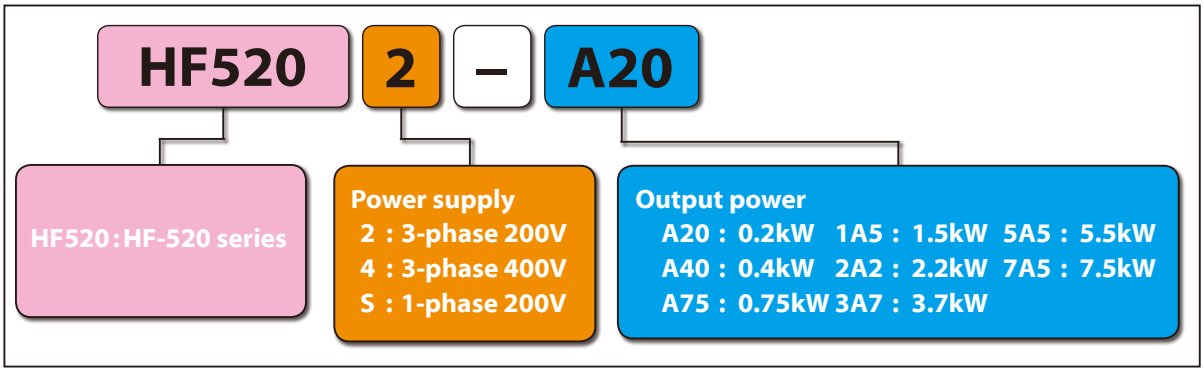
Power Range

Voltage Class (Input/Rated output)	Applicable Motor (kW)							
	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
3-phase 200V/3-phase 200V	■	■	■	■	■	■	■	■
3-phase 400V/3-phase 400V	■	■	■	■	■	■	■	■
1-phase 200V/3-phase 200V	■	■	■	■	■			

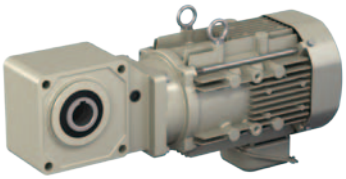
Model No.



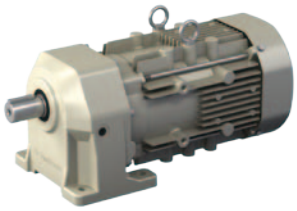
Gearmotor Product Lineup

CYCLO®

HYPONIC Gearmotor®



PREST® NEO Gearmotor



Bevel BUDDYBOX® and Helical BUDDYBOX® which can be driven by HF-520 too.

Operation

Data Display Area (5-digit)
Displays frequency, parameter number, and other data.

LO/RE Lamp
Light to indicate that the operator is set to LOCAL.

ESC Key
Return to the previous menu.

RESET & SHIFT Key
Resets to clear a fault situation.
Move the cursor to the right.

RUN Lamp
Light while the drive is operating the motor.

RUN Key
Start the drive.

Easy Operation
Used as a quick guide for the abbreviations used on the display screen.

LED Display

LO/RE Selection Key
Switch drive control between the operator (LOCAL) and the control terminals (REMOTE).

ENTER Key
Select all modes, parameters, settings, etc.
Select a menu item to move from one display screen to the next.

Communication Port
Port used for LED Operator.

Up Key
Scroll up to select parameter numbers, setting values, etc.

Down Key
Scroll down to select parameter numbers, setting values, etc.

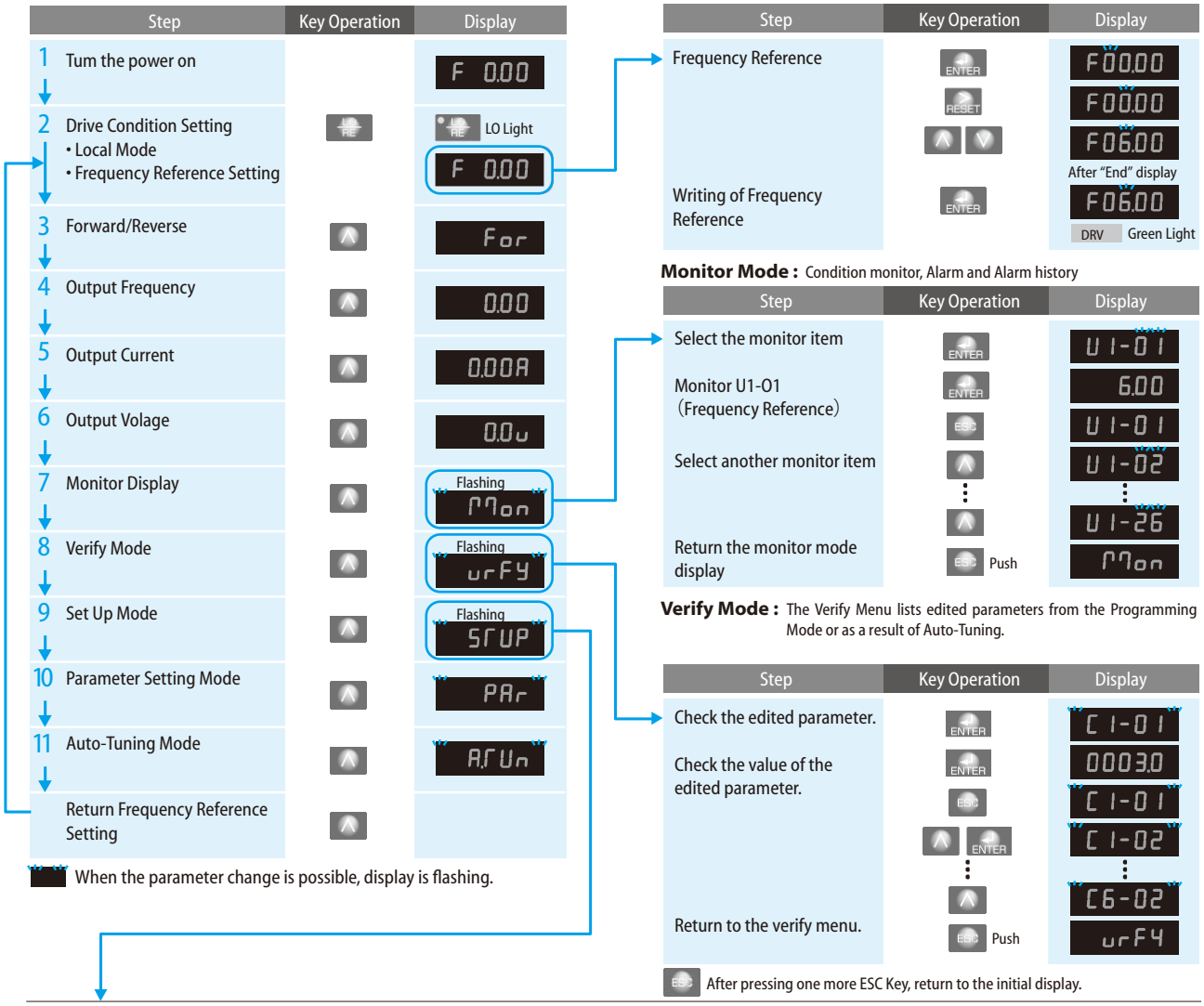
STOP Key
Stop the drive.

LED Display

LED	On	Flashing	Off
ALM	When the inverter detect the alarm	• When an alarm occurs • OPE (Operation Error) detected • When a fault or error occurs during Auto-Tuning	Normal state
REV	Motor is rotating in reverse Drive Mode.	——	Motor Forward rotation
DRV	• Drive Mode • Auto-Tuning	——	Programming mode
FOUT	Display output frequency (Hz)	——	Display except output frequency
RE	When the Run command is selected from the LED operator (LOCAL).	——	Other than LED operator (REMOTE)
RUN	During run	• During deceleration to stop • When the Run command is input and the frequency reference is 0.	During stop

LED Operator Screen Structure

Structure for LED Operator



Setup Mode

The application Presets function is applicable.

The parameters are changed to the optimum value for each application.

Conveyor Application

No.	Parameter Name	Default Setting
A1-02	Control Method Selection	0 : V/f Control
C1-01	Acceleration Time 1	3.0 s
C1-02	Deceleration Time 1	3.0 s
C6-01	Drive Duty Selection (ND/HD)	0 : Heavy Duty (HD)
L3-04	Stall Prevention Selection during Deceleration	1 : Enabled

Standard and Common Specifications

Standard Specifications

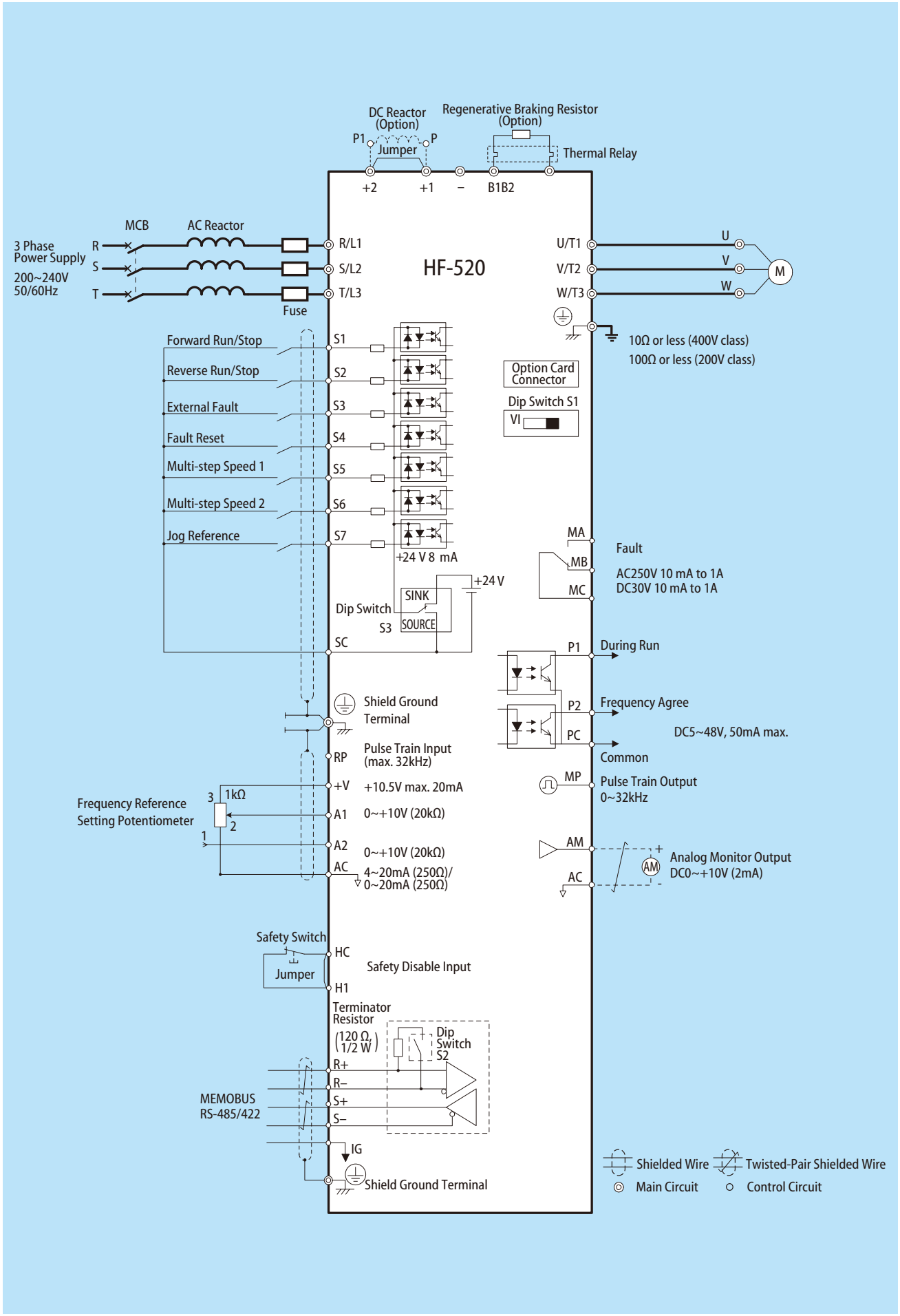
Item			Specifications							
Input Voltage Class			3-phase 200V / 3-phase 400V / 1-phase 200V							
Applicable Motor (kW)			0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Rating	Input Voltage Class	Model No.	HF520□-□□□							
	3-phase 200V	HF5202-	A20	A40	A75	1A5	2A2	3A7	5A5	7A5
	3-phase 400V	HF5204-								
	1-phase 200V	HF520S-						-	-	-
	Rated Output Capacity (kVA)	200V class	0.6	1.1	1.9	3.0	4.2	6.7	9.5	12.6
		400V class	0.9	1.4	2.6	3.7	4.2	7.0	11.3	13.7
	Rated Output Capacity (A)	3-phase 200V input	1.6	3.0	5.0	8.0	11.0	17.5	25.0	33.0
		3-phase 400V input	1.2	1.8	3.4	4.8	5.5	9.2	14.8	18.0
		1-phase 200V input	1.6	3.0	5.0	8.0	11.0	-	-	-
	Output Voltage		3-phase 200V~240V (200V class) / 3-phase 380~480V (400V class)							
	Over Load Current Rating		150% 1 minute							
Power Supply	Voltage Frequency	3-phase 200V	3-phase 200V~240V 50/60Hz							
		3-phase 400V	3-phase 380V~480V 50/60Hz							
		1-phase 200V	1-phase 200V~240V 50/60Hz							
	Allowable Fluctuation		Voltage -15~+10%, Frequency±5%							
Protective Method			Enclosed Type IP20						Enclosed Type (NEMA Type1)	
Cooling Method		3-phase 200V	Self-cooling		Cooling fan					
		3-phase 400V	Self-cooling			Cooling fan				
		1-phase 200V	Self-cooling			Cooling fan		-		

Common Specifications

Item		Specifications
Control Characteristics	Control Method	Sensorless Vector Control , V/f Control
	Frequency Control Range	0.01 to 400 Hz
	Frequency Accuracy	Digital input: within ±0.01% of the max output frequency (-10 to +50 °C)
		Analog input: within ±0.5% of the max output frequency (25 °C ±10 °C)
	Frequency Setting Resolution	Digital inputs: 0.01 Hz
		Analog inputs: 1/1000 of maximum output frequency
	Output Frequency Calculation Resolution	1/220 x Maximum output frequency (E1-04)
	Frequency Setting Signal	Main frequency reference: 0 to +10 Vdc (20 kΩ), 4 to 20 mA (250 Ω),0 to 20 mA (250 Ω) Main speed reference: Pulse Train Input (max 32 kHz)
	Torque Limit	Sensorless Vector Control only. Adjustable in 4 quadrants.
	Accel/Decel Time	0.00 to 6000.0 s (allows four separate settings for accel and decel)
	Braking Torque	Instantaneous Average Decel Torque [Note:1] : 0.1/0.2 kW: over 150%, 0.4/0.75 kW: over 100%, 1.5 kW: over 50%, 2.2 kW and above: over 20% Continuous Regen Torque: 20%, 125% with a Braking Resistor Unit [Note:2] : (10% ED) 10 s with an internal braking resistor.
	V/f Characteristics	Preset V/f patterns and user-set program available.
	Functions	Momentary Power Loss Ride-Thru,Speed Search Over/Undertorque Detection,Torque Limit, Multi-Step Speed (17 steps max) Accel/Decel Time Switch,S-Curve Accel/Decel,2-Wire/3-Wire Sequence,Rotational Auto-Tuning Stationary Auto-Tuning of Line-to-Line Resistance,Dwell,Cooling Fan ON/OFF,Slip Compensation Torque Compensation,Jump Frequencies (reference dead band) Frequency Reference Upper/Lower Limit,DC Injection Braking (start and stop), High Slip Braking PID Control (with Sleep Function),Energy Saving,MEMOBUS/Modbus (RS-485/RS-422) Fault Reset,Parameter Copy,Fault Restart,Removable Terminals with Parameter Backup Function
	Carrier Frequency	5 kHz (user-adjustable from 2 to 15 kHz)
Protection Functions	Motor Protection	Motor overheat protection via output current sensor
	Overcurrent Protection	Drives stops when output exceeds 200% of the rated current
	Overload Protection	A stop command will be entered after operating at 150% for 60 s [Note:3]
	Overvoltage Specification	200 V Class: Stops when DC bus voltage exceeds approx. 410 V
		400 V Class: Stops when DC bus voltage exceeds approx. 820 V
	Low Voltage Protection	Drive stops when DC bus voltage falls below the levels indicated: 190 V (3-phase 200 V), 160 V (single-phase 200 V) 380 V (3-phase 400 V), 350 V (3-phase 380 V)
	Momentary Power Loss Ride-Thru	3 selections available: Ride-Thru disabled (stops after 15 ms), time base of 0.5 s, and continue running as long as the drive control board is powered up.
	Heatsink Overheat Protection	Protected by thermistor
	Stall Prevention	Stall prevention is available during acceleration, deceleration, and duringrun. Separate settings for each type of stall prevention determine the current level at which stall prevention is triggered
	Ground Fault Protection	Electronic circuit protection
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V
Environment	Storage/Installation Area	Indoors
	Ambient Temperature	IP20/NEMA Type 1 enclosure: -10 °C to +40 °C IP20/IP00 Open-Chassis enclosure: -10 °C to +50 °C
	Storage Temperature	-20 to +60 °C allowed for short-term transport of the product
	Humidity	95% RH or less with no condensation
	Altitude	Up to 1000 meters without derating; up to 3000 meters with output current and voltage derating.
	Shock, Impact	10 to 20 Hz: 9.8 m/s2 20 to 55 Hz: 5.9 m/s2

Note: 1. Instantaneous average deceleration torque refers to the torque required to decelerate the motor (uncoupled from the load) from the rated motor speed down to zero in the shortest time.
2. Ensure that Stall Prevention Selection during Deceleration is disabled (L3-04 = 0) or set to 3 when using a regenerative braking resistor.
3. Overload protection may be triggered when operating with 150% of the rated output current if the output frequency is less than 6 Hz.

Standard Connection Diagram



Terminal Functions

Main Terminals

No.	Terminal Name	Function
R/L1	Main circuit power supply input	Connects line power to the drive. Drives with single-phase 200 V input power use terminals R/ L1 and S/L2 only. T/L3 must not be used.
S/L2		
T/L3		
U/T1	Drive output	Connects to the motor.
V/T2		
W/T3		
B1	Regenerative braking resistor	Available for connecting a regenerative braking resistor.
B2		
+1	DC reactor connection	These terminals are shorted at shipment. Remove the shorting bar between +1 and +2 when connecting a DC reactor to this terminal.
+2		
+1	DC power supply input	For connecting a DC power supply.
–		
⏚ (2 terminals)	Ground	Grounding Terminal 200V Class 100Ω or less 400V Class 10Ω or less

Input Terminals

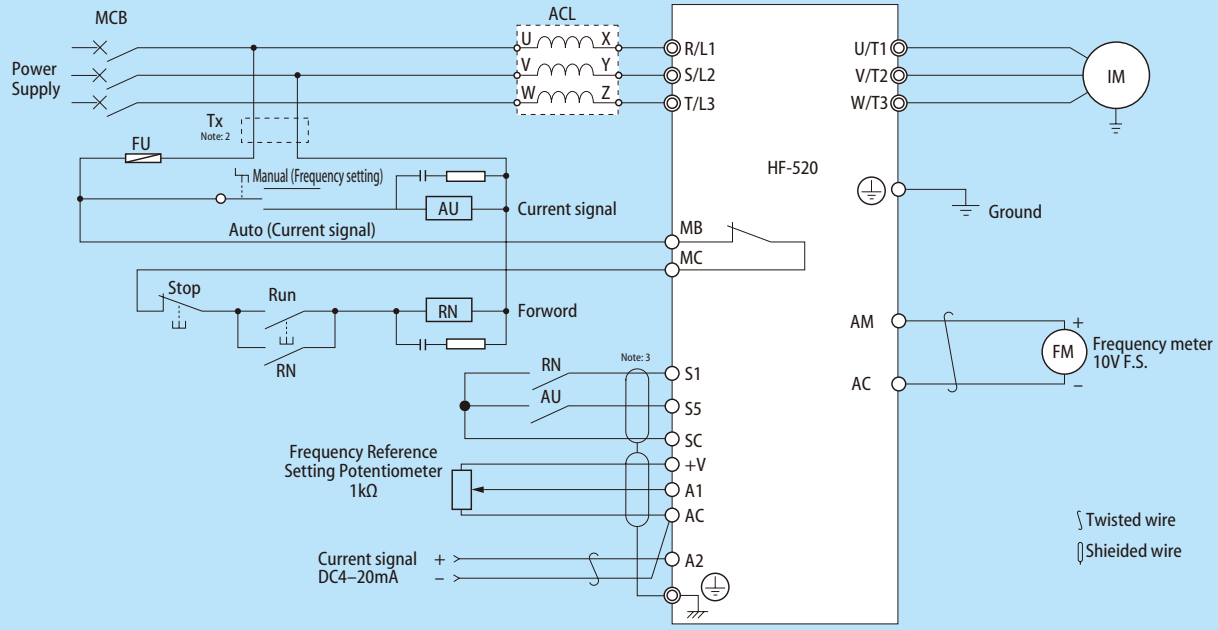
Type	No.	Terminal Name (Function)	Function (Signal Level)
Multi-Function Digital Inputs	S1	Multi-function input 1 (Closed: Forward run, Open: Stop)	Photocoupler 24 Vdc, 8 mA Note: Drive preset to sinking mode. When using source mode, set DIP switch S3 to allow for a 24 Vdc (±10%) external power supply.
	S2	Multi-function input 2 (Closed: Reverse run, Open: Stop)	
	S3	Multi-function input 3 (External fault (N.O.)	
	S4	Multi-function input 4 (Fault reset)	
	S5	Multi-function input 5 (Multi-step speed reference 1)	
	S6	Multi-function input 6 (Multi-step speed reference 2)	
	S7	Multi-function input 7 (Jog reference)	
	SC	Multi-function input common (Control common)	Sequence common
Safe Disable Input	HC	Power supply for safe disable input	+24 Vdc (max 10 mA allowed)
	H1	Safe disable input	Open: Output disabled Closed: Normal operation
Main Frequency Reference Input	RP	Multi-function pulse train input (frequency reference)	Response frequency: 0.5 to 32 kHz (Duty Cycle: 30 to 70%) (High level voltage: 3.5 to 13.2 Vdc) (Low level voltage: 0.0 to 0.8 Vdc) (input impedance: 3 kΩ)
	+V	Analog input power supply	+10.5 Vdc (max allowable current 20 mA)
	A1	Multi-function analog input 1 (frequency reference)	Input voltage 0 to +10 Vdc (20 kΩ) resolution 1/1000
	A2	Multi-function analog input 2 (frequency reference)	Input voltage or input current (Selected by DIP switch S1) 0 to +10 Vdc (20 kΩ), Resolution: 1/1000 4 to 20 mA (250 Ω) or 0 to 20 mA (250 Ω), Resolution: 1/500
	AC	Frequency reference common	0 V

Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Multi-Function Digital Output	MA	N.O. (fault)	Digital output 30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA (reference value)
	MB	N.C. output (fault)	
	MC	Digital output common	
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During run)	Photocoupler output 48 Vdc, 2 to 50 mA
	P2	Photocoupler output 2 (Frequency agree)	
	PC	Photocoupler output common	
Monitor Output	MP	Pulse train output (Output frequency)	32 kHz (max), DC5-12V (50% duty)
	AM	Analog monitor output	0 to 10 Vdc (2 mA or less) Resolution: 1/1000
	AC	Monitor common	0 V

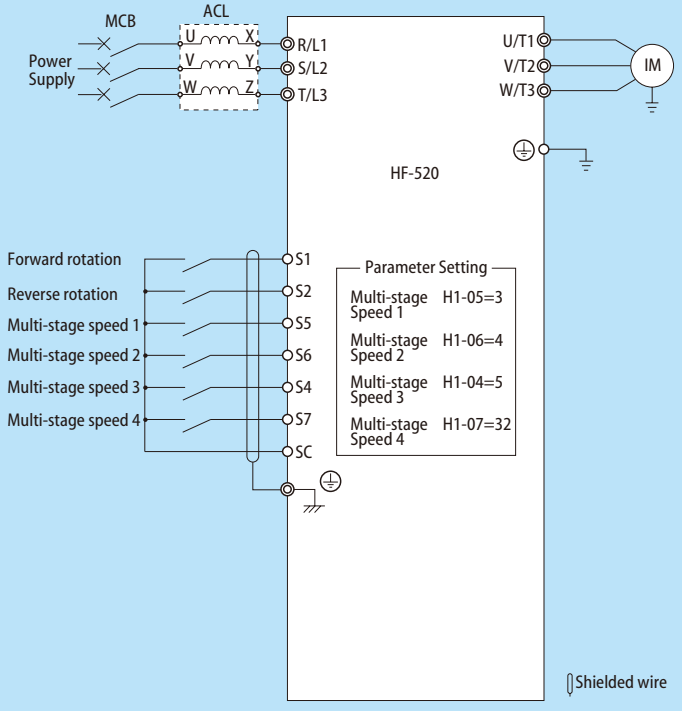
Operation by Current Signal (4-20mA)

When terminal S5 is used as a current/Voltage signal (Frequency reference setting potentiometer) Changeover signal input.



Note: 1. Set parameter b1-01 to "1: Frequency Reference Selection 1".
Set parameter H1-05 to "3: Multi-Function Digital Input Terminal S5 Function Selection".
Set parameter H3-02 to "0: A1 Frequency Bias".
Set parameter H3-09 to "2: Terminal A2 Signal Level Selection".
Set parameter H3-10 to "2: A2 Auxiliary Frequency Reference".
Set dip switch S1 on "I" side. (Current input)
2. Install a step-down transformer when the power is 400 V-class.
3. Connect the earth for shielded wire to the ground.

Multispeed Operation (16-Step Speed)



Frequency setting by external signal

Frequency setting	Multi-stage Speed 1	Multi-stage Speed 2	Multi-stage Speed 3	Multi-stage Speed 4
d1-01	×	×	×	×
d1-02	○	×	×	×
d1-03	×	○	×	×
d1-04	○	○	×	×
d1-05	×	×	○	×
d1-06	○	×	○	×
d1-07	×	○	○	×
d1-08	○	○	○	×
d1-09	×	×	×	○
d1-10	○	×	×	○
d1-11	×	○	×	○
d1-12	○	○	×	○
d1-13	×	×	○	○
d1-14	○	×	○	○
d1-15	×	○	○	○
d1-16	○	○	○	○

(×.....Open, ○.....Closed)

Table of Parameters

"S" in the "Control Mode" column indicates that the parameter is available in the Set up and Parameter mode.
"○" in the "Control Mode" column indicates that the parametr is available in the Parametr mode.
"×" in the "Control Mode" column indicates that the parameter is not available in the Set up and Parameter mode .

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
Initialization Parameters	A1-01	Access Level Selection	0 ~ 2	2	○	○
	A1-02	Control Method Selection	0,2	0	S	S
	A1-03	Initialize Parameters	0 ~ 5550	0	○	○
	A1-04	Password	0 ~ 9999	0	○	○
	A1-05 Note: 2	Password Setting	0 ~ 9999	0	○	○
	A1-06	Application Preset	0 ~ 8	0	○	○
User Parameters	A2-01 ~ A2-32	User Parameters, 1 to 32	b1-01 ~ o2-08	-	○	○
	A2-33	User Parameter Automatic Selection	0,1	1	○	○
Operation Mode Selection	b1-01	Frequency Reference Selection 1	0 ~ 4	1	S	S
	b1-02	Run Command Selection 1	0 ~ 3	1	S	S
	b1-03	Stopping Method Selection	0 ~ 3	0	S	S
	b1-04	Reverse Operation Selection	0,1	0	○	○
	b1-07	LOCAL/REMOTE Run Selection	0,1	0	○	○
	b1-08	Run Command Selection while in Programming Mode	0 ~ 2	0	○	○
	b1-14	Phase Order Selection	0,1	0	○	○
	b1-15	Frequency Reference Selection 2	0 ~ 4	0	○	○
	b1-16	Run Command Selection 2	0 ~ 3	0	○	○
	b1-17	Run Command at Power Up	0,1	1	○	○
DC Injection Braking	b2-01	DC Injection Braking Start Frequency	0.0 ~ 10.0	0.5 Hz	○	○
	b2-02	DC Injection Braking Current	0 ~ 75	50%	○	○
	b2-03	DC Injection Braking Time/ DC Excitation Time at Start	0.00 ~ 10.00	0.00 s	○	○
	b2-04	DC Injection Braking Time at Stop	0.00 ~ 10.00	0.00 s	○	○
	b2-08	Magnetic Flux Compensation Value	0 ~ 1000	0%	×	○
Speed Search	b3-01	Speed Search Selection at Start	0,1	0	○	○
	b3-02	Speed Search Deactivation Current	0 ~ 200	120	○	○
	b3-03	Speed Search Deceleration Time	0.1 ~ 10.0	2.0 s	○	○
	b3-05	Speed Search Delay Time	0.0 ~ 100.0	0.2 s	○	○
	b3-06	Output Current 1 during Speed Search	0.0 ~ 2.0	Note: 4	○	○
	b3-08	Current Control Gain during Speed Search (Speed Estimation Type)	0.00 ~ 6.00	0.5	○	○
	b3-10	Speed Search Detection Compensation Gain	1.00 ~ 1.20	1.05	○	○
	b3-14	Bi-Directional Speed Search Selection	0,1	0	○	○
	b3-17	Speed Search Restart Current Level	0 ~ 200	150%	○	○
	b3-18	Speed Search Restart Detection Time	0.00 ~ 1.00	0.10 s	○	○
	b3-19	Number of Speed Search Restarts	0 ~ 10	3	○	○
	b3-24	Speed Serch Method Selection	0,1	0	○	○
	b3-25	Speed Serch Retry Interval Time	0 to 30.0	0.5 s	○	○
Timer	b4-01	Timer Function On-Delay Time	0.0 ~ 300.0	0.0 s	○	○
	b4-02	Timer Function Off-Delay Time	0.0 ~ 300.0	0.0 s	○	○
PID Control	b5-01	PID Function Setting	0 ~ 4	0	○	○
	b5-02	Proportional Gain Setting (P)	0.00 ~ 25.00	1.00	○	○
	b5-03	Integral Time Setting (I)	0.0 ~ 360.0	1.0 s	○	○
	b5-04	Integral Limit Setting	0.0 ~ 100.0	100.0%	○	○
	b5-05	Derivative Time (D)	0.00 ~ 10.00	0.00 s	○	○
	b5-06	PID Output Limit	0.0 ~ 100.0	100.0%	○	○
	b5-07	PID Offset Adjustment	-100.0 ~+100.0	0.0%	○	○
	b5-08	PID Primary Delay Time Constant	0.00 ~ 10.00	0.00 s	○	○
	b5-09	PID Output Level Selection	0,1	0	○	○
	b5-10	PID Output Gain Setting	0.00 ~ 25.00	1.00	○	○
	b5-11	PID Output Reverse Selection	0,1	0	○	○
	b5-12	PID Feedback Reference Missing Detection Selection	0 ~ 5	0	○	○
	b5-13	PID Feedback Loss Detection Level	0 ~ 100	0%	○	○
	b5-14	PID Feedback Loss Detection Time	0.0 ~ 25.5	1.0 s	○	○
	b5-15	PID Sleep Function Start Level	0.0 ~ 400.0	0.0 Hz	○	○
	b5-16	PID Sleep Delay Time	0.0 ~ 25.5	0.0 s	○	○
	b5-17	PID Accel/Decel Time	0 ~ 255	0 s	○	○
	b5-18	PID Setpoint Selection	0,1	0	○	○

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
PID Control	b5-19	PID Setpoint Value	0.00 ~ 100.00	0.00%	○	○
	b5-20	PID Setpoint Scaling	0 ~ 3	1	○	○
	b5-34	PID Output Lower Limit	-100.0 ~ 100.0	0.0%	○	○
	b5-35	PID Input Limit	0 ~ 1000.0	1000.0%	○	○
	b5-36	PID Feedback High Detection Level	0 ~ 100	100%	○	○
	b5-37	PID Feedback High Level Detection Time	0.0 ~ 25.5	1.0 s	○	○
	b5-38	PID Setpoint / User Display	1 ~ 60000	Note: 4	○	○
	b5-39	PID Setpoint Display Digits	0 ~ 3		○	○
	b5-40	Frequency Reference Monitor Content during PID	0,1	0	○	○
	b5-47	Reverse Operation Selection 2 by PID Output	0,1	1	○	○
Dwell Function	b6-01	Dwell Reference at Start	0.0 ~ 400.0	0.0 Hz	○	○
	b6-02	Dwell Time at Start	0.0 ~ 10.0	0.0 s	○	○
	b6-03	Dwell Frequency at Stop	0.0 ~ 400.0	0.0 Hz	○	○
	b6-04	Dwell Time at Stop	0.0 ~ 10.0	0.0 s	○	○
Energy Saving	b8-01	Energy Saving Control Selection	0,1	0	○	○
	b8-02	Energy Saving Gain	0.0 ~ 10.0	0.7	×	○
	b8-03	Energy Saving Control Filter Time Constant	0.00 ~ 10.00	0.50	×	○
	b8-04	Energy Saving Coefficient Value	0.00 ~655.00	Note: 4	○	×
	b8-05	Power Detection Filter Time	0 ~ 2000	20 ms	○	×
	b8-06	Search Operation Voltage Limit	0 to 100%	0%	○	×
Acceleration and Deceleration Times	C1-01	Acceleration Time 1	0.0 ~ 6000.0 Note: 3	10.0 s	S	S
	C1-02	Deceleration Time 1			S	S
	C1-03	Acceleration Time 2			○	○
	C1-04	Deceleration Time 2			○	○
	C1-05	Acceleration Time 3 (Motor 2 Accel Time 1)			○	○
	C1-06	Deceleration Time 3 (Motor 2 Decel Time 1)			○	○
	C1-07	Acceleration Time 4 (Motor 2 Accel Time 2)			○	○
	C1-08	Deceleration Time 4 (Motor 2 Decel Time 2)			○	○
	C1-09	Fast-Stop Time			○	○
	C1-10	Accel/Decel Time Setting Units	0.1	1	○	○
	C1-11	Accel/Decel Time Switching Frequency	0.0 ~ 400.0	0.0 Hz	○	○
	C1-14	Accel/Decel Rate Frequency	0.0 ~ 400.0	0.0 Hz	○	○
S-Curve	C2-01	S-Curve Characteristic at Accel Start	0.00 ~ 10.00	0.00 s	○	○
	C2-02	S-Curve Characteristic at Accel End	0.00 ~ 10.00	0.00 s	○	○
	C2-03	S-Curve Characteristic at Decel Start	0.00 ~ 10.00	0.00 s	○	○
	C2-04	S-Curve Characteristic at Decel End	0.00 ~ 10.00	0.00 s	○	○
Slip Compensation	C3-01	Slip Compensation Gain	0.0 ~ 2.5	0.0	○	○
	C3-02	Slip Compensation Primary Delay Time	0 ~ 10000	2000 ms	○	○
	C3-03	Slip Compensation Limit	0 ~ 250	250%	○	○
	C3-04	Slip Compensation Selection during Regeneration	0,1	1	○	○
	C3-05	Output Voltage Limit Operation Selection	0,1	1	×	○
	C3-18	Output Voltage Limit Level	70.0 to 100.0	90.0%	×	○
Torque Compensation	C4-01	Torque Compensation Gain	0.00 ~ 2.50	1.00	○	○
	C4-02	Torque Compensation Primary Delay Time	0 ~ 60000	200 ms	○	○
	C4-03	Torque Compensation at Forward Start	0.0 ~ 200.0	0.0%	×	○
	C4-04	Torque Compensation at Reverse Start	-200.0 ~ 0.0	0.0%	×	○
	C4-05	Torque Compensation Time Constant	0 ~ 200	10 ms	×	○
	C4-06	Torque Compensation Primary Delay Time 2	0 ~ 10000	150 ms	×	○
Speed Control (ASR)	C5-01	ASR Proportional Gain 1	0.00 ~ 300.00	0.20	○	×
	C5-02	ASR Integral Time 1	0.000 ~ 10.000	0.200	○	×
	C5-03	ASR Proportional Gain 2	0.00 ~ 300.00	0.02	○	×
	C5-04	ASR Integral Time 2	0.000 ~ 10.000	0.050 s	○	×
	C5-05	ASR Limit	0.0 ~ 20.0	5.0%	○	×

Note: 1. Default setting is determined by A1-02, Control Method Selection.
2. This parameter is hidden from view to access A1-05, first display A1-04. Then press the STOP key while holding down the up arrow key.
3. Setting range value is dependent on parameter C1-10, Accel/Decel Time Setting Units.
4. Default setting value is dependent on parameter o2-04, Drive Model Selection.

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
Carrier Frequency	C6-01	Drive Duty Selection	0,1	0	S	S
	C6-02	Carrier Frequency Selection	1 ~ B,F	2	S	S
	C6-03	Carrier Frequency Upper Limit	1.0 ~ 15.0	Note: 4	○	○
	C6-04	Carrier Frequency Lower Limit	1.0 ~ 15.0		○	×
	C6-05	Carrier Frequency Proportional Gain	00 ~ 99		○	×
Frequency Reference	d1-01	Frequency Reference 1	0.00 ~400.00	0.00Hz	S	S
	d1-02	Frequency Reference 2			S	S
	d1-03	Frequency Reference 3			S	S
	d1-04	Frequency Reference 4			S	S
	d1-05	Frequency Reference 5			○	○
	d1-06	Frequency Reference 6			○	○
	d1-07	Frequency Reference 7			○	○
	d1-08	Frequency Reference 8			○	○
	d1-09	Frequency Reference 9			○	○
	d1-10	Frequency Reference 10			○	○
	d1-11	Frequency Reference 11			○	○
	d1-12	Frequency Reference 12			○	○
	d1-13	Frequency Reference 13			○	○
	d1-14	Frequency Reference 14			○	○
	d1-15	Frequency Reference 15			○	○
	d1-16	Frequency Reference 16			○	○
	d1-17	Jog Frequency Reference	0.00 ~ 400.00	5.00 Hz	S	S
Freq. Limits	d2-01	Frequency Reference Upper Limit	0.0 ~ 110.0	100.0%	○	○
	d2-02	Frequency Reference Lower Limit	0.0 ~ 110.0	0.0%	○	○
	d2-03	Master Speed Reference Lower Limit	0.0 ~ 110.0	0.0%	○	○
Jump Frequency	d3-01	Jump Frequency 1	0.0 ~ 400.0	0.0 Hz	○	○
	d3-02	Jump Frequency 2	0.0 ~ 400.0	0.0 Hz	○	○
	d3-03	Jump Frequency 3	0.0 ~ 400.0	0.0 Hz	○	○
	d3-04	Jump Frequency Width	0.0 ~ 20.0	1.0 Hz	○	○
Frequency Reference Hold	d4-01	Frequency Reference Hold Function Selection	0,1	0	○	○
	d4-03	Frequency Reference Bias Step (Up/Down 2)	0.00 ~ 99.99	0.00Hz	○	○
	d4-04	Frequency Reference Bias Accel/Decel (Up/Down 2)	0,1	0	○	○
	d4-05	Frequency Reference Bias Operation Mode Selection (Up/Down 2)	0,1	0	○	○
	d4-06	Frequency Reference Bias (Up/Down 2)	-99.9 ~ +100.0	0.0%	○	○
	d4-07	Analog Frequency Reference Fluctuation Limit (Up/Down 2)	0.1 ~ +100.0	1.0%	○	○
	d4-08	Frequency Reference Bias Upper Limit (Up/Down 2)	0.0 ~ 100.0	100.0%	○	○
	d4-09	Frequency Reference Bias Lower Limit (Up/Down 2)	-99.9 ~ 0.0	0.0%	○	○
	d4-10	Up/Down Frequency Reference Limit Selection	0,1	0	○	○
Offset Freq.	d7-01	Offset Frequency 1	-100.0 ~ +100.0	0.0%	○	○
	d7-02	Offset Frequency 2	-100.0 ~ +100.0	0.0%	○	○
	d7-03	Offset Frequency 3	-100.0 ~ +100.0	0.0%	○	○
V/f Pattern Characteristics	E1-01 Note: 2	Input Voltage Setting	155 ~ 255	Note: 4	S	S
	E1-03	V/f Pattern Selection	0 ~ F	F	○	○
	E1-04	Maximum Output Frequency	40.0 ~ 400.0	60.0 Hz	S	S
	E1-05 Note: 2	Maximum Output Voltage	0.0 ~ 255.0	200.0 V	S	S
	E1-06	Base Frequency	0.0 ~ E1-04	60.0 Hz	S	S
	E1-07	Middle Output Frequency	0.0 ~ E1-04	3.0 Hz	○	○
	E1-08	Middle Output Frequency Voltage	0.0 ~ 255.0	Note: 4	○	○

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
V/f Pattern Characteristics	E1-09	Minimum Output Frequency	0.0 ~ E1-04	1.5 Hz	S	S
	E1-10	Minimum Output Frequency Voltage	0.0 ~ 255.0	Note: 4	○	○
	E1-11	Middle Output Frequency 2	0.0 ~ E1-04	0.0 Hz	○	○
	E1-12 Note: 2	Middle Output Frequency Voltage 2	0.0 ~ 255.0	0.0 V	○	○
	E1-13 Note: 2	Base Voltage	0.0 ~ 255.0	0.0 V	○	S
Motor Parameters	E2-01	Motor Rated Current	Rated Current 10 ~ 200%	Note: 4	S	S
	E2-02	Motor Rated Slip	0.00 ~ 20.00		○	○
	E2-03	Motor No-Load Current	0 ~ E2-01 below		○	○
	E2-04	Number of Motor Poles	2 ~ 48	4pole	○	○
	E2-05	Motor Line-to-Line Resistance	0.000 ~ 65.000	Note: 4	○	○
	E2-06	Motor Leakage Inductance	0.0 ~ 40.0		○	○
	E2-07	Motor Iron-Core Saturation Coefficient 1	0.00 ~ 0.50	0.50	×	○
	E2-08	Motor Iron-Core Saturation Coefficient 2	E2-07 ~ 0.75	0.75	×	○
	E2-09	Motor Mechanical Loss	0.0 ~ 10.0	0.0%	×	○
	E2-10	Motor Iron Loss for Torque Compensation	0 ~ 65535	Note: 4	○	×
	E2-11	Motor Rated Output	0.00 ~ 650.00		S	S
	E2-12	Motor Iron-Core Saturation Coefficient 3	1.30 ~ 5.00	1.30	×	○
Motor 2 V/f Characteristics	E3-01	Motor 2 Control Method	0,2	0	○	○
	E3-04	Motor 2 Max Output Frequency	40.0 ~ 400.0	60.0 Hz	○	○
	E3-05 Note: 2	Motor 2 Max Voltage	0.0 ~ 255.0	200.0 V	○	○
	E3-06	Motor 2 Base Frequency	0.0 ~ E3-04	60.0 Hz	○	○
	E3-07	Motor 2 Mid Output Freq.	0.0 ~ E3-04	3.0 Hz	○	○
	E3-08 Note: 3	Motor 2 Mid Output Freq. Voltage	0.0 ~ 255.0	13.6 V (26.6 V)	○	○
	E3-09	Motor 2 Min. Output Freq.	0.0 ~ E3-04	1.5 Hz	○	○
	E3-10 Note: 3	Motor 2 Min. Output Freq. Voltage	0.0 ~ 255.0	9.1 V (17.7V)	○	○
	E3-11	Motor 2 Mid Output Frequency 2	0.0 ~ E3-04	0.0 Hz	○	○
	E3-12 Note: 2	Motor 2 Mid Output Frequency Voltage 2	0.0 ~ 255.0	0.0 V	○	○
	E3-13 Note: 2	Motor 2 Base Voltage	0.0 ~ 255.0	0.0 V	○	S
Motor 2 Parameters	E4-01	Motor 2 Rated Current	Rated Current 10 ~ 200%	Note: 4	○	○
	E4-02	Motor 2 Rated Slip	0.00 ~ 20.00		○	○
	E4-03	Motor 2 Rated No- Load Current	0 ~ E4-01 below		○	○
	E4-04	Motor 2 Motor Poles	2 ~ 48	4pole	○	○
	E4-05	Motor 2 Line-to- Line Resistance	0.000 ~ 65.000	Note: 4	○	○
	E4-06	Motor 2 Leakage Inductance	0.0 ~ 40.0		○	○
	E4-07	Motor 2 Motor Iron-Core Saturation Coefficient 1	0.00 ~ 0.50	0.50	×	○
	E4-08	Motor 2 Motor Iron-Core Saturation Coefficient 2	Setting of E4-07 ~ 0.75	0.75	×	○
	E4-09	Motor 2 Mechanical Loss	0.0 ~ 10.0	0.0	×	○
	E4-10	Motor 2 Iron Loss	0 ~ 65535	Note: 4	○	×
	E4-11	Motor 2 Rated Capacity	0.00 ~ 650.00		○	×
	E4-12	Motor 2 Iron-Core Saturation Coefficient 3	1.30 ~ 5.00	1.30	×	○
	E4-14	Motor 2 Slip Compensation Gain	0.0 ~ 2.5	0.0	○	○
	E4-15	Torque Compensation Gain Motor 2	0.00 ~ 2.50	1.00	○	○
	E5-39	Current Detection Delay Time	-1000 to 1000	0μs	○	○
PG Setup Parameters	F1-02	Operation Selection at PG Open Circuit (PGo)	0 ~ 3	1	○	×
	F1-03	Operation Selection at Overspeed (oS)	0 ~ 3	1	○	×
	F1-04	Operation Selection at Deviation	0 ~ 3	3	○	×
	F1-08	Overspeed Detection Level	0 ~ 120	115%	○	×
	F1-09	Overspeed Detection Delay Time	0.0 ~ 2.0	1.0	○	×

Note: 1. Default setting is determined by A1-02, Control Method Selection.
2. Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
3. Values shown here are for 200 V class drives. ( ) the value when using a 400 V class drive.
4. Default setting value is dependent on parameter o2-04, Drive Model Selection.

Table of Parameters

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
PG Setup Parameters	F1-10	Excessive Speed Deviation Detection Level	0 ~ 50	10%	○	×
	F1-11	Excessive Speed Deviation Detection Delay Time	0.0 ~ 10.0	0.5 s	○	×
	F1-14	PG Open-Circuit Detection Time	0.0 ~ 10.0	2.0 s	○	×
Serial Communications Option Card	F6-01	Communications Error Operation Selection	0 ~ 3	1	○	○
	F6-02	External Fault from Comm. Option Selection	0,1	0	○	○
	F6-03	External Fault from Comm. Option Operation Selection	0 ~ 3	1	○	○
	F6-04	Bus Error Detection Time	0.0 ~ 5.0	2.0 s	○	○
	F6-07	NetRef/ComRef Function Selection	0,1	0	○	○
	F6-08	Reset Communication Parameters	0,1	0	○	○
	F6-10	CC-Link Node Address	0 ~ 64	0	○	○
	F6-11	CC-Link Communications Speed	0 ~ 4	0	○	○
	F6-14	BUS Error Auto Reset	0,1	0	○	○
	F6-50	DeviceNet MAC Address	0 ~ 64	0	○	○
	F6-51	Device Net Communications Speed	0 ~ 4	0	○	○
	F6-52	DeviceNet PCA setting	0 ~ 255	21	○	○
	F6-53	DeviceNet PPA setting	0 ~ 255	71	○	○
	F6-54	54 DeviceNet Idle Mode Fault Detection	0,1	0	○	○
	F6-55	DeviceNet Baud Rate Monitor	0 ~ 2 (Read only)	-	○	○
	F6-56	DeviceNet Speed Scaling Factor	-15 ~ 15	0	○	○
	F6-57	DeviceNet Current Scaling Factor	-15 ~ 15	0	○	○
	F6-58	DeviceNet Torque Scaling Factor	-15 ~ 15	0	○	○
	F6-59	DeviceNet Power Scaling Factor	-15 ~ 15	0	○	○
	F6-60	DeviceNet Voltage Scaling Factor	-15 ~ 15	0	○	○
	F6-61	DeviceNet Time Scaling Factor	-15 ~ 15	0	○	○
	F6-62	DeviceNet Heartbeat Interval	0 ~ 10	0	○	○
	F6-63	MAC ID Memory	0 ~ 63 (Read only)	-	○	○
Multi-Function Digital Input	H1-01	Multi-Function Digital Input Terminal S1 Function Selection	1 ~ 9F	40	○	○
	H1-02	Multi-Function Digital Input Terminal S2 Function Selection		41	○	○
	H1-03	Multi-Function Digital Input Terminal S3 Function Selection	0 ~ 9F	24	○	○
	H1-04	Multi-Function Digital Input Terminal S4 Function Selection		14	○	○
	H1-05	Multi-Function Digital Input Terminal S5 Function Selection		3(0)	○	○
	H1-06	Multi-Function Digital Input Terminal S6 Function Selection		4(3)	○	○
	H1-07	Multi-Function Digital Input Terminal S7 Function Selection		6(4)	○	○
Multi-Function Digital Outputs	H2-01	Terminal MA, MB and MC Function Selection (relay)	0 ~ 192	E	○	○
	H2-02	Terminal P1 Function Selection (open- collector)		0	○	○
	H2-03	Terminal P2 Function Selection (open- collector)		2	○	○
	H2-06	Watt Hour Output Unit Selection	0 ~ 4	0	○	○
Analog Inputs	H3-01	Terminal A1 Signal Level Selection	0,1	0	○	○
	H3-02	Terminal A1 Function Selection	0 ~ 41	0	○	○
	H3-03	Terminal A1 Gain Setting	-999.9 ~999.9	100.0%	○	○
	H3-04	Terminal A1 Bias Setting	-999.9 ~999.9	0.0%	○	○
	H3-09	Terminal A2 Signal Level Selection	0 ~ 3	2	○	○
	H3-10	Terminal A2 Function Selection	0 ~ 41	0	○	○
	H3-11	Terminal A2 Gain Setting	-999.9 ~ 999.9	100.0%	○	○
	H3-12	Terminal A2 Bias Setting	-999.9 ~ 999.9	0.0%	○	○
	H3-13	Analog Input Filter Time Constant	0.00 ~ 2.00	0.03 s	○	○
	H3-14	Analog Input Terminal Enable Selection	1,2,7	7	○	○

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
Analog Inputs	H3-16	Terminal A1 Offset	-500 ~ 500	0	○	○
	H3-17	Terminal A2 Offset	-500 ~ 500	0	○	○
Multi-Function Analog Outputs	H4-01	Multi-Function Analog Output Terminal AM	000 ~ 999	102	○	○
	H4-02	Multi-Function Analog Output Terminal AM Gain	-999.9 ~999.9	100.0%	S	S
	H4-03	Multi-Function Analog Output Terminal AM Bias	-999.9 ~999.9	0.0%	○	○
MEMOBUS/Modbus Communications	H5-01	Drive Node Address	0 ~ FFH	1F	○	○
	H5-02	Communication Speed Selection	0 ~ 8	3	○	○
	H5-03	Communication Parity Selection	0 ~ 2	0	○	○
	H5-04	Stopping Method After Communication Error	0 ~ 3	3	○	○
	H5-05	Communication Fault Detection Selection	0,1	1	○	○
	H5-06	Drive Transmit Wait Time	5 ~ 65	5 ms	○	○
	H5-07	RTS Control Selection	0,1	1	○	○
	H5-09	CE Detection Time	0.0 ~ 10.0	2.0 s	○	○
	H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0,1	0	○	○
	H5-11	Communications ENTER Function Selection	0,1	1	○	○
	H5-12	Run Command Method Selection	0,1	0	○	○
Pulse Train Input/Output	H6-01	Pulse Train Input Terminal RP Function Selection	0 ~ 3	0	○	○
	H6-02	Pulse Train Input Scaling	100 ~ 32000	1440 Hz	○	○
	H6-03	Pulse Train Input Gain	0.0 ~ 1000.0	100.0%	○	○
	H6-04	Pulse Train Input Bias	-100.0 ~+100.0	0.0%	○	○
	H6-05	Pulse Train Input Filter Time	0.00 ~ 2.00	0.10 s	○	○
	H6-06	Pulse Train Monitor Terminal MP Selection	000,031,101,102, 105,116,501,502	102	○	○
	H6-07	Pulse Train Monitor Scaling	0 ~ 32000	1440 Hz	○	○
	H6-08	Pulse Train Min. Frequency	0.1 ~ 1000.0	0.5 Hz	○	○
Momentary Power Loss	L1-01	Motor Overload Protection Selection	0 ~ 2,6	1	S	S
	L1-02	Motor Overload Protection Time	0.1 ~ 5.0	1.0 min	○	○
	L1-03	Motor Overheat Alarm Operation Selection (PTC input)	0 ~ 3	3	○	○
	L1-04	Motor Overheat Fault Operation Selection (PTC input)	0 ~ 2	1	○	○
	L1-05	Motor Temperature Input Filter Time (PTC input)	0.00 ~ 10.00	0.20 s	○	○
	L1-08	Electrothermal Level Setting 1	□.□□A 10~150%	Note: 4	○	○
	L1-09	Electrothermal Level Setting 2			○	○
	L1-13	Continuous Electrothermal Operation Selection	0,1	1	○	○
	L1-22 Note: 2	Leakage Current Filter Time Constant 1	0.0 ~ 60.0	20.0S	○	○
	L1-23 Note: 2	Leakage Current Filter Time Constant 2	0.0 ~ 60.0	1.0S	○	○
Stall Prevention Function	L2-01	Momentary Power Loss Operation Selection	0 ~ 2	0	○	○
	L2-02	Momentary Power Loss Ride-Thru Time	0.0 ~ 25.5	Note: 4	○	○
	L2-03	Momentary Power Loss Minimum Baseblock Time	0.1 ~ 5.0		○	○
	L2-04	Momentary Power Loss Voltage Recovery Ramp Time	0.0 ~ 5.0		○	○
	L2-05 Note: 3	Undervoltage Detection Level (Uv)	150 ~ 210		○	○
	L2-06	KEB Deceleration Time	0.0 ~ 200.0	0.0s	○	○
	L2-07	KEB Acceleration Time	0.0 ~ 25.5	0.0s	○	○
	L2-08	KEB Start Output Frequency Reduction	0 ~ 300	100%	○	○
	L2-11 Note: 3	Desired DC Bus Voltage during KEB	150 ~ 400	E1-01× 1.22(V)	○	○
Stall Prevention Function	L3-01	Stall Prevention Selection during Acceleration	0 ~ 2	1	○	○
	L3-02	Stall Prevention Level during Acceleration	0 ~ 150	Note: 4	○	○
	L3-03	Stall Prevention Limit during Acceleration	0 ~ 100	50%	○	○
	L3-04	Stall Prevention Selection during Deceleration	0 ~ 4,7	0	S	S
	L3-05	Stall Prevention Selection during Run	0 ~ 2	1	○	×
	L3-06	Stall Prevention Level during Run	30 ~ 150	Note: 4	○	×

Note: 1. Default setting is determined by A1-02, Control Method Selection.
2. Parameter can be changed and displayed at parameter C6-02=B.
3. Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
4. Default setting value is dependent on parameter o2-04, Drive Model Selection.

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
Stall Prevention Function	L3-11	Ov Suppression Function Selection	0,1	0	○	○
	L3-17 Note: 3	Overvoltage Suppression and Stall Prevention Desired DC Bus Voltage	150 ~ 400	375 V	○	○
	L3-20	Main Power Circuit Voltage Adjustment Gain	0.00 ~ 5.00	1.00	○	○
	L3-21	Accel/Decel Rate Calculation Gain	0.00 ~ 200.00	1.00	○	○
	L3-23	Automatic Reduction Selection for Stall Prevention during Run	0,1	0	○	○
	L3-24	Motor Acceleration Time for Inertia Calculations	0.001 ~10.000	Note: 3	○	○
	L3-25	Load Inertia Ratio	0.0 ~ 1000.0	1.0	○	○
Frequency Detection	L4-01	Speed Agreement Detection Level	0.0 ~ 400.0	0.0 Hz	○	○
	L4-02	Speed Agreement Detection Width	0.0 ~ 20.0	2.0 Hz	○	○
	L4-03	Speed Agreement Detection Level (+/-)	-400.0 ~ 400.0	0.0 Hz	○	○
	L4-04	Speed Agreement Detection Width (+/-)	0.0 ~ 20.0	2.0 Hz	○	○
	L4-05	Frequency Reference Loss Detection Selection	0,1	0	○	○
	L4-06	Frequency Reference at Reference Loss	0.0 ~ 100.0	80.0%	○	○
	L4-07	Frequency Detection Conditions	0,1	0	○	○
	L4-08	Speed Agreement Detection Conditions	0,1	0	○	○
Fault Reset	L5-01	Number of Auto Restart Attempts	0 ~ 10	0	○	○
	L5-02	Auto Restart Operation Selection	0,1	0	○	○
	L5-04	Fault Reset Interval Time	0.5 ~ 600.0	10.0 s	○	○
	L5-05	Fault Reset Operation Selection	0,1	0	○	○
Overtorque Detection	L6-01	Torque Detection Selection 1	0 ~ 8	0	○	○
	L6-02	Torque Detection Level 1	0 ~ 300	150%	○	○
	L6-03	Torque Detection Time 1	0.0 ~ 10.0	0.1s	○	○
	L6-04	Torque Detection Selection 2	0 ~ 8	0	○	○
	L6-05	Torque Detection Level 2	0 ~ 300	150%	○	○
	L6-06	Torque Detection Time 2	0.0 ~ 10.0	0.1 s	○	○
	L6-08	Mechanical Weakening (oL5) Detection Operation	0 ~ 8	0	○	○
	L6-09	Mechanical Weakening Detection Speed Level	-110.0 ~ 110.0	110%	○	○
	L6-10	Mechanical Weakening Detection Time	0.0 ~ 10.0	0.1 s	○	○
	L6-11	Mechanical Weakening Detection Start Time	0 ~ 65535	0h	○	○
Torque Limit	L7-01	Forward Torque Limit	0 ~ 300	Note: 3	×	○
	L7-02	Reverse Torque Limit	0 ~ 300		×	○
	L7-03	Forward Regenerative Torque Limit	0 ~ 300		×	○
	L7-04	Reverse Regenerative Torque Limit	0 ~ 300		×	○
	L7-06	Torque Limit Integral Time Constant	5 ~ 10000	50 ms	×	○
	L7-07	Torque Limit Control Method Selection during Accel/Decel	0,1	1	×	○
Hardware Protection	L8-02	Overheat Alarm Level	50 ~ 130	Note: 3	○	○
	L8-03	Overheat Pre-Alarm Operation Selection	0 ~ 4	3	○	○
	L8-05	Input Phase Loss Protection Selection	0,1	0	○	○
	L8-07	Output Phase Loss Protection Selection	0 ~ 2	0	○	○
	L8-09	Output Ground Fault Detection Selection	0,1	Note: 3	○	○
	L8-10	Heatsink Cooling Fan Operation Selection	0,1	0	○	○
	L8-11	Heatsink Cooling Fan Operation Delay Time	0 ~ 300	60 s	○	○
	L8-12	Ambient Temperature Setting	-10 ~ 50	40°C	○	○
	L8-15	oL2 Characteristics Selection at Low Speeds	0,1	1	○	○
	L8-18	Soft Current Limit Selection	0,1	0	○	○
	L8-19	Frequency Reduction Rate during oH Pre-Alarm	0.1 ~ 0.9	0.8	○	○
	L8-35	Installation Method Selection	0 ~ 2	Note: 3	○	○
	L8-38	Carrier Frequency Reduction	0 ~ 2		○	○
	L8-40	Carrier Frequency Reduction Time	0.00 ~ 2.00	0.50	○	○
	L8-41	High Current Alarm Selection	0,1	0	○	○
Hunting Prevention	n1-01	Hunting Prevention Selection	0,1	1	○	×
	n1-02	Hunting Prevention Gain Setting	0.00 ~ 2.50	1.00	○	×
	n1-03	Hunting Prevention Time Constant	0 ~ 500	10	○	×
	n1-05	Hunting Prevention Gain while in Reverse	0.00 ~ 2.50	0.00	○	×

Function	No.	Name	Range	Def. Note: 1	Control Mode	
					V/f	SV
Speed Feedback Detection Control Function	n2-01	Speed Feedback Detection Control (AFR) Gain	0.00 ~ 10.00	Note: 3	×	○
	n2-02	Speed Feedback Detection Control (AFR) Time Constant	0 ~ 2000	50 ms	×	○
	n2-03	Speed Feedback Detection Control (AFR) Time Constant 2	0 ~ 2000	750ms	×	○
High-Slip Braking	n3-01	High-Slip Braking Deceleration Frequency Width	1 ~ 20	5%	○	×
	n3-02	High-Slip Braking Current Limit	100 ~ 200	150%	○	×
	n3-03	High-Slip Braking Dwell Time at Stop	0.0 ~ 10.0	1.0 s	○	×
	n3-04	High-Slip Braking Overload Time	30 ~ 1200	40 s	○	×
	n3-13	Overexcitation Deceleration Gain	1.00 ~ 1.40	1.10	○	○
	n3-21	High-Slip Suppression Current Level	0 ~ 150	100%	○	○
	n3-23	Overexcitation Operation Selection	0 ~ 2	0	○	○
Online Tuning of Motor Line-to-Line Resistance	n6-01	Line-to-Line Motor Resistance Online Tuning	0,1	1	×	○
Display Settings	o1-01	Drive Mode Unit Monitor Selection	104 ~ 699	106	○	○
	o1-02	User Monitor Selection After Power Up	1 ~ 5	1	○	○
	o1-03	Digital Operator Display Selection	0 ~ 3	0	○	○
	o1-10	Frequency Reference Setting and User-Set Display	1 ~ 60000	Note: 3	○	○
	o1-11	Frequency Reference Setting / Decimal Display	0 ~ 3		○	○
Operator Keypad Functions	o2-01	LO/RE Key Function Selection	0,1	1	○	○
	o2-02	STOP Key Function Selection	0,1	1	○	○
	o2-03	User Parameter Default Value	0 ~ 2	0	○	○
	o2-04	Drive Model Selection	0 ~ FF	Note: 3	○	○
	o2-05	Frequency Reference Setting Method Selection	0,1	0	○	○
	o2-06	Operation Selection when LED Operator is Disconnected	0,1	0	○	○
	o2-07	Motor Direction at Power Up when Using Operator	0,1	0	○	○
Copy Function	o3-01	Copy Function Selection	0 ~ 3	0	○	○
	o3-02	Copy Allowed Selection	0,1	0	○	○
Maintenance Period	o4-01	Accumulated Operation Time Setting	0 ~ 9999	0	○	○
	o4-02	Accumulated Operation Time Selection	0,1	1	○	○
	o4-03	Cooling Fan Operation Time Setting	0 ~ 9999	0	○	○
	o4-05	Capacitor Maintenance Setting	0 ~ 150	0%	○	○
	o4-07	DC Bus Pre-Charge Relay Maintenance Setting	0 ~ 150	0%	○	○
	o4-09	IGBT Maintenance Setting	0 ~ 150	0%	○	○
	o4-11	U2, U3 Initialization	0,1	0	○	○
	o4-12	kWh Monitor Initialization	0,1	0	○	○
	o4-13	Number of Run Commands Initialize Selection	0,1	0	○	○
Special Adjustments	S1-01 Note: 4	Motor Selection	0,2	2	○	○
	S2, S3	Special Adjustments	-	Note: 3	×	○
Motor Tuning	T1-00	Motor Selection 1/2	1,2	1	○	○
	T1-01	Auto-Tuning Mode Selection	0,2,3	Note: 3	○	○
	T1-02	Motor Rated Power	0.03 ~ 650.00		○	○
	T1-03 Note: 2	Motor Rated Voltage	0.0 ~ 255.5	200.0 V	○	○
	T1-04	Motor Rated Current	Rated Current 10 ~ 200%	Note: 3	○	○
	T1-05	Motor Base Frequency	0.0 ~ 400.0	60.0 Hz	○	○
	T1-06	Number of Motor Poles	2 ~ 48	4pole	○	○
	T1-07	Motor Base Speed	0 ~ 24000	1750 r/min	○	○
	T1-11	Motor Iron Loss	0 ~ 65535	14 W	○	×

Note: 1. Default setting is determined by A1-02, Control Method Selection.
2. Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.
3. Default setting value is dependent on parameter o2-04, Drive Model Selection.
4. Software version : 5551 or later.

Outline Drawing

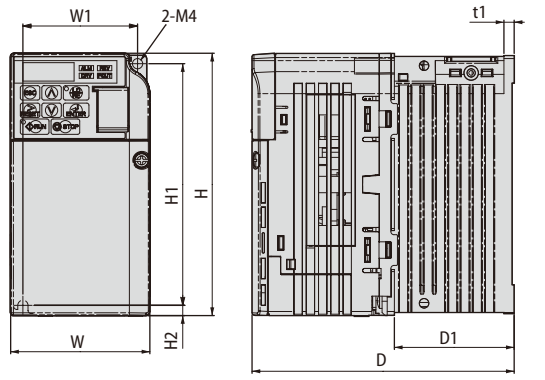


Fig.A

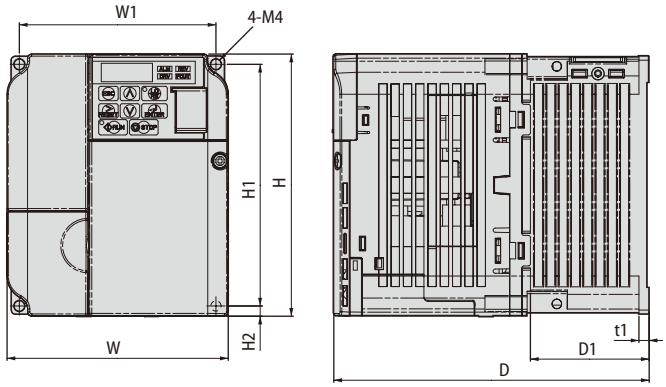
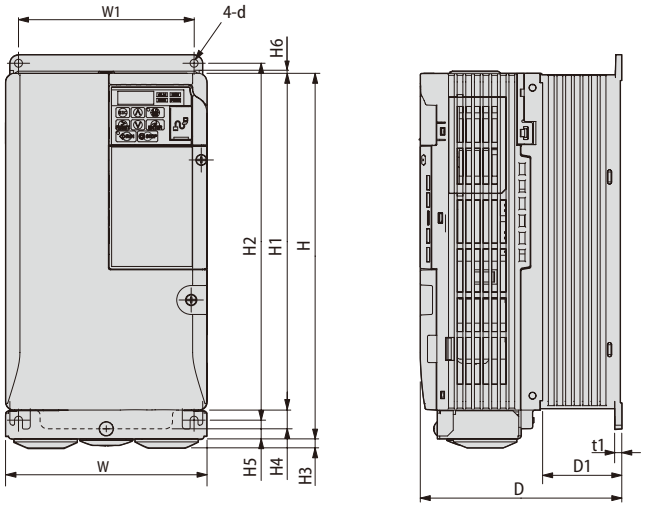


Fig.B

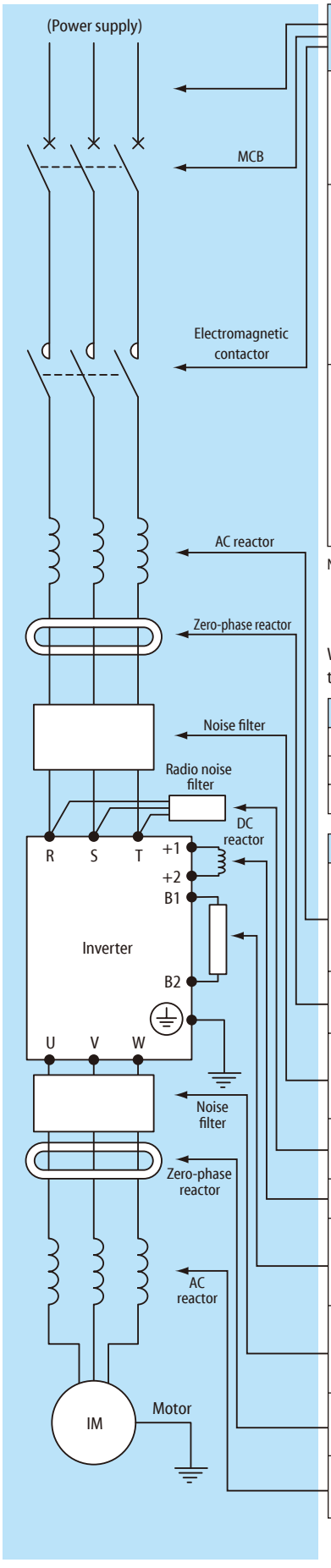
Input voltage	Inverter model	Dimensions (mm)									Drawing
		W	H	D	W1	H1	H2	D1	t1	Approx.weight (kg)	
1-phase 200V class	HF520S-A20	68	128	76	56	118	5	6.5	3	0.6	A
	HF520S-A40	68	128	118	56	118	5	38.5	5	1.0	
3-phase 200V class	HF5202-A20	68	128	76	56	118	5	6.5	3	0.6	
	HF5202-A40	68	128	108	56	118	5	38.5	5	0.9	
	HF5202-A75	68	128	128	56	118	5	58.5	5	1.1	

Input voltage	Inverter model	Dimensions (mm)									Drawing
		W	H	D	W1	H1	H2	D1	t1	Approx.weight (kg)	
1-phase 200V class	HF520S-A75	108	128	137.5	96	118	5	58	5	1.7	B
	HF520S-1A5	108	128	154	96	118	5	58	5	1.8	
	HF520S-2A2	140	128	163	128	118	5	65	5	2.4	
3-phase 200V class	HF5202-1A5	108	128	129	96	118	5	58	5	1.7	
	HF5202-2A2	108	128	137.5	96	118	5	58	5	1.7	
	HF5202-3A7	140	128	143	128	118	5	65	5	2.4	
3-phase 400V class	HF5204-A20	108	128	81	96	118	5	10	5	1.0	
	HF5204-A40	108	128	99	96	118	5	28	5	1.2	
	HF5204-A75	108	128	137.5	96	118	5	58	5	1.7	
	HF5204-1A5	108	128	154	96	118	5	58	5	1.7	
	HF5204-2A2	108	128	154	96	118	5	58	5	1.7	
	HF5204-3A7	140	128	143	128	118	5	65	5	2.4	



Input voltage	Inverter model	Dimensions (mm)													
		W	H	D	W1	H1	H2	H3	H4	H5	H6	D1	t1	d	Approx.weight (kg)
3-phase 200V class	HF5202-5A5	140	254	140	122	234	248	6	13	13	1.5	55	5	M5	3.8
	HF5202-7A5	140	254	140	122	234	248	6	13	13	1.5	55	5	M5	3.8
3-phase 400V class	HF5204-5A5	140	254	140	122	234	248	6	13	13	1.5	55	5	M5	3.8
	HF5204-7A5	140	254	140	122	234	248	6	13	13	1.5	55	5	M5	3.8

Standard Accessories



Rated input voltage	Applicable motor (kw)	Inverter model	Circuit breaker (made by Mitsubishi Electric)		Electromagnetic contactor (made by Fuji Electric)	Cable size (mm^2) Length 30m
			Rated current (A)	Type	Type	
1-phase 200V class	0.2	HF520S-A20	5	NF-32SV	SC-03	2
	0.4	HF520S-A40	10	NF-32SV	SC-03	2
	0.75	HF520S-A75	20	NF-32SV	SC-4-0	2
	1.5	HF520S-1A5	30	NF-32SV	SC-N2	2
	2.2	HF520S-2A2	40	NF-63SV	SC-N2	2
3-phase 200V class	0.2	HF5202-A20	5	NF-32SV	SC-03	2
	0.4	HF5202-A40	5	NF-32SV	SC-03	2
	0.75	HF5202-A75	10	NF-32SV	SC-03	2
	1.5	HF5202-1A5	15	NF-32SV	SC-4-0	2
	2.2	HF5202-2A2	20	NF-32SV	SC-N1	2
	3.7	HF5202-3A7	30	NF-32SV	SC-N2	3.5
	5.5	HF5202-5A5	50	NF-63SV	SC-N2S	5.5
	7.5	HF5202-7A5	60	NF-125SV	SC-N3	8
3-phase 400V class	0.2	HF5204-A20	5	NF-32SV	SC-03	2
	0.4	HF5204-A40	5	NF-32SV	SC-03	2
	0.75	HF5204-A75	5	NF-32SV	SC-03	2
	1.5	HF5204-1A5	10	NF-32SV	SC-03	2
	2.2	HF5204-2A2	15	NF-32SV	SC-4-0	2
	3.7	HF5204-3A7	20	NF-32SV	SC-N1	2
	5.5	HF5204-5A5	30	NF-32SV	SC-N2	3.5
	7.5	HF5204-7A5	30	NF-32SV	SC-N2	5.5

Note: 1. The shown accessories are for use with SUMITOMO 3-phase, 4-pole motors.
2. Select the circuit breaker based on required capacity.
3. Use thicker cables when wiring distance exceeds 30 m.
4. The alarm output cable should be 0.75mm^2.

When using an earth leakage breaker (ELB), select the breaker's trip current from the table below based on the total wire distance (R) by summing the distance from the breaker to the inverter and the inverter to the motor.

ℓ	Trip current (mA)
100m or less	30
300m or less	100
600m or less	200

Note: 1. When CV wiring is used in metal conduit, the leakage current is approximately 30mA/km.
2. Leakage current will increase eightfold with IV type cable due to higher dielectric constant. In this case, use ELB with the next higher trip rating.

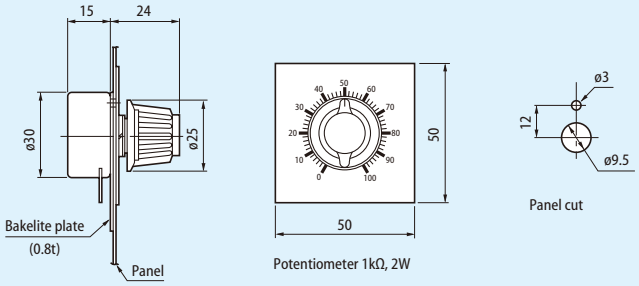
Input AC reactor for harmonic suppression/power smoothing/powerfactor improvement	This is useful in suppressing harmonics induced on the power supply lines, or when the main power voltage imbalance exceeds 3%, (and power source capacity is more than 600kVA), or to smooth out line fluctuations. It also improves the power factor.
Radio noise filter Zero-phase reactor	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise.
Input noise filter	This filter reduces the conducted noise in the power supply wiring between the inverter and the power distribution system. Connect it to the inverter primary (input side).
Input radio noise filter (XY filter)	This capacitive filter reduces radiated noise from the main power wires in the inverter input side.
DC reactor	The inductor or choke filter suppresses harmonics generated by the inverter.
Regenerative braking resistor	The regenerative braking resistor is useful for increasing the inverter's control torque for high duty-cycle (on-off) applications, and improving the decelerating capacity.
Output noise filter	This filter reduces radiated noise emitted on the inverter output cable that may interfere with radio or television reception and test equipment and sensor operation.
Radio noise filter Zero-phase reactor	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise.
Output AC reactor	Install it on the output side to reduce leakage current contributed by higher harmonics. Contact our company for details.

Caution in Selecting Peripheral Equipment

Wiring and connection		1. Be sure to connect the power supply to RST (input terminals) and the motor to U, V, W (output terminals). 2. Be sure to connect the grounding terminal. (⏚ mark) Inverters generate high frequency, increasing leakage current. Be sure to ground the inverter and motor.
Wiring between inverter and motor	Electromagnetic contactor	When using an electromagnetic contactor between the inverter and motor, do not turn the contactor ON or OFF during inverter operation.
	Thermal relay	Install a thermal relay that matches the motor in the following cases: *Install a thermal relay for each motor when operating more than one motor with one inverter. *Set the current of the thermal relay at the rated motor current x 1.1. When the wiring length is long (more than 10 m), the thermal relay may be activated too quickly. Install an AC reactor or current sensor on the output side. *When motors are to be operated with the rated current exceeding the adjustable level of the built-in electronic thermal relay.
Earth leakage breaker		Install an earth leakage breaker on the input side for protection of the inverter wiring and operators. Conventional earth leakage breakers may malfunction because of high harmonics from the inverter; therefore use an earth leakage breaker that is applicable to the inverter. The leakage current differs according to the cable length. Refer to p.14.
Wiring distance		The wiring distance between the inverter and operation panel should be less than 30m. If it exceeds 30m, use a current/voltage converter, etc. Use shielded cable for wiring. When the wiring distance between the motor and inverter is long, the leakage current from high harmonics may cause the protective function of the inverter and peripheral equipment to be activated. The situation will be improved by an AC reactor installed on the output side of the inverter. Select appropriate cable to prevent voltage drop. (Large voltage drop lowers the torque.)
Phase-advanced capacitor		Do not use a phase-advanced capacitor. When a power factor improving capacitor is connected between the inverter and motor, the capacitor may be heated or broken by the higher harmonics in the inverter output.

Frequency Reference Setting Unit

Model No. VR07

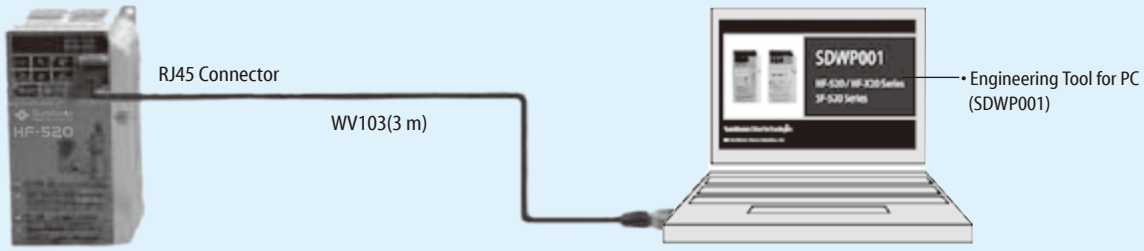


Weight: 0.1kg

Unit : mm

Cable for Engineering Tool (Model No. WV103)

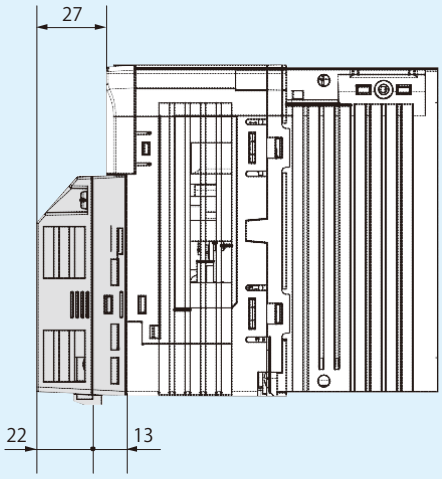
Connection Method



Item	Specification
Connector	DSUB 9P
Cable Length	3 m

Note: Engineering Tool for drive setup and parameter management
The installation files can be obtained at free from
: http://www.shi.co.jp/ptc/

Communication Unit



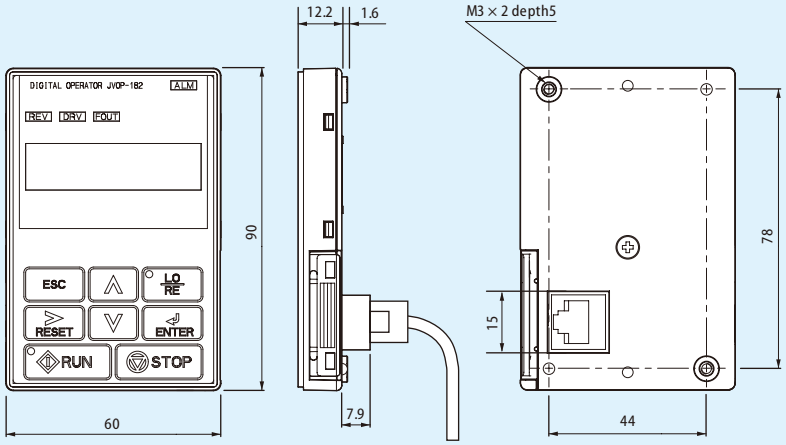
Name	Model No.
CC-Link Unit	SI-C3/V-H
DeviceNet Unit	SI-N3/V-H

Outline Drawing (mm)

When installing the communication unit in the HF-520, the 27mm depth becomes long.

LED Operator

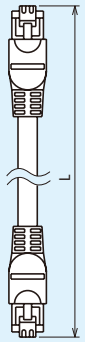
● JVOP-182-H



Weight: 0.1kg

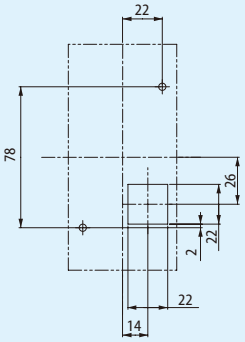
Unit : mm

● ICS-1 , 3



Model	Cable length L (m)
ICS-1	1
ICS-3	3

● Dimensions for the panel cut

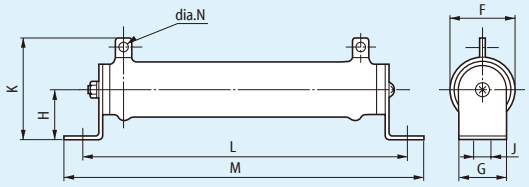


Unit : mm

Regenerative Braking Resistor

Rated power (W)	Dimensions (mm)								Weight (g)
	F	G	H	J	K	L	M	N	
200	28	26	22	6	53	287	306	4	340
300	44	40	40	10	78	309	335	5	840
400	44	40	40	10	78	385	411	5	1000
750	57	40	40	10	84	355	381	5	1360

100% braking torque: 10 sec 10% ED



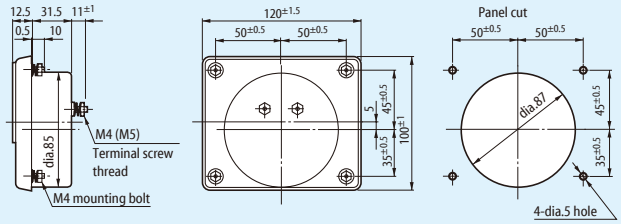
Voltage (V)	Capacity (kW)	Braking resistor				Thermal relay set value (A)
		Model No.	Rated power	Resistance	Qty	
200V	0.2	Y135AA201	200W	400Ω	1	0.83
	0.4	Y135AA200	200W	200Ω	1	0.83
	0.75	Y135AA205	300W	200Ω	1	1.25
	1.5	Y135AA204	300W	80Ω	1	1.25
	2.2	Y135AA208	400W	70Ω	1	1.7
	3.7	Y135AA203	300W	20Ω	2-pc. series	2.1
	5.5	X435AC069	750W	10Ω	2-pc. series	5.3
	7.5	X435AC069	750W	10Ω	2-pc. series	5.3
400V	0.2, 0.4	Y135AA202	200W	750Ω	1	0.42
	0.75	Y135AA207	300W	750Ω	1	0.63
	1.5	Y135AA206	300W	400Ω	1	0.63
	2.2	Y135AA209	400W	250Ω	1	0.83
	3.7	Y135AA204	300W	80Ω	2-pc. series	1.1
	5.5	Y135AA209	400W	250Ω	3-pc. series	2.0
	7.5	Y135AA209	400W	250Ω	3-pc. series	2.0

Type of thermal relay: TR-ONH

% Speed Meter: DCF-12N

Unit : mm

0-100% 50 divisions

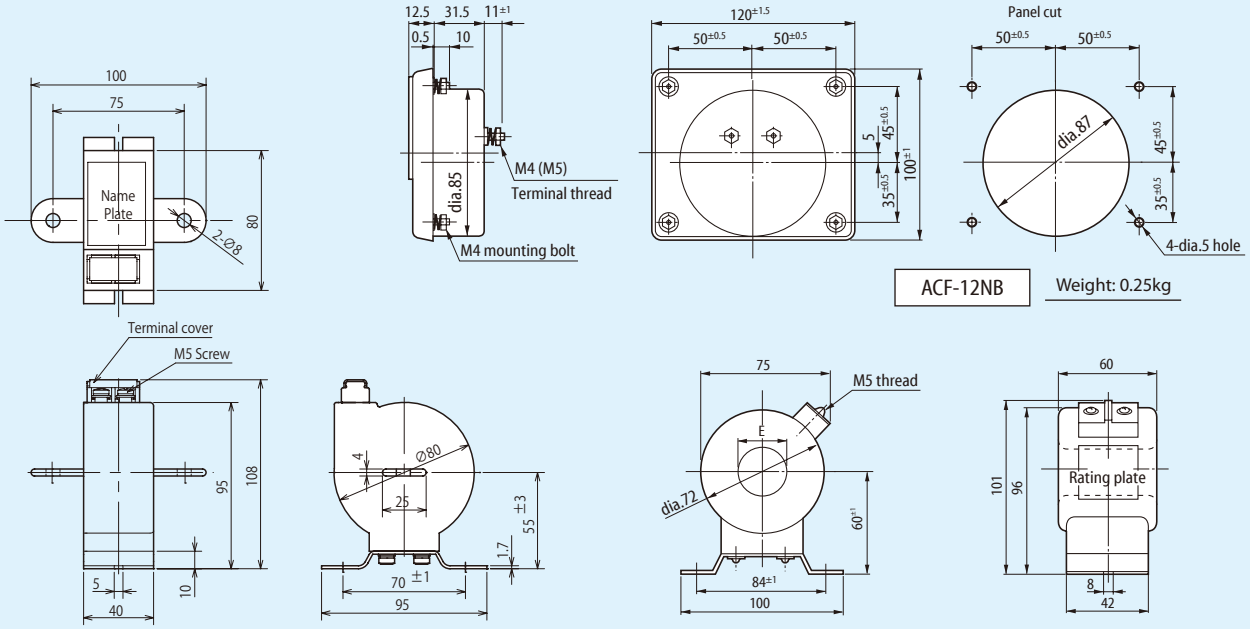


Model No.	
X525AA048	10V F.S.

Weight: 0.15kg

AC Ammeter: ACF-12NB

The current transformer (CT) directly detects the current of the secondary side of the inverter.



ACF-12NB Weight: 0.25kg

COMA-15A Weight: 0.8kg

COM-15-26 E=Ø26 Weight: 0.9kg

Table of combination of AC ammeter (ACF-12NB) and current transformer (CT)

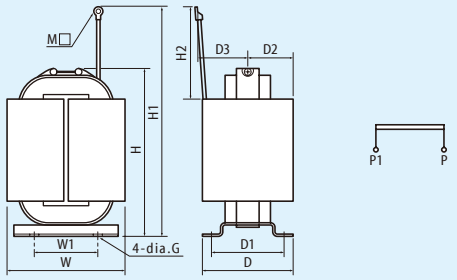
Motor capacity (kW)	200V class					400V class				
	Model No.	Meter		CT Type	Number of primary through holes	Model No.	Meter		CT Type	Number of primary through holes
		Rated current [A]	Max. scale [A]				Rated current [A]	Max. scale [A]		
0.2	CT002AW	3	3	COMA-15A 5/5A	-	CT001AW	2	2	COMA-15A 5/5A	-
0.4	CT003AW	5	5	COMA-15A 5/5A	-	CT002AW	3	3	COMA-15A 5/5A	-
0.75	CT004AW	5	10	COMA-15A 10/5A	-	CT003AW	5	5	COMA-15A 5/5A	-
1.5	CT005AW	5	15	COMA-15A 15/5A	-	CT004AW	5	10	COMA-15A 10/5A	-
2.2	CT006AW	5	20	COMA-15A 20/5A	-	CT004AW	5	10	COMA-15A 10/5A	-
3.7	CT007AW	5	30	COMA-15A 30/5A	-	CT005AW	5	15	COMA-15A 15/5A	-
5.5	X525AA042	5	50	COM-15-26 50/5A	3	CT006AW	5	20	COMA-15A 20/5A	-
7.5	X525AA042	5	50	COM-15-26 50/5A	3	CT007AW	5	30	COMA-15A 30/5A	-

Construction of current transformer (CT) COMA-15A type: Totally molded current transformer with primary winding
COM-15-26 type: Totally molded current transformer, throughhole type

Install the current transformer (CT) on the output side of the inverter.

DC Reactor for Power Factor Improvement and Harmonics Suppression

The DC reactor is available for improvement of the power factor of the inverter, ensuring power line impedance, and control of higher harmonics.



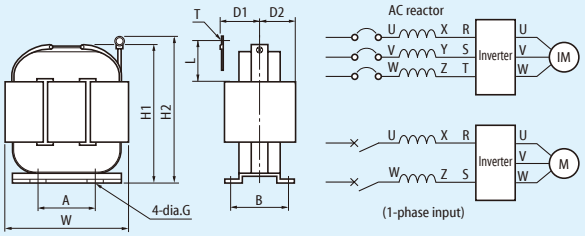
Unit : mm

	Applicable capacity (kW)	Specification		Model No. Y220DA	W	W1	D	D1	D2	D3	H	H1	H2	G	Connection Terminal	Weight (kg)	Insulation
		Current (A)	L (mH)														
200V Series	0.2	1.0	29.7	032	52	35	40	32	20	22	65	-	300	dia.4	M4	0.3	B
	0.4	2.0	14.8	033	52	35	40	32	20	22	75	-	300	dia.4	M4	0.4	B
	0.75	3.75	9.72	034	52	35	50	42	25	27	85	-	300	dia.4	M4	0.6	B
	1.5	7.5	4.83	035	74	50	45	37	-	-	120	145	-	dia.5	M5	1.0	B
	2.2	11.0	3.41	036	74	50	45	37	-	-	120	145	-	dia.5	M5	1.1	B
	3.7	18.5	2.13	037	90	60	62	52	-	-	140	170	-	dia.5	M5	2.0	B
	5.5	28.0	1.47	038	90	60	62	52	-	-	140	170	-	dia.5	M5	2.4	B
	7.5	38.0	1.11	039	100	80	95	80	-	-	140	170	-	5.5×7	M5	3.5	B
400V Series	0.2	0.5	116	002	52	35	40	32	20	22	65	-	300	dia.4	M4	0.3	B
	0.4	1.0	59.3	003	52	35	40	32	20	22	75	-	300	dia.4	M4	0.4	B
	0.75	1.88	38.9	004	52	35	50	42	25	27	85	-	300	dia.4	M4	0.6	B
	1.5	3.75	19.3	005	59	40	60	47	30	35	100	-	300	dia.4	M4	0.9	B
	2.2	5.5	13.7	006	74	50	45	37	-	-	120	140	-	dia.5	M5	1.1	B
	3.7	9.25	8.52	007	74	50	70	62	-	-	120	145	-	dia.5	M5	1.8	B
	5.5	14.0	5.87	008	90	60	62	52	-	-	140	165	-	dia.5	M5	1.5	B
	7.5	19.0	4.46	009	100	80	95	80	-	-	140	165	-	5.5×7	M5	3.5	B

AC Reactor for Power Factor Improvement and Harmonics Suppression

The AC reactor is available for improvement of the power factor of the inverter, ensuring proper power line impedance, and control of higher harmonics.

Note: The AC reactor is for 3-phase input.



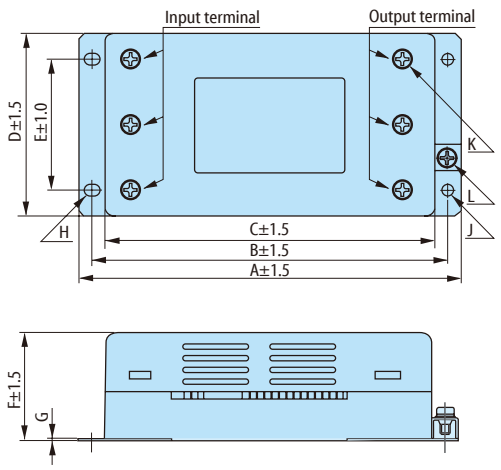
Unit : mm

	Applicable capacity (kW)		Specification		Model No. Y220DA	W	DI	D2	H1	H2	A	B	G	L	T	Weight (kg)	Insulation
	3-Phase	1-Phase	Current (A)	L (mH)													
200V Series	0.2, 0.4	0.2	2.1	5.8	053	87	26	23	95	-	50	38	4	310	M4	1.0	B
	0.75	0.4	4.0	3.1	054	87	26	23	95	-	50	38	4	310	M4	1.1	B
	1.5	0.75	8.0	1.6	055	90	33	30	100	120	55	48	4	-	M4	1.6	B
	2.2	-	11	1.2	056	113	35	30	116	140	55	43	4	-	M4	2.1	B
	3.7	1.5/2.2	17	0.7	057	113	35	30	116	140	55	43	4	-	M5	2.4	B
	5.5	-	24	0.5	058	146	35	35	147	180	80	50	5	-	M5	3.9	F
	7.5	-	33	0.4	059	150	35	35	150	185	80	50	5	-	M6	4.4	F
400V Series	0.2, 0.4	-	1.2	22	080	87	26	23	95	-	50	38	4	310	M4	1.0	B
	0.75		2.1	12	081	90	26	23	96	-	50	38	4	310	M4	1.1	B
	1.5		4.0	6.5	082	90	33	30	100	-	55	48	4	310	M4	1.7	B
	2.2		5.5	4.6	083	113	33	30	115	-	55	43	4	310	M4	2.5	B
	3.7		9.0	2.9	084	113	35	30	115	140	55	43	4	-	M4	2.8	B
	5.5		13	2.0	085	153	35	35	145	175	80	50	5	-	M4	4.2	B
	7.5		17	1.5	086	162	37	35	145	175	80	50	5	-	M5	4.4	B

Noise Filter

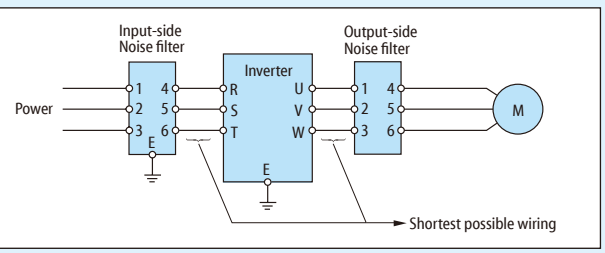
Voltage Class	Applicable Motor (kW)	Input side			Output side		
		Model No.	Type	Weight (kg)	Model No.	Type	Weight (kg)
3-phase 200V	0.2, 0.4	X480AC289	NF3010A-VZ	0.5	X480AC163	CC3005C-P	1
	0.75, 1.5				X480AC164	CC3010C-P	
	2.2	X480AC290	NF3020A-VZ		X480AC165	CC3015C-P	
	3.7				X480AC166	CC3020C-P	1.5
	5.5	X480AC291	NF3030A-VZ	0.7	X480AC167	CC3030C-P	
	7.5	X480AC292	NF3040A-VZ	1.3	X480AC168	CC3045C-P	2.5
3-phase 400V	0.2, 1.5	X480AC296	NF3010C-VZ	0.5	X480AC163	CC3005C-P	1
	2.2, 3.7				X480AC164	CC3010C-P	
	5.5	X480AC297	NF3020C-VZ		X480AC165	CC3015C-P	
	7.5				X480AC166	CC3020C-P	1.5
1-Phase 200V	0.2, 0.4	X480AC289	NF3010A-VZ	0.5	X480AC163	CC3005C-P	1
	0.75				X480AC164	CC3010C-P	
	1.5	X480AC290	NF3020A-VZ		X480AC165	CC3015C-P	
	2.2	X480AC291	NF3030A-VZ	0.7	X480AC166	CC3020C-P	1.5

Input-side Noise Filter

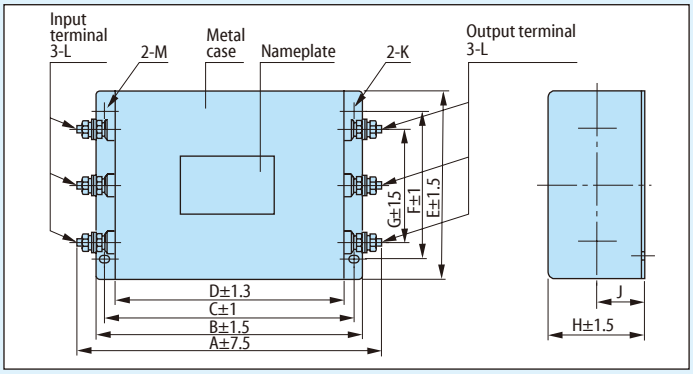


Input side	Dimensions (Unit: mm)										
Model No.	A	B	C	D	E	F	G	H	J	K	L
X480AC289	128	118	108	63	43	42	1.0	4.5 X 6	Ø4.5	M4	M4
X480AC290											
X480AC291	145	135	125	70	50						
X480AC292	179	167	155	90	70	54	1.6			M5	
X480AC296	128	118	108	63	43	42	1.0			M4	
X480AC297											

1. Connect the input-side filter between the power supply and inverter input terminal, and the output-side filter between the inverter output terminal and motor. Make the connection cable as short as possible.
2. Use grounding cable as thick as possible. Correctly ground the equipment.
3. The input and output cables of the filter should be sufficiently separated.
4. Do not connect the input-side filter to the inverter output (motor) side.



Output-side Noise Filter

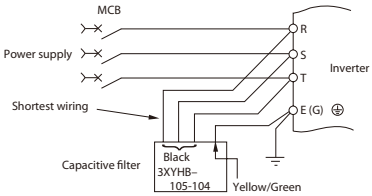


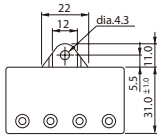
Output side	Dimensions (Unit: mm)											
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
X480AC163	147	140	125	110	95	70	50	50	25	Ø4.5	M4	R2.25 length 6
X480AC164												
X480AC165												
X480AC166	167	160	145	130	110	80	60	70	35	Ø5.5	M5	R2.75 length 7
X480AC167	215	200	185	170	120	90	70	70	35	Ø5.5	M5	R2.75 length 7
X480AC168	255	230	215	200	140	110	80	80	40	Ø6.5	M6	R3.25 length 8

Capacitive filter (XY filter) Type: X480AC185

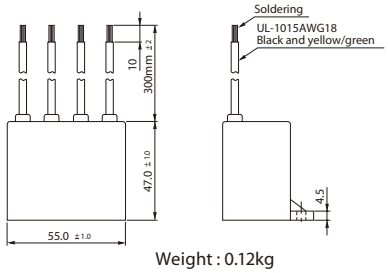
Model No. X480AC185, Type: 3XYHB-105-104
Applicable to all models for HF-430NEO: rated voltage 500VAC

[Method of connection]
(1) Connect it directly to the inverter input (power supply) terminal. Make the connection line as short as possible.
(2) Ensure correct grounding. (Grounding resistance: 100 Ω or less)
(3) Do not use on the inverter output (motor) side.





Unit : mm



Weight : 0.12kg

Zero-phase Reactor (Inductive Filter)

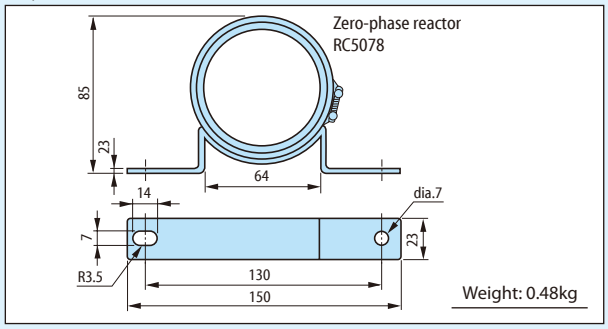
Unit : mm

Common to 200 V and 400 V classes, as well as input and output sides

· 3.7 kW or less

Model No. X480AC188

Type RC5078

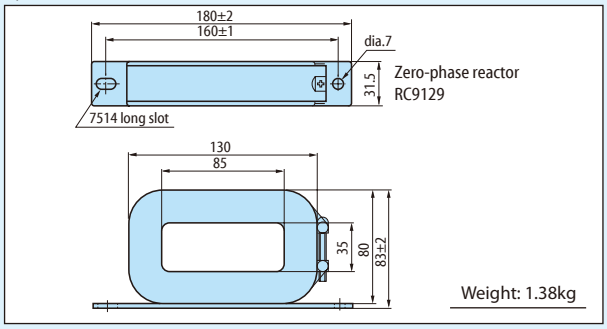


Winding turns	More than 3 times (4T)
Qty used	1 pc
Winding	

· 5.5 kW or more

Model No. X480AC192

Type RC9129



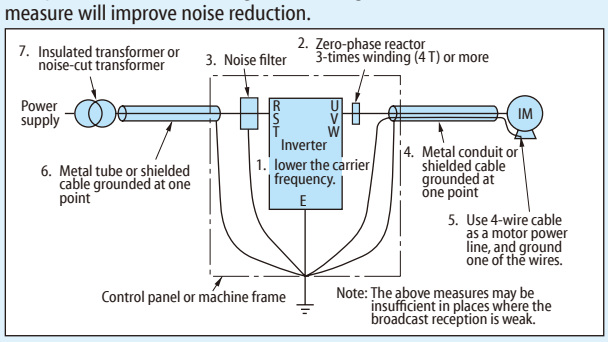
Method of connection

1. It can be used on both input (power supply) side and output (motor) side of the inverter.
2. Wind the cables of the three phases respectively on the input or output side more than three times (4 turns) in the same direction. If cables are too thick to wind more than three times (4 turns), arrange two or more zero-phase reactors to reduce the number of winding turns.
3. Make the gap between the cable and the inside of the core as small as possible.

When AM Radio Picks Up Noise

1. When noise level is high

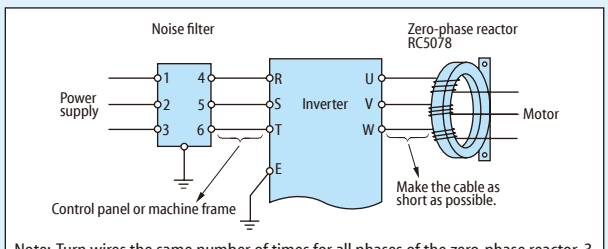
Take possible measures among the following in the order of 1 to 7. Each measure will improve noise reduction.



■ Corrective measures

1. Lower the carrier frequency as much as possible. Up to approx. 10 kHz when low-noise operation is necessary.
2. Install a zero-phase reactor on the output side of the inverter. (Type: RC9129)
3. Install a Noise filter on the input side of the inverter.
4. Connect the inverter and motor with a metal conduit or shielded cable.
5. Use 4-wire cable as a motor power line, and ground one of the wires.
6. Connect the inverter and power with a metal conduit or shielded cable.
7. Install a drive isolation or noise reduction transtormer for the power supply. The transformer capacity differs according to the inverter capacity and voltage.

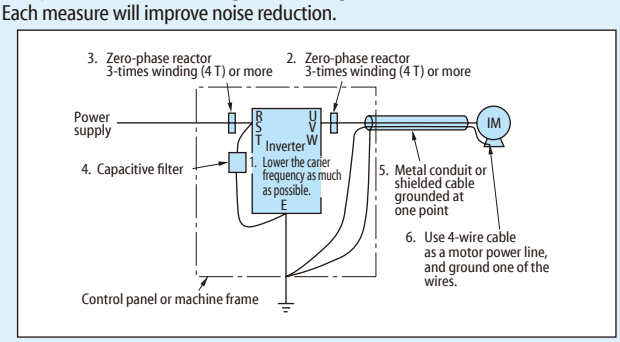
■ Connection of the zero-phase reactor and the Noise filter



Note: Turn wires the same number of times for all phases of the zero-phase reactor. 3 times (4 T) or more Increase the number of zero-phase reactor when the cable is too thick to wind correctly.

2. When noise level is low

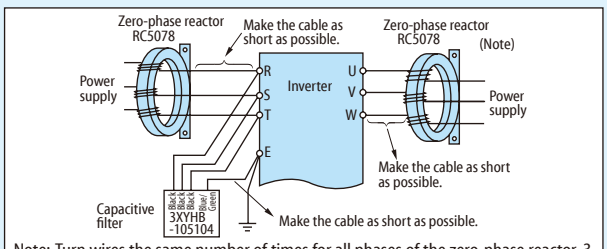
Take possible measures among the following in the order of 1 to 6.
Each measure will improve noise reduction.



■ Corrective measures

1. Lower the carrier trequency as much as possible. Up to approx. 10 kHz when low-noise operaton is necessary.
2. Install a zero-phase reactor on the output side of the inverter. (Type: RC5078, RC9129)
3. Install a zero-phase reactor on the input side the inverter. (Type: RC5078, RC9129)
4. Install a capacitive filter on the input side of the inverter. (Type: 3XYHB-105104)
5. Connect the inverter and motor with a metal conduit or shielded cable.
6. Use 4-wire cable as a motor power line, and ground one of the wires.

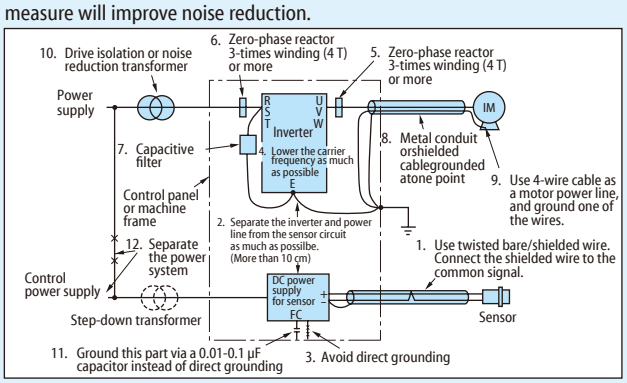
■ Connection of the zero-phase reactor and the capacitive filter



Note: Turn wires the same number of times for all phases of the zero-phase reactor. 3 times (4 T) or more Increase the number of zero-phase reactor when the cable is too thick to wind correctly.

Measures to Take When Proximity Switch/photoelectric Switch, etc. Malfunction

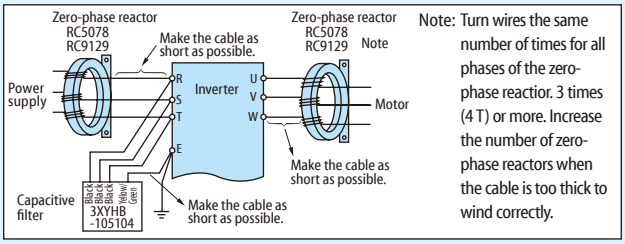
Take possible measures among the following in the order of 1 to 12. Each measure will improve noise reduction.



Corrective measures

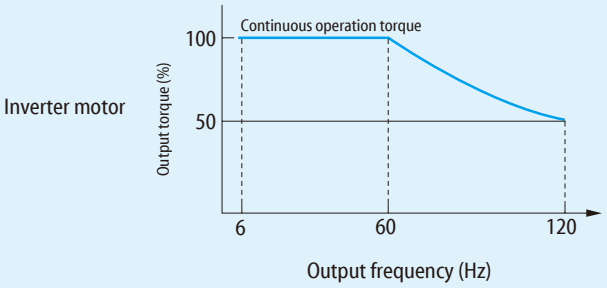
1. Use twisted pair/shielded wire as a sensor signal line, and connect the shielded wire to common.
2. Separate the inverter and power line from the sensor circuit as much as possible. (More than 10 cm desirable)
3. Remove the grounding wire when the power supply for the sensor is grounded.
4. Lower the carrier frequency as much as possible. Up to approx. 10 kHz when low-noise operation is necessary.
5. Install a zero-phase reactor on the output side of the inverter. (Type: RC5078, RC9129)
6. Install an LC filter on the input side of the inverter. (Type: FS)
7. Install a capacitive filter on the input side of the inverter. (Type: 3XYHB-105104)
8. Use a metal conduit or shielded cable for power supply wiring.
9. Use 4-wire cable as a motor power line, and ground one of the wires.
10. Install a drive isolation or noise reduction transformer for the inverter power supply.
11. Ground the power supply for the sensor via a 0.01-0.1 →(630V 0.1µF)
12. Separate the inverter power supply from the sensor power supply system.

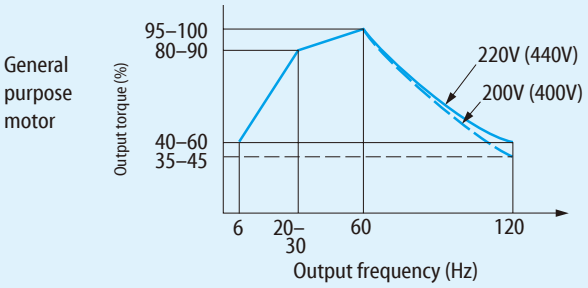
Connection of the reactors and the capacitive filter



Note: Turn wires the same number of times for all phases of the zero-phase reactior. 3 times (4 T) or more. Increase the number of zero-phase reactors when the cable is too thick to wind correctly.

Motor Operating Characteristics





Motor Temperature Rise

When a general-purpose motor is used in variable-speed operation with an inverter, the temperature rise of the motor will be slightly greater than in cases where commercial power is used. The causes are shown below:

Influence of output waveform	Unlike commercial power, the output waveform of an inverter is not a perfect sine wave, and contains higher harmonics. Therefore, the motor loss increases and the temperature is slightly higher.
Reduction in the motor cooling effect during slow-speed operation	Motors are cooled by the fan on the motor itself. When the motor speed is reduced by an inverter, the cooling effect will decrease.

Therefore, lower the load torque or use an inverter motor to control temperature rise when the frequency is below the frequency of commercial power.

Notes to Inverter Users

Precautions for Application of Inverter

- Power supply
  1. When the inverter is connected directly to a large-capacity power supply (especially in a 400 V line), excessively large peak will flow in, breaking the inverter unit. In such a case, install an AC reactor (option) on the input side of the inverter unit.
  2. Install an AC reactor in the following cases as well.
     1) There is a possibility of surge voltage generated in the power supply system: When surge energy flows into the inverter, OV tripping may result.
     2) When a large-capacity thyristor Leonard or other phase control units are installed
  3. When the inverter is operated by a private power generator, secure a sufficiently large generation capacity for the inverter kVA in consideration of the influence of higher harmonic current on the generator.
- Installation
  1. Do not install the inverter in places with poor environmental conditions subjected to dust, oil mist, corrosive gas, or inflammable gas.
  2. In places where there is suspended matter in the air, install the inverter inside a "closed-type" panel to prevent entry of suspended matter. Determine the cooling method and dimensions of the panel so that the ambient temperature around the inverter will be lower than the allowable temperature.
  3. Vertically install the inverter on a wall. Do not install it on wood or other inflammable products.
- Handling
  1. Do not connect the output terminal UVW of the inverter to the power supply; otherwise the inverter will be broken. Carefully check the wiring for correct arrangement before turning on the power.
  2. It takes some time for the internal capacitors to discharge completely after the power is turned off. Check that the charge lamp on the printed circuit board is OFF before inspection.
- Operation
  1. Do not start and stop the inverter frequently by means of an electromagnetic contactor (MC) installed on the input side of the inverter; otherwise failure of the inverter will result.
  2. When more than one motor is operated by one inverter, select the inverter capacity so that 1.1 times the total rated current of the motors will not exceed the rated output current of the inverter.
  3. When an error occurs, the protective function is activated and the inverter trips and stops operation. In that case, motors will not stop immediately. When emergency stop is desired, use mechanical brakes as well.
  4. The acceleration time of the motor is subject to the inertial moment of the motor and load, motor torque, and load torque.
     1) When the acceleration time setting is too short, the stall prevention function is activated, and the setting time is elongated automatically. For stable acceleration and deceleration, set longer time so that the stall prevention function will not be activated.
     2) When the deceleration time is too short, the stall prevention function is activated or OV tripping will result. Set longer deceleration time or install a braking unit/braking resistor.

When Operating 400 V Class 3-Phase Induction Motor

When the inverter is used to drive the 3-phase induction motor (general-purpose motor), a high carrier frequency type inverter (e.g. IGBT) requiring high input voltage (more than 400 V) is necessary. When the wiring distance is long, the withstand voltage of the motor must be taken into consideration. Contact us in such cases.

Life of Major Parts

The electrolytic capacitor, cooling fan, and other parts used for inverters are consumables. Their life substantially depends on the operating condition of inverters. When replacement of the cooling fan is necessary, contact our dealer or service center.

The inverter described in this brochure is used for variable-speed operation of 3-phase induction motors for general industry use.

⚠ CAUTION

▼This product is designed and manufactured for use in industrial applications.
When this product is applied to the following applications that have a significant impact on the human, and public functions (nuclear power, aerospace, public transportation, medical instrument and related applications), contact our agency at each time.

▼Our products are manufactured under stringent quality control. However, install a safety device on the equipment side in order to prevent serious accidents or loss when our products are applied to equipment that may cause serious accidents or loss due to failure or malfunction.

▼Do not use the inverter for any load other than 3-phase induction motors.

▼When an explosion-proof motor is selected, pay attention to the installation environment, because the inverter is not an explosion-proof type.

▼Carefully read the "Operation Manual" before use for correct operation.
Read the manual carefully aiso for long-term storage.

▼Electrical work is necessary for installation of the inverter. Leave the electric work to specialists.

The cautions to special motor application

<Pole change motor>
When controlling a pole-change motor with the inverter, select the inverter with current rating higher than the maximum current of the motor.
After stopping the motor, please change poles of the motor.
When poles of the motor is changed during the motor running, the alram of overvoltage or overcurrent occurs.

<Motor with the brake>
The power supply for the brake must be certainly connected to the primary side of an inverter.
The inverter must be "OFF" when the brake is "ON" (the motor is stopped).

<Single-phase motor>
The inverter is not suitable to operate a single phase motor.
If the inverter is used with a single phase motor, there's a possibility of capacitor damage, phase-splitting, or even fire hazard.

Selecting the Capacity (Model) of the Inverter

Selection

● Capacity

Refer to the applicable motor capacities listed in the standard specifications. When driving a high-pole motor, special motor, or multiple motors in parallel, select such an inverter that the sum of the motor rated current multiplied by 1.05 to 1.1 is less than the inverter's rated output current value.

● Acceleration/Deceleration Times

The actual acceleration and deceleration times of a motor driven by an inverter are determined by the torque and moment of inertia of the load, and can be calculated by the following equations.

The acceleration and deceleration times of an inverter can be set individually. In any case, however, they should be set longer than their respective values determined by the following equations.

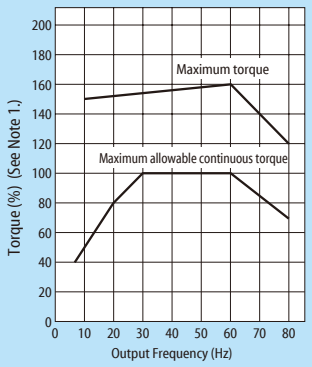
Acceleration time	$ta = \frac{(J_M + J_L) \times \Delta N}{9.56 \times (T_M + T_L)}$ (sec)
Deceleration time	$ta = \frac{(J_M + J_L) \times \Delta N}{9.56 \times (T_B + T_L)}$ (sec)
Conditions	J_M: Moment of inertia of motor (kg·m^2) J_L: Moment of inertia of load (kg·m^2) (converted into value on motor shaft) ΔN: Difference in rotating speed between before and after acceleration or deceleration (r/min) T_L: Load torque (N·m) T_M: Motor rated torque x 1.2-1.3 (N·m) [V/f control] Motor rated torque x 1.5 (N·m) [Vector operation control] T_B: Motor rated torque x 0.2 (N·m) When a braking resistor or a braking resistor unit is used: Motor rated torque x 0.8-1.0 (N·m)

● Allowable Torque Characteristics

When the 3-phase induction motor is combined with an inverter to perform variable speed operation, the motor temperature rises slightly higher than it normally does during commercial power supply operation. This is because the inverter output voltage has a sinusoidal (approximate) PWM waveform. In addition, the cooling becomes less effective at low speed, so the torque must be reduced according to the frequency.

When constant-torque operation must be performed at low speeds, use an AF motor designed specifically for use with inverters.

[An example of V/f control at a base frequency of 60 Hz]



Note: 1. 100% of torque refers to the amount of torque that the motor produces when it is running at a 60Hz-synchronized speed. The starting torque is smaller in this case than that required when power is supplied from a commercial power line. So, the characteristics of the machine to be operated need to be taken into consideration.
2. The maximum allowable torque at 50Hz can be calculated approximately by multiplying the maximum allowable torque at a base frequency of 60Hz by 0.8.

● Starting Characteristics

When a motor is driven by an inverter, its operation is restricted by the inverter's overload current rating, so the starting characteristic is different from those obtained from commercial power supply operation.

Although the starting torque is smaller with an inverter than with the commercial power supply, a high starting torque can be produced at low speeds by adjusting the V/f pattern torque boost amount or by employing vector control. (200% in sensorless control mode, though this rate varies with the motor characteristics). When a larger starting torque is necessary, select an inverter with a larger capacity and examine the possibility of increasing the motor capacity.

Harmonic Current and Influence to Power Supply

● Harmonics are defined as sinusoidal waves that is multiple freguency of commercial power (base frequency: 50Hz or 60Hz). Commercial power including harmonics has a distorted waveform.

Some electrical and electronic devices produce distorted waves in their rectifying and smoothing circuits on the input side. Harmonics produced by a device influence other electrical equipment and facilities in some cases (for example, overheating of phase advancing capacitors and reactors).

Measures for Suppressing Higher Harmonics when Driving with Inverter

● Connecting a Reactor

Harmonic current leakage from the inverter may be suppressed by connecting an input AC reactor (ACL) to the input side of the inverter or DC reactor (DCL) to the DC section of the inverter.

1. Input AC Reactor (ACL)
   Used to improve the input power factor, reduce the harmonics, and suppress external surge on the inverter power source side.
2. DC Reactor (DCL)
   DC reactor is more efficient on improving power factor for inverter power source side. Use input AC reactor together, for suppressing external surges.

Note: Refer to section on Peripheral Equipments, or Options for measures on high frequency noise when using inverters.

1. Warranty Policy on Inverter

Warranty period	The warranty shall be 18 months from date of shipment or 12 months after intial operation, whichever is shorter.
Warranty condition	In the event that any problem or damage to the Product arises during the "Warranty Period" from defects in the Product whenever the Product is properly installed and combined with the Buyer's equipment or machines maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agreed upon in writing between the Seller and the Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product without charge at a designated facility, except as stipulated in the "Warranty Exclusions" as described below. However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.
Warranty exclusion	Not withstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by: 1. Installation, connection, combination or integration of the Product in or to the other equipment or machine that rendered by any person or entity other than the Seller; 2. Insufficient maintenance or improper operation by the Buyer or its customers such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller; 3. Improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications; 4. Any problem or damage on any equipment or machine to which the Product is installed, connected or combined or any specifications particular to the Buyer or its customers; 5. Any changes, modifications, improvements or alterations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller; 6. Any parts in the Product that are supplied or designated by the Buyer or its customers; 7. Earthquake, fire, flood, salt air, gas, lightning, acts of God or any other reasons beyond the control of the Seller; 8. Normal wear and tear, or deterioration of the Product's parts, such as the cooling fan bearings; 9. Any other troubles, problems or damage to the Product that are not attributable to the Seller.
Others	The Seller will not be responsibility for the installation and removal of the inverter. Any inverter transportation cost shall be born by both Seller and Buyer.

2. Warranty Policy on Repaired and Returned Products

Warranty period	The warranty shall be 6 months from date of repair and shipment.
Warranty condition	Warranty on repaired Product will apply only on the replacement parts used in the repair done or authorized by the Seller. All other aspects conform to the Warranty Conditions described in item 1.
Warranty exclusion	Please refer to Warranty Exclusions described in item 1.
Others	Please refer to Others decribed in item 1.

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