TekDrive Inverter

TDS-V8

Instruction Manual

(SENSORLESS VECTOR)

220VClass 3ϕ 1～60Hp
440VClass 3ϕ 1～60Hp

Please directly hand over this instruction manual to the end-users. In order to accomplish the best usage. Thank you.

Preface

Thank you so much to adopt the Tek-Drive multi-function sensorless vector IGBT inverter TDS-V8 series (hereafter referred as TDS-V8).

TDS-V8 series of general-purpose inverters provide V/f and vector control as standard features with user-friendly operation. They are the high-end work of modern power electronics and electro-mechanic drive technology. Please read this instruction before attempting to install, operate, maintain, or inspect a TDS-V8 inverter. It is recommended to keep this manual in secure and convenient place for any future reference.

■ ” WARNING” or “ CAUTION”

DANGER !

1. Be sure to turn off the main circuit power before any wiring work is to conduct.
2. Do not touch the circuit or replace any component right after turning off the power source until the ” CHARGE” LED off because of the high voltage still in the converter. (LED “Charge” lamp indicates that there is still some charge in the capacitor)
3. Never connect the output terminals U, V, W to AC power supply by mistake.
4. Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.
5. Always connect the ground lead E to ground.
6. Never apply high voltage test directly to the components within the inverter. (The semiconductor devices are vulnerable to high voltage shock).

WARNING

1. Install a (or more) cooling fan to keep the temperature below 45 ℃, when mounting the inverter in enclosure.
2. Never apply high voltage test directly to the components within the inverter. (The semiconductor devices are vulnerable to high voltage shock).
3. The CMOS IC on the control board is vulnerable to Electro-Static Discharge. Do not try to touch the control board.
4. All the parameters of the inverter have been preset at the factory. Do not change the settings unnecessarily except the case of special application.

CAUTION

1. Prior to installation, operation, and maintenance, read this manual thoroughly and make sure to be proceeded by qualified professional personnel.
2. Verify if the model types is the same as your expectation.
3. Do not install the converter with any damage or missing part.
4. Each inverter shall be attached with QC marking. Do not install the inverter without QC marking.

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1.TDS-V8 Handing Description

1-1 Inspection Procedure upon Receiving

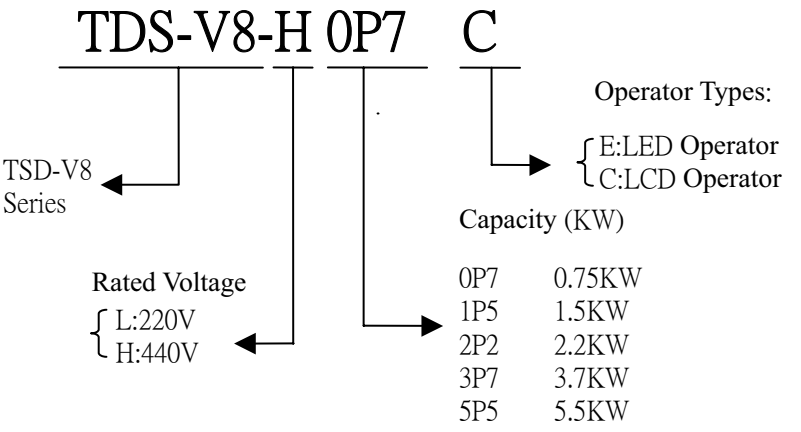
Before delivery, every TDS-V8 inverter has been properly adjusted and has passed a demanding factory test. After receiving the TDS-V8 inverter, the customer should follow the procedures listed below:

- Verify that the Model Number of the inverter you have received is the same as the Model Number listed on your purchase order. (Please read the Nameplate)
- Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your inverter.

■ Inverter Nameplate:

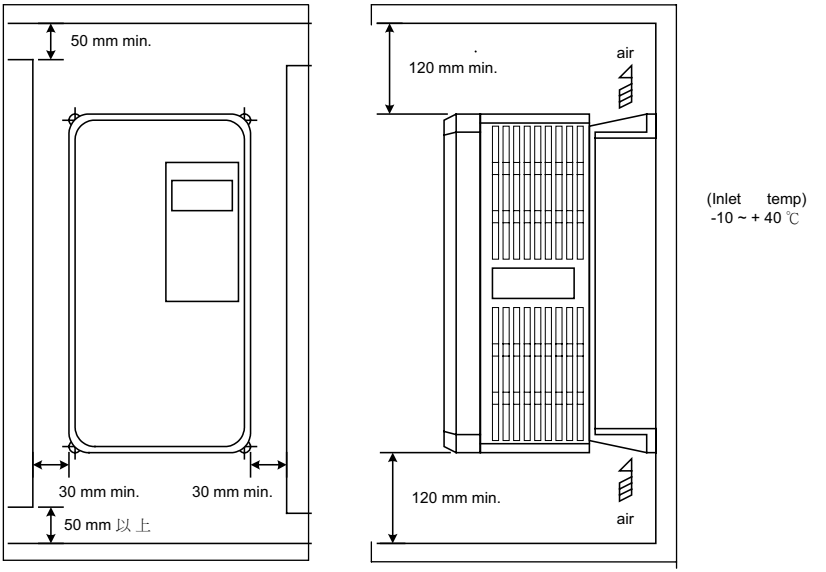
MODEL	**TDS-V8-H0P7C**	← Model No,.
INPUT	AC3PH，380~460V，50/60Hz	← Input Specification
OUTPUT	AC3PH，0~460V，0~400Hz，2.1KVA，2.6A	← Output Specification
MASS	2.0kg	← Weight
SER.NO.	**12345**	← Series No.
TEK-DRIVE CO., LTD. Made in Taiwan CE		

■ Inverter Model Number:



1-2 Installation Orientation and Space

When installing the inverter TDS-V8, always provide the following installation space to allow normal heat dissipation.



(a) Horizontal space (b) Vertical space

Fig 1 TDS-V8 Installation orientation and Space

1-3 Checking and Controlling the Installation Site

It is important for the installation site of inverter to achieve proper performance and normal operating life. Followings are the conditions need to be considered.

- Ambient temperature: －10℃ ～ ＋40 ℃
- Free from rain, moisture, and direct sunlight.
- Free from harmful mist, gases, liquids, dusts and metallic powder.
- Free from excessive oscillation and electromagnetic noise.
- If more than 1 inverter are installed in a box, be sure to add a cooling fan or air conditioner to maintain the air temperature below +45℃ 。

1-4 Stock Site (or warehouse) Notice:

The inverter, when not used, must be properly placed in the clean location where has or is

- Free from oil mist and dust
- Ambient temperature :-20℃ to +60℃
- Relative humidity below 90% RH with no condensation
- Free from harmful mists, gases, liquids, airborne dusts and metallic particles.
- Properly packaged on the on the case or table above the ground
- Not in direct sunlight

1-5 TDS-V8 Inverter Standard Specification

There are 2 voltage class types: 220V class and 440V class.

Input Voltage Class			220V Class												
			3 phase												
MODEL			TDS-V8-												
			0P7	1P5	2P2	3P7	5P5	7P5	011	015	018	022	030	037	045
Max. Applicable Motor Output (CT)*		HP	1	2	3	5	7.5	10	15	20	25	30	40	50	60
		kW	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45
Output Power	Rated Output Capacity (kVA)		2	2.7	4	7.5	10.1	13.7	20.6	27.4	34	41	54	68	78
	Rated Output Current (A)*		4.8	6.4	9.6	17.5	24	32	48	64	80	96	130	160	183
	Max. Output Voltage (V)		3 phase 200～230V (Proportional to input voltage)												
	Max. Output frequency(Hz)		Through parameter setting (0 Hz to 400Hz)												
Power Source	Rated Voltage, Frequency		3 Phase 200V～230V, 50/60Hz												
	Allowable Voltage Fluctuation		-15% ～ +10%												
	Allowable Frequency Fluctuation		±5%												
Control Characteristics	Operation Mode		LED operator or LCD operator。												
	Control Mode		Sinusoidal PWM												
	Frequency Control Range		0.1Hz～400Hz												
	Frequency Accuracy (varied with temperature)		Digital Command: ± 0.01%(-10 ～ +40℃) Analog Command: ± 0.1%, (25± 10℃)												
	Frequency Command Resolution		Digital Command: 0.01Hz Analog Command: 0.06Hz/60Hz												
	Frequency Output Resolution		0.01Hz												
	Overload Resistibility		(constant torque)150% Rated Current for 60 sec; (varied torque) 120% rated Current for 60 sec												
	Frequency Setting Signal		DC 0 ～ +10V / 4 ～ 20mA												
	Acc./Dec. Time		0.0 to 6000 Seconds (Independent Accel/Decel Time Settings)												
	Voltage-Frequency Characteristics		Adaptable V/f through parameter setting												
	Regeneration Torque		100%，2%ED，5 秒												
	Main Control Function		Auto Torque Boost, Slip Compensation, Restart After Momentary Power Loss, Energy-Saving, PID Control, RS-485 Communication, Simple PLC Function, Sensorless Vector Control												
	Extra Function		Up/Down Operation, 4 Different Sets of Fault Status Record (Including Latest One), Cumulative Power On & Operation Hour Memory, MODBUS Communication, Multiple-Pulse Output Ports, 2 Analog output port etc.												
Protection Function	Stall Prevention		During Acceleration/Deceleration and Constant Speed Operation (Current Level can be Selected During Acceleration and Constant Speed Operation. During Deceleration, Stall Prevention can be Enabled or Disabled)												
	Instantaneous Overcurrent (OC)		200% of Rated Output Current												
	Inverter overloads Protection(OL2)		Motor Coasts to Stop after 1 Minute at 150% Rated Output Current												
	Motor Overload (OL1)		Electronic Overload Protection												
	Over voltage(OV)		Motor Coasts to Stop if VDC > 410V (220V Class) or VDC > 820V (440V Class)												
	Low voltage(UV)		Motor Coasts to Stop if VDC < 200V (220V Class) or VDC < 400V (440V Class)												
	Momentary Power Loss Ride-Through time		Motor Coasts to Stop after Momentary Power Loss Lasting ≥ 15ms												
	Overheat (OH)		Protection by Thermistor												
	Grounding Protection (GF)		Protection by the DC Current Sensor												
	Charge Indication		Lit when the DC Bus Voltage ≧50V												
Mechanical Construction			Enclosed, Wall-Mounted Type (NEMA-1)												
Cooling			Self		Forced										
Weight(kg)			2	2	3.2	3.2	5.5	5.5	13.1	13.1	24.5	24.5	24.5		
Environmental Conditions	Location		Indoor (Protected from Corrosive Gases and Dust)												
	Ambient Temperature		-10 to +40℃ (Not Frozen)												
	Storage Temperature		-20 to +60℃												
	Humidity		Below 90%RH (Non-Condensing)												
	Altitude, Vibration		Below 3300ft. (1000m), 5.9m/S^2 (0.6G), (JISC0911 Standard)												
Communication Function			RS-485 Installed (MODBUS Protocol)												
EMI			Meets EN50081-2 (1994) With EMI Filter												
EMC Compatibility			Meets Pr EN50082-2												

Input Voltage Class		440V Class													
		3 phase													
MODEL		TDS-V8-													
		0P7	1P5	2P2	3P7	5P5	7P5	011	015	018	022	030	037	045	
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	kW	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	
Output Power	Rated Output Capacity (kVA)	2.1	2.7	4	7.5	10.1	13.7	20.6	27.4	34	41	54	68	82	
	Rated Output Current (A)*	2.6	4.0	4.8	8	12	16	24	32	40	48	64	80	96	
	Max. Output Voltage (V)	3 phase 380～460V (Proportional to input voltage)													
	Max. Output frequency(Hz)	Through parameter setting (0 Hz to 400Hz)													
Power Source	Rated Voltage, Frequency	3 Phase 380V～460V, 50/60Hz													
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	Overload Resistibility	(constant torque)150% Rated Current for 60 sec; (varied torque) 120% rated Current for 60 sec													
	Frequency Setting Signal	DC 0 ～ +10V / 4 ～ 20mA													
	Acc./Dec. Time	0.0 to 6000 Seconds (Independent Accel/Decel Time Settings)													
	Voltage-Frequency Characteristics	Adaptable V/f through parameter setting													
	Regeneration Torque	100%，2%ED，5seconds													
	Main Control Function	Auto Torque Boost, Slip Compensation, Restart After Momentary Power Loss, Energy-Saving, PID Control, RS-485 Communication, Simple PLC Function, Sensorless Vector Control													
	Extra Function	Up/Down Operation, 4 Different Sets of Fault Status Record (Including Latest One), Cumulative Power On & Operation Hour Memory, , MODBUS Communication, Multiple-Pulse Output Ports, 2 Analog Output Port etc.													
Protection Function	Stall Prevention	During Acceleration/Deceleration and Constant Speed Operation (Current Level can be Selected During Acceleration and Constant Speed Operation. During Deceleration, Stall Prevention can be Enabled or Disabled)													
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	Inverter overloads Protection(OL2)	Motor Coasts to Stop after 1 Minute at 150% Rated Output Current													
	Motor Overload (OL1)	Electronic Overload Protection													
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	Momentary Power Loss Ride-Through time	Motor Coasts to Stop after Momentary Power Loss Lasting ≥ 15ms													
	Overheat (OH)	Protection by Thermistor													
	Grounding Protection (GF)	Protection by the DC Current Sensor													
	Charge Indication	Lit when the DC Bus Voltage ≧50V													
Mechanical Construction		Enclosed, Wall-Mounted Type (NEMA-1)													
Cooling		Self		Forced											
Weight(kg)		2	2	3.2	3.2	5.5	5.5	13.1	13.1	24.5	24.5	24.5	40	40	
Environmental Conditions	Location	Indoor (Protected from Corrosive Gases and Dust)													
	Ambient Temperature	-10 to +40ºC (Not Frozen)													
	Storage Temperature	-20 to +60ºC													
	Humidity	Below 90%RH (Non-Condensing)													
	Altitude, Vibration	Below 3300ft. (1000m), 5.9m/S2 (0.6G), (JISC0911 Standard)													
Communication Function		RS-485 Installed (MODBUS Protocol)													
EMI		Meets EN50081-2 (1994) With EMI Filter													
EMC Compatibility		Meets Pr EN50082-2													

*:The Rated Output Current While In Continuous Operation

1- 6 Dimension

(A) Standard dimension: 220V/440V 1-10HP

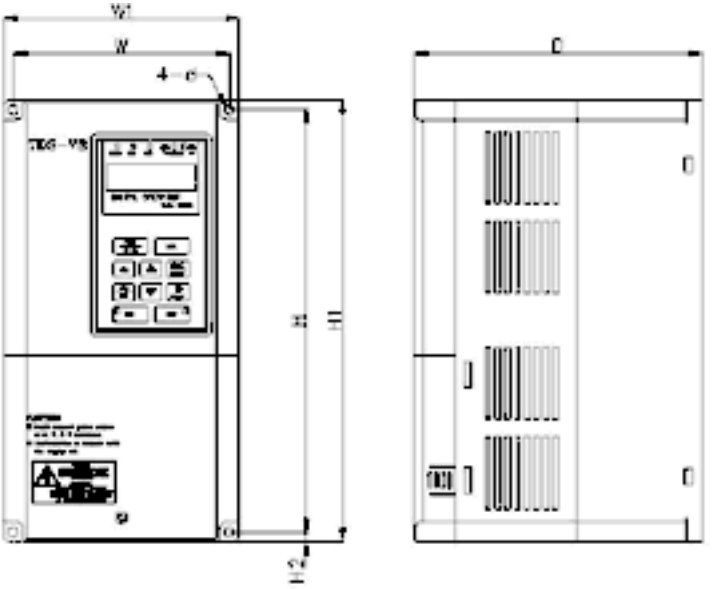


Fig 2(A)

Voltage	Max. Applicable Motor Output (HP)/KW	Mounting Dimensions (mm)				External Dimensions (mm)			Approx. Mass (kg)
		W	H	H2	D	W1	H1	D	
220V 3 ϕ	1HP／0.75KW	108	173	55	5	118	184	160	2.0
	2HP／1.5KW								
	3HP／2.2KW	133	260	6	5	145	273	170	3.2
	5HP／3.7KW								
	7.5HP／5.5KW	174	281	8	8	191	297	197	5.5
	10HP／0.75KW								
440V 3 ϕ	1HP／0.75KW	108	173	5.5	5	118	184	160	2.0
	2HP／1.5KW								
	3HP／2.2KW	133	260	6	5	145	273	170	3.2
	5HP／3.7KW								
	7.5HP／5.5KW	174	281	8	8	191	297	197	5.5
	10HP／0.75KW								

(B) 220V/440V 15HP above

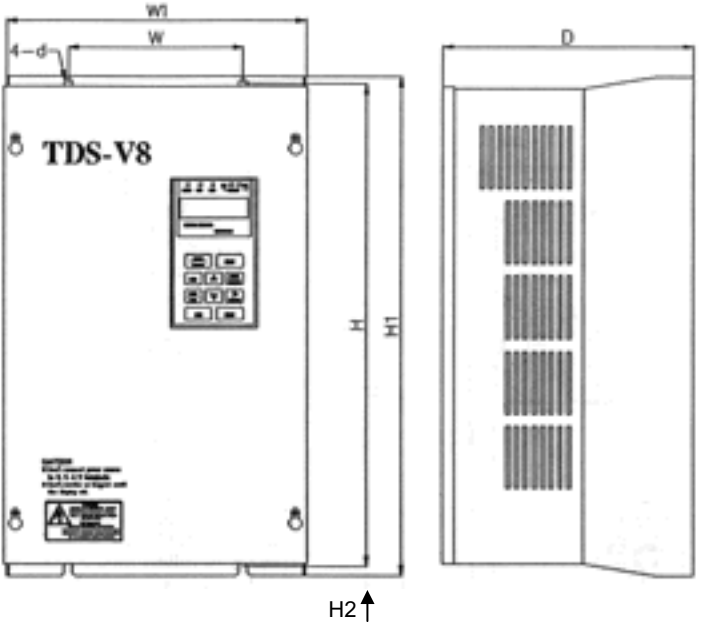


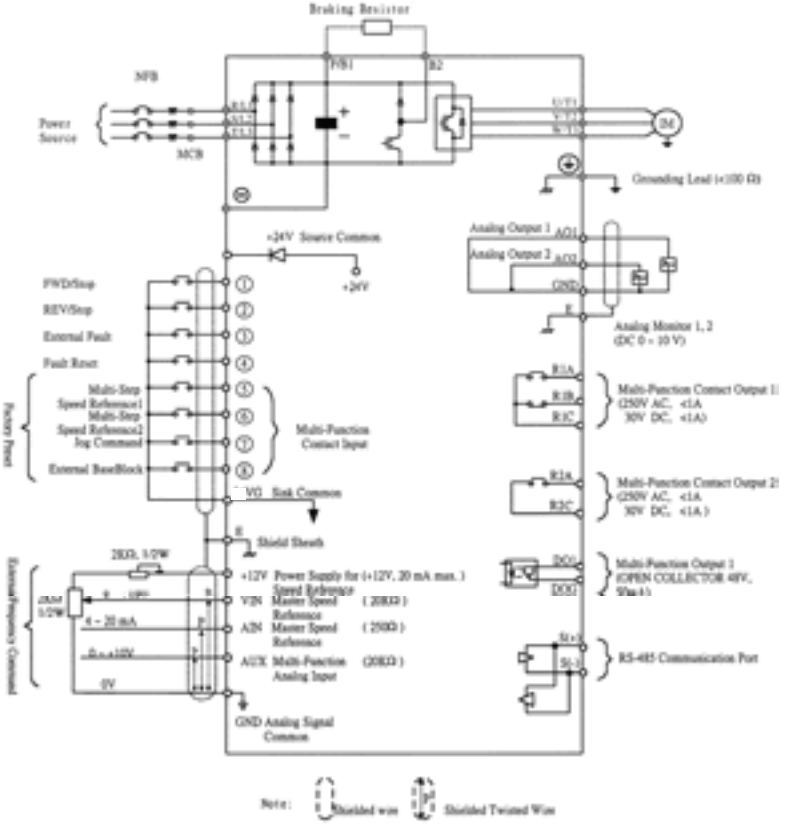
Fig 2(B)

Voltage	Max. Applicable Motor Output (HP)/KW	Mounting Dimensions (mm)				External Dimensions (mm)			Approx. Mass (kg)
		W	H	H2	d	W1	H1	D	
220V 3 ϕ	15HP/11KW	140	394	8	8	244	410	202	13.1
	20HP/15KW								
	25HP/18.5KW	170	479	12.5	10	287	504	273	24.5
	30HP/22KW								
	40HP/30KW								
	50HP/37KW								
	60HP/45KW								
440V 3 ϕ	15HP/11KW	140	394	8	8	244	410	202	13.1
	20HP/15KW								
	25HP/18.5KW	170	479	12.5	10	287	504	273	24.5
	30HP/22KW								
	40HP/30KW								
	50HP/37KW	250	575	12.5	12	364	600	290	40
	60HP/45KW								

2 wiring

2-1a Standard Connection Diagram

The standard connection diagram of TDS-V8 is shown in Fig 3a The sign ◎ indicates the power circuit terminal and the sign ◯ indicates control circuit terminal. The terminal arrangement for inverter 2.2KW and above is shown below



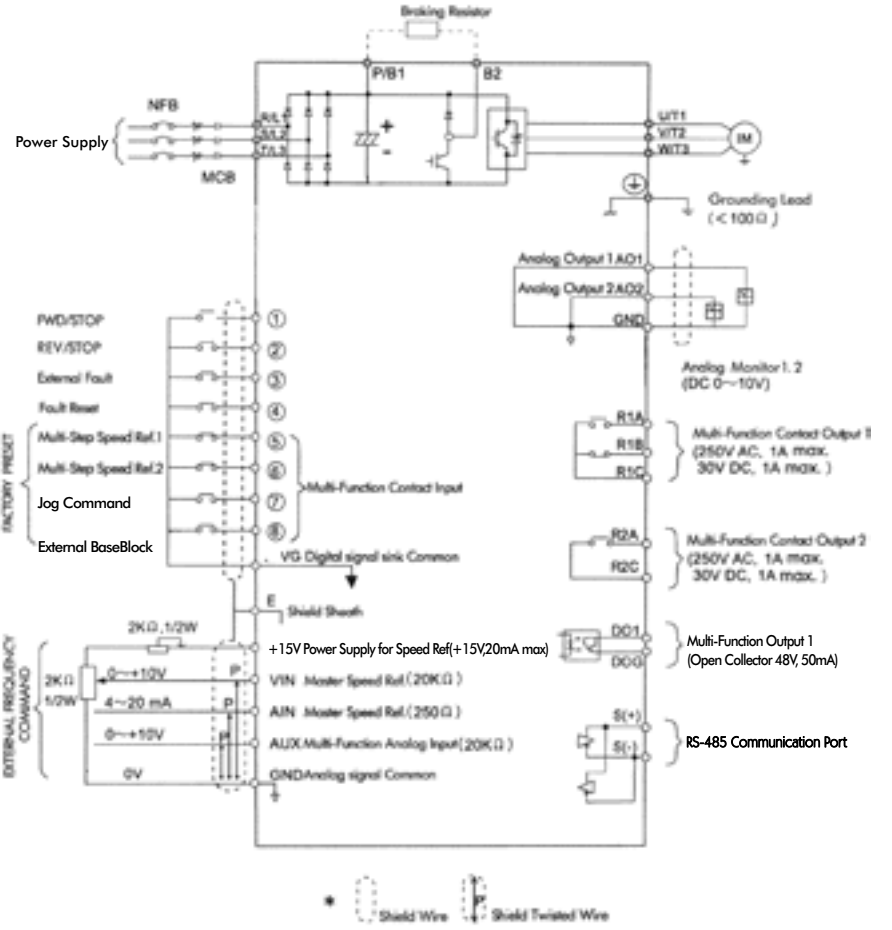
1	2	3	4	5	6	7	8	AO1	GND	DO1	S(+)
E	24V	VG	+12V	AIN	VIN	AUX	AO2	GND	DOG	E	S(-)

R1A	R1B	R1C	R2A	R2C

Fig 3a：TDS-V8standard connection diagram

2-1b Standard Connection Diagram

1.5KW and below



VG	5	6	7	8	15V	A01	A02	D01	D0G	R2A	R2C
	1	2	3	4	VIN	AIN	AUX	GND	GND	R1A	R1B	RIC

S-	S+

Fig 3b：TDS-V8,＜1.5KW Standard connection diagram

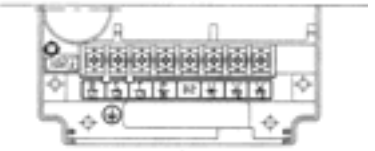
2-2 Description of Terminal Function

Table 1 Main circuit terminals

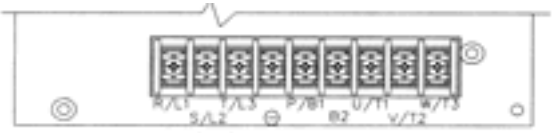
Terminal	Terminal Function
R/L1	Main circuit input power supply (For single phase power supply, please use R/L1, S/L2 as input terminal)
S/L2	
T/L3	
⊖	P/B1, B2: External braking resistor P/B1, ⊖ : DC power supply input P, ⊖ :18.5kw above (DC power supply input)
P/B1	
B2	
P	
U/T1	Inverter output
V/T2	
W/T3	
E	Grounding lead (3rd type grounding)

Main circuit terminal block configuration

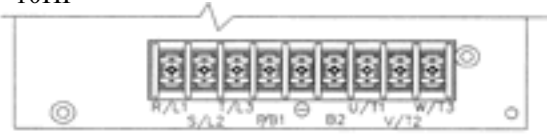
. 220V/440V 1HP～2HP



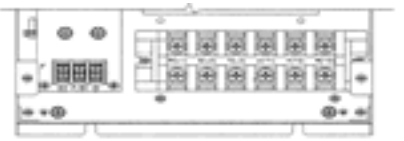
. 220V/440V 3HP～5HP



. 220V/440V 7.5HP～10HP



. 220V/440V 15HP～20HP



. 220V/440V 25HP～60HP

Table 2 Control circuit terminals

Terminals	Functions	
1	Forward Operation – Stop Signal	
2	Reverse Operation – Stop Signal	
3	External Fault Input	
4	Fault Reset	
5	Multifunction Input Terminal: 3 – Wire Operation, Local/Remote Control, Multi-Speed Select, FWD/Rev ACC/DEC Choice, ACC/DEC Halting, Base Block, Overheat Warn, PID Control, DC Braking, Speed Search, Up/Down Function, External Fault, Timer function, Multifunction Analog Input Setting.	
6		
7		
8		
VG	Digital Signal Ground Sink Common Point (Locate the short jumper of JP1 in 1-2 position) (NPN)	
24V	Digital Signal Ground Sink Common Point (Locate the short jumper of JP1 in 2-3 position (PNP)	
E	Connection to Shield Signal Lead(Frame Ground)	
+12V(+15V)	Power Supply for External Device	
VIN	Master speed Voltage Reference (0-10V)	
AIN	Master speed Current Reference (4-20mA)	
AUX	Auxiliary Analog Input: Auxiliary Frequency Command, Frequency Gain, Frequency Bias, Overtorque Detection, Output Voltage Bias, ACC/DEC Ramp, DC-Brake Current, Stall Prevention Current Level during Running Mode, PID Control, Lower-Bound of Frequency Command, Frequency-Jump-4, etc…	
GND	Analog Signal Common	
AO1	Analog Multi-Function Output Port: Frequency Command, Output Frequency, Output Current, Output Voltage, DC Voltage, PID Controlled Value, Analog Command Input of VIN, AIN or AUX.	
AO2		
GND	Common Lead for Analog Port	
R1A	Relay Contact R1 Output A	Digital Multi-Function Output: During-Running, Zero-Speed, Agreed-frequency, Agree-Frequency-Setting, Frequency Output, Invert-Operation-Ready, Under-voltage-Detections, Base Block, Frequency Command, Overtorque Detection, Frequency Command Invalid, Fault, Undervoltage, Overheat, Motor overload, Inverter Overload, During-Retry, Communication-Fault, Timer-Function-Output
R1B	Relay Contact R1 Output B	
R1C	Relay Contact R1 Common	
R2A	Relay Contact R2 Output A	
R2C	Relay Contact R2 Common	
DO1	Open-collector transistor's output	
DOG	Common terminal of open collector transistor	
S(+)	RS-485 Port	
S(-)		

Caution

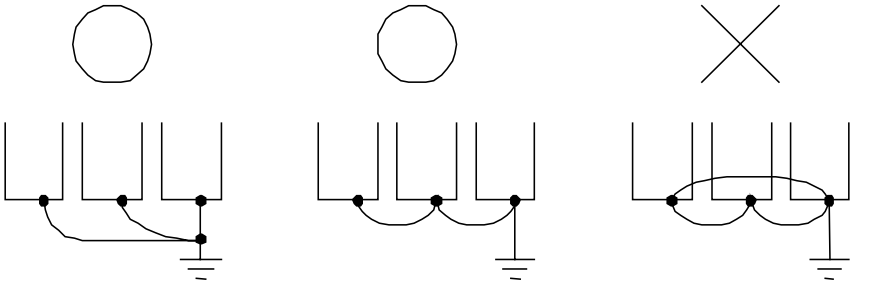
- Use the control circuit terminals VIN, AIN according to the setting of Sn-11.
- The maximum output current at terminal (+15V or +12V) is 20mA.
- The multi-function analog output terminals AO1, AO2 is a dedicated output for a frequency meter, ammeter, etc. Do not use these 2 analog outputs for feedback control or for any other control purpose.

2-3 Wiring between the inverter and peripheral devices and notice

1. Always use ground leads that comply with AWG standards and make sure the length is as short as possible. (refer Table 3)
2. Always check the output voltage and maximum current of the power source if it can handle the required power.
3. Never connect AC main circuit power supply to output terminals U/V1, V/T2 and W/T3.
4. Make sure all the screws properly tightened/fixed together
5. The MCCB (Molded-Case Circuit Breaker) should be installed between the AC power supply and input terminals R/L1-S/L2-T/L3 on the TDS-V8 inverter. The user can make his own decision whether or not to install a MC (Magnetic Contactor) block. When a ground fault interrupter is used, select the one with no influence for high frequency. Setting current should be 200mA or above and the operating time at 0.1 second or longer to avoid false triggering.

Grounding.

1. Always use the ground terminal (E) with a ground resistance of less than 100 ohm.
2. Never ground TDS-V8 with other devices such as welding machines, motors, and other large-current electrical equipment, or ground pole. Run the ground lead in separate conduit from leads for large-current electrical equipment.
3. Always use ground leads that comply with AWG standards and make sure the length is as short as possible.
4. When using several TDS-V8 inverters side by side, it is preferable to ground each unit separately to ground poles. However, connecting all the ground terminals of TDS-V8 in parallel while only grounding one of the TDS-V8's to the ground pole is also permissible. Be sure not to form a loop with the ground leads.



(a) Correct (b) Correct (c) Not Acceptable

Wiring Main Circuit Terminals:

1. Phase rotation of input terminals R/L1, S/L2, T/L3 is available in either direction. (Clockwise and Counter-Clockwise)
2. .Never connect AC main circuit power supply to output terminals U/V1, V/T2 and W/T3.
3. Connect the output terminals U/T1, V/T2, W/T3 to motor lead wires U/T1, V/T2, and W/T3, respectively.
4. Check that the motor rotates forward with the forward run source. Switch over any 2 of the output terminals to each other and reconnect if the motor rotates in reverse with the forward run source.
5. Never connect power factor correction capacitors or input side EMI/RFI filters to TDS-V8 output.

Wiring Control Circuit terminals:

1. After turning OFF the main circuit power supply, do not touch or change any circuit components until the LED "CHARGE" lamp has extinguished. (LED "Charge" lamp indicates that there is still some charge in the capacitor).
2. Never do wiring work or take apart the connectors in the inverter while the power is still on.
3. Separate the control circuit leads from the main circuit leads (R/L1, S/L2, T/L3, U/T1, V/T2, W/T3) and other power cables to prevent erroneous operation caused by noise interference. When necessary, try to have main-circuit wire and control circuit wire cross in 90 degree to avoid signal interference.
4. Separate the control circuit terminals leads RA-RB-RC (R1A-R1B-R1C) (contact output) from leads to terminals ①~⑧, A01, A02, GND, DO1, (R2A-R2C), DOG and 15V, VIN, AIN, AUX, GND, 12V
5. Use twisted-pair or shielded twisted-pair cables for control circuits to prevent operating faults. Process the cable ends as shown in Figure 3. The maximum wiring distance should not exceed 150 feet.
6. When the digital multi-function output terminals connect serially to an external relay, an anti-parallel freewheeling diode should be applied at both ends of the relay.
7. Never apply high voltage test directly to the components within the inverter. (The semiconductor devices are vulnerable to high voltage shock).
8. The CMOS IC on the control board is vulnerable to Electro-Static Discharge. Do not try to touch the control board.
9. If Sn-03 is set to 3,5,7 for 2-wire operation or if Sn-03 is set to 4,6,8 for 3-wire operation, the parameter settings will return to factory default settings. (Except for parameter settings in Sn-01 and Sn-02, they will remain at their modified settings). If the inverter is initially operated in 3-wire mode (Sn-03= 4,6,8), the motor will rotate in CCW direction after setting has been changed to 2-wire mode. (Sn-03= 3,5,7). Be sure that terminals 1 and 2 are OPEN to ensure protection against personal harm or injury and to prevent any potential damage to machines.
10. If the cable between the inverter and the motor is excessively long, the high-frequency leakage current will increase causing the inverter output current to increase as well. This may affect peripheral devices. To prevent this, adjust the carrier frequency as shown below.

Cable Length	< 100ft.	100-165ft.	166-328ft.	≥ 329ft.
Carrier Frequency (Cn-34)	15kHz max (Cn-34=6)	10kHz max (Cn-34=4)	5kHz max (Cn-34=2)	2.5kHz (Cn-34=1)

2-4 Wiring Main Circuit and Notice

The user should decide if it is necessary to install the non-fusible-breaker (NFB) and electromagnetic contactor block (MCB) between the AC source and the R, S, T input terminals. To protect against the false triggering of leakage-current , the user should install a leakage current breaker with amperage sensitivity ≧ 200 mA and operation time ≧ 0.1 sec.

Table 3 (a) 220V SERIES

Applicable Power Rating HP(KW) [NOTE1]	TDS-V8 Model		Wire Size(mm^2)			NFB [NOTE4]	MCB [NOTE4]
	Rated K V A	Rated current (A)	Main Circuit*2 [NOTE2]	Ground Wire E[G]	Control Wire*3 [NOTE3]		
1(0.75)	2	4.8	2～5.5	2～5.5	0.5～2	TO-50E (15A)	C-11L
2(1.5)	2.7	6.4	2～5.5	3.5～5.5	0.5～2	TO-50E (20A)	C-11L
3(2.2)	4	9.6	3.5～5.5	3.5～5.5	0.5～2	TO-50E (20A)	C-11L
5(3.7)	7.5	17.5	5.5	5.5	0.5～2	TO-50E (30A)	C-16L
7.5(5.5)	10.1	24	8	5.5～8	0.5～2	TO-100S (50A)	C-18L
10(7.5)	13.7	32	8	5.5～8	0.5～2	TO-100S (60A)	C-25L
15(11)	20.6	48	22	8	0.5～2	TO-100S (100A)	C-50L
20(15)	27.4	64	30	8	0.5～2	TO-100S (100A)	C-65L
25(18.5)	34	80	30	14	0.5～2	TO-225S (150A)	C-80G
30(22)	41	96	38	14	0.5～2	TO-225S (175A)	C-100L
40(30)	54	130	100	22	0.5～2	TO-225E (175A)	C-125G (170A)
50(37)	68	160	60*2P	22	0.5～2	TO-225E (200A)	C-125G (200A)
60(45)	78	183	60*2P	22	0.5～2	TO-225E (200A)	C-125G (235A)

Table 3 (b) 440V SERIES

Applicable Power Rating HP(KW) [NOTE1]	TDS-V8 Model		Wire Size(mm^2)			NFB [NOTE4]	MCB [NOTE4]
	Rated K V A	Rated current (A)	Main circuit [NOTE2]	Ground connection wire E[G]	Control wire*3 [NOTE3]		
1(0.75)	2.1	2.6	2～5.5	2～5.5	0.5～2	TO-50E (15A)	C-11L
2(1.5)	2.7	4.0	2～5.5	3.5～5.5	0.5～2	TO-50E (15A)	C-11L
3(2.2)	4	4.8	2～5.5	3.5～5.5	0.5～2	TO-50E (15A)	C-11L
5(3.7)	7.5	8	3.5～5.5	5.5	0.5～2	TO-50E (15A)	C-18L
7.5(5.5)	10.1	12	3.5～5.5	5.5～8	0.5～2	TO-100S (20A)	C-18L
10(7.5)	13.7	16	5.5	5.5～8	0.5～2	TO-100S (30A)	C-25L
15(11)	20.6	24	8～14	8	0.5～2	TO-100S (50A)	C-25L
20(15)	27.4	32	8～14	8	0.5～2	TO-100S (60A)	C-35L
25(18.5)	34	40	14	14	0.5～2	TO-225S (75A)	C-50G
30(22)	41	48	22	14	0.5～2	TO-225S (100A)	C-50L
40(30)	54	64	22	22	0.5～2	TO-225E (100A)	C-65G
50(37)	68	80	38	22	0.5～2	TO-225E (150A)	C-80L
60(45)	82	196	50	22	0.5～2	TO-225E (175A)	C-100L (170A)

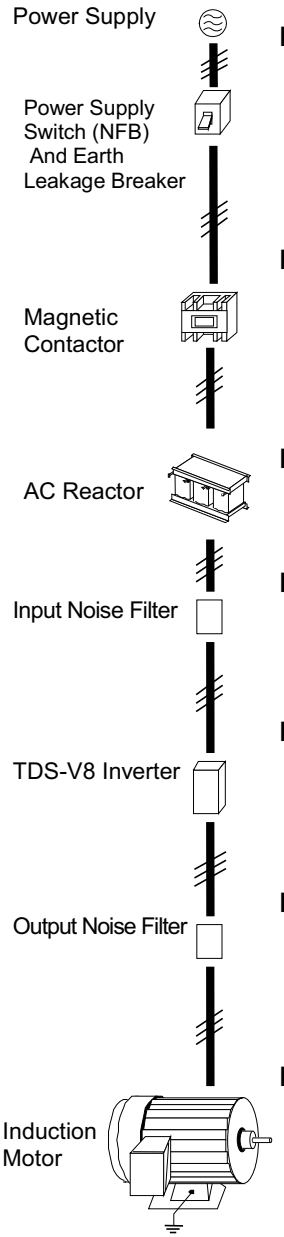
＊ 1 ：It is assumed constant torque load。

＊ 2 ：The main circuit has terminals of R(L1)、S(L2)、T(L3)、U(T1)、V(T2)、W(T3)、P/B1、⊖ 、B2、

＊ 3 ：The control wire is the wire led to the pin terminals of control board.

＊ 4 ：In Table 3 ,the specified Part No. of NFB and MCB are the item No. of the products of (Teco). The customer can use the same rating of similar products from other sources. To decrease the noise interference, be sure to add R-C surge suppressor(0.1uf/1000VDC,10Ω/5W) at the 2 terminals of coils of electromagnetic contractor.

Example of connection between the TDS-8V and typical peripheral devices are shown as below.



■ Power supply switch (NFB) and earth leakage breaker

- Refer to Table3, choose the power supply switch of proper current rating.
- Do not use the NFB as the switch that the inverter is used to control the running or stop of motor.
- When the earth leakage breaker installed to protect the leakage current fault, be sure the earth leakage breaker has the sensitivity amperage ≧ 200 mA and operation time ≧ 0.1 sec to avoid false-triggering.

■ Electromagnetic contactor

In normal operation, you don't need an electromagnetic contactor. However, you need to install an electromagnetic contactor while in the case of sequence control through the external device or automatically re-start after power outage.

Do not use the electromagnetic contactor as the switch that control the operation of running or stop.

■ AC reactor

- The AC-Side reactor on the input AC side can be improve the power factor and suppress the surge current.

■ Input noise filter

- TDS-V8 will comply with the EN55011 Class A regulation if an input noise filter is used。
- Please consult with the selection guide on Appendix " Noise filter at power supply side"

■ Inverter

- Input power supply can be connected to any terminals or terminals block.
- Please connect the ground terminal ⏚ to the site ground securely.

■ Output noise filter

- Install the noise filter to eliminate noise transmitted through the power line and the inverter so that the electromagnetic conductive noise and inductive noise can be reduced to an acceptable level.
- Please consult with the selection guide on Appendix "zero-phase noise filter"
-

■ Induction Motor

- If one inverter is drive more than one motor, the inverter's rated current should be much greater than the sum of total current of motors while in operation.
- The inverter and the motor should connect to the ground separatedly.

3. Using the LED Digital Operator

3.1 Functions of LED Digital Operator

The digital Operator has 2 modes: DRIVE mode and PRGM mode. When the inverter is stopped, DRIVE mode or PRGM mode can be selected by pressing the key PRGM/DRIVE. In DRIVE mode, the operation is enabled. In PRGM mode, the parameter settings for operation can be changed but the operation is not enabled. The component names and functions are shown below:

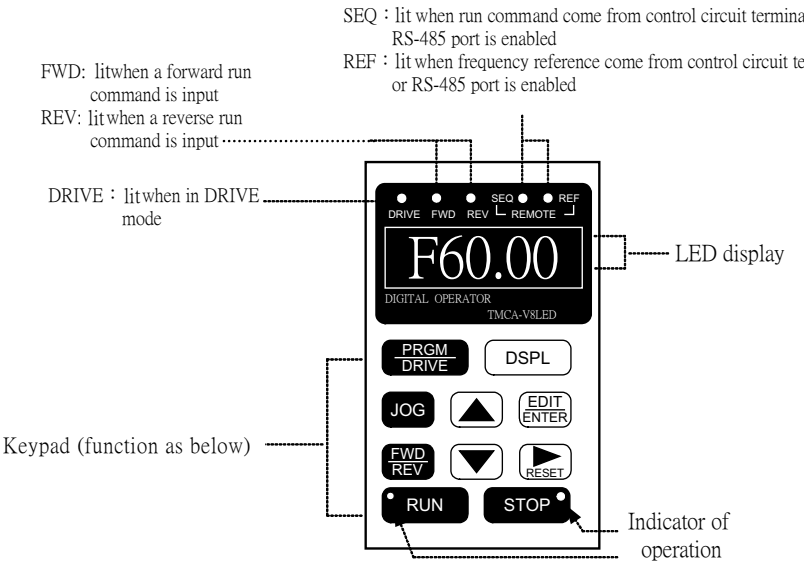
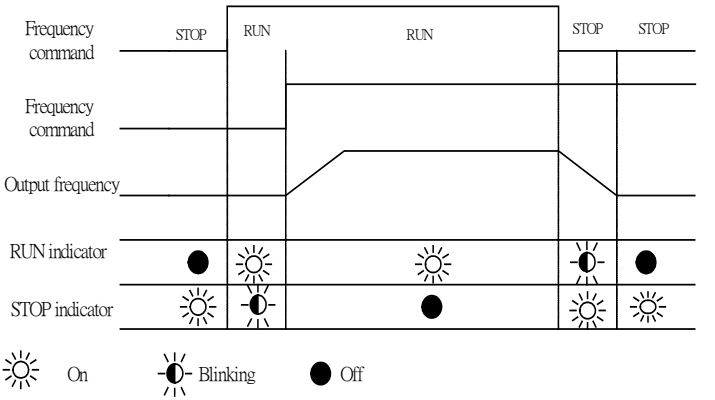


Fig LED Digital Operator

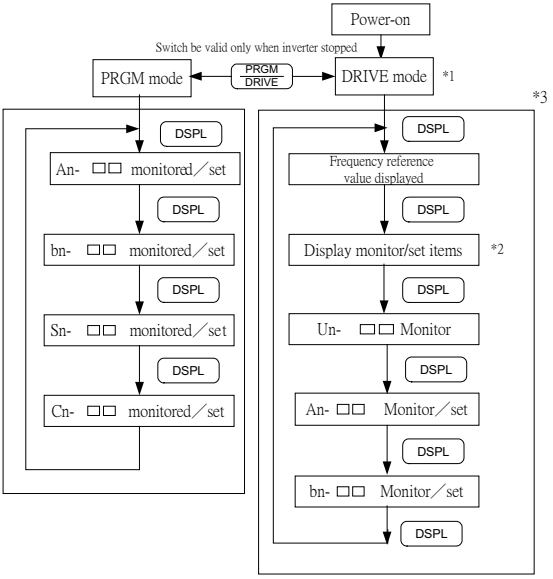
Key's function Table 4

Key	Name	Function
PRGM/DRIVE	PRGM/DRIVE Key	Switch between operation (PRGM) and operation (DRIVE)
DSPL	DSPL Key	Display operation status
JOG	JOG Key	Enable jog operation from LED digital operator in operation (DRIVE)
FWD/REV	FWD/REV Key	Select the rotation direction from LED digital operator.
RESET	SHIFT/RESET Key	Set the number of digital for user constant settings. Also It acts as the 'RESET' key when a fault has occurred.
▲	Increment Key	Select the menu items, groups, functions and user constant name, and increment set values.
▼	Decrement Key	Select the menu items, groups, functions and user constant name, and decrement set values.
EDIT/ENTER	EDIT/ENTER Key	Select the menu items, groups, functions and user constant name, and set values (EDIT). After finishing the above action, press the key.
RUN	RUN Key	Start inverter operation in (Drive) mode when the digital operator is used. The LED will light.
STOP	STOP Key	Stop inverter operation from LED digital operator. The key can be enabled or disabled by setting a constant (Sn-07) when operation from the control circuit terminal

* : RUN，STOP indicators lights or blinks to indicate the 3 operating status



■ DRIVE mode and PRGM mode displayed contents



*1：When the inverter is put into operation , the inverter system immediately enters into DRIVE mode.

The default displayed items can be set by bn-38. Press the PRGM DRIVE key, the system will switch into PRGM mode.

*2：The monitored items to be displayed can be selected by ▲ ▼ key .

*3：When in DRIVE mode, press the DSPL key and RESET key to monitor the setting values of Sn- and Cn- .

■ Parameter description

All parameters can be grouped as followings.

Parameter	Description
An-□□	Frequency command
bn-□□	Parameter settings can be changed during running
Sn-□□	System parameter settings
Cn-□□	Control parameter settings

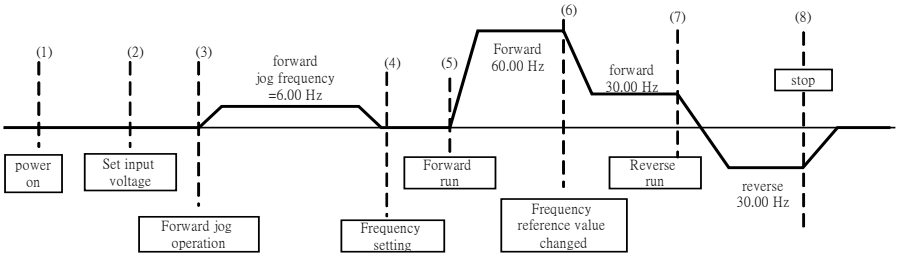
The parameter setting of Sn-03 (operation status) will determine if the setting value of different parameter groups are allowed to be changed or only to be monitored as shown below.

Sn-03	DRIVE mode		PRGM mode	
	To be set	To be monitored	To be set	To be monitored
0	An,bn	Sn,Cn	An,bn,Sn,Cn	
1	An	bn, Sn,Cn	An	bn,Sn,Cn

When in DRIVE mode, the parameter group Sn-, Cn- can only be monitored if the RESET key and DSPL key are to be pressed at the same time. After a few trial operation and adjustment, the setting value Sn-03 is set to be "1" so as not to be modified again..

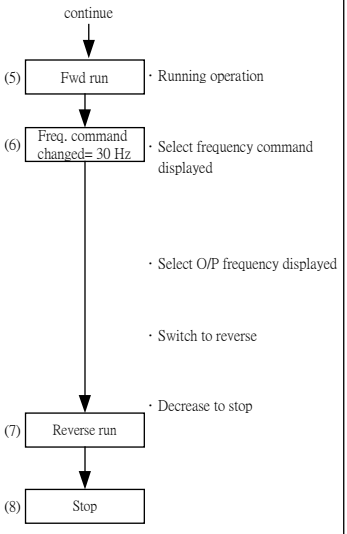
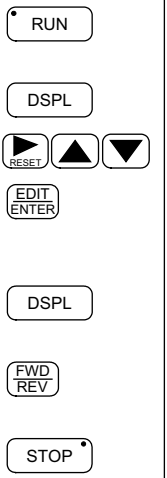
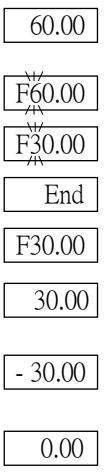
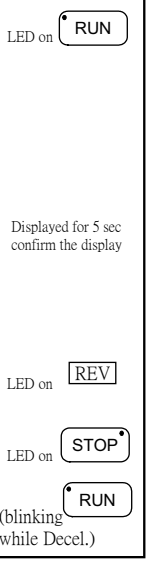
■ Sample example of using digital operator

This sample example will explain the operating of digital operator according to the following time chart.



■ Sample operation

Description	Key sequence	LED digital operator display	Remark
(1) When power on		F00.00	
	PRGM DRIVE	An -01	LED off DRIVE
(2) Input voltage setting (e.g., AC input voltage 380V)	DSPL (Press 3 times)	Cn -01	
	EDIT ENTER	440.0	
	RESET ▲ ▼	380.0	
	EDIT ENTER	End	Displayed for 5 sec. confirmed displayed
(3) Fwd. jog · Select drive mode	PRGM DRIVE	F00.00	LED on DRIVE
· Select output frequency displayed	DSPL	0.00	LED on FWD
· Select direction of rotation (when power-on, initially defaulted FWD)			
· Jog operation	JOG	6.00	
(4) Frequency setting = 60.00Hz · Select frequency command displayed	DSPL (Press for 6 times)	F00.00	
· Change frequency command	RESET ▲ ▼	F60.00	
· Set new frequency setting	EDIT ENTER	End	
· Select frequency command displayed		F60.00	Displayed for 5 sec Confirm displayed
Continue	DSPL	0.00	

Description	Key sequence	LED digital operator display	Remark
			

4. Parameter settings

4-1 Frequency command An-□□

An - □□ (in multi-speed operation) ¶ Under the DRIVE mode, the user can set the values.

Parameter No.	Name	Setting Range	Setting Unit*1	Factory Setting	User Setting	Ref. Page
An-01	Frequency Command 1	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-02	Frequency Command 2	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-03	Frequency Command 3	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-04	Frequency Command 4	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-05	Frequency Command 5	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-06	Frequency Command 6	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-07	Frequency Command 7	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-08	Frequency Command 8	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		62
An-09	Frequency Command 9	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		83
An-10	Frequency Command 10	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		84
An-11	Frequency Command 11	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-12	Frequency Command 12	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-13	Frequency Command 13	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-14	Frequency Command 14	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-15	Frequency Command 15	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-16	Frequency Command 16	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-17	Jog Frequency Command	0.00 ~ 400.00 Hz	0.01Hz	6.00 Hz		

*1.The displayed “Setting Unit” can be changed through the parameter Cn-28. At factory setting, the value of “Setting Unit” is 0.01 Hz.

∗ The setting of An-01~An-16 can be used with frequency command for Multi-step operation or for 16-stepAuto-Run Mode operation.

4-2 Parameters Can Be Changed during Running bn-□□

bn - □□	Parameters can be changed during Running					
Parameter No.	Name	Setting Range	Setting Unit*1	Factory Setting	User Setting	Ref. Page
bn-01	Acceleration Time 1	0.0～6000.0s	0.1s	10.0s		27
bn-02	Deceleration Time 1	0.0～6000.0s	0.1s	10.0s		
bn-03	Acceleration Time 2	0.0～6000.0s	0.1s	10.0s		
bn-04	Deceleration Time 2	0.0～6000.0s	0.1s	10.0s		
bn-05	Analog Frequency Cmd. VIN Gain	0.0～1000.0%	0.1%	100.0%		28
bn-06	Analog Frequency Cmd. VIN Bias	-100.0～100.0%	0.1%	0.0%		
bn-07	Analog Frequency Cmd. AIN Gain	0.0～1000.0%	0.1%	100.0%		
bn-08	Analog Frequency Cmd. AIN Bias	-100.0～100.0%	0.1%	0.0%		
bn-09	Multi-function Analog Input AUX Gain	0.0～1000.0%	0.1%	100.0%		
bn-10	Multi-function Analog Input AUX Bias	-100.0～100.0%	0.1%	0.0%		
bn-11	Multi-function Analog Output AO1 Gain	0.01～2.55	0.01	1.00		29
bn-12	Multi-function Analog Output AO2 Gain	0.01～2.55	0.01	1.00		
bn-13	PID Detection Gain	0.01～10.00	0.01	1.00		30
bn-14	PID Proportional Gain (P)	0.01～10.00	0.01	1.00		
bn-15	PID Integral Time (I)	0.00～100.00s	0.01s	1.00s		
bn-16	PID Differential Time (D)	0.00～1.00s	0.01s	0.00s		
bn-17	PID Bias	0～109%	1%	0%		
bn-18	Energy Saving Gain	50～150%	1%	100%		32
bn-19	Auto Torque Boost Gain	0.0～2.0	0.1	0.5		33
bn-20	Time Function ON_Delay Time	0.0～6000.0s	0.1s	0.0s		34
bn-21	Time Function OFF_Delay Time	0.0～6000.0s	0.1s	0.0s		
bn-22	1st _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		35,83, 84
bn-23	2nd _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-24	3rd _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-25	4th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-26	5th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-27	6th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-28	7th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-29	8th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-30	9th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-31	10th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		

bn - □□	Parameters can be changed during Running					
bn-32	11th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		35,83, 84
bn-33	12th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-34	13th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-35	14th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-36	15th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-37	16th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-38	Monitor	00～18	—	00		30

● bn - □□ Parameter Function

bn-01～bn-04：Accel. / Decel. Time					
Parameter No.	Name	Setting Range	Unit	Factory Setting	Function
bn-01	Acceleration Time 1	0.0～6000.0s	0.1s	10.0s	1. Acceleration time: the time required to go from 0% to 100% of the maximum output frequency. Deceleration time: the time required to go from 100 % to 0% of the maximum output frequency. 2. The acceleration and deceleration can be grouped as 2 sectors. The acceleration and deceleration of each sector can be set individually. The 2 sectors can be switched via the multi-function input terminal⑤～⑧. 3. Under some circumstances, the motor will vibrate in the beginning-accel. , beginning-decel. , ending-accel. or ending-decel. . Vibration can be reduced by these 4 different setting of the S-curve. Their settings are determined by the parameters of Cn-40~Cn-43. To extend their time (make larger values setting), you should refer Fig 4 for more details.
bn-02	Deceleration Time 1	0.0～6000.0s	0.1s	10.0s	
bn-03	Acceleration Time 2	0.0～6000.0s	0.1s	10.0s	
bn-04	Deceleration Time 2	0.0～6000.0s	0.1s	10.0s	

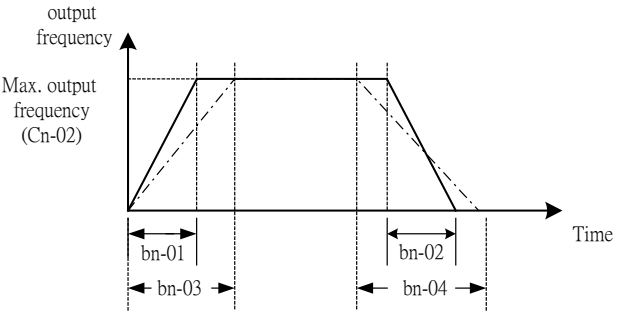


Fig 4 Acceleration time 1 and Deceleration time 2

bn-05～bn-10：Analog output setting					
Parameter No. & Name		Setting Range	Unit	Factory Setting	Function
bn-05	Analog frequency command VIN Gain	0.0～1000.0%	0.1%	100.0%	Analog voltage frequency command VIN gain：Input voltage range:0～10V， Analog current frequency command AIN gain：Input current range:4～20mA， Multi-function analog input AUX gain：Input voltage range:0～10V， For every different Analog Frequency Command (Voltage or Current) and Multi-Function Analog Inputs, their corresponding Gain and Bias are related as Fig 5.
bn-06	Analog frequency command VIN Bias	-100.0～100.0%	0.1%	0.0%	
bn-07	Analog frequency command AIN Gain	0.0～1000.0%	0.1%	100.0%	
bn-08	Analog frequency command AIN Bias	-100.0～100.0%	0.1%	0.0%	
bn-09	Multi-function Analog Input AUX Gain	0.0～1000.0%	0.1%	100.0%	
bn-10	Multi-function Analog Input AUX Bias	-100.0～100.0%	0.1%	0.0%	

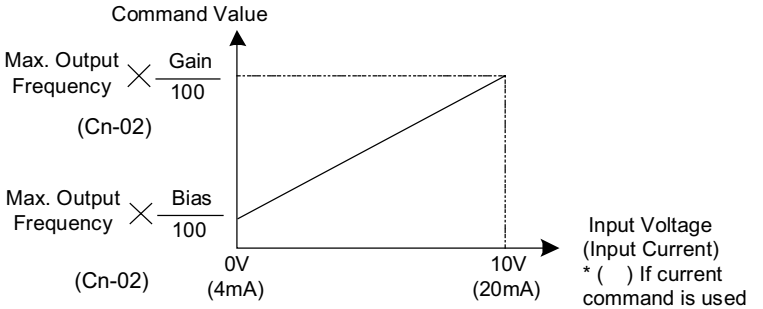


Fig 5 Analog input gain and bias

bn-11 & bn-12：Multi-Function Analog Output Gain					
Parameter No. & Name		Setting Range	Unit	Factory Setting	Function
bn-11	Multi-function Analog Output AO1 Gain	0.01～2.55	0.01	1.00	1. Multi-Function Analog Output AO1 and AO2 can be set upon Sn-34 & Sn-35 for their individual voltage level respectively. Their output range is 0~10V. 2. When the bn-11 & bn-12=1.00 and AO1& AO2 has output 10V, refer the "Multi-Function Analog output" for their detailed usage. 3. Users can set the gain respectively to modify the voltage. The resolution of max output is 10V/256.
bn-12	Multi-function Analog Output AO2 Gain	0.01～2.55	0.01	1.00	

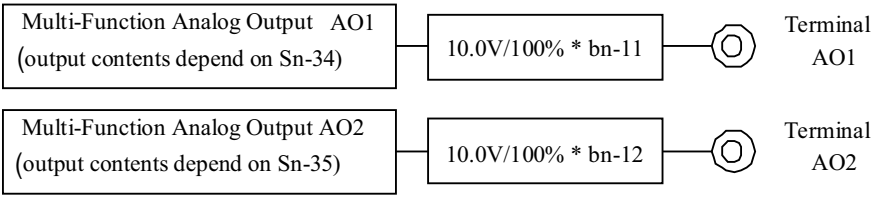


Fig 6 Multi-function Analog Output Gain

bn-13～bn-17：PID parameter setting					
Parameter No. & Name		Setting Range	Unit	Factory Setting	Function
bn-13	PID detection gain	0.01～10.00	0.01	1.00	1. The PID Control Function is a control system that matches the feedback value (i.e., a detected value) to the target value. Combining the Proportional (P), Integral (I) and Derivative (D) control enable the PID controller to achieve required response through the tuning procedure of PID Proportional Gain bn-14, PID Integral Time bn-15 and PID Derivative Time bn-16. 2. Please refer to Fig 7 of "Block diagram of PID Control". 3. To enable PID, set Sn-41=1. The detected value is obtained through the input terminals of master speed terminals (VIN & AIN). Its source of target value (frequency command) can be determined/selected from 1) operator 2) RS-485 3) AUX control terminal under the setting of Sn-05.(refer Sn-05). Note that if the target value is from the AUX multi-function analog terminal, the setting of Sn-29 is set as Sn-29=11. 4. Please refer to Fig 8 'Response of PID control for STEP-shape (deviation) input' for the meaning of the bn-13, bn-14, bn-15 and bn-16and how they work in PID control.。 5. If both the target value and feedback value are set to 0, make the inverter output frequency to zero by tuning the PID offset Bias bn-17.
bn-14	PID proportional gain (P)	0.01～10.00	0.01	1.00	
bn-15	PID integral time (I)	0.00～100.00s	0.01s	1.00s	
bn-16	PID differential time(D)	0.00～1.00s	0.01s	0.00s	
bn-17	PID Bias	0～109%	1%	0%	

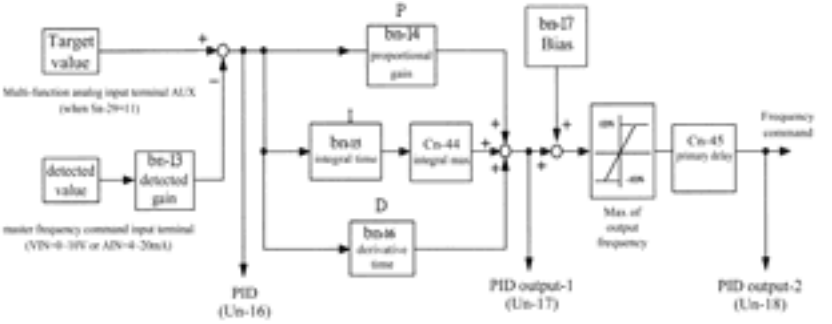


Fig 7 Block diagram for PID Control in inverter (set Sn-41=1) to enable PIDcontrol)

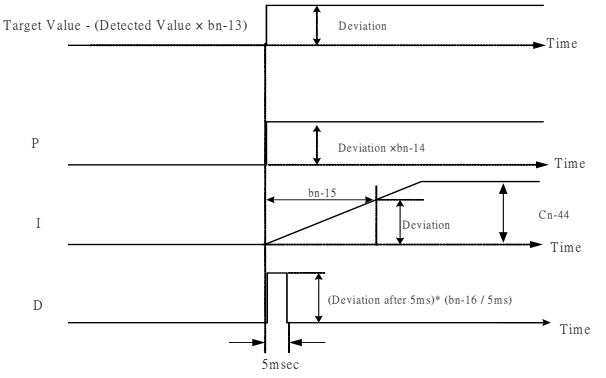


Fig 8 Response of PID control for STEP-shape (deviation) input

- Deviation = Target Value - Detected Value × bn-13.
- P's Control Output = Deviation × bn-14.
- I's Control Output will increase with time and the output will be equal to the deviation after time specified by parameter bn-15.
- The parameter Cn-44 will prevent the calculated value of the Integral Control (with the Integral Time bn-16) in the PID Control from exceeding the fixed amount.

- D's control output $= \left(\frac{\text{bn-16}}{\text{5 msec}} \right) \times (\text{5 msec difference})$

Note : To enable PID Function, parameter Sn-41 must be set to 1.

bn-18：Energy Saving Gain			Factory Setting	100%
Setting Range	Unit	Function		
50～150%	1%	1. The Energy Saving command can be used when the load torque is almost constant or is of quadratic-torque characteristic curve (decreasing torque), especially for pump/fan application. This command, when executed, will cause the inverter output voltage to be proportionally changed resulting in an energy saving. The bn-18 setting should be large enough to avoid stalling the motor. 2. The Energy Saving Function is disabled in the PID Closed-Loop Control, Vector Control and during Acceleration and Deceleration. 3. When bn-18 is 100%, the energy saving does not work. In Energy Saving Mode (bn-18 ≠ 100), the output voltage will automatically decrease and be proportional to Energy Saving Gain bn-18. To enable the Energy saving operation, the setting of bn-18 as 70% may result in quite a good energy saving.		

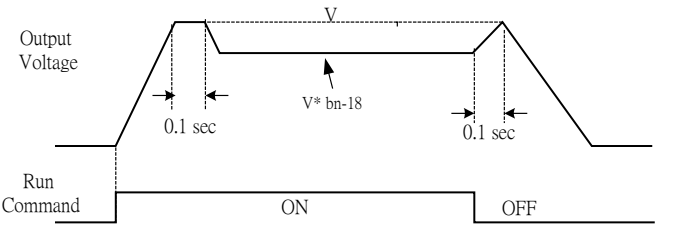


Fig 9 Time chart for energy-saving operation

bn-19：Auto torque boost gain			Factory Setting	0.5
Setting Range	Unit	Function		
0.0～2.0	0.1	1. The inverter can increase the output torque automatically to compensate the load increase through the Auto Torque Boost function. Then the output voltage will increase. As a result, the fault trip cases can be avoided. The energy efficiency is also improved. 2. The compensated torque is resulted by the setting of Cn-12, Cn-13 and bn-19 through the increase of output voltage. If the driven motor has smaller power capacity than its inverter, the setting of bn-19 can be adjusted larger (because the stored motor parameters of inverter are less than the real motor parameters.) 3. In the case that the wiring distance between the inverter and the motor is too long (e.g. more than 328ft.), the motor torque is a little short because of voltage drop of wiring cable. Increase the value of bn-19 gradually and make sure that the current will not increase too much. Usually no adjustment is required. 4. Increase the setting of bn-19, the starting torque will increase consequently. If the motor at starting suffers some vibration, decrease the setting of bn-19 gradually until the vibration is gone.		

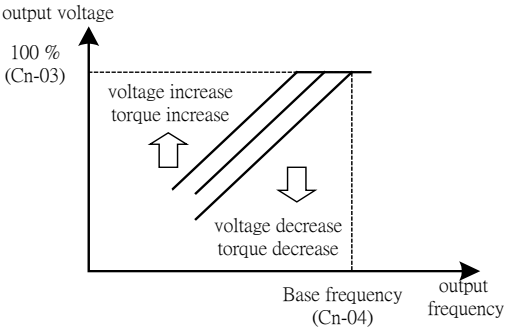


Fig 10 Adjust the auto torque boost gain

bn-20 & bn-21：Timer Function					
Parameter No. & Name		Setting Range	Unit	Factory Setting	Function
bn-20	Timer ON Delay Time	0.0～6000.0s	0.1s	0.0s	1 The Timer Function is enabled when the Multi-Function Input terminal⑤～⑧(setting of Sn-25~28=23) and its Timer Function output setting (Sn-30~32=18) are set for the Multi-Function Input and Output respectively. 2. These inputs and outputs serve as general-purpose I/O. Setting ON/OFF Delay Time (Bn-20/21) for the timer can prevent chattering of sensors, switches and so on. 3. When the Timer Function input ON time is longer than the value set for Bn-20, the Timer Function output turns ON. 4. When the Timer Function input OFF time is longer than the value set for Bn-21, the Timer Function output turns OFF. An example is shown in Fig 11.
bn-21	Timer OFF Delay Time	0.0～6000.0s	0.1s	0.0s	

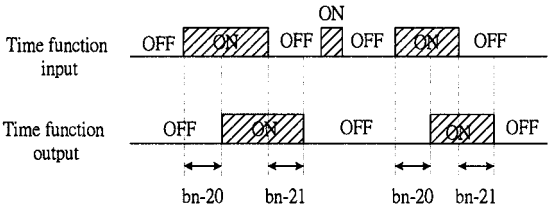


Fig 11 An operation example of timer function

bn-22～bn-37：Time setting in auto_run mode					
Parameter No. & Name		Setting Range	Unit	Factory Setting	Function
bn-22 ～ bn-37	1st~16th Step Time Under Auto Run Mode	0.0～ 6000.0s	0.1s	0.0s	In Auto Run Mode, the time setting for individual step is described on Page 68. (Auto Run Mode Selection and Enable (Sn-45)).

bn-38：Monitor			Factory Setting	00
Setting Range	Unit	Function		
00～18	—	When the inverter is pressed “RUN” and in “DRIVE” mode, the screen of operator will display the following items upon the setting bn-38 as below. bn-38=0：frequency command bn-38=1：output frequency bn-38=2：output current		

4-3 System parameter ----------Sn- □□

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-01	Basic Parameter Setting	Inverter Capacity Selection	Inverter Capacity Selection: 01～33 220V：01～13 440V：21～33	*1		43
Sn-02		V/F Curve Selection	V/F Curve Selection: 00～15 0～14：15 fixed V/Fcurve pattern 15：arbitrary V/F pattern selection	1		45
Sn-03	Parameter Initialization	Factory Setting Selection	Status of operation and initial setting：00～14 00：An-□□、Bn-□□、Sn-□□，Cn-□□setting & reading enabled 01：An-□□setting & reading enabled，Bn-□□、Sn-□□、Cn-□□reading only。 02：reserved 03：2-wire initialization，220V/440V 04：3-wire initialization，220V/440V 05：2-wire initialization，200V/415V 06：3-wire initialization，200V/415V 07：2-wire initialization，200V/380V 08：3-wire initialization，200V/380V 09～10：reserved 11：clear fault message 12～14：reserved	0		48
Sn-04	Operation Mode Selection 1	Run Source Selection	0：Operator 1：Control circuit terminal 2：RS-485 communication	0		49
Sn-05		Frequency Command Selection	0：Operator 1：Control circuit terminal 2：RS-485 communication	0		49
Sn-06		Stopping Method Selection	0：Deceleration to stop 1：Coast to stop 2：Whole-Range braking stop 3：Coast to stop with Timer	0		49
Sn-07	Operation Mode Selection 2	Priority of Stopping	If operation command from control terminal or RS-485 communication port 0：operator stop key effective 1：operator stop key not effective	0		51
Sn-08		Prohibition of REV Run	0：reverse run enabled 1：reverse run disabled	0		51
Sn-09		Scanning Times at input Terminal	0：scan and confirm once per 5 ms 1：continously scan and confirm twice per 10 ms	0		51

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-10		Output Frequency Up/Down Function	0：Reference frequency is changed through the key “UP/DOWN”pressing, later followed by key “ENTER”pressing, and then this output freq. will be acknowledged 1：Reference frequency will be acknowledged immediately after the key “UP/DOWN”pressing. No need to press “ENTER”key.	0		51
Sn-11	Operation Mode Selection 3	Frequency Command Characteristics Selection	0：voltage signal 0～10V (VIN) 1：addition of voltage signal and current signal (VIN+AIN) 2：subtraction of current signal and voltae signal (VIN-AIN) 3： current signal 4～20mA (AIN)	1		52
Sn-12		Frequency Command Characteristics Selection	0：Reference command has forward characteristics (0~10V or 4~20mA) 0~100% 1：Reference command has reverse characteristics (0～10V or 4～20mA) 100～0%	0		52
Sn-13		Zero speed braking function selection	0：Invalid 1：Valid	0		52
Sn-14		Output Voltage Limit Selection	0：Output voltage is limited 1：Output voltage is unlimited	0		53
Sn-15	Protection Characteristic selection 1	Stall prevention During Acc. Function Selection	0：invalid 1：valid	1		54
Sn-16		Stall prevention During Dec. Function Selection	0：invalid 1：valid	1		54
Sn-17		Stall prevention During Running Function Selection	0：invalid 1：valid─Deceleration time 1 (bn-02) 2：valid─Deceleration time 2 (bn-04)	1		54
Sn-18	Protection Characteristic selection	Restart after power outage operation selection	0：Stop running 1：Continue to run	0		55

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-19	Protection Characteristic Selection 2	Motor Overload Protection Selection	0：electronically motor overload protection invalid 1：standard motor cold start overload protection characteristics 2：standard motor hot start overload protection characteristics 3：special motor cold start overload protection characteristics 4：special motor hot start overload protection characteristics	1		56
Sn-20		Overtorque Detection Selection	0 : Overtorque detection function is not effective. 1 : Overtorque is detected only at frequency agree; the motor will sustain operation even after the overtorque has been detected 2 : Overtorque is detected only at frequency agree; the motor will stop after the baseblock time when the overtorque has been detected. 3 : Overtorque is detected during running (Accel.,Decel. included). The motor will sustain operation even after the overtorque has been detected. 4 : Overtorque is detected during running (Accel., Decel included). The motor will stop after the baseblock time when the overtorque has been detected.	0		57
Sn-21	External Fault Detection	Operation selection at fault contact during fault retrying	0 : Do not output fault retry. (The fault contact does not operate.) 1 : Output fault retry. (The fault contact operates.)	0		57
Sn-22		External Fault(Contact③) Contact Selection	0 : A-contact (normally open input) 1 : B-contact (normally closed input)	0		57 58
Sn-23		External Fault(Contact③) Detection Selection	0：Detection all time 1：detect only during operation	0		
Sn-24		External Fault Operation Selection	0 : Dec. to stop (upon dec. time 1 bn-02) 1 : Coast (free run) to stop 2 : Dec. to stop (upon dec. time 1 bn-04) 3 : Continue operating	1		

Sn - □□ System Parameters			¶ can not be monitored or changed during				
Parameter No.	Name		Description		Factory setting	User Setting	Ref. Page
Sn-25	Multi-function Digital Input Selection	Multi-function Input Terminal⑤ Function Selection	00～21	The factory setting is multi-function command 1	3		58
Sn-26		Multi-function Input Terminal⑥ Function Selection	01～22	The factory setting is multi-function command 2	4		
Sn-27		Multi-function Input Terminal ⑦ Function Selection	02～23	The factory setting is jog command	7		
Sn-28		Multi-function Input Terminal ⑧ Function Selection	03～24	The factory setting is Acc. &Dec. Interrupt	8		
Sn-29	Multi-function Analog Input Selection	Multi-function Analog Input (Aux) Selection	00～11	Multi-function analog input (Aux) as Auxiliary frequency command (factory setting)	0		68
Sn-30	Multi-function Digital Output Selection	Multi-function Output Terminal (R1A-R1B-R1C) Function Selection	00～25	Terminal (R1A-R1B-R1C) as fault output (factory setting)	10		71
Sn-31		Multi-function Terminal (DO1)Function Selection	00～25	Terminal (DO1-DOG) as digital output during running (factory setting)	0		
Sn-32		Multi-function Terminal (R2A-R2C) Function Selection	00～25	Terminal (R2A-R2C) as digital output at zero speed (factory setting)	1		
Sn-33		Pulse Output Multiplier Selection	When multi-function output terminal (DO1) is set as pulse signal output Setting Range：01～16		1		76

Sn - □□ System Parameters			¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-34	Multi-function Analog output Selection	Multi-function Analog output (AO1) Function Selection	Multi-function Analog output Selection：00～11 00： Freq. Cmd.	0		77
Sn-35		Multi-function Analog output (AO2) Function Selection	01： Output frequency 02： Output current 03： Output voltage 04： DC voltage 05： Output power 06： VIN External analog input command VIN 07： AIN External analog input command AIN 08： Aux Multi-function Analog input (Aux) 09： PID control input 10： PID control output 1 11： PID control output 2	1		
Sn-36	RS-485 Communication Function	RS-485 Inverter Address	Setting Range : 01～31	1		77
Sn-37		RS-485 Comm. Baud Rate Setting	0：1200 bps (bytes / per second) 1：2400 bps 2：4800 bps 3：9600 bps	3		
Sn-38		RS-485 Comm. Transmission Parity Setting	0： (No parity) 1： (even parity) 2： (odd parity)	0		
Sn-39		RS-485 Comm. Fault stop Selection	0：deceleration to stop (bn-02) 1：coast to stop 2：deceleration to top(bn-04) 3：continue to run	0		
Sn-40	Applied Function Selection	Load torque selection	0：constant torque (CT) 1：variable descending torque (VT)	0		79
Sn-41		PID Function	0：PID Invalid 1：PID Valid	0		79
Sn-42	Reserved					

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-43	Vector control selection	Motor parameters autotune selection	0：Autotune disabled 1 : Autotune enabled	0		79
Sn-44		Control mode	0：V/F control 1：Voltage vector control	0		81
Sn-45	Auto Run Mode	Operation Mode Selecton During Auto-Run	0：Auto-Run mode not effective 1：Auto-Run mode for one single cycle.(continuing running from the unfinished step if restarting) 2：Auto-Run mode be performed periodically.(continuing running from the unfinished step if restarting) 3：Auto-Run mode for one single cycle,then hold the speed of final step to run (continuing running from the unfinished step if restarting) 4：Auto-Run mode for one single cycle from the the initial step.(starting a new cycle if restarting) 5：Auto-Run mode performed periodically. (starting a new cycle if restarting) 6：Auto-Run mode for one single cycle,then hold the speed of final step to run (starting a new cycle if restarting)	0		82
Sn-46		Auto-Run Mode Operation Selection 1	0： stop 1： forward 2： reverse	0		82
Sn-47		Auto-Run Mode Operation Selection 2		0		
Sn-48		Auto-Run Mode Operation Selection 3		0		
Sn-49		Auto-Run Mode Operation Selection 4		0		
Sn-50		Auto-Run Mode Operation Selection 5		0		
Sn-51		Auto-Run Mode Operation Selection 6		0		
Sn-52		Auto-Run Mode Operation Selection 7		0		
Sn-53		Auto-Run Mode Operation Selection 8		0		
Sn-54		Auto-Run Mode Operation Selection 9		0		

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-55		Auto-Run Mode Operation Selection 10		0		82
Sn-56		Auto-Run Mode Operation Selection 11		0		
Sn-57		Auto-Run Mode Operation Selection 12		0		
Sn-58		Auto-Run Mode Operation Selection 13		0		
Sn-59		Auto-Run Mode Operation Selection 14		0		
Sn-60		Auto-Run Mode Operation Selection 15		0		
Sn-61		Auto-Run Mode Operation Selection 16		0		

*1: The factory settings are different depending on the different capacity of inverters

● Sn - □□ Parameter Function:

Sn-01： Inverter capacity selection		Factory Setting	*
Settiing Range		Function	
220V Class	01～13	1. Whenever the control board of inverter changed, the new seting of Sn-01 should be entered again based upon its real power capacity. If the setting of voltage class (220/440V) is not correct, an error message 'oPE01' will be shown on the display.	
440V Class	21～33	2. Whenever the setting Sn-01 has been changed, the inverter system parameter settings should be changed based upon the Constant Torque (CT) load (setting of Sn-40= 0) or Variable Torque (VT) load (Sn-40= 1). The resulted inverter system parameter settings will be as follows.	

Table 5　220VClass Inverter Capacity Selection

Sn-01setting			01		02		03		04		05		06		07	
Item name \ CT & VT			CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT
Inverter rated capacity(KVA)			2		2.7		4		7.5		10.1		13.7		20.6	
Inverter rated current(A)			4.8		6.4		9.6		17.5		24		32		48	
Max.applicable capacity(HP)			1	2	2	3	3	3	5	7.5	7.5	10	10	10	15	20
Factory setting	Cn-09	Motor rated current (A)	3.4	6.1	6.1	8.7	8.7	8.7	14.6	20.1	20.1	25.1	25.1	25.1	36.7	50.3
	Cn-12	Motor line impedance (Ω)	5.732	2.407	2.407	1.583	1.583	1.583	0.684	0.444	0.444	0.288	0.288	0.288	0.159	0.109
	Cn-13	Core loss torque compensation (W)	64	108	108	142	142	142	208	252	252	285	285	285	370	471
	Cn-34	Carrier freq. (kHz)	15	10	15	5	15	15	15	5	15	10	15	15	10	5
	Cn-37	Min. baseblock time(s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	Sn-02	V/f curve	01	07	01	07	01	07	01	07	01	07	01	07	01	07

Sn-01 setting			08		09		10		11		12		13	
Item name \ CT & VT			CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT
Inverter rated capacity(KVA)			27.4		34		41		54		68		78	
Inverter rated current(A)			64		80		96		130		160		183	
Max.applicable capacity(HP)			20	25	25	30	30	40	40	50	50	60	60	75
Factory setting	Cn-09	Motor rated current (A)	50.3	62.9	62.9	72.9	72.9	96.7	96.7	124	124	143.5	143.5	183.5
	Cn-12	Motor line impedance (Ω)	0.109	0.077	0.077	0.060	0.060	0.041	0.041	0.033	0.033	0.028	0.028	0.019
	Cn-13	Core loss torque compensation (W)	471	425	425	582	582	536	536	641	641	737	737	790
	Cn-34	Carrier freq. (kHz)	10	5	10	5	10	5	10	5	10	5	10	5
	Cn-37	Min. baseblock time(s)	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Sn-02	V/f curve	01	07	01	07	01	07	01	07	01	07	01	07

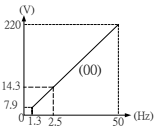
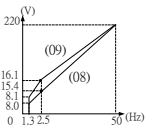
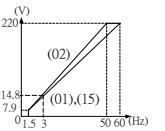
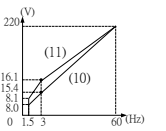
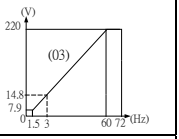
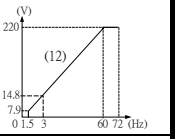
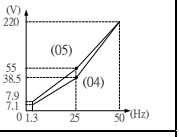
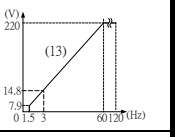
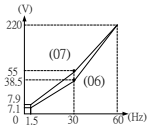
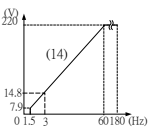
Table 6　440VClass Inverter Capacity Selection

Sn-01 setting			21		22		23		24		25		26		27	
Item name \ CT & VT			CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT
Inverter rated capacity(KVA)			2.1		2.7		4		7.5		10.1		13.7		20.6	
Inverter rated current(A)			2.6		4.0		4.8		8		12		16		24	
Max.applicable capacity(HP)			1	2	2	3	3	3	5	7.5	7.5	10	10	15	15	20
Factory setting	Cn-09	Motor rated current (A)	1.7	2.9	2.9	4.0	4.0	4.0	6.8	10.1	10.1	12.6	12.6	18.6	18.6	24.8
	Cn-12	Motor line impedance (Ω)	22.927	9.629	9.629	6.333	6.333	6.333	2.735	1.776	1.776	1.151	1.151	0.634	0.634	0.463
	Cn-13	Core loss torque compensation (W)	64	108	108	142	142	142	208	252	252	285	285	370	370	471
	Cn-34	Carrier freq. (kHz)	15	10	15	5	15	15	15	5	15	10	15	5	10	5
	Cn-37	Min. baseblock time(s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	Sn-02	V/f curve	01	07	01	07	01	07	01	07	01	07	01	07	01	07

Sn-01 setting			28		29		30		31		32		33	
Item name \ CT & VT			CT	VT	CT	VT	CT	VT	CT	VT	CT	VT	CT	VT
Inverter rated capacity(KVA)			27.4		34		41		54		68		82	
Inverter rated current(A)			32		40		48		64		80		96	
Max.applicable capacity(HP)			20	25	25	30	30	40	40	50	50	60	60	75
Factory setting	Cn-09	Motor rated current (A)	24.8	31.1	31.1	36.3	36.3	48.7	48.7	59.0	59.0	70.5	70.5	80.0
	Cn-12	Motor line impedance (Ω)	0.436	0.308	0.308	0.239	0.239	0.164	0.164	0.133	0.133	0.110	0.110	0.074
	Cn-13	Core loss torque compensation (W)	471	425	425	582	582	536	536	641	641	737	737	790
	Cn-34	Carrier freq. (kHz)	10	5	10	5	10	5	10	5	10	5	10	5
	Cn-37	Min. baseblock time(s)	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Sn-02	V/f curve	01	07	01	07	01	07	01	07	01	07	01	07

Sn-02：V/F Curve		Factory Setting	1
Setting Range		Function	
Fixed V/F curve	00～14	Set the Inverter Input Voltage (Cn-01) to match the power supply voltage. The V/F Curve can be set as belows. When Sn-02= 00~14 : 15 preset curve patterns can be used. Then, the settings of Cn-03～Cn-08 will not be used.	
Arbitrary V/F curve	15	When Sn-02=15, the V/F curve can be set/dertermined through setting the parameters of Cn-01~Cn-08. Please refer to the parameters Cn-02～Cn-08	

Table 7 the fixed V/F curve for 1~2 Hp **220V** (Cn-01) class inverter
(double the values for 440 V class inverter)

Purpose	Specifications		Sn-02	V/F Pattern*1	Purpose	Specifications		Sn-02	V/F Pattern*1
General Purpose	50Hz		00		High starting torque *2	50Hz	Low starting torque	08	
							High starting torque	09	
	60Hz	60Hz Saturation	01			60Hz	Low starting torque	10	
		50Hz Saturation	02				High starting torque	11	
	72Hz		03		Rated Output Operation (Machine tool)	90Hz		12	
Variable Torque Characteristics	50Hz	Variable Torque 1	04			120Hz		13	
		Variable Torque 2	05						
	60Hz	Variable Torque 3	06			180Hz		14	
		Variable Torque 4	07						

*1 Consider the following items as conditions for selecting aV/F pattern:

(1) The voltage and frequency characteristic of motor

(2) The maximum rotation speed of motor

*2 Select high starting torque only in the following conditions.Normally, the selection if not required.

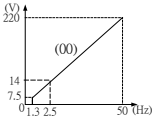
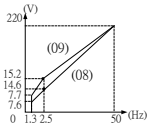
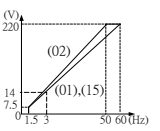
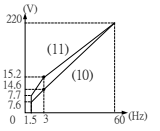
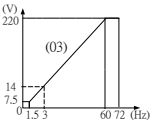
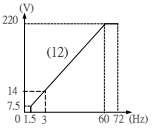
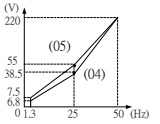
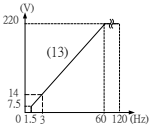
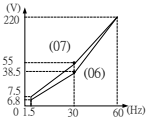
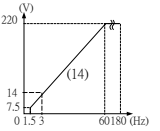
(1) The winding distance is long (150m and above)

(2) 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 maximum applicable inverter is used.

Table 8 The fixed V/F curve for 3-60 HP,220V (Cn-01) class inverter
(double the values for 440 V class inverter)

<table>
<tr><th>Purpose</th><th colspan="2">Specifications</th><th>Sn-02</th><th>V/F Pattern*1</th><th>Purpose</th><th colspan="2">Specifications</th><th>Sn-02</th><th>V/F Pattern*1</th></tr>
<tr><td rowspan="6">General Purpose</td><td colspan="2">50Hz</td><td>00</td><td>  </td><td rowspan="6">High starting torque*2</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>08</td><td rowspan="2">  </td></tr>
<tr><td>High starting torque</td><td>09</td></tr>
<tr><td rowspan="2">60Hz</td><td>60Hz Saturation</td><td>01</td><td rowspan="2">  </td><td rowspan="2">60Hz</td><td>Low starting torque</td><td>10</td><td rowspan="2">  </td></tr>
<tr><td>50Hz Saturation</td><td>02</td><td>High starting torque</td><td>11</td></tr>
<tr><td colspan="2">72Hz</td><td>03</td><td>  </td><td rowspan="5">Rated output Operation (Machine Tool)</td><td colspan="2">90Hz</td><td>12</td><td>  </td></tr>
<tr><td rowspan="3">Variable Torque Characteristics (fan, pump, etc.)</td><td rowspan="2">50Hz</td><td>Cubic decreasing curve</td><td>04</td><td rowspan="2">  </td><td colspan="2">120Hz</td><td>13</td><td rowspan="2">  </td></tr>
<tr><td>Quadratic decreasing curve</td><td>05</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic decreasing curve</td><td>06</td><td rowspan="2">  </td><td colspan="2">180Hz</td><td>14</td><td rowspan="2">  </td></tr>
<tr><td>Quadratic decreasing curve</td><td>07</td></tr>
</table>

Sn-03：Factory Setting Selection				Factory Setting	0
Setting Value	Function	Description			
00	Set parameter Sn-03 to 00 or 01 to determine the access status.	DRIVE mode	Set：An、bn ；Read Only：Sn,Cn		
		PRGM mode	Set：An、bn、Sn、Cn ；Read Only：An、bn、Sn、Cn		
01		DRIVE mode	Set：An ；Read Only：bn、 Sn、Cn		
		PRGM mode	Set：An ；Read Only：bn、Sn、Cn		
02	reserved				
03～08	With the exception of parameters Sn-01~02 and Sn-40, the parameter groups of An-□□, bn-□□, Cn-□□ and Sn-□□ can be initialized as factory setting according to the different input voltage. At the same time, terminals ⑤~⑧ can be set for 2-wire or 3-wire operation mode with different settings of Sn-03. Please refre to the below table.				
09～10	reserved				
11	To clear fault memory.				
12～14	reserved				

Sn-03	Function		Description
	Outter Operation Terminals Initialized	Motor input volatge (by the nameplate of motor)	
03	2-wire	220V/440V，60Hz	1. The parameter groups of An-□□ ，bn-□□ ，Cn-□□ ，Sn-□□ (except Sn-01～02 及 Sn-40)can be initialized as factory setting according to the different input voltage. (220V/440V,60Hz 、200V/415V,50Hz or 200V/380V,50Hz) 2. At the same time , the terminals ⑤～⑧ can be set as 2-wire or 3-wire operation mode under different setting of Sn-03.
04	3-wire	220V/440V，60Hz	
05	2-wire	200V/415V，50Hz	
06	3-wire	200V/415V，50Hz	
07	2-wire	200V/380V，50Hz	
08	3-wire	200V/380V，50Hz	

Sn-04：Run Source selection			Factory setting	0
Setting Value	Command Source	Description		
0	Digital operator	The source of run command (RUN/STOP, FWD/REV)is from the digital operator.		
1	Control circuit terminal	1. The run source is from the control circuit terminals. 2. Under the initial seting of 3-wire operation, the run source wull be RUN,STOP, FWD / REV 3. Under the initial seting of 3-wire operation, the run source wull be FWD/STOP, REV/STOP 4. For more details , see “2-/3- wire operation”		
2	RS-485 communication	Run Source (RUN/STOP, FWD/REV) is controlled by RS-485 communication.		

Sn-05：Frequency Command Setting Method Selection		Factory setting	0
Setting	Command Source	Description	
0	Digital operator	Frequency command is from the input of digital operator.	
1	Control circuit terminal	Frequency command is from the input of control circuit terminal.	
2	RS-485 communication	Frequency command is from the input of RS-485 communication.	

Sn-06：Stopping method selection		Factory setting	0
Setting	Method to Stop	Description	
0	Deceleration to stop	Deceleration to a stop at a rate set with the selected deceleration time (bn-02 or bn-04)	
1	Coast to stop	After the stop command is input, run source is discharged until the Min. baseblock time Cn-37 has elapsed.	
2	Whole range DC injection braking stop	After the stop command is input and the minimum baseblock time (Cn-37) has elapsed, DC injection braking is applied and the motor stopped. The DC injection braking time depends upon the output frequency when stop commands is input and the “DC injection time at stop “ setting (Cn-16) as shown in Fig.14.	
3	Coast to stop with timer	After the stop command is input, run sources are disregarded until the time T1 has elapsed .The time T1 depends upon the output frequency when the stop command is input and the deceleration time (bn-02 or bn-04)	

1. Deceleration to stop (Sn-06＝0)

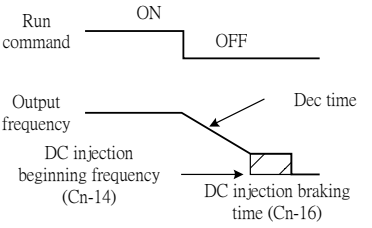


Fig 12 Deceleration to Stop

2. Coast to stop (Sn-06＝1)

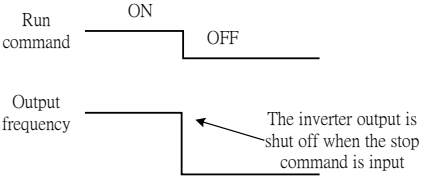


Fig 13 Coast to Stop

3. Whole range DC injection braking stop (Sn-06＝2)

- Lengthen the minimum baseblock time(Cn-37) when an overcurrent (OC) occurs during stopping. When the power to an induction motor is turned OFF, the counter-electromotive force generated by the residual magnetic field in the motor can cause an overcurrent to be detected when DC injection braking stop is applied.

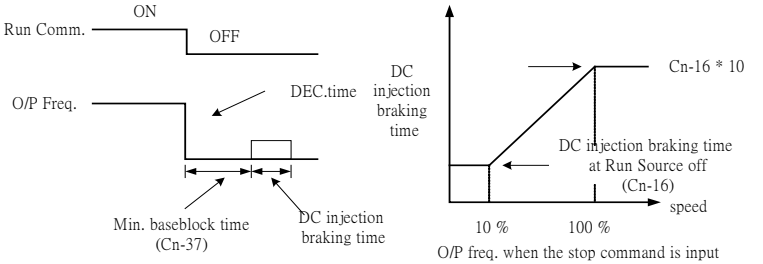


Fig 14 Whole range DC injection braking stop

4. Coast to stop with timer (Sn-06＝3)

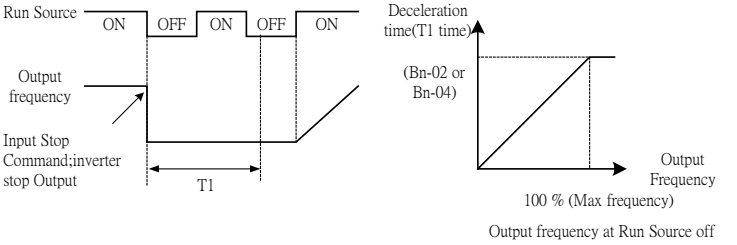


Fig 15 Coast to stop with timer

Sn-07：Priority of Stopping			Factory setting	0
Setting	Function	Description		
0	Valid	The parameter enable or disable the STOP key on the digital operator when the run source is from an control circuit terminal or RS-485 communication port while the motor is running		
1	Invalid			

Sn-08：Prohibition of REV run			Factory setting	0
Setting	Function	Description		
0	Reverse allowed	Set if the reverse run of motor is allowed		
1	Reverse not allowed			

Sn-09：Scan times at input terminal			Factory setting	0
Setting	Function	Description		
0	1 times	Setting of scan frequency at external control circuit terminal ①～⑧. Scan input terminals every 5ms.		
1	2 times			

Sn-10： Output frequency UP/DOWN function		Factory setting	0
Setting	Description		
0	Change output frequency through the (▲／▼) key. The frequency command will be acknowledged only after the key EDIT/ENTER has been pressed.		
1	Change output frequency through the (▲／▼) key. The frequency command can be recalled even restarting the inverter if the EDIT/ENTER key has been pressed at that time.		

- The output frequency can be changed [increasing (UP) or decreasing (DOWN)] the output frequency through either the LED digital operator or external multifunction input terminal(terminals ⑤～⑧).

Sn-11： Frequency Characteristics Command Selection at External Analog Input Terminal		Factory setting	1
Setting	Description		
0	Frequency command is input at VIN terminal (0~10V)		
1	Frequency command is the addition (VIN + AIN) at VIN (0~10V) and AIN (4~20mA) terminal.		
2	Frequency command is the combination (VIN - AIN) at VIN (0~10V) and AIN (4~20mA) terminal. If the value (VIN - AIN) is negative, the reference command will take '0' as a result.		
3	Frequency command is input at AIN terminal (4~20mA)		

Sn-12：Frequency command Chararcteristic Selection			Factory setting	0
Setting	Function	Description		
0	Forward	Analog input 0～10V or 4～20mA represents frequency command 0～100%		
1	Reverse	Analog input 0～10V or 4～20mA represents frequency command 100～0%		

Sn-13： Zero speed braking operation selection		Factory setting	1
Setting	Function	Description	
0	Invalid	The run-source and frequency command is input from control circuit under the setting of Sn-04=1，Sn-05=1 ,If Sn-13 is enabled ,blocking torque will be generated in DC –braking mode when the frequency command is 0V and forward-run source is"ON"	
1	Valid		

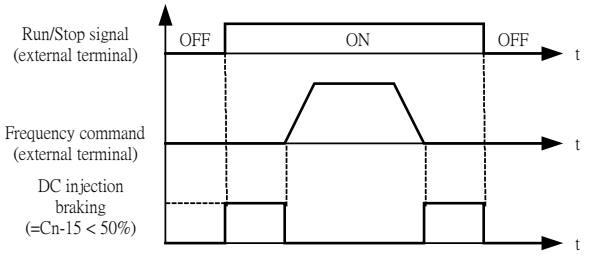


Fig 16. Zero speed braking operation selection

Sn-14： Output voltage limitation selection			Factory setting	0
Setting	Function	Description		
0	Valid	In low speed region ,if the output voltage from V/Fpattern is too high, the inverter will be driven into fault status.As a result, the user can use the option to set the upper bound limit of output voltage.		
1	Invalid			

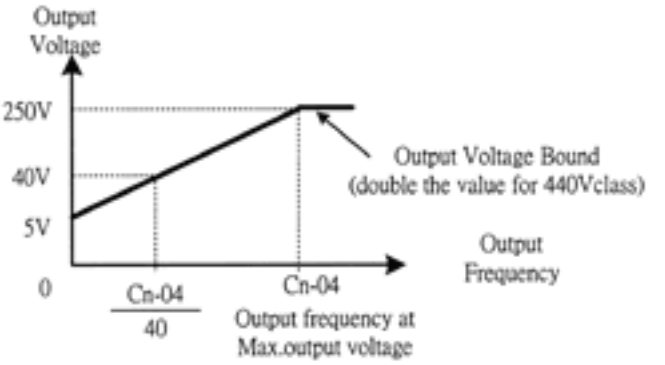


Fig 17　Output voltage limit

Sn-15～Sn-17：Stall prevention selection					
Name		Setting	Function	Factory setting	Description
Sn-15	Stall prevention selection during acceleration	0	Disabled	1	• A stall occurs if the rotor cannot keep up with the rotating electromagnetic field in the stator winding when a large load is suddenly applied or when a sudden acceleration or deceleration is performed. In this case, the inverter should automatically adjust the output frequency to prevent stall. • The Stall Prevention Function can be set independently for accelerating and running. • Stall Prevention During Acceleration : See Fig 18. Inverter stops accelerating if Cn-25 setting is exceeded. Accelerates again when the current recovers.
		1	Enabled		
Sn-16	Stall prevention selection during deceleration	0	Disabled	1	While decelerating, a large re-generation voltage will occur if a large inertia load or the Dec. time is too short. At this time the external braking resistor should be installed. If not, the parameter Sn-16 should be set to '1' to automatically enlengthen the Dec. time to avoid over-voltage trip fault. See Fig 20.
		1	Enabled		
Sn-17	Stall prevention selection during running	0	Disabled	1	Stall Prevention During Running : See Fig 19. Deceleration is started if the Run Stall Prevention Level Cn-26 is exceeded, especially when an impact load is suddenly applied. Accelerates again when the current level is lower than Cn-26.
		1	Enabled		

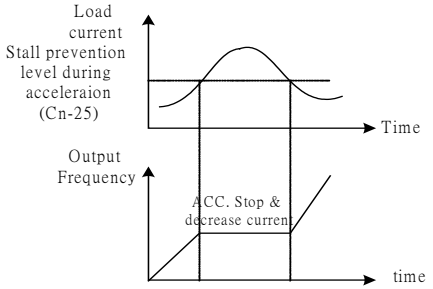


Fig.18 Stall prevention during acceleration

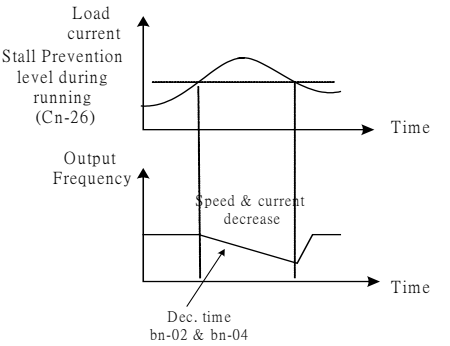


Fig.19 Stall prevention during running

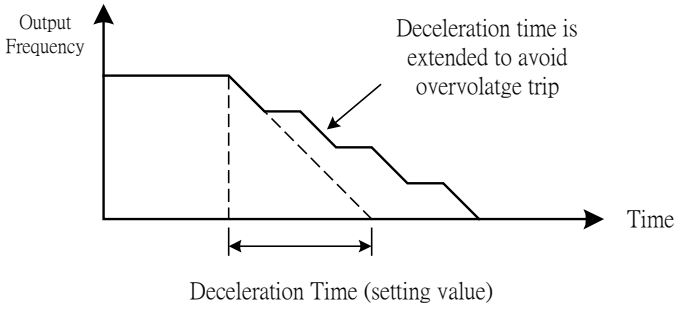


Fig .20 Stall prevention function during deceleration(Sn-16=1)

Sn-18：Restart after power outage selection		Factory setting	0
Setting	**Restart after power outage**	Description	
0	Stop running	The inverter will not run and coast to stop freely when the power is back after previous power outage.	
1	Continue to run	The inverter will re-start to run and return its previous frequency command after speed search invoked when the power is back after previous power outage.	

Sn-19： Motor overload protection selection		Factory setting	1
Setting	Function	Description	
0	Electronic overload protection disable	1. The electronic thermal overload is detected according to the characterisic curve of protecion operating time vs. motor rated current setting. To protect the motor from overload by use of electronic overload protection, be sure to st the parameter Cn-09 according to the rated current value shown on the motornameplate. 2. Disable the motor protection function (Sn-19 = 0) when 2 or more motors are connected to a single inverter. 3. The motor protection function should be set as Sn-19=2 or 4 (hot start protection chararcteristic curve) when the power supply is turned on or off frequenctly. 4. For the motor without forced cooling fan, the heat dissipation capacity is lower when in the low speed operation. The setting Sn-19 can be either ‘1’ or ‘2’ (standard motor start curve). 5. For the motor with forced cooling fan, the heat dissipation is not dependent upon the rotating speed. The setting Sn-19 can be either ‘3’ or ‘4’. (specific motor start curve).	
1	The overload is detected according to the standard motor cold start curve		
2	The overload is detected according to the standard motor hot start curve		
3	The overload is detected according to the specific motor cold start curve		
4	The overload is detected according to the specific motor hot start curve		

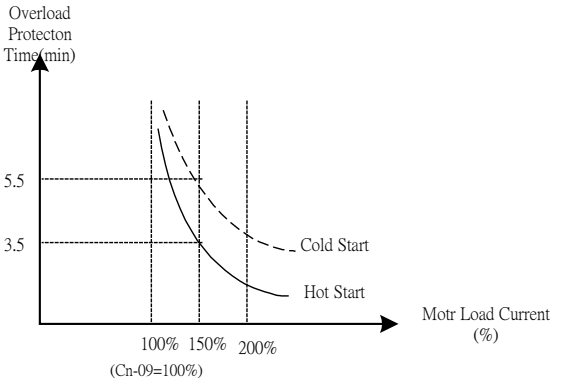


Fig.21 Motor overload protection curve(Cn-09 setting＝100％)

Sn-20： Overtorque detection selection		Factory setting	0
Setting	Function	Description	
0	Overtorque detection disabled	Set overtorque detection enable/disabled, the timing of detection and the operation mode of inverter when fault detected.	
1	Detect only during speed agree.Continue operation after detection.(Miner fault)		
2	Detect only duting speed agree.Stop output after detection (Fault)		
3	Detect overtorque at any time..Continue operation after detection.(Miner fault)		
4	Detect overtorque at any time.Stop output after detection (Fault)		

Sn-21：Operation selection at fault contact during fault retrying		Factory setting	1
Setting	Fault Contact	Description	
0	Disable	When ‘fault retry’ is invoked, the setting will enable the fault contact to be ‘ON’ or not.	
1	Enable		

Sn-22～Sn24：External fault contact ③ contact selection					
Name		Setting	Function	Factory setting	Description
Sn-22	External fault contact ③contact selection	0	A-contact	0	When the signal ‘ON’ input the External fault contact ③ terminal, the inverter will output ‘EP3’ fault—‘External fault contact ③’ has fault.
		1	B-contact		When the signal ‘OFF’ input the External fault contact ③ terminal, the inverter will output ‘EP3’ fault—‘External fault contact ③’ has fault.
Sn-23	External fault contact ③detection selection	0	Always detect	1	Always detects if the External fault contact ③ terminal has fault.
		1	Detect only during running		Detects only during running if the External fault contact ③ terminal has fault.

Sn-24	External fault Detection Mode selection	0	Decelerate to stop with the specified deceleration time bn-02	0	If an external fault is detected (at terminal ③), the following operation will be performed based upon the setting of Sn-24. Sn-24 = 0: Decelerates to stop with the specified deceleration Time Bn-02. = 1: Coasts to stop. =2: Decelerates to stop with the specified Deceleration Time Bn-04. = 3: Continues running with no regard of external fault.
		1	Coast to stop		
		2	Decelerate to stop with the specified deceleration time bn-04		
		3	Continue running with no regard of external fault		

Sn-25：Multi-funtion input terminal⑤function selection	Factory Setting	3
Sn-26：Multi-funtion input terminal⑥function selection		4
Sn-27：Multi-funtion input terminal⑦function selection		7
Sn-28：Multi-funtion input terminal⑧function selection		8

Setting	Function	Description
00	3-wire Forward/Reverse command	3-wire operation mode !
01	LOCAL/REMOTE control 1	OFF：determined according to Sn-04 setting ON：through LED operator
02	LOCAL/REMOTE control 2	OFF：determined according to Sn-04 setting ON：through control circuit terminal
03	Multi-speed command 1	Multi-speed frequency command switch
04	Multi-speed command 2	
05	Multi-speed command 3	
06	Multi-speed command 4	
07	Jogging	ON：select jogging frequency
08	Acc/Dec time switch command	OFF： the first stage Acc/Dec time(Bn-01 / Bn-02) ON ： the second stage Acc/Dec time(Bn-03 / Bn-04)
09	Inhibit Acc/Dec command	ON： Inhibit Acc/Dec (hold frequency)
10	External base-block	ON： inverter output baseblock

	command (input at A -contact)	
11	External base-block command (input at B-contact)	OFF： inverter output baseblock
12	FJOG command	ON： Forward jog
13	RJOG command	ON： Reverse jog
14	PID control invalid	ON： PID control not effective
15	PID integration reset	ON： reset PID integration
16	Inverter overheat warning	ON： blink show overheat(inverter can proceed running)
17	External fault (A-contact)	ON： External fault input (normally open)
18	External fault (B-contact)	OFF： External fault input (normally close)
19	Multi-functon analog input setting	ON： Multi-functon analog input (AUX) effective
20	DC braking command	ON： DC injection braking applied when the frequency output is less than the DC injecton start frequency
21	speed search 1 command	ON：speed search is performed from max. output frequency
22	speed search 2 command	ON： speed search is performed from reference output frequency
23	Timer function input	ON-Delay / OFF-Delay timer input
24	Frequency UP/DOWN function	Only Sn-28 can set if terminal ⑦ used as UP command and terminal ⑧ used as DOWN command.

Note : An error message of “oPE02” will be displayed if the setting combination of Sn-25<Sn-26< Sn-27< Sn-28 is not followed or setting 21, 22 (both for speed search command) are enabled and set at the same time.

Multi-Function Digital Input Terminal Selection：

• 3-wire Forward/Reverse Change (setting : 00)

Under 3-wire initialization mode (Sn-03= 04 or 06 or 08), the Multi-Function Input Terminals ⑤ have setting “00”, the inverter will be in 3-wire mode operation. As shown in Fig 22, the Forward/Reverse change mode is set at the terminal ⑤.(Sn-25 ＝00)

Forward/Reverse change

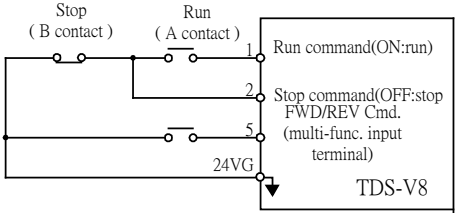


Fig.22 3-wire mode connection diagram

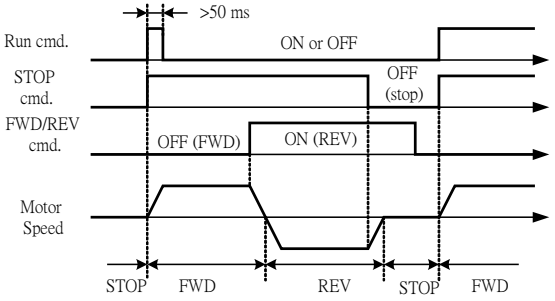


Fig.23 Operation sequence in 3-wire mode

• LOCAL/REMOTE Control 1 (Setting：01)

Output	Description
OFF	**Remote Control** Run Command and Frequency Command is performed through Control Circuit Input or RS-485 Communication Port. (It will be set by the combination of settings of Sn-04 and Sn-05.) The REMOTE-REF, SEQ LED light is ON.
ON	**Local Control** Run Command and Frequency Command is performed through the LED Digital Operator. The REMOTE-REF, SEQ LED light is OFF.

• LOCAL/REMOTE Control 2 (Setting：02)

Output	Description
OFF	**Remote Control** Run Command and Frequency Command is performed through Control Circuit Input or RS-485 Communication Port. (It will be set by the combination of settings of Sn-04 and Sn-05.) The REMOTE-REF, SEQ LED light is OFF.
ON	**Local Control** Run Command and Frequency Command is controlled through External Terminal. The REMOTE-REF, SEQ LED light is ON.

- The inverter must be in the STOP mode to change the operation from LOCAL to REMOTE.
- Multi-Step Speed Command 1 (Setting：03)
- Multi-Step Speed Command 2 (Setting：04)
- Multi-Step Speed Command 3 (Setting：05)
- Multi-Step Speed Command 4 (Setting：06)
- Jog Frequency Selecton (Setting：07)
  - Jog Frequency Command will surpass Multi-Step Speed Command.
  - Through terminal ⑤～⑧, we can setMulti-Step Speed command1～4. There is a maximum of 16 Multi-Step Speed Command Selections from the combination of the Multi-Step Speed Command and jog frequency command。

Terminal⑧ (Sn-28＝06)	Terminal ⑦ (Sn-27＝05)	Terminal ⑥ (Sn-26＝04)	Terminal ⑤ (Sn-25＝03)	Different Selected Multi-step Frequency Command
Multi-step speed cmd.4	Multi-step speed cmd.3	Multi-step speed cmd.2	Multi-step speed cmd.1	
0	0	0	0	Freq.Cmd. 1 (An-01) *1
0	0	0	1	Freq.Cmd. 2 (An-02) *2
0	0	1	0	Freq.Cmd. 3 (An-03)
0	0	1	1	Freq.Cmd. 4 (An-04)
0	1	0	0	Freq.Cmd. 5 (An-05)
0	1	0	1	Freq.Cmd. 6 (An-06)
0	1	1	0	Freq.Cmd. 7 (An-07)
0	1	1	1	Freq.Cmd. 8 (An-08)
1	0	0	0	Freq.Cmd. 9 (An-09)
1	0	0	1	Freq.Cmd. 10 (An-10)
1	0	1	0	Freq.Cmd. 11 (An-11)
1	0	1	1	Freq.Cmd. 12 (An-12)
1	1	0	0	Freq.Cmd. 13 (An-13)
1	1	0	1	Freq.Cmd. 14 (An-14)
1	1	1	0	Freq.Cmd. 15 (An-15)
1	1	1	1	Freq.Cmd. 16 (An-16)

0：Termianl OFF　　1：Termianl ON

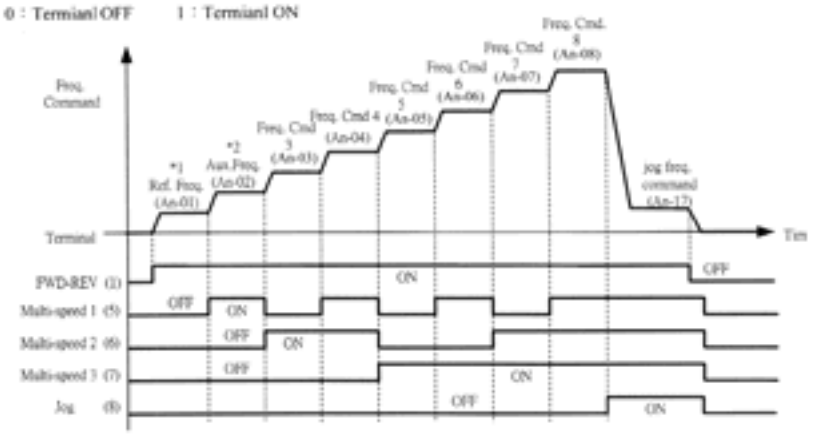


Fig 24　Time Chart for 8-step speed and jog command

*1 When the parameter Sn-05＝0，the reference command is input by the setting of An-01.Instead, when the parameter Sn-05＝1, the reference command is input from analog command through the terminal VIN and AIN.

*2 If the parameter Sn-29＝0, the auxiliary frequency is input from the AUX terminal. If the parameter Sn-29 ≠0, the 2nd step frequency setting is determined by the parameter of An-02.

• Acceleration time and deceleration time change (Setting：08)

Input	Acc./Dec. Time	Description
OFF	Acc. Time 1 / Dec. Time1	Acc. /Dec. time can be changed through the control circuit terminals.
ON	Acc. Time 2 / Dec. Time2	

• Acceleration and deceleration ramp hold (Setting：09)

Input	Function	Description
OFF	Proceed Acc./Dec.	Acceleration and Deceleration Ramp Hold (Setting:10) 1. With this setting, the signal of Acceleration/Deceleration ramp hold (input from the Multi-Function Input Terminals) will pause the Acceleration/Deceleration of motor and maintain the output frequency. 2. The motor will coast to stop if an OFF command is input while the Acceleration/Deceleration ramp hold input is ON. The output frequency will be memorized and the command of Acceleration/Deceleration ramp hold is released.
ON	Inhabit Acc./Dec.	

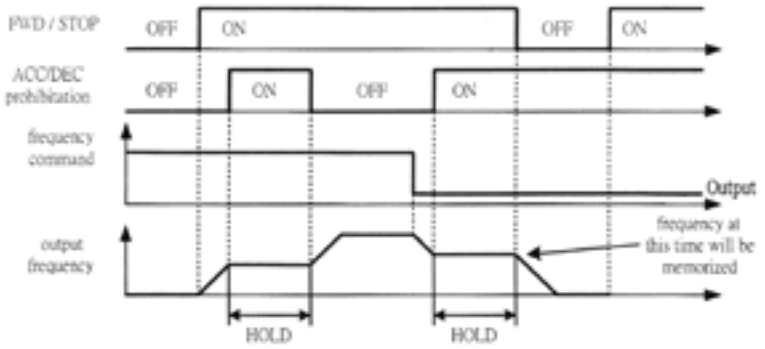


Fig 25 Acceleration and deceleration ramp hold

- External baseblock (input at A-contact) (Setting：10)
- External baseblock (input at B-contact) (Setting：11)

External baseblock	External Output		Description
	OFF	ON	
A-Contact (Setting：10)	Normal	External baseblock	1. Use external terminals to control inverter baseblock. 2. During running : As an external baseblock signal is detected, the digital operator will display a “bb” alarm. Then, the inverter output is blocked. After the baseblock signal is cleared, the motor will resume running according to the reference signal. 3. During deceleration : An external basecblock is input, the digital operator will display “bb” alarm, the inverter is blocked from output and the output frequency will drop to zero. The motor will then coast to stop freely. After this external baseblock signal is cleared, the inverter will stay in stop mode.
B-Contact (Setting：11)	External baseblock	Normal	

- FJOG command (Setting：12)
- RJOG command (Setting：13)

Jog Command	External input		Description
	OFF	ON	
FJOG Command (Setting：12)	stop	Run forward at the jog frequency	1. The jogging can be performed in forward or reverse at the frequency (An-17). 2. The forward jog and reverse jog commands have priority over other frequency commands. 3. The inverter will stop running with the stopping method set by the setting of Sn-07 if the forward jog and reverse jog commands are both ON for more the an 500ms.
RJOG Command (Setting：13)	stop	Run Reverse at the jog frequency	

• PID Control invalid (Setting :14)

Input	PID Control	Description
OFF	Valid	1. The setting can be used in the changeover of test run. 2. To disable the PID function (PID control invalid is “ON”), an open-loop operation or jog operation can be performed in the test. The system can be set up properly after some test runs. Then, the system can be changed into PID control mode. Moreover, if the feedback signal is not usable, the PID function is disabled through this setting.
ON	Invalid	

• PID Integral reset (Setting：15)

Input	I_RESET function	Description
OFF	Valid	In the application of PID control, the integral can be reset to zero through the function terminal.
ON	Invalid	

• Inverter overheat alarm (Setting:16)

Input	Function	Desription
OFF	Normal	When the inverter detects a overheat signal “ON”, the digital operator will change its display as “OH” (overheat alarm), the inverter still maintains its operation. When the overheat is “OFF”, the digital operator will restore its previous display automatically. No RESET-key pressing is required.
ON	Overheat alarm	

• External fault contact A (Setting：17)

• External fault contact B (Setting：18)

External fault	External input		Description
	OFF	ON	
contact A (Setting：17)	Normal	External fault	1. When an external fault occurs, the inverter will be blocked from output and the motor will coast to stop. 2. The external fault input will display the external fault input terminal (i.e. the external input terminal ⑤ is set for the external fault input terminal use, a message of “EF5” will be displayed. 3. These terminals ③、⑤、⑥、⑦ and ⑧ are assigned as external fault input.
contact B (Setting：18)	External fault	Normal	

• Multi-function analog input (AUX) setting (Setting : 19)

Input	Multi-function analog input	Description
OFF	Invalid	To disable or enable the multi-function analog input (AUX) is controlled by input at an external terminal.
ON	Valid	

• DC injection braking command (Setting：20)

Input	DC Braking Command	Description
OFF	Invalid	1. It is used to prevent the motor from rotating due to inertia or external forces when the inverter is stopped. 2. Opertion command is prior to DC braking command. If a run resource or jog command is input , the DC injection braking will be cleared and the motor opertion will restared.
ON	Valid	

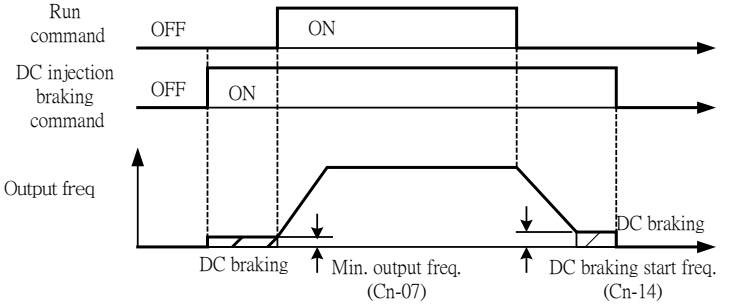


Fig 26 Time Chart for DC injection braking command

- Speed Search from Max. frequency (Setting：21)
- Speed Search from selected reference frequency (Setting：22)

Speed Search	External Input		Description
	OFF	ON	
From Max. output frequency	Normal	Max. output frequency	1. The speed search function will search for the speed of a coasting motor from the frequency command or max. frequency downward, then restart smoothly from that frequency or max. frequency. It is effective in situations such as switching from a commercial power supply to an inverter without tripping occurred. 2. Please refer to the speed search function.
From Frequency command	Normal	reference frequency	

- Timer Function Input (Setting：23)
- For more details, refer to 'Timer function output'。

- Frequency UP/DOWN function (Setting：24)
  - Only set through parameter Sn-28.
  - The inverter can use either the Digital Operator or External Multi-Function Input Terminals (terminal ⑦ or ⑧) to change the output frequency upward or downward.
  - Set parameters Sn-04 and Sn-05 to 1. The run source and frequency command is set through the control circuit terminals. Then set parameter Sn-28 to 24 (terminal ⑦ will now have the function "UP", its original function is disabled). Terminal ⑦ and ⑧ can now be used for "UP" and "DOWN" function to control /change the output frequency.
  - When the frequency UP/DOWN function is being used, the output frequency will accelerate to the lower limit (Cn-19) if a run command is pressed.
  - The output frequency held by the UP/DOWN function will be stored in memory. This output frequency will be retained even after a power loss. When power is back after power-down, the inverter will restart at this hold frequency if a run command is pressed next time.
  - If the UP/DOWN function and jog frequency command are both assigned to Multi-Function Inputs, the jog frequency command input has highest priority.

• Frequency UP/DOWN operation sequence as below：

Control circuit terminal⑦ ＝ UP function	ON	OFF	OFF	ON
Control circuit terminal ⑧ ＝ DOWN function	OFF	ON	OFF	ON
Operation status	ACC (UP)	DEC (DOWN)	Constant (HOLD)	Constant (HOLD)

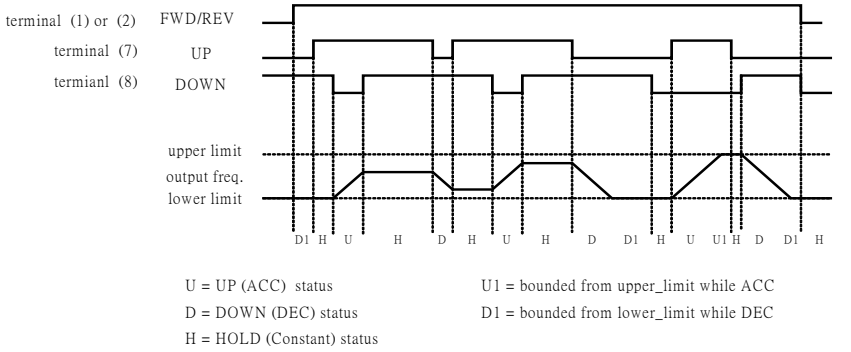
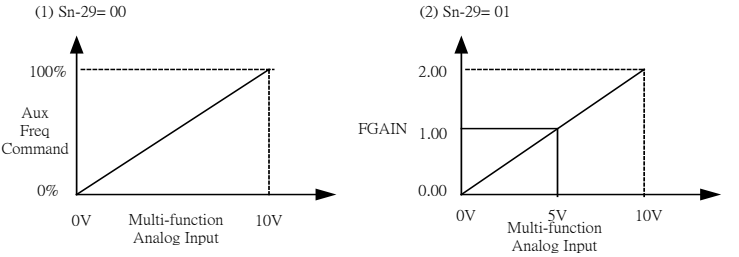


Fig.27 Time Chart of output frequency through the UP ands DOWN function

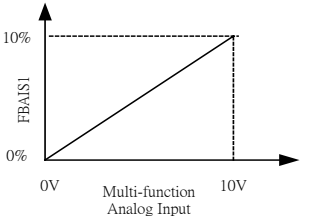
Sn-29：Multiple-function analog input function selection (AUX)		Factory Setting	00
Setting	Function	Description (100% output corresponds to 10 V level)	
00	Auxiliary frequency command	(Max output frequency)	
01	Frequency command gain (FGAIN)	Total gain =bn-09 ×FGAIN (Frequency command in voltage form, terminal VIN frequency command)	
02	Frequency command bias1 (FBIAS1)	Total bias ＝ Bn-10 + FBIAS1 (Max output frequency)	
03	Frequency command bias 2 (FBIAS2)	Total bias＝Bn-10 + FBIAS2	
04	Output frequency bias (VBIAS)	Total output voltage＝V/F pattern voltage + VBIAS	

05	Scaling of ACC/DEC time (TK)	Real ACC/DEC time = ACC/DEC time + (bn-01～04) / TK
06	DC injection braking	According to analog input voltage (0~10V), change the level of DC injection current (0~100%) (inverter rated current =100%,the setting of DC injection current Cn-15 is disabled)
07	Overtorque detection level	According to analog input voltage (1.5V ~10V),change overtorque detection level (setting of Cn-32 is disabled)
08	Stall prevention level during running	According to analog input voltage (1.5V~10V), change the level of stall prevention during running(30%~200%) (inverter rated current =100%, the setting Cn-26 is diabled)
09	Frequency command lower limit	Change the frequency command lower-limit (0~100%) value according to the analog input voltage (0~10V) (Max output frequency (Cn-02) corresponds to the 100% analog output. The actual lower-limit is determined by the maximum of Cn-19 and the value corresponding to the multi-function analog input terminal)
10	Jump frequency setting 4	Set the jump frequency 4, according to analog input voltage (0~10V) , while Cn-20~Cn-23 can be used to set the jump frequency 1~3 and their jump frequency width.
11	PID control reference input	Multi-function analog input (terminal AUX) used as PID control reference input (0~10V)

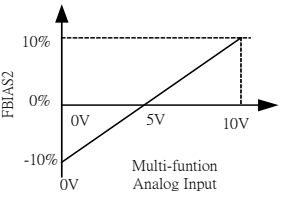
Multi-function analog input characteristics



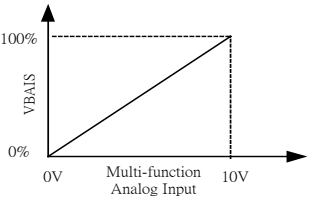
(3) Sn-29= 02



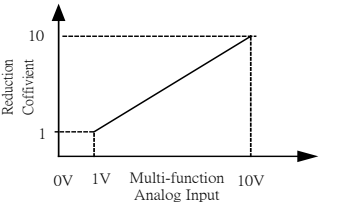
(4) Sn-29= 03



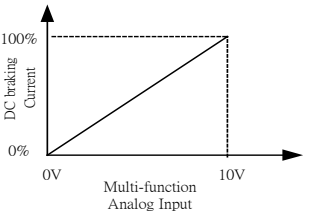
(5) Sn-29= 04



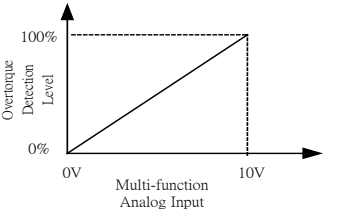
(6) Sn-29= 05



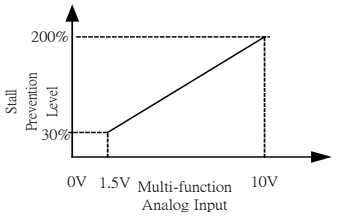
(7) Sn-29= 06



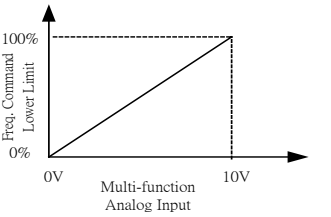
(8) Sn-29= 07



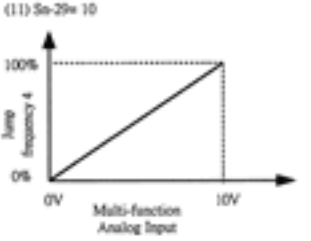
(9) Sn-29= 08



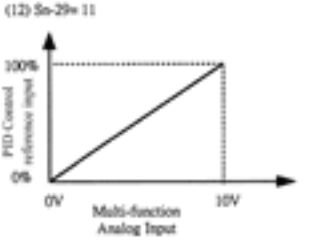
(10) Sn-29= 09



(11) Sn-29= 10



(12) Sn-29= 11



Sn-30：Multi-function output terminal(R1A-R1B-R1C) function selection			Factory Setting	10
Sn-31：Mutli-function output terminal (DO1) function selection				0
Sn-32：Multi-function output terminal (R2A -R2C) function selection				1
Setting	Function	Description		
00	During running	ON：During running		
01	Zero speed	ON：Zero speed		
02	Frequency agree	ON：freq. command–Cn-31 ≦ output frequency ≦freq. command+ Cn-31		
03	Setting frequency agree	ON：Cn-29 – Cn-31 ≦ output frequency ≦Cn-29 + Cn-31		
04	Output frequency detection 1	ON：while ACC → | output freq. | ≦ Cn-29 while DEC → | output freq. | ≦ Cn-30 Speed agree width : Cn-31		
05	Output frequency detection 2	ON：while ACC→ | output freq. | ≧ Cn-29 while DEC → | output freq. | ≧ Cn-30 Speed agree width :Cn-31		
06	Inverter Ready	ON：READY		
07	Undervoltage detected	ON：Undervolatge detected		
08	External baseblock (A- contact)	ON：Output baseblock		
09	External baseblock (B- contact)	OFF：Output baseblock		
10	Fault	ON：fault		
11	Overtorque detected (A-contact)	ON：Overtorque detected		
12	Run source mode	ON：Run source from digital operator (Local mode)		
13	Frequency command mode	ON：Frequency command from digital operator (Local mode)		
14	Reverse rotation detected	ON：Reverse rotation		
15	Frequency command Invalid	ON：Frequency command Invalid		
16	Overtorque detected (B-contact)	OFF：Overtorque detected		

17	Pulse signal output	Only Multi-Function Output Terminal DO1-DOG (Setting Sn-31) can be set for Pulse Signal Output. DO1 is a Photo-Coupler Output, its Pulse Output Frequency is set by parameter Sn-33. See Fig 28.
18	Timer function output	Signal delay output (vs. timer function input)
19	Undervoltage alarm	ON：Undervoltage alarm
20	Fault retry	ON：retry
21	Motor overload (OL1)	ON：OL1
22	Inverter overheat (OH)	ON：OH
23	Inverter overload (OL2)	ON：OL2
24	RS-485 communication fault	ON：RS-485 communication fault
25	Communication Application	Extension output contact application for communication like RS-485 MODBUS

Multi-Function digital output terminal function:

• During Running (Setting：00)

Output	Description
OFF	Run source : OFF，inverter is off
ON	Run source ON or Run source OFF but residues output exists

• Zero Speed (Setting：01)

Output	Description
OFF	Output frequency ≧ Min. output frequency (Cn-07)
ON	Output frequency ＜Min. output frequency (Cn-07)

• Frequency agree： (Setting：02)

• Setting frequency agree (Setting：03)

• Output frequency detected1 (Setting：04)

• Output frequency detected 2 (Setting：05)

- Refer frequency detection function

• Inverter ready (Setting：06)

• Undervoltage detected (Setting：07)

• Output baseblocked(A-contact) (Setting：08)

• Output baseblocked(B-contact) (Setting：09)

• Fault (Setting : 10)

- If a Fault occurs, the Multi-Function Output Terminal is ON. However, no response will occur if a communication fault occurs.

• Overtorque detected (A-contact) (Setting：11)

• Overtorque detected(B-contact) (Setting：16)

- Refer overtorque detection function

• Run Command mode (Setting：12)

Output	Description
OFF	Remote Mode (Sn-04= 1 , 2 or multi-function input terminal ⑤~⑧ is set as Local/remote control I mode or Local/remote control II mode and contact terminal is OFF). Remote-SEQ LED is light in LED digital operator.
ON	Local Mode (Sn-04=0 or multi-function input teminal ⑤~⑧ is set as Local/remote control I mode and contact terminal is ON). Remote-SEQ LED is OFF, run command is from LED digital operator.

• Frequency command mode (Setting : 13)

Output	Description
OFF	Remote mode (Sn-05 = 1,2 or multi-functioninput terminal ⑤~⑧ is set as Local/remote control I mode or Local/remote control II mode and contact terminal is OFF). Remote-REF LED is light in LED digital operator.
ON	Local mode (Sn-05 = 0 or multi-funtion input terminal ⑤~⑧ is set as Local/remote control I mode and contact terminal is ON). Remote-REF LED is OFF, run command is from LED digital operator.

• Reverse rotation detected (Setting：14)

- When the rotor changesdirectionreversely, the output contact will be ‘ON’.

• Frequency command missing (Setting：15)

- Run source (RUN) is ON and frequency command is 0, the output at the multi-function output terminal is ON.

• Pulse signal output (Setting：17)

- Only multi-function output terminal DO1-DOG (Setting Sn-31= 17) can be set as the pulse signal output.
- DO1 is a (Open-Collector) photo-coupler output, its pulse output frequency is set by parameter Sn-33.
- The wiring is：

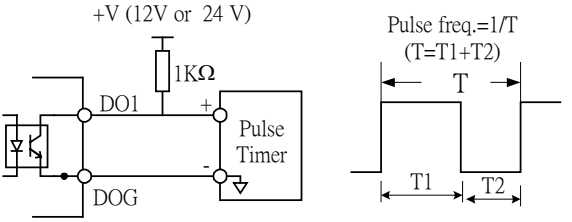


Fig.28 Pulse signal output

• Timer function output (Setting：18)

If the multi-function input terminal ⑤～⑧ be set as the timer input terminals (Sn-25～28＝23),the input signal will be output through the corresponding multi-function output terminals as specified by the ON-delay and OFF-delay, as shown below.

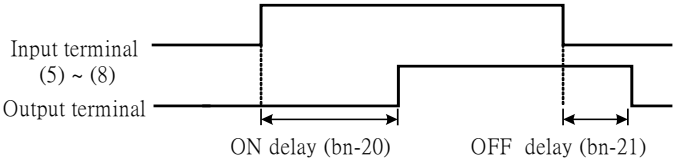


Fig. 29 The input/output signal in “Timer” function application

- Undervoltage alarm (Setting：19)
  - If the main circuit DC bus voltage is below the undervoltage alarm detected level, the multi-function output terminal is ON.
  - Undervoltage alarm detected level : 220 V Class : 230 VDC
    440 V Class : 460 VDC
- Fault retry (Setting：20)
  - See Fault Restart Function (Cn-24) on Page 79. Upon restart, the Multi-Function Output Terminal is ON.

- Operation Selection at Fault Contact During Fault Retrying (Sn-21)
  - = 0 : Do not output fault restart. (The fault contact will not operate)
  - = 1 : Output fault restart. (The fault contact operates)

- Please refer to “Number of Auto Restart Attempts” on Page 79.

- Motor overload (Setting：21)
  - See “Motor overload protection selection” . Upon restart, the multi-function output terminal is ON.

• Inverter Overheat (Setting：22)

- If the inverter is overheat (OH), the multi-function output terminal is ON.

• Inverter Overload (Setting：23)

- If the inverter is overload (OL2), the multi-function output terminal is ON.

• RS-485 communication fault (Setting：24)

- If the inverter communication is fault, the multi-function output terminal is ON.

• Communication Application (Setting：25)

- In the application that the control commands are executed through the RS-485 communication port, the multi-function output terminals can be used as the PLC extension output contact terminals. For more details, please refer to TDS-V8 RS-485 communication manual.

Sn-33：Pulse output multi-function multiplier selection	Factory Setting	01
Setting	Description	
01～16	If the multi-function output terminal (DO1) be set as pulse output (when Sn-31 = 17), the final output pulse frequency is the multiple (according to Sn-33) of the inverter output frequency. Pulse output frequency = Inverter output frequency * Sn-33 setting value	

Sn-34：Multi-function analog output (AO1) selection **Sn-35：Multi-function analog output (AO2) selection**		Factory Setting	0 1
Setting	Output contents	Multi-function analog output level	
00	Frequency command	10V/ Max. output frequency	
01	Output frequency	10V/ Max. output frequency	
02	Output current	10V/ rated current	
03	Output voltage	10V/220V or 440V	
04	DC voltage	10V/220V or 440V	
05	Output Power	10V/ rated output power	
06	VIN analog command	10V/ Max. output frequency	
07	AIN analog command	10V/ Max. output frequency	
08	AUX analog command	10V/100%	
09	PID input	10V/ Max. output frequency	
10	PID output 1	10V/ Max. output frequency	
11	PID output 2	10V/ Max. output frequency	

- For the output gain (Bn-14 and Bn-15), set what multiple of 10V will correspond to 100% output monitored item.

Sn-36～Sn-39：RS-485 Communication setting				
Name		Setting Range	Factory Setting	Description
Sn-36	Inverter Station Address	01～31	01	When the RS-485 communication is used, the communication address of each inverter must be different.
Sn-37	RS-485 baud rate setting	0	3	1200 Baud rate (bytes／sec)
		1		2400 Baud rate (bytes／sec)
		2		4800 Baud rate (bytes／sec)
		3		9600 Baud rate (bytes／sec)
Sn-38	Parity Setting	0	0	no parity
		1		even parity
		2		odd parity
Sn-39	Stop while communication fault	0	0	Decelerate to stop according to bn-02
		1		Coast to stop
		2		Decelerate to stop according to bn-04
		3		Continue to run (Press STOP key to stop)

- The inverter has built-in RS-485 port fot monitoring inverter status and reading the parameter setting. Under the remote operation, the inverter status and the paramter setting can be monitored. Moreover, the user can change the parameter setting to control the motor operation.
- If the communication fault time exceeds the setting of Cn-27, the digital operatot will display the message “CErr”
- MODBUS’s RTU protocol is used.
- Every data has a data length of 11 bits: 1 start_bit, 8 data_bits, 1 parity_bit and 1 stop_bit. If Sn-38=0, the parity_bit is 1.

1	2	3	4	5	6	7	8	9	10	11
Start_bit	Data_bit 0	Data_bit 1	Data_bit 2	Data_bit 3	Data_bit 4	Data_bit 5	Data_bit 6	Data_bit 7	Parity_bit	Stop_bit

- 3 different commands are used for communication between the inverter and external units：
  (1) Read command: external unit to read the memory address of the inverter.
  (2) Write command: external units to write the memory address of the inverter in order to control the inverter.
  (3) Circuit test command to test the commnication status between the inverter and external units
- Forbid the DRIVE/PRGM change while writing through RS-485.
- For more details of RS-485 communication, refer to “TEKDRIVE / TDS-V8 Inverter MODBUS Communication Application Manual”.

Sn-40：Load Torque Selection			Factory Setting	0
Setting	Load toque	Description		
0	Constant torque (CT)	1. It depends upon whether the real torque load is a constant toque load or a variable torque load. After setting the applied torque load mode, return to its factory setting. The inverter will then pick up the proper V/F curve and the inverter overload protection curve. 2. When to use the constant torque mode: In the case when the applied torque load is roughly same at the high or low speed, or, in the case when the torque load is heavy at low speed, use the constant torque load mode. The then overload has 150% rated current for 1 minute. 3. When to use the variable torque mode: In the case when the applied torque load is small at low speed, or, in the case when the ACC time is larger and the then torque varies less (i.e., pump/fan case), the inverter overload current can be increased 1 frame size, but the inverter overload current has 110% rated current for 1 minute.		
1	Variable toque (VT)			

Sn-41：PID function selection			Factory Setting	0
Setting	PID function	Description		
0	Invalid	1. PID function selection 2. Refer to ‘Block Diagram for PID control’ and ‘How to adjust PID parameters’.		
1	Valid			

Sn-43：Motor Parameter Autotuning Selection			Factory Setting	0
Setting	Autotune function	Description		
0	Invalid	To enable vector control (Sn-44=1) without the exact motor parameters, the operator can still have the motor parameter through the Autotune function. Please refer ‘Motor Parameter Autotune Operation Procedure’ for more details. After autoning, Sn-43 will reset to ‘0’.		
1	Valid			

Motor Parameter Autotune Operation Procedure:

The AUTOTUNE feature can be used to identify and store the important motor parameters for the Sensorless Vector Control Mode. If Output Line Reactor/Filter is used, Autotune will not function properly. Sometimes, the motor parameters for Sensorless Vector operation will need to be entered manually. Consult motor manufacturer for motor parameter data.

1. Make sure the inverter capacity and motor rating is suitably matched (their voltage rating must be same. Their power capacity rating class can not exceed 2 frame size. Disconnect the motor load and make sure that the wiring between the inverter and the motor is suitable. The difference between inverter capacity and motor rating should not be greater than two frame sizes.
2. After validation, switch to PRGM operation mode. Set Sn-02 to '15'. Input the Motor Rated Voltage to parameter Cn-03 (Max. Output Voltage) and the Motor Rated Frequency to parameter Cn-04 (Max. Voltage Frequency) using data from motor's nameplate. Enable Autotune function (Sn-43= 1).
3. After enabling the Autotuning Function by setting Sn-43= 1. Switch to DRIVE operation mode, the 'Autot' will display on the keypad. Then, run the inverter by pressing 'RUN' and the inverter system immediately enters into the autotuning operation until completing its procedure (The keypad will show 'run').
4. It will take some short time (depends upon the ACC/DEC time setting) to tune the parameters then stops automatically. On the keypad, the led above the 'RUN' key will flash and the led of the 'STOP' key will be ON. Moreover, the keypad will display 'End'. By pressing 'STOP' will finish the 'Autotune' process and return to normal.
5. If the parameters obtained through Autotne procedure are quite differenet from normal values, the inverter will signal an alarm. The keypad will display 'ATE' and cancel the storing of parameters. In normal case the value of motor parameter will be automatically stored in these parameters: Cn-46 (Motor Line-to-Line Resistance R1), Cn-47 (Motor Rotor Equivalent Resistance R2), Cn48 (Motor Leakage Inductance Ls) and Cn-59 (Mutual Inductance Lm). This set of parameters will be stored in the memory for the sensorless vector control use.
6. Stop the parameter autotuning operation if an abnormality ('OV' or 'OC') occurs during autotuning operation. Then, the keypad will display 'ATE" and return to normal.

Sn-44：Control Mode Selection			Factory Setting	0
Setting	Function	Description		
0	V/F control	When to use: used for 1) the derating (or quadratic) torque load –pump/fan etc. where the load is light at low speed operation, 2) for energy-saving purpose and 3) when 1 inverter derive more than 2 motors at the same time.		
1	Voltage vector control	When to use: used for 1) the constant torque load, especially, when the load is heavier at slow speed like washing maching etc. 2) the torque load is varied and not constant but speed accuracy is required. How to use： Single inverter can only drive 1 single motor. The inverter and motor pair should have equivalent power rating class. Moreover, the motor parameter (Cn-46～Cn-49) must be known. The motor parameters can be derived from auto-tuning process after Sn-43 set to ‘1’.		

Voltage vector control operation procedure and tuning：

- 1) Make sure the inverter capacity and motor rating is suitably matched. Use the motor nameplate value and motor parameters provided by the manufacturer or use the AUTOTUNE feature to identify and store the motor parameters in the first time vector control operation after installation. And, enter the following parameters of Motor: Max. output voltage (Cn-03), Max voltage frequency (Cn-04), Motor line-to-Line resistance (Sn-46), Motor rotor resistance (Cn-47), Motor equivalent leakage inductance (Cn-48) and Motor equivalent mutual inductance (cn-49).
- 2) Enable voltage vector control by setting Sn-44 to ‘1’.
- 3) Increase setting Cn-46 to increase the generating torque at low speed. Decrease the setting of Cn-46 to reduce the generating torque to avoid overcurrent trip at low speed.
- 4) Adjust setting Cn-50 if the speed accuracy needs to improve. When the actual speed is low, increase the set value and when the actual speed is high, decrease the set value.
- 5) If the motor speed is not stable or the load inertia is too large, increase the Cn-51 (Slip Compensation Primary Delay Time) setting. If the speed response is slow, decrease the setting of Cn-51.

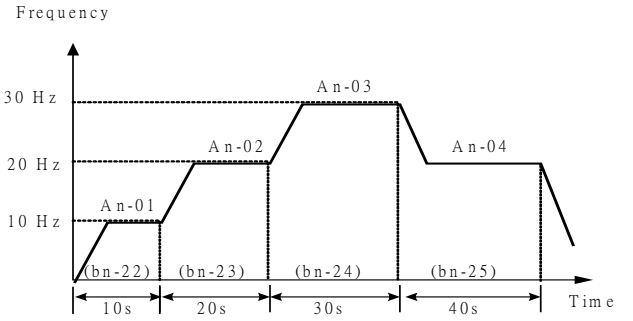
Sn-45～Sn-61：Auto_Run mode selection					
Name		Setting	Function	Factory Setting	Description
Sn-45	Auto_ Run Mode selection	0	Auto_Run Mode not effective	0	1. Auo-Run mode can provide up to 16 step settings for simplified PLC operation. Among them, every step setting has its different frequency command(by An-01~16), Auto-Run mode selection(Sn-46~61) and operation time(Bn-22~37) for many different combinations 2. The multi-step frequency command 1~4 derived from the multi-function input terminals ⑤～⑧ are ineffective.(refer to Sn-25~28) ~ 3. ACC/DEC time follow the setting of bn-01, bn-02 in Auto_Run Mode. 4. If the setting values of Bn-22~Bn-37 are all zero, the Auto_Run mode is disabled 5. ACC/DEC time follow the setting of bn-01,bn-02. 6. Sn-45=1~3: If the inverter stops and starts again, it will continue running from the unfinished step, according to the setting of Sn-45 Sn-45=4~6:If the inverter stops and starts again,it will begin a new cycle and conitinue running according to the setting of Sn-44 7. Samples of each Auto_Run Mode are as followings:
		1	Auto-Run mode for one single cycle. (continuing running from the unfinished step if restarting)		
		2	Periodic running Auto_Run Mode (continue running from the unfinished step if restarting)		
		3	Auto-Run mode for one single cycle,then hold the speed of final step to run (continuing running from the unfinished step if restarting)		
		4	Auto-Run mode for one single cycle from the first step.(starting a new cycle if restarting)		
		5	Auto-Run mode performed periodically from first step. (starting a new cycle if restarting)		
		6	Auto-Run mode for one single cycle, then hold the speed of final step to run (starting a new cycle if restarting)		
Sn-46 ～ Sn-61	Auto_ Run Mode selection	0	STOP	0	
		1	Forward		
		2	Reverse		

- Some sample in auto_run mode

(a) Single cycle running (Sn-45＝1,4)

The inverter will run based upon the specified setting mode for a single full cycle. Then it will stop.

Ex：	Bn-22 ＝ 10s	An-01 ＝ 10Hz
	Bn-23 ＝ 20s	An-02 ＝ 20Hz
	Bn-24 ＝ 30s	An-03 ＝ 30Hz
	Bn-25 ＝ 40s	An-04 ＝ 20Hz
	Bn-26～37 ＝ 0 s	An-05～16 ＝ 0
	Sn-46～49 ＝ 1	Sn-45＝1



(b) Periodic running (Sn-45＝2,5)

The inverter will repeat the same cycle periodically

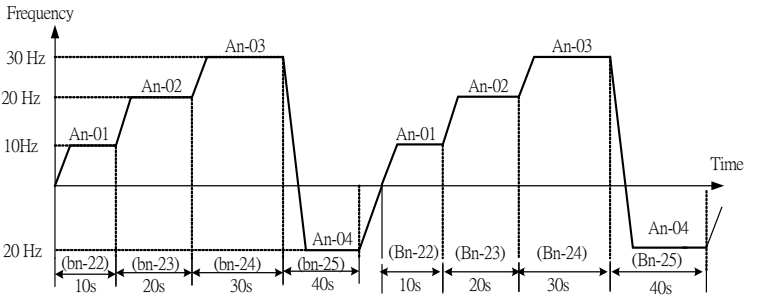
Ex：

Sn-45 ＝ 2

bn-22～37：same setting as (a)

An-01～16：same setting as (a)

Sn-46～48 ＝ 1 Sn-49 ＝ 2



(c) Auto_Run mode for one single cycle, then hold the speed of final step to run. (Sn-45＝3,6)

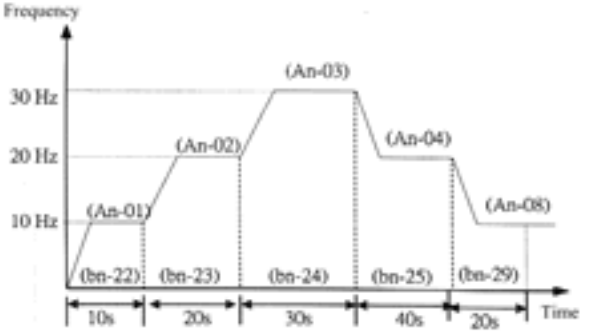
Ex：

Sn-45 ＝ 2　　Bn-29 ＝ 20s

An-08 ＝ 10Hz　　An-09～An-16 ＝ 0

Bn-22～37：same setting as (a)，　An-01～07：same setting as (a)

Sn-46～Sn-61 ＝ 1



4-4 Control Parameters ----------Cn

Cn - □□ Control Parameters ¶ Parameters can't be monitored or changed during operation.							
Parameter No.	Name		Setting Range	Unit	Factory Setting	User Setting	Ref. Page
Cn-01	V/F Pattern Setting	Input Voltage	150.0～255.0V*1	0.1V	220.0V*2		87
Cn-02		Max. Output Frequency	50.0～400.0Hz	0.1Hz	60.0Hz		87
Cn-03		Max. Output Voltage	0.1～255.0V*1	0.1V	220.0V*2		
Cn-04		Max. Voltage Frequency	0.1～400.0Hz	0.1Hz	60.0Hz		
Cn-05		Middle Output Frequency	0.1～400.0Hz	0.1Hz	3.0Hz		
Cn-06		Voltage At Middle Output Frequency	0.1～255.0V*1	0.1V	16.5V*2		
Cn-07		Min Output Frequency	0.1～400.0Hz	0.1Hz	1.5Hz		
Cn-08		Voltage At Min. Output Frequency	0.1～255.0V*1	0.1V	11.0V*2		
Cn-09	Motor Parameter	Motor Rated Current	*3	0.1A	3.3A*4		88
Cn-10		No Load Current of Motor	0～99%	1%	30%		88
Cn-11		Rated Slip of Motor	0～9.9%	0.1%	0.0%		89
Cn-12		Motor Line-to-Line Resistance	0～65.535Ω	0.001 Ω	*4		90
Cn-13		Motor iron-core loss	0～65535 W	1W	*4		
Cn-14	DC Braking Function	DC Injection Braking Starting Frequency	0.1～10.0Hz	0.1Hz	1.5Hz		91
Cn-15		DC Braking Current	0～100%	1%	50%		
Cn-16		DC Injection Braking Time At Stop	0.0～25.5s	0.1s	0.5s		
Cn-17		DC Injection Braking Time At Start	0.0～25.5s	0.1s	0.0s		
Cn-18	Frequency Limit	Frequency Command Upper Bound	0～109%	1%	100%		92
Cn-19		Frequency Command Lower Bound	0～109%	1%	0%		
Cn-20	Frequency Jump	Frequency Jump Point 1	0.0～400.0Hz	0.1Hz	0.0Hz		93
Cn-21		Frequency Jump Point 2	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-22		Frequency Jump Point 3	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-23		Jump Frequency Width	0.0～25.5Hz	0.1Hz	1.0Hz		
Cn-24	Retry Function	Number of Auto Restart Attempt	0~10	—	0		94
Cn-25	Stall Prevention	Stall Prevention During Acceleration	30～200%	1%	170%		95
Cn-26		Stall Prevention During Running	30～200%	1%	160%		
Cn-27	—	Communication Fault Detection Time	0.0～25.5s	0.1s	1.0s		96
Cn-28	Display Unit	Digital operator Display mode	0-39999	—	1		96

Cn - □□ Control Parameter ¶ Parameters can't be monitored or changed during operation.							
Cn-29	Frequency Agree Detection	Freq. Agree Detection Level During Accel.	0.0～400.0Hz	0.1Hz	0.0Hz		97
Cn-30		Freq. Agree Detection Level During Decel	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-31		Frequency Agree Detection Width	0.1～25.5Hz	0.1Hz	2.0Hz		
Cn-32	Over-torque Detection	Overtorque Detection Level	30～200%	1%	160%		99
Cn-33		Overtorque Detection Time	0.0～25.5s	0.1s	0.1s		
Cn-34	Carrier Frequency	Carrier frequency setting	1～6	—	*4		100
Cn-35	Speed Search Control	Speed Search Detection Level	0～200%	1%	150%		100
Cn-36		Speed Search Time	0.1～25.5s	0.1s	2.0s		
Cn-37		Min. Baseblock Time	0.5～5.0s	0.1s	0.5s		
Cn-38		V/F Curve in Speed Search	10～100%	1%	100%		
Cn-39	Low Voltage Detection	Low Voltage Alarm Detection Level	150～210V	1V	190V		102
Cn-40	S-curve time	S-curve Characteristic Time at Accel. Start	0.0～1.0s	0.1s	0.0s		102
Cn-41		S-curve Characteristic Time at Accel. End	0.0～1.0s	0.1s	0.0s		
Cn-42		S-curve Characteristic Time at Decel. Start	0.0～1.0s	0.1s	0.0s		
Cn-43		S-curve Characteristic Time at Decel. End	0.0～1.0s	0.1s	0.0s		
Cn-44	PID control	PID Integral Upper Bound	0～109%	1%	100%		103
Cn-45		PID Primary Delay Time Constant	0.0～2.5s	0.1s	0.0s		
Cn-46	Motor parameter	Motor line-to-Line resistance	0.000～65.535Ω	0.001Ω	*4		106
Cn-47		Motor rotor resistance	0.000～65.535Ω	0.001Ω	*4		
Cn-48		Motor equivalent leakage inductance	0.00～655.35 mH	0.01mH	*4		
Cn-49		Motor equivalent mutual inductance	0.0～6553.5 mH	0.1mH	*4		
Cn-50	Slip Comp.	Slip Compensation Gain	0.00～2.55	0.01	1.00		106
Cn-51		Slip Compensation Delay Time	0.0～25.5s	0.1s	2.0s		

*1: These are for a 220V class inverter. Value for a 440 V class inverter is double.

*2: The initial values are for a 220V class inverter. Value for a 440 V class inverter is double

*3: The setting range is 10% ~200 % of the inverter rated current.

*4: The factory setting value will vary based upon the inverter capacity value.

● Cn - □□ Parameters Function

Cn-01: Input Voltage			Factory Setting	220.0V*
Setting range	Unit	Function		
150.0～255.0V*	0.1V	Set Inverter Voltage to match power supply voltage at input side first. After Cn-01 set, you can make the setting of Sn-02 as one of the preset V/F curve patterns. Because the preset V/F curve patterns are based upon 220/440 rating class (refer Sn-02 for V/F patterns). If the indicated power supply voltage of motor nameplate is not 220 or 440 V, you have to use their indicated supply voltage and set this specified value as Cn-01. Then, you can choose and set the Sn-02 such that the over-excitation or under-excitation will not happen.		

*：These are for a 220V class inverter. Value for a 440V class inverter is double.

Cn-02～Cn-08：V/F Pattern Setting					
Parameters No. & Name		Setting Range	Unit	Factory Setting	Function
Cn-02	Max. Output Frequency	50.0～400.0Hz	0.1Hz	60.0Hz	1. Setting of Cn-02~Cn-08 can be set by the user when Sn-02 has been set to "15". You can define your special V/F by referring Fig 30. 2. In low speed operation (<3Hz), a larger torque can be generated by increasing the slope of the V/F Curve. However, the motor temperature will increase due to over-excitation. At the same time the inverter will be more inclined to fault. Based upon the applied load, properly adjust the V/F Curve according to the magnitude of monitored current into the motor. 3. The following relationship must be valid, otherwise an error message " oPE04" will display. Cn-02 ≥ Cn-04 ＞ Cn-05 ≥ Cn-07 Cn-03 ≥ Cn-06 ＞ Cn-08。 4. If Mid. Output Frequency (Cn-05) = Min. Output Frequency (Cn-07), the setting (Cn-06) will not be effective.
Cn-03	Max Output Voltage	0.1～255.0V	0.1V	220.0V*	
Cn-04	Max Voltage Frequency	0.1～400.0Hz	0.1Hz	60.0Hz	
Cn-05	Middle Output Frequency	0.1～400.0Hz	0.1Hz	3.0Hz	
Cn-06	Voltage At Middle Output Frequency	0.1～255.0V*	0.1V	16.5V*	
Cn-07	Min. Output Voltage	0.1～400.0Hz	0.1Hz	1.5Hz	
Cn-08	Voltage At Min. Output Voltage	0.1～255.0V*	0.1V	11.0V*	

*：Value (*) for a 440V class inverter is double

• The following fig is the example of 220V/60Hz

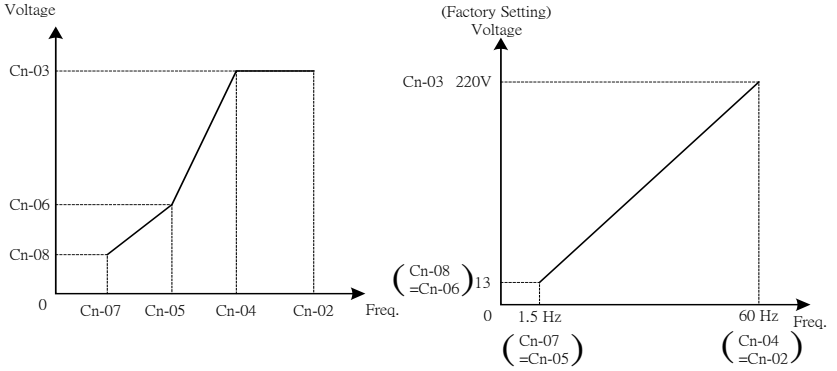


Fig 30　User-defined V/F Curve

Cn-09：Motor Rated Current			Factory Setting	*2
Setting Range	Unit	Function		
*1	0.1A	Set the rated current shown on the motor nameplate as electronic overload thermal reference current.		

*1： The setting range is 10~200% of rated current.

*2： The factory setting depends upon the capacity type of inverter.(Sn-01)

Cn-10：Motor no-load current			Factory Setting	30%
Setting Range	Unit	Function		
0～99%	1%	This setting of Cn-09 is used as a reference value for slip compensation function. • The setting range is 0~99% of the inverter rated current Cn-09 (100%). • Slip compensation is enabled when the output current is greater than Motor No-Load Current (Cn-10). The output frequency will shift from f1 to f2 (>f1) for the positive change of load torque. (See Fig 32)		

Cn-11：Motor rated slip			Factory Setting	0.0%
Setting Range	Unit	Function		
0～9.9%	0.1%	1. This setting is used as a reference value for torque compensation function. See Figure 31. The setting is 0.0~9.9% as a percentage of motor Maximum Voltage Frequency (Cn-04) as 100%. The rated Cn-11 can be derived as the formula of “Motor rated slip” 2. The setting is shown in Fig 31 in the constant torque and constant output range. 3. If setting Cn-11 is zero, no slip compensation is used。 4. There is no slip compensation in the cases when the frequency command is less than the Min. output frequency or during regeneration. 5. Please refer to the “Slip Compensation Control”		

Motor rated slip：

$$\text{Motor Rated Slip (Cn-11)} = \frac{\text{Motor rated freq. (Cn-04)(Hz)} - [\text{Rated speed (rpm)} \times \text{Motor No. of poles (p)}]/120}{\text{Max-voltage freq (Cn-04)(Hz)}} \times 100\ \%$$

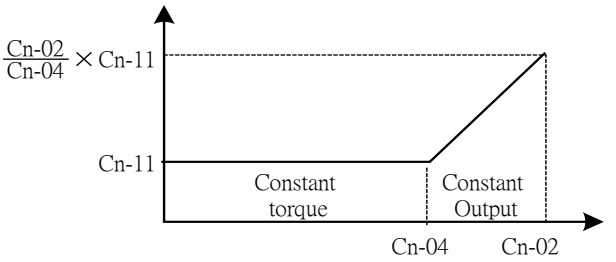


Fig 31　Slip compensation limit

Slip Compensation Control：

See Fig 32. As the load torque is increased from no-load, the real rotor speed will begin to decrease successively from f1. The difference from f1 to the real speed is the slip frequency. To keep the same rotor speed (output frequency) at the desired frequency command, a compensation must be added. This slip compensation control is enabled when the load current is larger than the no-load current Cn-10, the inverter will add the set slip compensation value so that the output frequency f1 increased to f2 and rotor speed is kept at the desired speed as possible even loaded. The added Slip compensation Cn-51 is determined by the following formula.

$$\text{Slip frequency} = \frac{\text{Motor rated slip (Cn-11)} \times (\text{Output current} - \text{Motor no-load current}) \times \text{Max voltage frequency(Cn-04)}}{100 \times (\text{Motor rated current (Cn-09)} - \text{Motor no-load current(Cn-10)})}$$

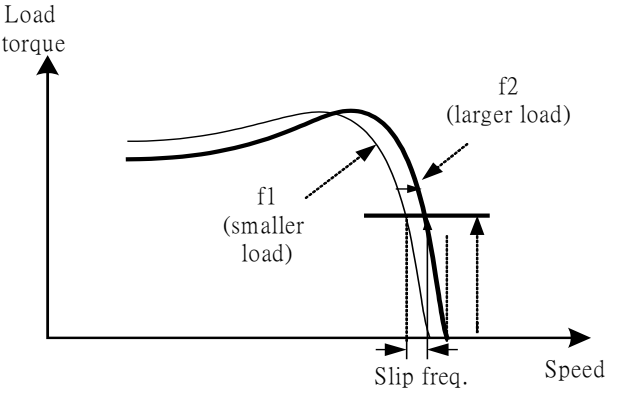


Fig 32 Slip compensation

Cn-12 & Cn-13：Motor parameter (V/F control only)					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-12	Line-To-Line Resistance of Motor	0～65.535Ω	0.001Ω	*	The settings of Cn-12 and Cn-13 are used to do “Auto torque compensation” in V/F control only. They are used together with the bn-19 (torque compensation). For more details, refer the setting of bn-19.
Cn-13	Torque Compensation of Core Loss	0～65535 W	1W	*	

* ： The default setting depends upon the Inverter Capacity (Sn-01). Normally, the setting does not need to be altered.

Cn-14～Cn-17：DC Braking Function					
Parameter & Name		Setting Range	Unit	Factory Setting	Function
Cn-14	DC Injection Braking Starting Frequency	0.1～10.0Hz	0.1Hz	1.5Hz	If your setting of Cn-14 is less than Cn-07，the setting Cn-07 will be loaded as the effective DC Injection Braking Starting Frequency.
Cn-15	DC injection Braking Current	0～100%	1%	50%	The setting value is set as 100% at rated current.
Cn-16	DC injection Braking Time At Stop	0.0～25.5s	0.1s	0.5s	If the DC injection braking time at stop (Cn-16) is 0.0s, no DC injection braking is enabled. In the case, the inverter output will block off when the output frequency is less than the DC injection braking frequency (Cn-14).
Cn-17	DC injection Braking Time at start	0.0～25.5s	0.1s	0.0s	If the DC injection braking time at start (Cn-17) is 0.0s, the motor starts from the Min. output frequency and no DC injection braking are enabled.

DC injection braking function：

The DC injection braking function is to decelerate the motor running by applying a DC current into the winding. Depending on the different usage, the DC injection braking can be divided into two cases.

a) DC injection braking time at stop：

It is used to prevent ‘Coasting by inertia’ when the motor is not completely stopped within normal deceleration time or the rotor is still free run after stop command is pressed when there is a large load. The DC injection braking can shorten the time of rotor braking to its stop or stop the undesired rotation. Lengthening the DC Injection Braking Time at stop (Cn-16) or increasing the DC Injection Braking Current (Cn-15) can shorten the stopping time.

b) DC injection braking time at start:

Before pressing ‘Run’ command, the rotor is in free/random rotation, We can enable DC injection Braking to stop its rotating.

Lengthen the DC injection braking time (Cn-16 及 Cn-17) or increasing the DC injection braking current (Cn-15) can increase the capability of braking. The function of DC injection braking is as the following figure.

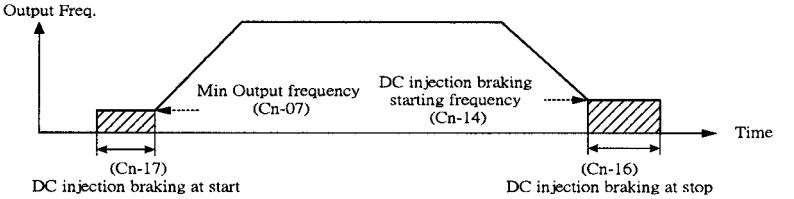


Fig 33 DC injection braking time chart

Cn-18 & Cn-19：Frequency command upper and lower bound					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-18	Frequency command upper bound	0～109 %	1%	100%	1. The upper and lower bounds of the frequency command are used to limit output frequency. If the frequency command is more than the upper bound, the output frequency is limited as the upper bound. If the frequency command is less than the lower bound, the output frequency is limited as the lower bound. (when the lower bound Cn-19 ≥ the Min. output frequency Cn-07) 2. The upper and lower bounds of the frequency command are set as a percentage of the Max. output frequency (Cn-02) as 100%. 3. The relationship Cn-18 > Cn-19 must be abided by. If not, an error message "**oPE05** " is displayed on the digital operator until a correct setting enters again.
Cn-19	Frequency command lower bound	0～109 %	1%	0%	

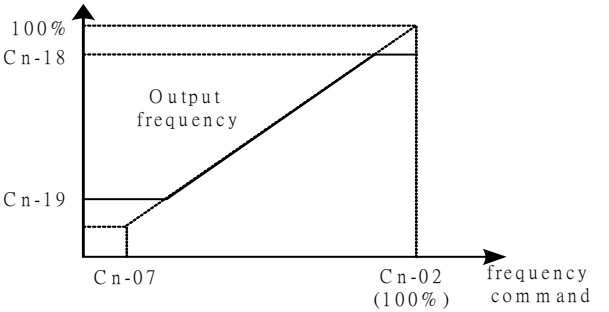


Fig 34 Upper and lower bounds of the frequency command

Cn-20～Cn-23：Jump Frequency					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-20	Frequency jump point1	0.0～400.0Hz	0.1Hz	0.0Hz	1. These settings allow the jumping of certain frequencies within the inverter's output frequency range so that the motor can operate without resonant oscillation caused by some machine system. 2. Operation is prohibited within the jump frequency range, but changes during accel. and decel. are smooth with no jump. 3. To disable this function, set the jump frequency 1~3 (Cn-20-Cn-22) to 0.0 Hz. 4. The jump frequency function is disabled, if Cn-23 is set as 0.0 Hz. 5. Be sure to set the jump so that frequency jump point 1 (Cn-20) ≥ frequency jump point 2(Cn-21) ≥ frequency jump point 3(Cn-22). If not, an error message "oPE06" is displayed.
Cn-21	Frequency jump point 2	0.0～400.0Hz	0.1Hz	0.0Hz	
Cn-22	Frequency jump point 3	0.0～400.0Hz	0.1Hz	0.0Hz	
Cn-23	Jump Frequency Width	0.0～25.5Hz	0.1Hz	1.0Hz	

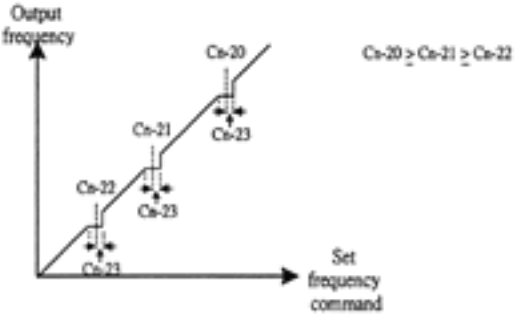


Fig 35　Setting jump frequency

Cn-24：Number of auto restart attempt			Factory Setting	0
Setting Range	Unit	Function		
0~10	—	1. The fault restart function will restart the inverter even when an internal fault occurs during inverter operation. The number of restart is set by parameter Cn-24. Max. is 10 times. If Cn-24 is set as 0, the fault restart is disabled. 2. The fault restart function is effective with the following faults : Over-current / Main circuit over-voltage / Over-torque / Ground fault / Motor Overload / Over-voltage / Inverter Overload 3. The fault restart count will automatically increase upon the restart activated and will be cleared in the following cases (1) When the operation is normal for 10 minutes after a fault restart is performed. (2) When the fault reset input is received after the protection operation has been activated and the fault confirmed .(e.g. by pressing RESET key or enable fault RESET terminals ③) (3) When the power is turned off and on again. 4. When one of the multi-function output terminals (R1A-R1B-R1C、DO1-DOG、R2A- R2C) is set to restart enabled, the output will be ON while the fault restart function is in progress. See the setting of (Sn-30~Sn-32)		

Cn-25 & Cn-26：Stall Prevention Level					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-25	Stall Prevention level During Accel.	30～200 %	1%	170%	1. A stall occurs if the rotor cannot keep up with the rotating electromagnetic field in the stator winding when a large load is suddenly applied or when a sudden acceleration or deceleration is performed. In this case, the inverter should automatically adjust the output frequency to prevent stall. The Stall Prevention Function can be set independently for accelerating, decelerating and running. Please refer Sn-15~17 for more details. 2. **Stall prevention During Acceleration :** When the load current exceeds Cn-25 during acceleration , the output frequency will stop accelerating automatically to prevent stalling. After the load current decreases and less than Cn-25, the output frequency will accelerate automatically. See the Fig 36 ‘Acceleration stall prevention function’ . **3. Stall prevention during running:** See Fig 37. Deceleration is started if the Run Stall Prevention Level Cn-26 is exceeded, especially when an impact load is suddenly applied. Accelerates again when the current level is lower than Cn-26. 4. Cn-25 and Cn-26 are set as a percentage of inverter rated current. And the default set is 100%.
Cn-26	Stall Prevention level During Running	30～200 %	1%	160%	

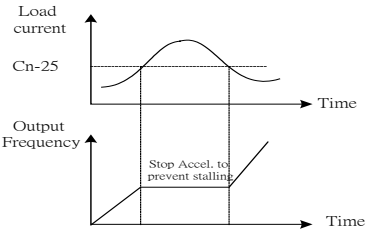


Fig 36 Acceleration stall prevention function

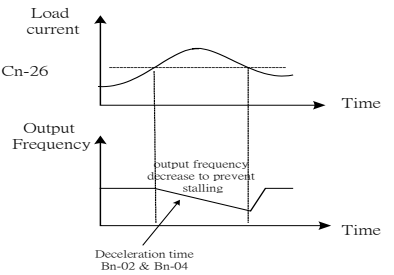


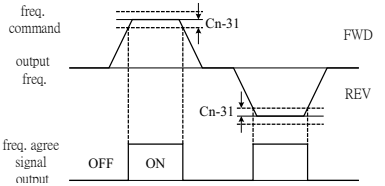
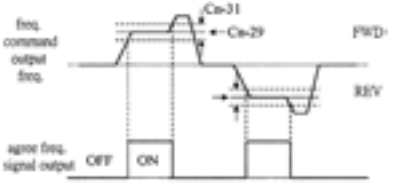
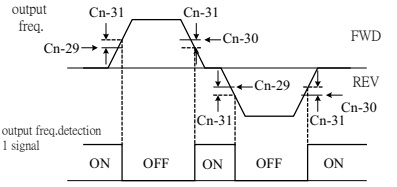
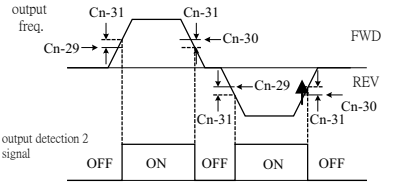
Fig 37 Run stall prevention function

Cn-27：Communication fault detection time		Factory Setting	1.0s
Setting Range	Unit	Function	
0.0～25.5s	0.1s	1. Cn-27 is set as the time to warn that the RS-485 communication fault last. When it happens, the error message " CErr " will be displayed on the digital operator. 2. When Cn-27 is set as 0.0 , the communication fault will not be displayed.	

Cn-28：Digital Operator display unit	Factory Setting	0
Setting Range	Displayed Contents	
0	**0.01Hz** unit	
1	**0.01%** unit (Max. output frequency is 100%)	
2～39	Cn-28 Setting = motor poles **rpm unit** rpm＝120 × frequency command (Hz) / Cn-28	
00040～**0**9999	The fifth digit is 0 ⇒ none digit after decimal point Display：**XXXX**， e.g. Cn-28 = 00500 , 100% speed will be displayed 0500.	
10000～**1**9999	The fifth digit is 1 ⇒ one digit after decimal point Display：**XXX.X**， e.g. Cn-28 =13000 , 100% speed will be displayed 300.0 .	
20000～**2**9999	The fifth digit is 2⇒ two digits after decimal point Display：**XX.XX**， e.g. Cn-28 =22000 , 100% speed will be displayed20.00 .	
30000～**3**9999	The fifth digit is 3⇒ three digits after decimal point Display：**X.XXX**， e.g. Cn-28 =32000 , 100% speed will be displayed 2.000 .	

Cn-29～Cn-31：Frequency Detection					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-29	Frequency Agree Detection Level During Acceleration	0.0～400.0Hz	0.1Hz	0.0Hz	1. Set the multi-function output terminals(control circuit terminals R1A-R1B-R1C，DO1-DOG，R2A-R2C) to output the desired Frequency Agree signal, Agreed Frequency and Output Frequency Detection level. 2. The time chart for frequency Detection operation is described as follows :
Cn-30	Frequency Agree Detection Level During Deceleration	0.0～400.0Hz	0.1Hz	0.0Hz	
Cn-31	Frequency Agree Detection Width	0.1～25.5Hz	0.1Hz	2.0Hz	

Table 9 Frequency Detection Operation

Function	Frequency Detection Operation	Description
Frequency Agree		1. When output freq. is within freq. Command +/- freq. Detection width (Cn-31), frequency agree output is “ON”. 2. Set Sn-30~Sn-32 to be “02”
Setting Frequency Agree		1. After acceleration, the output freq. reaches freq. agree detection level during acceleration (Cn-29) and within freq. detection width (Cn-31), agree freq. output is “ON”. 2. Set Sn-30~Sn-32 to be “03”
Output Frequency Detection 1		1. During acceleration, the output freq. is less than freq. agree detection level during acceleration (Cn-29), output freq. detection 1 is “ON”. 2. During deceleration, the output freq. is less than freq. agree detection level during deceleration (Cn-30), output freq. detection 1 is “ON”. 3. Set Sn-30~Sn-32 to be “04”.
Output Frequency Detection 2		1. During acceleration, the output freq. is large than freq. agree detection level during acceleration (Cn-29) , output freq. detection 2 is “ON”. 2. During deceleration, the output freq. is large than freq. agree detection level during deceleration (Cn-30), output freq. detection 2 is “ON”. 3. Set Sn-30~Sn-32 to be “05”.

Cn-32 & Cn-33：Overtorque Detection					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-32	Overtorque Detection Level	30～200%	1%	160%	1. The overtorque detection function detects the excessive mechanical load from an increase in output current. 2. When the overtorque detection function is set enabled (Sn-20＝1～4), excessive mechanical load can be detected from an increase in output current. An overtorque condition is detected when the torque current exceeds the overtorque detection level (Cn-32) longer than the overtorque time (Cn-33) .The multi-function output terminals (control circuit terminals R1A-R1B-R1C，DO1-DOG，R2A-R2C) can be set to indicate an overtorque condition has been detected. 3. Set the parameter Sn-20 to decide the timing of overtorque detection and operation after detection : detect during frequency agreement or running ; continue or stop operation after detection. 4. Cn-32 is set as a percentage of inverter rated current (Cn-32 as 100%).
Cn-33	Overtorque Detection Time	0.0～25.5s	0.1s	0.1s	

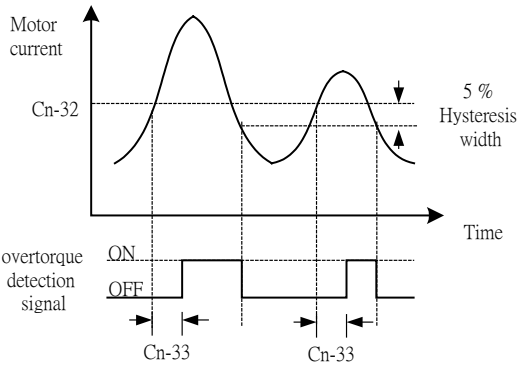


Fig 38 Time chart for overtorque detection

Cn-34：Carrier Frequency setting			Factory Setting	*
Setting Range	Unit	Function		
1～6	—	1. The setting ranges from 1 ~ 6 corresponding to the carrier frequency 2.5kHz～15KHz. Each increment represent 2.5 kHz. 2. Lower the carrier frequency can decrease the noise interference and leakage. However the metal noise will be enlarged relatively. The higher carrier frequency, the smaller the metal noise. 3. The output frequency does not need to be adjusted, except in the following cases. If the wire distance between the inverter and motor is long, lower the carrier frequency as shown below to allow less leakage current.		

*: The factory setting is depended on the capacity of inverter.

Table : wiring distance vs. carrier frequency

Wiring distance	< 30m	30m～50m	50m~100m	> 100m
Carrier frequency (Cn-34)	< 15kHz	< 10kHz	< 5KHz	< 2.5KHz

Cn-35～Cn-38：Speed Search					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-35	Speed Searching Detection Level	0～200%	1%	150%	1. The speed search function finds the speed of a coasting motor and starts up smoothly form that frequency or max. frequency. It is effective in situations such as switching from a commercial power supply to an inverter without tripping. 2. The timing of speed search function as shown below:
Cn-36	Speed Searching Time	0.1～25.5s	0.1s	2.0s	
Cn-37	Min. Baseblock Time	0.5～5.0s	0.1s	0.5s	
Cn-38	V/F Curve in Speed Search	10～100%	1%	100%	

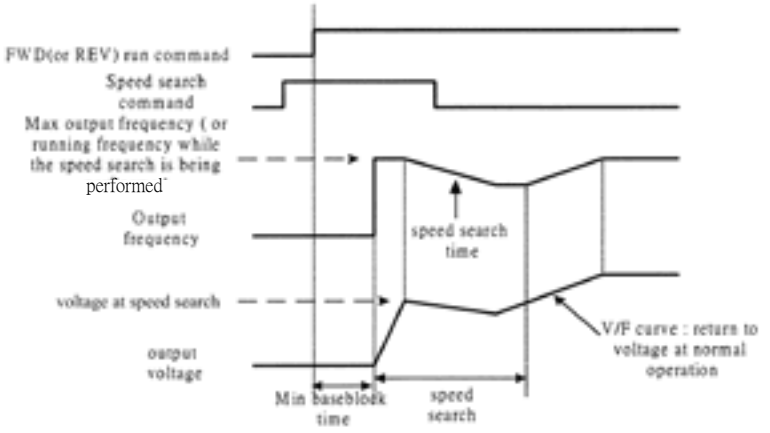


Fig 39 Speed search timing chart

- The speed search command can be set through the multi-function contact input terminal ⑤,⑥,⑦,⑧ (By setting the parameters Sn-25~Sn-28)
  If Sn-25~Sn-28 = 21 : Speed search is performed from Max, output frequency and motor is started.
  If Sn-25~Sn-28 = 22 : Speed search starts from the running frequency when the speed search command is enabled.
- After the inverter output is blocked, the user should input speed search commands then enabled run operation, the inverter will begin to search the motor speed after the min. baseblock time Cn-37.
- Speed search operation, if the inverter output current is less than Cn-35, the inverter will take the output frequency as the real frequency at that time. From those values of real frequency, the inverter will accelerate or decelerate to the set frequency according to the acceleration or deceleration time.
- While the speed search command is being performed , the user can slightly decrease the setting of V/F curve (Cn-38) in order to prevent the OC protection function enabled . Normally, the V/F curve needs not to be changed.
- Speed search operating V/F curve = Cn-38 * (normal operating V/F curve)

Note:

1. The speed search operation will be disabled if the speed search command is enacted for the max. frequency. (i.e., Sn-25=21,Sn-26=22 and multi-function input terminals ⑤ 、⑥ is used at the same time)
2. Make sure that the FWD/REV command must be performed after or at the same time with the speed search command.
3. When Baseblock is enabled, a min. value of Cn-37 must be set such that the time is long enough to allow the motor's residual voltage to dissipate. If an overcurrent is detected when starting a Speed Search or DC Injection Braking, raise the setting Cn-37 to prevent a fault from occurring.

Cn-39：Low voltage detection level		
Setting Range	Unit	Function
150～210V	1V	1. The setting value is the main-circuit DC voltage (V)。 2. In most cases, the setting Cn-39 needs not to be changed. 3. If an external AC reactor is used, decrease the low voltage alarm detection level by adjusting Cn-39 setting smaller.

Cn-40～Cn-43：S-curve Characteristic time					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-40	S-curve Characteristic time at Accel. start	0.0～1.0s	0.1s	0.0s	1. Using the S-curve characteristic function for acceleration and deceleration can reduce shock to the machinery when stopping and starting. 2. After the S- curve time is set, the final acceleration and deceleration time will be as follows: Acc. Time= selected Acc. Time 1(or 2) + [(Cn-40) + (Cn-41)] / 2 Dec. Time= selected Dec. Time 1(or 2) + [(Cn-42) + (Cn-43)] / 2 3. S-curve can be set respectively for beginning acceleration, ending acceleration, beginning deceleration and ending deceleration shown as follows :
Cn-41	S-curve Characteristic time at Accel. end	0.0～1.0s	0.1s	0.0s	
Cn-42	S-curve Characteristic time at Decel. start	0.0～1.0s	0.1s	0.0s	
Cn-43	S-curve Characteristic time at Decel. end	0.0～1.0s	0.1s	0.0s	

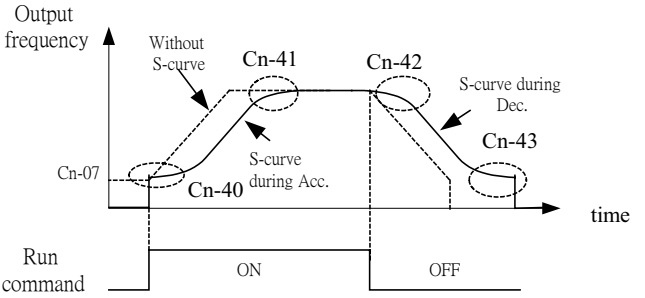


Fig 40 S-curve during acceleration and deceleration

Cn-44 & Cn-45：PID Control					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-44	PID integral upper bound	0～109 %	1%	100%	1. Please refer to " Block diagram for PID control in inverter " 2. PID integral upper bound (Cn-44)： Under PID control, Cn-44 is set within 0~109%. Max. output frequency is 100%. In general, Cn-44 need not be changed. Increase Cn-44 will improve the integral control. If we cannot reduce the hunting by decreasing the bn-15 or increasing Cn-45, we have to decrease Cn-44. If the setting of Cn-44 is too small, the output may not match the target setting.
Cn-45	PID primary delay time constant	0.0～ 2.5s	0.1s	0.0s	3. PID primary delay time constant (Cn-45)： Under PID control, the primary delay time interval is set to invoke the PID control after the frequency command is pressed. If the viscous friction of the mechanical system is high, or if the rigidity is low, causing the mechanical system to oscillate, increase the setting Cn-45 to the value higher than the oscillation period to avoid the oscillation. It will decrease the responsiveness, but it will prevent the oscillation.

How to adjust PID parameters：

Please adjust PID control parameter by the following steps. While adjusting parameters, notice the response of the system.

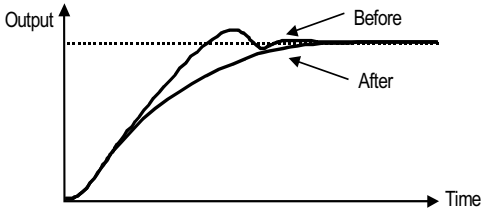
a. Coefficient tuning of PID controller:

1. Enable PID Control (Sn-41=1)
2. Increase the proportional gain (P) as far as possible without creating oscillation.
3. Reduce the integral time (I) as far as possible without creating oscillation.
4. Increase the derivative time (D) as far as possible without creating oscillation.

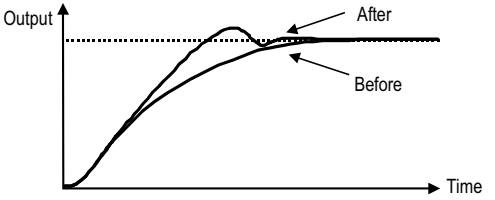
b. Delicate Adjust

Process delicate adjusting after setting the PID parameter

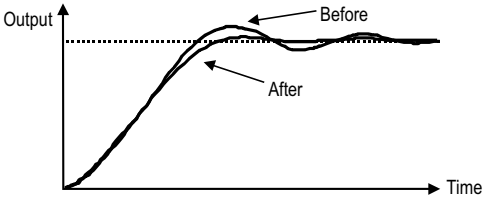
- Reduce oscillation
  If overshoot occurs, shorten the derivative time (D) and lengthen the integral time (I).
- Rapidly stabilize the control conditions
  Even when overshooting occurs, shorten the integral time(I) and lengthen the derivative time (D)
- Reduce oscillation with a longer cycle
  When oscillation with a cycle longer than the integral time (I) setting happens, the oscillation will be reduced as the integral time (I) is lengthened.
- Reduce oscillation with a short cycle
  If oscillation cycle is short and approximately the same as the derivative time (D), the oscillation will be reduced as the derivative time (D) is shorten. If oscillation cannot be reduced even by setting the derivative time (D) to 0.00, then either decrease the proportional gain (P) or raise the PID primary delay time constant(Cn-45).



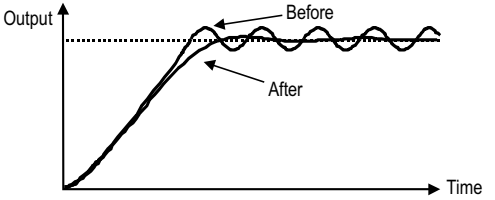
If overshoot occurs, shorten the derivative time (D) and lengthen the integral time (I).



To rapidly stabilize the control conditions even when overshooting occurs, shorten the integral time (I) and lengthen the derivative time (D).



If oscillation occurs with a longer cycle than the integral time (I) setting, then the integral operation is strong. The oscillation will be reduced as the integral time (I) is lengthened.



If oscillation cycle is short and approx. the same as the derivative time (D) setting, then the derivative operation is strong. The oscillation will be reduced as the derivative time (D) is shortened. If even setting the derivative time (D) to 0.00 cannot reduce oscillation, either to decrease the proportional gain (P) or to raise the PID primary delay time constant.

Cn-46～Cn-49：Motor parameter (Vector Control)					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-46	Motor line-to-line Resistance	0.000～65.535Ω	0.001Ω	*	1. Motor's terminal resistance (including the motor external cable resistance) in Ω units. 2. Motor's rotor Y-equivalent model resistance in Ω units. 3. Motor's rotor Y-equivalent model leakage inductance in mH units. 4. Motor Y-equivalent model mutual inductance in mH units. 5. The above motor parameters are for voltage-vector control use. They can be obtained through auto-tuning (Sn-43) or provided by the motor manufacturer.
Cn-47	Motor rotor resistance	0.000～65.535Ω	0.001Ω	*	
Cn-48	Motor equivalent leakage inductance	0.00～655.35 mH	0.01mH	*	
Cn-49	Motor equivalent mutual inductance	0.0～6553.5 mH	0.1mH	*	

＊： The factory setting is upon its different power capacity of inverter.

Cn-50 & Cn-51：Slip Compensation					
Parameter		Setting Range	Unit	Factory Setting	Function
Cn-50	Slip Compensation Gain	0.00～2.55	0.01	1.00	1. Cn-50 is used to adjust the slip compensation. 2. In most cases, the setting Cn-50 need not be changed. Only when the slip compensation is not precise, Cn-50 need to be adjusted. If the motor speed is not lower than setting value, increase the Cn-50 setting. If the motor speed is higher than setting value, decrease the Cn-50 setting. 3. Cn-51 is used to set the compensation primary delay time. 4. In most cases, the setting Cn-51 need not be changed. If the speed response is slow, decrease the setting of Cn-51. If the motor speed is unstable, increase the setting of Cn-51.
Cn-51	Compensation Primary Delay Time	0.0～25.5s	0.1s	2.0s	

5 Fault Message and Trouble Shooting

The inverter has the protective and warning functions. If warning occurs, the digital operator will display the warning code. However, the fault-contact output does not operate. If fault occurs, the fault-contact output operates, and the inverter shut off to stop the motor.

Error message& troubleshooting

LCD Display	Fault Content	Error Cause	Action to be Taken
Uu1 Fault DC Volt. Low	The main circuit DC voltage is lower than the low voltage detection level while power on.	• Power capacity is too small. • Voltage drop due to wiring resistance. • A motor of large capacity connected to the same power system has been started. • Defective electromagnetic contactor.	• Check the source voltage and wiring. • Check the power capacity and power system.
oC Fault Overcurrent	The inverter output current becomes approx. 200% above the inverter rated current.	• Short-circuit or ground- fault at the inverter output side. • Motor of a capacity greater than the inverter rating has been started. • High speed motor or pulse motor has been started. • Extremely rapid accel.	• Check if the capacity of motor matches the capacity of inverter • Check the load wiring. • Extend the accel. Time .
ou Fault Overvoltage	The main circuit DC voltage becomes excessive because of regenerative energy caused by decelerating motor.	• Insufficient deceleration time. • High input voltage compared to motor rated voltage.	• Check the source voltage and wiring • Extend the accel. time. • Use a braking resistor.
oH Fault overheat	The temperature of the cooling fin reaches the detection level.	• Defective cooling fan. • Ambient temperature rise. • Clogged filter.	Check the fan, filter and the ambient temperature.

LCD Display	Fault Content	Error Cause	Action to be Taken
oL 1 Fault motor Overload	Motor overload is detected by the electronic thermal relay. (motor protection)	• Improper rated current (Cn-09) setting. • Motor overloads for very long time, esp. at low speed operation • Improper V/F Characteristic setting	• Set proper rated current (Cn-09) • Reduce the load of motor or replace the inverter with larger capacity • Set proper V/F curve according to the nameplate and load of motor.
oL2 Fault inverter Overload	The electronic thermal sensor detects inverter overload while the output current exceeds 150% of rated value for 1 min. (inverter protection)	• Motor overloads for very long time, esp. at low speed operation • Improper V/F Characteristic setting make the motor operated in over- or under- excitation	• Reduce the load of motor or replace the inverter with larger capacity • Set proper V/F curve according to the nameplate and load of motor.
oL3 Fault Overtorque	Overtorque is detected while the output current is larger than or equal to the setting of Cn-32. The inverter stops operating.	• Mechanical system errors or overload	• Check the mechanical system • Set a proper overload detection level (Cn-32)
EF3 Ext Fault 3	External fault signal input from terminal ③	• Fault input of external signal	• Exclude the fault signal input by external terminals.
EF5 Ext Fault 5	External fault signal input from terminal ⑤		
EF6 Ext Fault 6	External fault signal input from terminal ⑥		
EF7 Ext Fault 7	External fault signal input from terminal ⑦		
EF8 Ext Fault 8	External fault signal input from terminal ⑧		
CPF03 Fault Inverter EEPROM	EEPROM fault	• EEPROM of control board is faulted	• Use Sn-03 to initialize the inverter. If the error still exist, replace the control board.

LCD Display	Fault Content	Error Cause	Action to be Taken
CPFOS Fault Inverter A/D	A/D converter (inside the CPU) fault	• Control board is damaged.	• Replace the control board
GF Ground fault	A ground fault occurs at the inverter output side and the ground-fault current exceeds approx. 50% of the inverter rated current.	• Motor dielectric strength is insufficient. • Load wiring is not proper.	• Check the motor wiring impedance and the output/load wiring.
rH Dynamic braking resistor overheat	The protection function (of installed dynamic braking resistor) invoked and the accumulation of regeneration energy is too much due to many brakings occurred.	• The rating of dynamic braking resistor is too small • The Decel. time is too short	• Increase higher rating of dynamic braking resistor (larger power rating and smaller resistance). • Increase Decel. Time.
CErr RS-485 Comm. fault	RS-485MODBUS Communication fault occurs. In this case the inverter is set to stop running.	• Improper RS-485 comm. setting • Improper RS-485 wiring. • Incorrect RS-485 comm. format • Noise corruption.	• Check RS-485 comm. setting • Check RS-485wiring. • Check RS-485 comm. format • Use noise-resistive wire or parts

Warning and Self-Diagnosis

LCD Display	Fault Contents	Error Causes	Action to be taken
Uu (blinking) Alarm DC Volt. Low	The main circuit DC voltage becomes lower than the lower under-voltage level before motor starts.	• Input voltage is too low. • Input power is not contacted properly. • The surge current contactor opened	• Check if the main circuit DC voltage is too low or if the surge current occurred • Check input power wiring
ou (blinking) Alarm Over Voltage	The main circuit DC voltage exceeds the higher over-voltage level before the motor starts.	• Input voltage is too low. • Input power is not contacted properly.	• Check if the main circuit DC voltage is too low or if the surge current occurred • Check input power wiring
oH (blinking) Alarm Overheat	The thermal protection contact is input to the external terminal.	• Inverter overheat alarm signal is input from a multi-function input and this multi-function input terminal is set	• Check the multi-function input overheat alarm terminal
oL3 (blinking) Alarm Overtorque	Overtorque is detected when the output current is larger than or equal to the setting of Cn-32. However, the Sn-20 has been set such that the inverter continues to run and disregards the overtorque warning.	• Machine error or overload • Improper setting of Cn-32	• Check application and correct the cause of overtorque . • Set a higher protection level (Cn-32).
CErr (blinking) RS-485 Interrupt	RS-485MODBUS Communication fault occurs. In this case the inverter is set to continue to run	• Improper RS-485 comm. setting • Improper RS-485 wiring. • Incorrect RS-485 comm. format • Noise corruption.	• Check RS-485 comm. setting • Check RS-485wiring. • Check RS-485 comm. format • Use noise-resistive wire or parts to improve the noise immunity.
rH (blinking) Alarm Overheat	The protection function (of installed dynamic braking resistor) invoked and the accumulation of regeneration energy is too much due to many bra kings occurred.	• The rating of dynamic braking resistor is too small • The Decel. time is too short	• Increase higher rating of dynamic braking resistor (larger power rating and smaller resistance). • Increase Decel. Time.

LCD Display	Fault Contents	Error Causes	Action to be taken
AtE (blinking) Autotune error	Motor parameter autotune error or improper ending	• The ACCEL/DECEL time is too short • Inverter capacity and motor rating are not properly matched. • The wiring between inverter and motor is disconnected. • Motor load unbalance. • The motor has a heavy load Incorrect setting of motor voltage class and rated frequency	• Lengthen the ACCEL/DECEL time (bn-01& bn-02) • Relive or decrease the load • Check motor rating and wiring • Set proper Cn-03/-04 upon nameplate
CPF01 Operator comm. error	• Communication with digital operator is not established within 5 sec after power-on • After communication is established, there is the transmission error with digital operator for more than 2 sec.	• The digital operator is not properly connected. • He control board is faulty	• Disconnect the digital operator and then connect it again. • Replace the control board.
bb (blinking) Base blocked	External base-block signal occurred at the input of multi-function terminal, the inverter coast to stop. When the base-block interrupt signal is gone, the inverter will execute the speed search and run again.	• External base-block signal occurred at the input of multi-function terminal, the inverter stop output frequency command.	• Clear the external base-block signal, the 'bb' warning will disappear.
EF1 (blinking) Input Error	FWD/REV command executed simultaneously for more than 500ms ((inverter will stop as the setting of Sn-04specified)	• Improper operation procedure.	1.Check the wiring of control board. 2.Check the setting of operation procedure.

oPE01 Input Error	Parameter setting is not correct.	1.Improper setting of inverter capacity (Sn-01). 2.Setting value exceeds its range	• Set proper KA value. Be aware of the difference of 220V and 440 V • Re-initiate the parameter setting (Sn-03)
oPE02 Input Error	Improper setting of multi-function input terminals (Sn-25～Sn-28)	1.The setting of Sn-25～Sn-28 does not comply with the rule of Sn-25<Sn-26< Sn-27< Sn-28. 2.There are 2 multi-function input terminals that are assigned as speed search command	1.Change the settings of Sn-25～Sn-28 to comply with the rule of Sn-25< Sn-26 < Sn-27 < Sn-28. 2.Only 1 multi-functional input terminal is assigned to speed search.
oPE03 Input Error	Auto operation set improperly	Sn-45 enable auto-run(> 0)，however, the setting of Sn-46～Sn-61enable stop mode (= 0)	• Enter the correct settings of Sn-45or Sn-46～Sn-61.
oPE04 Input Error	V/F curve parameters set improperly (Cn-02～Cn-08)	The setting of Cn-02～Cn-08 does not satisfy the condition of Cn-02 ≥ Cn-04 > Cn-05 ≥ Cn-07 and Cn-03 ≥ Cn-06 > Cn-08.	Adjusting the setting of the parameters Cn-02~Cn-08.
oPE05 Input Error	Improper setting of the frequency upper and lower bounds	The setting of the frequency upper and lower bounds does not satisfy the condition of Cn-19 ≤ Cn-18.	Adjusting the setting of the parameters Cn-18~Cn-19.
oPE06 Input Error	Improper setting of jump frequency	The setting of Cn-20~Cn-22 jump frequency does not satisfy the condition of Cn-20 ≥ Cn-21 ≥Cn-22.	Adjusting the setting of the parameters Cn-20~Cn-22.

6. Appendix

6-1 List of braking resistor and braking detection module

TDS-V8 220V/ below 20HP and 440V/ below 20HP have included the braking chips. Only the external resistance is needed.

Inverter		Braking Detection Module		External Braking Resistor	Unit		Approx. Braking Torque 10%ED
Voltage	Max. Capability of Motor (HP)	Product ID TMBU-….	Number	Resistance Value (1 set)	Number	Min. Resistance	
220V	1	—	—	80W 200Ω	1	80Ω	125
	2	—	—	300W 100Ω	1	55Ω	125
	3	—	—	300W 70Ω	1	35Ω	125
	5	—	—	400W 40Ω	1	25Ω	125
	7.5	—	—	500W 30Ω	1	16Ω	125
	10	—	1	1000W 20Ω	1	12Ω	125
	15	—	1	2400W 13.6Ω	1	13.6Ω	125
	20	—	1	3000W 10Ω	1	10Ω	125
	25	TMBU-L22	1	5000W 8Ω	1	6Ω	125
	30	TMBU-L22	1	5000W 8Ω	1	6Ω	125
	40	TMBU-L37	1	6000W 5Ω	1	4.5Ω	125
	50	TMBU-L37	1	6000W 5Ω	1	4.5Ω	125
	60	TMBU-L22	2	5000W 8Ω	2	6Ω	125
440V	1	—	—	80W 750Ω	1	260Ω	125
	2	—	—	300W 400Ω	1	190Ω	125
	3	—	—	300W 250Ω	1	145Ω	125
	5	—	—	400W 150Ω	1	95Ω	125
	7.5	—	—	500W 100Ω	1	60Ω	125
	10	—	1	1000W 75Ω	1	45Ω	125
	15	—	1	1000W 50Ω	1	50Ω	125
	20	—	1	1500W 40Ω	1	40Ω	125
	25	TMBU-H30	1	5000W 24Ω	1	17Ω	125
	30	TMBU-H30	1	5000W 24Ω	1	17Ω	125
	40	TMBU-H30	1	6000W 20Ω	1	17Ω	125
	50	TMBU-H45	1	10000W 15Ω	1	12Ω	125
	60	TMBU-H45	2	11000W 3.6Ω	1	12Ω	125

6-2 AC Reactor

An AC reactor can be added on the power supply side if the inverter is connected to a much larger capacity power supply system, or to increase the power factor on the power supply side. Choose the proper AC reactor according to the below list.

Voltage Class	Max. Capacity of Motor (HP)	Current A	Specification mH
220V	1	5	2.1
	2	10	1.1
	3	15	0.71
	5	20	0.53
	7.5	30	0.35
	10	40	0.265
	15	60	0.18
	20	80	0.13
	25	90	0.12
	30	120	0.09
	40	160	0.07
	50	200	0.05
	60	240	0.044
440V	1	2.5	8.4
	2	5	4.2
	3	7.5	3.6
	5	10	2.2
	7.5	15	1.42
	10	20	1.06
	15	30	0.7
	20	40	0.53
	25	50	0.42
	30	60	0.36
	40	80	0.26
	50	90	0.24
	60	120	0.18

6-3 Noise filter List

A. Noise filter at power supply side

External noise filters on power supply side meet the EMC code of EN50081-2

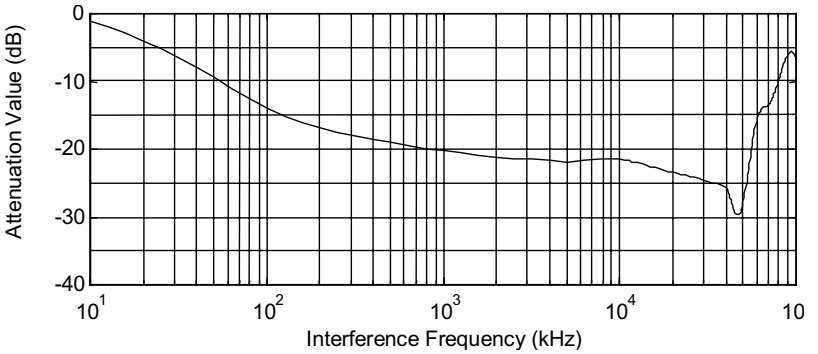
Voltage Class	Max. Capacity of Motor HP(KW)	Standard noise filter		
		Code No. TDSNSF	Number	Rated Current(A)
220V	1(0.75)	TDSNF 32006	1	6A
	2(15)	TDSNF 32012	1	12A
	3(2.2)	TDSNF 30024	1	24A
	5(3.7)	TDSNF 32024	1	24A
	7.5(5.5)	TDSNF 32048	1	48A
	10(7.5)	TDSNF 32048	1	48A
	15(11)	TDSNF 32060	1	60A
	20(15)	TDSNF 32100	1	100A
	25(18.5)	TDSNF 32100	1	100A
	30(22)	TDSNF 32120	1	120A
	40(30)	TDSNF 32170	1	170A
	50(37)	TDSNF 32240	1	240A
	60(45)	TDSNF 32240	1	240A
440V	1(0.75)	TDSNF 34006	1	6A
	2(1.5)	TDSNF 34006	1	6A
	3(2.3)	TDSNF 34012	1	12A
	5(3.7)	TDSNF 34012	1	12A
	7.5(5.5)	TDSNF 34024	1	24A
	10(7.5)	TDSNF 34024	1	24A
	15(11)	TDSNF 34048	1	48A
	20(15)	TDSNF 34048	1	48A
	25(18.5)	TDSNF 34048	1	48A
	30(22)	TDSNF 34060	1	60A
	40(30)	TDSNF 34100	1	100A
	50(37)	TDSNF 34100	1	100A
	60(45)	TDSNF 34120	1	120A

B. Zero phase Noise Filter

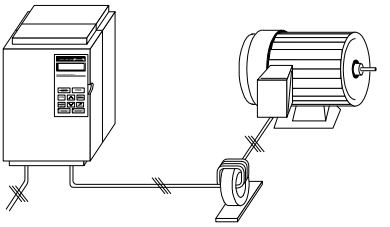
TDSZF-100---- Zero phase Noise Filter at output Side Description

- The Zero-Sequence Noise Filter (Ferrite Core) can be installed either on the input side or on the output side. The wire around the core for each phase should be wound by following the same convention and in one direction. The more winding turns, the better attenuation effect. (without saturation). If the wire size is too big to be wound, all the wire can be grouped together and go through several cores in one direction. According to the required power rating and wire size, select the matched Ferrite Core to reduce EMI noise.
- The Zero-Sequence Noise Filter (Ferrite Core) can attenuate the frequency response at high frequency range (from 100KHz to 50MHz, as shown below). It should be able to attenuate the RFI from inverter to outside.

• Frequency Attenuation Characteristics (10 Winding Case)

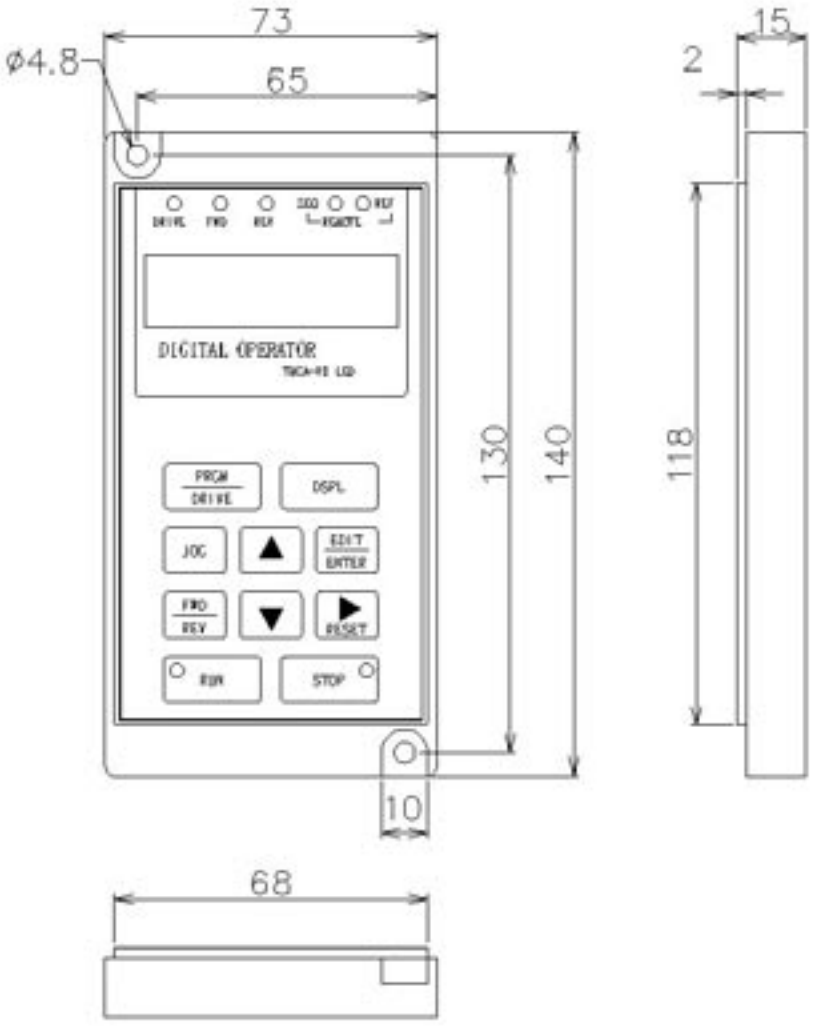


Example: EMI Suppression Zero Phase Core Application Example



Note: All the line wire for U/T1, V/T2, and W/T3 phases must pass through the same Zero-Phase Core in the same direction. The zero phase cores can be placed close to the inverter to achieve better attenuation effect.

6-4 Physical dimension of digital operator



6-5 LCD Digital Operator Display, Language Selection and Parameter Copy Function Setting

bn-38：LCD Digital Operator Monitor Item After Power-On			Factory Setting	00
Setting Range	Unit	Description		
00～18	—	When the inverter is powered up, the inverter system immediately enters into DRIVE mode. The monitored items will be displayed according to the settings of bn-38. bn-38=0: reference frequency bn-38=1~18, will display the following items as in the table “LCD Digital Operator Monitor Item”		

bn-39 & bn-40: LCD Digital Operator Monitor Display Setting					
Parameter No.	Name	Setting Range	Unit	Factory Setting	Description
bn-39	Monitor Display1	01～18	—	01	1. Under Drive mode, there are 2 display rows for LCD digital operator to monitor the I/O parameter settings. The monitored items are determined by the setting of bn-39 and bn-40. Please refer to the table “LCD Digital Operator Monitor Item”. 2. To monitor the parameter setting, the operator can use ▲ ▼ key to change the displayed items of bottom row easily. However, there will be no change to the display contents determined by the setting of bn-40.
bn-40	Monitor Display2	01～18	—	02	

Table: LCD Digital Operator Monitor Item

	Setting Value	Monitor Contents	Setting Value	Monitor Contents	Setting Value	Monitor Contents
bn-39 Monitor Display1 (Factory Setting =01)	01	Frequency Command	07	Input Terminal	13	Analog Command (AUX)
	02	Output Frequency	08	Output terminal	14	Analog Output (A01)
bn-40 Monitor Display2 (FactorySetting=02)	03	Output Current	09	Accumulation RunTime	15	Analog Output (A02)
	04	Output Voltage	10	Accumulation Power-On Time	16	PID Input
	05	DC Voltage	11	Analog Command (VIN)	17	PID Output1
	06	Output Power	12	Analog Command (AIN)	18	PID Output2

Sn-□□ System Parameters ¶ can not be monitored or changed during operation							
Parameter No.	Name		LCD screen display	Description	Factory setting	User Setting	Ref. Page
Sn-62	LCD function	Language selection	Sn-62=1 Traditional Chinese	0: English 1:Traditional Chinese 2: Simplified Chinese	1		
Sn-63		Parameter Copy	Sn-63=0 Not loaded (copied)	0:Not loaded (copied) 1:Upload from digital operator to inverter 2:Download from inverter to digital operator 3:Inspect the EEPROM of digital operator	0		

Sn-62:LCD Language Selection			Factory Setting	1
Setting Value	Function	Description		
0	English	LCD digital operator can display 3 different fonts: English, Traditional Chinese, and Simplified Chinese.		
1	Traditional Chinese			
2	Simplified Chinese			

Sn-63: Parameter Copy Selection			Factory Setting	0
Setting Value	Function	Description		
0	Not loaded (copied)	1. Through LCD digital Operator, we can copy and store the system parameters of inverter. 2. Sn-63=1:Upload LCD's parameter contents to inverter. During this uploading period, the LEDs (of digital operator) will switch on clockwise. 3. Sn-63=2: Download LCD's parameter contents to inverter. During this uploading period, the LEDs (of digital operator) will switch on counterclockwise. 4. Sn-63=3:Check LCD's EEPROM. During this checking period, the LEDs (of digital operator) will switch on between groups.		
1	Upload from digital operator to inverter			
2	Download from inverter to digital operator			
3	Inspect the EEPROM of digital operator	Please follow these 3 steps to implement the action of Parameter Copy between different inverters (either upload or download). ① Check the contents of LCD Digital Operator EEPROM, then check the contents of inverter's EEPROM. Make sure that both EEPROM function properly. ② Download and copy the inverter's parameter settings to LCD Digital Operator EEPROM. ③ Upload and copy the parameter settings of LCD Digital Operator to other inverter's EEPROM.		

6-6. Parameter settings Table

(1) Frequency command An-□□

An - □□ (in multi-speed operation) ¶ Under the DRIVE mode, the user can set the values.						
Parameter No.	Name	Setting Range	Setting Unit*1	Factory Setting	User Setting	Ref. Page
An-01	Frequency Command 1	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-02	Frequency Command 2	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-03	Frequency Command 3	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-04	Frequency Command 4	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-05	Frequency Command 5	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-06	Frequency Command 6	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-07	Frequency Command 7	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-08	Frequency Command 8	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		62
An-09	Frequency Command 9	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		83
An-10	Frequency Command 10	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		84
An-11	Frequency Command 11	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-12	Frequency Command 12	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-13	Frequency Command 13	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-14	Frequency Command 14	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-15	Frequency Command 15	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-16	Frequency Command 16	0.00 ~ 400.00 Hz	0.01Hz	0.00 Hz		
An-17	Jog Frequency Command	0.00 ~ 400.00 Hz	0.01Hz	6.00 Hz		

*1.The displayed “Setting Unit” can be changed through the parameter Cn-28. At factory setting, the value of “Setting Unit” is 0.01 Hz.

∗ The setting of An-01~An-16 can be used with frequency command for Multi-step operation or for 16-stepAuto-Run Mode operation.

(2) Parameters Can Be Changed during Running bn-□□

bn - □□	Parameters can be changed during Running					
Parameter No.	Name	Setting Range	Setting Unit*1	Factory Setting	User Setting	Ref. Page
bn-01	Acceleration Time 1	0.0～6000.0s	0.1s	10.0s		27
bn-02	Deceleration Time 1	0.0～6000.0s	0.1s	10.0s		
bn-03	Acceleration Time 2	0.0～6000.0s	0.1s	10.0s		
bn-04	Deceleration Time 2	0.0～6000.0s	0.1s	10.0s		
bn-05	Analog Frequency Cmd. VIN Gain	0.0～1000.0%	0.1%	100.0%		28
bn-06	Analog Frequency Cmd. VIN Bias	-100.0～100.0%	0.1%	0.0%		
bn-07	Analog Frequency Cmd. AIN Gain	0.0～1000.0%	0.1%	100.0%		
bn-08	Analog Frequency Cmd. AIN Bias	-100.0～100.0%	0.1%	0.0%		
bn-09	Multi-function Analog Input AUX Gain	0.0～1000.0%	0.1%	100.0%		
bn-10	Multi-function Analog Input AUX Bias	-100.0～100.0%	0.1%	0.0%		
bn-11	Multi-function Analog Output AO1 Gain	0.01～2.55	0.01	1.00		29
bn-12	Multi-function Analog Output AO2 Gain	0.01～2.55	0.01	1.00		
bn-13	PID Detection Gain	0.01～10.00	0.01	1.00		30
bn-14	PID Proportional Gain (P)	0.01～10.00	0.01	1.00		
bn-15	PID Integral Time (I)	0.00～100.00s	0.01s	1.00s		
bn-16	PID Differential Time (D)	0.00～1.00s	0.01s	0.00s		
bn-17	PID Bias	0～109%	1%	0%		
bn-18	Energy Saving Gain	50～150%	1%	100%		32
bn-19	**Auto Torque Boost Gain**	0.0～2.0	0.1	0.5		33
bn-20	Time Function ON_Delay Time	0.0～6000.0s	0.1s	0.0s		34
bn-21	Time Function OFF_Delay Time	0.0～6000.0s	0.1s	0.0s		
bn-22	1st _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		35,83, 84
bn-23	2nd _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-24	3rd _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-25	4th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-26	5th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-27	6th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-28	7th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-29	8th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-30	9th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-31	10th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		

bn - □□	Parameters can be changed during Running					
bn-32	11th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		35,83, 84
bn-33	12th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-34	13th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-35	14th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-36	15th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-37	16th _Step Time Under Auto_Run Mode	0.0～6000.0s	0.1s	0.0s		
bn-38	Monitor	00～18	—	00		30

(3) System parameter ----------Sn- □□

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-01	Basic Parameter Setting	Inverter Capacity Selection	Inverter Capacity Selection: 01～33 220V：01～13 440V：21～33	*1		43
Sn-02		V/F Curve Selection	V/F Curve Selection: 00～15 0～14：15 fixed V/Fcurve pattern 15：arbitrary V/F pattern selection	1		45
Sn-03	Parameter Initialization	Factory Setting Selection	Status of operation and initial setting：00～14 00：An-□□、bn-□□、Sn-□□，Cn-□□setting & reading enabled 01：An-□□setting & reading enabled，bn-□□、Sn-□□、Cn-□□reading only。 02：reserved 03：2-wire initialization，220V/440V 04：3-wire initialization，220V/440V 05：2-wire initialization，200V/415V 06：3-wire initialization，200V/415V 07：2-wire initialization，200V/380V 08：3-wire initialization，200V/380V 09～10：reserved 11：clear fault message 12～14：reserved	0		48
Sn-04	Operation Mode Selection 1	Run Source Selection	0：Operator 1：Control circuit terminal 2：RS-485 communication	0		49
Sn-05		Frequency Command Selection	0：Operator 1：Control circuit terminal 2：RS-485 communication	0		49
Sn-06		Stopping Method Selection	0：Deceleration to stop 1：Coast to stop 2：Whole-Range braking stop 3：Coast to stop with Timer	0		49
Sn-07	Operation Mode Selection 2	Priority of Stopping	If operation command from control terminal or RS-485 communication port 0：operator stop key effective 1：operator stop key not effective	0		51
Sn-08		Prohibition of REV Run	0：reverse run enabled 1：reverse run disabled	0		51
Sn-09		Scanning Times at input Terminal	0：scan and confirm once per 5 ms 1：continously scan and confirm twice per 10 ms	0		51

Sn - □□	System Parameters		¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-10		Output Frequency Up/Down Function	0：Reference frequency is changed through the key “UP/DOWN”pressing, later followed by key “ENTER”pressing, and then this output freq. will be acknowledged 1：Reference frequency will be acknowledged immediately after the key “UP/DOWN”pressing. No need to press “ENTER”key.	0		51
Sn-11	Operation Mode Selection3	Frequency Command Characteristics Selection	0：voltage signal 0～10V (VIN) 1：addition of voltage signal and current signal (VIN+AIN) 2：subtraction of current signal and voltae signal (VIN-AIN) 3： current signal 4～20mA (AIN)	1		52
Sn-12		Frequency Command Characteristics Selection	0：Reference command has forward characteristics (0~10V or 4~20mA) 0~100% 1：Reference command has reverse characteristics (0～10V or 4～20mA) 100～0%	0		52
Sn-13		Zero speed braking function selection	0：Invalid 1：Valid	0		52
Sn-14		Output Voltage Limit Selection	0：Output voltage is limited 1：Output voltage is unlimited	0		53
Sn-15	Protection Characteristic selection1	Stall prevention During Acc. Function Selection	0：invalid 1：valid	1		54
Sn-16		Stall prevention During Dec. Function Selection	0：invalid 1：valid	1		54
Sn-17		Stall prevention During Running Function Selection	0：invalid 1：valid─Deceleration time 1 (bn-02) 2：valid─Deceleration time 2 (bn-04)	1		54
Sn-18	Protection Characteristic selection	Restart after power outage operation selection	0：Stop running 1：Continue to run	0		55

Sn - □□ System Parameters ¶ can not be monitored or changed during						
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-19	Protection Characteristic Selection 2	Motor Overload Protection Selection	0：electronically motor overload protection invalid 1：standard motor cold start overload protection characteristics 2：standard motor hot start overload protection characteristics 3：special motor cold start overload protection characteristics 4：special motor hot start overload protection characteristics	1		56
Sn-20		Overtorque Detection Selection	0 : Overtorque detection function is not effective. 1 : Overtorque is detected only at frequency agree; the motor will sustain operation even after the overtorque has been detected 2 : Overtorque is detected only at frequency agree; the motor will stop after the baseblock time when the overtorque has been detected. 3 : Overtorque is detected during running (Accel.,Decel. included). The motor will sustain operation even after the overtorque has been detected. 4 : Overtorque is detected during running (Accel., Decel included). The motor will stop after the baseblock time when the overtorque has been detected.	0		57
Sn-21	External Fault Detection	Operation selection at fault contact during fault retrying	0 : Do not output fault retry. (The fault contact does not operate.) 1 : Output fault retry. (The fault contact operates.)	0		57
Sn-22		External Fault(Contact③) Contact Selection	0 : A-contact (normally open input) 1 : B-contact (normally closed input)	0		57 58
Sn-23		External Fault(Contact③) Detection Selection	0：Detection all time 1：detect only during operation	0		
Sn-24		External Fault Operation Selection	0 : Dec. to stop (upon dec. time 1 bn-02) 1 : Coast (free run) to stop 2 : Dec. to stop (upon dec. time 1 bn-04) 3 : Continue operating	1		

Sn - □□ System Parameters			¶ can not be monitored or changed during				
Parameter No.	Name		Description		Factory setting	User Setting	Ref. Page
Sn-25	Multi-function Digital Input Selection	Multi-function Input Terminal⑤ Function Selection	00～21	The factory setting is multi-function command 1	3		58
Sn-26		Multi-function Input Terminal⑥ Function Selection	01～22	The factory setting is multi-function command 2	4		
Sn-27		Multi-function Input Terminal ⑦ Function Selection	02～23	The factory setting is jog command	7		
Sn-28		Multi-function Input Terminal ⑧ Function Selection	03～24	The factory setting is Acc. &Dec. Interrupt	8		
Sn-29	Multi-function Analog Input Selection	Multi-function Analog Input (Aux) Selection	00～11	Multi-function analog input (Aux) as Auxiliary frequency command (factory setting)	0		68
Sn-30	Multi-function Digital Output Selection	Multi-function Output Terminal (R1A-R1B-R1C) Function Selection	00～25	Terminal (R1A-R1B-R1C) as fault output (factory setting)	10		71
Sn-31		Multi-function Terminal (DO1)Function Selection	00～25	Terminal (DO1-DOG) as digital output during running (factory setting)	0		
Sn-32		Multi-function Terminal (R2A-R2C) Function Selection	00～25	Terminal (R2A-R2C) as digital output at zero speed (factory setting)	1		
Sn-33		Pulse Output Multiplier Selection	When multi-function output terminal (DO1) is set as pulse signal output Setting Range：01～16		1		76

Sn - □□ System Parameters ¶ can not be monitored or changed during						
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-34	Multi-function Analog output Selection	Multi-function Analog output (AO1) Function Selection	Multi-function Analog output Selection：00～11 00： Freq. Cmd.	0		77
Sn-35		Multi-function Analog output (AO2) Function Selection	01： Output frequency 02： Output current 03： Output voltage 04： DC voltage 05： Output power 06： VIN External analog input command VIN 07： AIN External analog input command AIN 08： Aux Multi-function Analog input (Aux) 09： PID control input 10： PID control output 1 11： PID control output 2	1		
Sn-36	RS-485 Communication Function	RS-485 Inverter Address	Setting Range : 01～31	1		77
Sn-37		RS-485 Comm. Baud Rate Setting	0：1200 bps (bytes / per second) 1：2400 bps 2：4800 bps 3：9600 bps	3		
Sn-38		RS-485 Comm. Transmission Parity Setting	0： (No parity) 1： (even parity) 2： (odd parity)	0		
Sn-39		RS-485 Comm. Fault stop Selection	0：deceleration to stop (bn-02) 1：coast to stop 2：deceleration to top(bn-04) 3：continue to run	0		
Sn-40	Applied Function Selection	Load torque selection	0：constant torque (CT) 1：variable descending torque (VT)	0		79
Sn-41		PID Function	0：PID Invalid 1：PID Valid	0		79
Sn-42	Reserved					

Sn - □□ System Parameters			¶ can not be monitored or changed during			
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-43	Vector control selection	Motor parameters autotune selection	0：Autotune disabled 1 : Autotune enabled	0		79
Sn-44		Control mode	0：V/F control 1：Voltage vector control	0		81
Sn-45	Auto Run Mode	Operation Mode Selecton During Auto-Run	0：Auto-Run mode not effective 1：Auto-Run mode for one single cycle.(continuing running from the unfinished step if restarting) 2：Auto-Run mode be performed periodically.(continuing running from the unfinished step if restarting) 3：Auto-Run mode for one single cycle,then hold the speed of final step to run (continuing running from the unfinished step if restarting) 4：Auto-Run mode for one single cycle from the the initial step.(starting a new cycle if restarting) 5：Auto-Run mode performed periodically. (starting a new cycle if restarting) 6：Auto-Run mode for one single cycle,then hold the speed of final step to run (starting a new cycle if restarting)	0		82
Sn-46		Auto-Run Mode Operation Selection 1	0： stop 1： forward 2： reverse	0		82
Sn-47		Auto-Run Mode Operation Selection 2		0		
Sn-48		Auto-Run Mode Operation Selection 3		0		
Sn-49		Auto-Run Mode Operation Selection 4		0		
Sn-50		Auto-Run Mode Operation Selection 5		0		
Sn-51		Auto-Run Mode Operation Selection 6		0		
Sn-52		Auto-Run Mode Operation Selection 7		0		
Sn-53		Auto-Run Mode Operation Selection 8		0		
Sn-54		Auto-Run Mode Operation Selection 9		0		

Sn - □□ System Parameters ¶ can not be monitored or changed during						
Parameter No.	Name		Description	Factory setting	User Setting	Ref. Page
Sn-55		Auto-Run Mode Operation Selection 10		0		82
Sn-56		Auto-Run Mode Operation Selection 11		0		
Sn-57		Auto-Run Mode Operation Selection 12		0		
Sn-58		Auto-Run Mode Operation Selection 13		0		
Sn-59		Auto-Run Mode Operation Selection 14		0		
Sn-60		Auto-Run Mode Operation Selection 15		0		
Sn-61		Auto-Run Mode Operation Selection 16		0		

(4) Control Parameters ----------Cn

Cn - □□ Control Parameters ¶ Parameters can't be monitored or changed during operation.							
Parameter No.	Name		Setting Range	Unit	Factory Value	User Setting	Ref. Page
Cn-01	V/F Pattern Setting	Input Voltage	150.0～255.0V*1	0.1V	220.0V*2		87
Cn-02		Max. Output Frequency	50.0～400.0Hz	0.1Hz	60.0Hz		87
Cn-03		Max. Output Voltage	0.1～255.0V*1	0.1V	220.0V*2		
Cn-04		Max. Voltage Frequency	0.1～400.0Hz	0.1Hz	60.0Hz		
Cn-05		Middle Output Frequency	0.1～400.0Hz	0.1Hz	3.0Hz		
Cn-06		Voltage At Middle Output Frequency	0.1～255.0V*1	0.1V	16.5V*2		
Cn-07		Min Output Frequency	0.1～400.0Hz	0.1Hz	1.5Hz		
Cn-08		Voltage At Min. Output Frequency	0.1～255.0V*1	0.1V	11.0V*2		
Cn-09	Motor Parameter	Motor Rated Current	*3	0.1A	3.3A*4		88
Cn-10		No Load Current of Motor	0～99%	1%	30%		88
Cn-11		Rated Slip of Motor	0～9.9%	0.1%	0.0%		89
Cn-12		Motor Line-to-Line Resistance	0～65.535Ω	0.001Ω	*4		90
Cn-13		Motor iron-core loss	0～65535 W	1W	*4		
Cn-14	DC Braking Function	DC Injection Braking Starting Frequency	0.1～10.0Hz	0.1Hz	1.5Hz		91
Cn-15		DC Braking Current	0～100%	1%	50%		
Cn-16		DC Injection Braking Time At Stop	0.0～25.5s	0.1s	0.5s		
Cn-17		DC Injection Braking Time At Start	0.0～25.5s	0.1s	0.0s		
Cn-18	Frequency Limit	Frequency Command Upper Bound	0～109%	1%	100%		92
Cn-19		Frequency Command Lower Bound	0～109%	1%	0%		
Cn-20	Frequency Jump	Frequency Jump Point 1	0.0～400.0Hz	0.1Hz	0.0Hz		93
Cn-21		Frequency Jump Point 2	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-22		Frequency Jump Point 3	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-23		Jump Frequency Width	0.0～25.5Hz	0.1Hz	1.0Hz		
Cn-24	Retry Function	Number of Auto Restart Attempt	0~10	—	0		94
Cn-25	Stall Prevention	Stall Prevention During Acceleration	30～200%	1%	170%		95
Cn-26		Stall Prevention During Running	30～200%	1%	160%		
Cn-27	—	Communication Fault Detection Time	0.0～25.5s	0.1s	1.0s		96
Cn-28	Display Unit	Digital operator Display mode	0-39999	—	1		96

Cn - □□ Control Parameter ¶ Parameters can't be monitored or changed during operation.							
Cn-29	Frequency Agree Detection	Freq. Agree Detection Level During Accel.	0.0～400.0Hz	0.1Hz	0.0Hz		97
Cn-30		Freq. Agree Detection Level During Decel	0.0～400.0Hz	0.1Hz	0.0Hz		
Cn-31		Frequency Agree Detection Width	0.1～25.5Hz	0.1Hz	2.0Hz		
Cn-32	Over-torque Detection	Overtorque Detection Level	30～200%	1%	160%		99
Cn-33		Overtorque Detection Time	0.0～25.5s	0.1s	0.1s		
Cn-34	Carrier Frequency	Carrier frequency setting	1～6	—	*4		100
Cn-35	Speed Search Control	Speed Search Detection Level	0～200%	1%	150%		100
Cn-36		Speed Search Time	0.1～25.5s	0.1s	2.0s		
Cn-37		Min. Baseblock Time	0.5～5.0s	0.1s	0.5s		
Cn-38		V/F Curve in Speed Search	10～100%	1%	100%		
Cn-39	Low Voltage Detection	Low Voltage Alarm Detection Level	150～210V	1V	190V		102
Cn-40	S-curve time	S-curve Characteristic Time at Accel. Start	0.0～1.0s	0.1s	0.0s		102
Cn-41		S-curve Characteristic Time at Accel. End	0.0～1.0s	0.1s	0.0s		
Cn-42		S-curve Characteristic Time at Decel. Start	0.0～1.0s	0.1s	0.0s		
Cn-43		S-curve Characteristic Time at Decel. End	0.0～1.0s	0.1s	0.0s		
Cn-44	PID control	PID Integral Upper Bound	0～109%	1%	100%		103
Cn-45		PID Primary Delay Time Constant	0.0～2.5s	0.1s	0.0s		
Cn-46	Motor parameter	Motor line-to-Line resistance	0.000～65.535Ω	0.001Ω	*4		106
Cn-47		Motor rotor resistance	0.000～65.535Ω	0.001Ω	*4		
Cn-48		Motor equivalent leakage inductance	0.00～655.35 mH	0.01mH	*4		
Cn-49		Motor equivalent mutual inductance	0.0～6553.5 mH	0.1mH	*4		
Cn-50	Slip Comp.	Slip Compensation Gain	0.00～2.55	0.01	1.00		106
Cn-51		Slip Compensation Delay Time	0.0～25.5s	0.1s	2.0s		

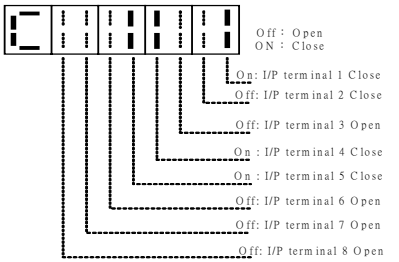
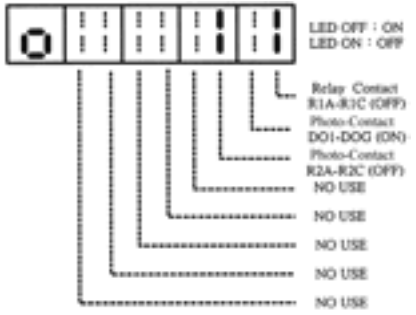
*1: These are for a 220V class inverter. Value for a 440 V class inverter is double.

*2: The initial values are for a 220V class inverter. Value for a 440 V class inverter is double

*3: The setting range is 10% ~200 % of the inverter rated current.

*4: The factory setting value will vary based upon the inverter capacity value.

(5) Monitoring parameter ----------Un－□□

Un - □□	Monitoring parameter	¶ can only be monitored under the DRIVE mode	
Parameter No.	Name	Unit	Function
Un-01	Frequency Command	0.01Hz	Display frequency command. The displayed unit is determined by Cn-28.
Un-02	Output Frequency	0.01Hz	Display output frequency. The displayed unit is determined by Cn-28.
Un-03	Output Current	0.1A	Display inverter output current.
Un-04	Output Voltage	0.1V	Display output voltage command of inverter .
Un-05	Main Circuit DC Voltage	0.1V	Display DC voltage of inverter main circuit.
Un-06	Output Power	0.1KW	Display the output power of inverter.
Un-07	Input Terminal Status	-	 Monitor the input terminals ① ~ ⑧ status : ON/OFF
Un-08	Output Terminal Status	-	 To monitor the status of output terminals R1A-R1C，R2A-R2C，DO1-DOG : ON/OFF
Un-09	The cumulative operation time	1Hr	The parameter will record the cumulative operation time with voltage output. Its value is 0~65535 Hr. If the value exceeds 65536, it will restart from 0 again.

Un - □□	Monitoring parameter	¶ can only be monitored under the DRIVE mode	
Parameter No.	Name	Unit	Function
Un-10	The cumulative side-power operation time	1Hr	The parameter will record the cumulative operation time from side power involved until power-off. Its value is 0~65535 Hr. If the value exceeds 65536, it will restart from 0 again.
Un-11	Output Analog Command VIN (0～10V)	0.1%	The parameter can monitor the external analog terminal voltage VIN (0%~100%/0~10V). When the PID control is valid, the analog command is the feedback of PID. Refer to the "PID Controller block diagram ". 100% = Max. Output Freq.
Un-12	Output Analog Command AIN (4～20mA)	0.1%	The parameter can monitor the external analog terminal current AIN (0%~100% / 4～20mA). When the PID control is valid, the analog command is the feedback of PID. Refer to the "PID Controller block diagram ". 100% = Max. Output Freq.
Un-13	Multi-function Analog Input Command AUX	0.1%	The parameter can monitor multi-function analog input command AUX (0%~100% / 0～10V). When the PID control is valid, the analog command is the feedback of PID. Refer to the "PID Controller block diagram ". 100% = Max. Output Freq. 10V/100%
Un-14	External Analog Output A01	0.1%	The parameter can monitor multi-function analog output terminal A01, A02 voltage(0～10V). Their output gain can be adjusted through the setting of parameters bn-11 or bn-12. Their outputs are determined and varied proportionally according to the setting of (Sn-34 or Sn-35) 10V/100%
Un-15	External Analog Output A02	0.1%	
Un-16	PID Control Input	0.01%	Refer to "PID Controller block diagram". Un-16,17,18 can be used to monitor. 100%＝Max. Output Frequency
Un-17	PID Control Output 1	0.01%	
Un-18	PID Control Output 2	0.01%	
Un-19	Freq. Command While Fault Occurred	0.01Hz	The parameters will display the inverter status when the fault occurred lately so as the status.
Un-20	Output Freq. While Fault Occurred	0.01Hz	

Un - □□	Monitoring parameter	¶ can only be monitored under the DRIVE mode	
Parameter No.	Name	Unit	Function
Un-21	Output Current While Fault Occurred	0.1A	
Un-22	Output Voltage While Fault Occurred	0.1V	
Un-23	DC Voltage While Fault Occurred	0.1V	
Un-24	The cumulative time between last fault and the nearest fault.	1Hr	
Un-25	I/P terminal status while fault occurred	-	
Un-26	O/P terminal status while fault occurred	-	
Un-27	Fault Message 1	-	Fault message occurred now
Un-28	Fault Message 2	-	Fault message occurred last time
Un-29	Fault Message 3	-	Fault message occurred last two times
Un-30	Fault Message 4	-	Fault message occurred last three times
Un-31	EPROM S/W version	-	Software Serial No. for manufacturing use
Un-32	TEK DRIVET ™ Inverter Model Number	-	Display : tdSu8 , represent the model number " TDS-V8 " of TEK DRIVE TM

TDS-V8

INSTRUCTION MANUAL