Foreword

Thank you for using WIN-9 series of frequency inverters of Shezhen Winner S&T Co., Ltd. WIN-9 series of SVPWM frequency inverters feature in rated torque output at low speed, ultra-low noise running, built-in PID function, multiple control modes, on-line parameter adjustment monitoring, easy operation, double LED display. They satisfy customers' demands to the extreme extend. WIN-9 includes models for general purpose, for blower/pump, for extruder and for textile machines.

WIN-9 series of frequency inverters are suitable for most equipment driven by motors, such as equipment in industries of paper-making, textile, food, cement, print, plastic, metallurgy, iron and steel, etc. They are stable, accurate, reliable and efficient in improving the power factor and saving cost. A noise filter must be added to comply with the CE standards.

This User's Manual provides the users with the instructions on the installation, parameter setting, fault diagnosis, routine maintenance and necessary precautions. Please read the Manual carefully before handling the inverter inorder to ensure the correct installation and operation.

We are not going to give pre-notice for any change in the user's manual.

Safety Precautions

Proper transportation, installation, operation and maintenance decide the secure performance of the product. Pay attention to the safety precautions before working on the product.

This sign means that the mal-usage may lead to injury or fatal error.

DANGER!

This sign means that the mal-usage may lead to slight or medium human injury or equipment damage.

NOTE!

CONTENTS

Chapter 1 Check the Product at Acceptance

> **NOTE!**
>
> Do not install defective inverter or uncompleted inverter,otherwise, injury might occur.

Although we check the goods strictly before shipment, you are suggested to check the goods carefully because some unexpected damage may be made during the transportation.

1.1 Check The Content

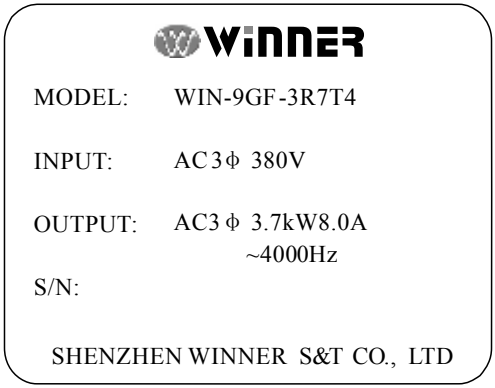
Please check the following items when you receive the goods:

What to check?	How to Check
Is the model correct?	Check the label at the side of the inverter's body.
Is anything damaged?	Make an overall inspection.
Are the screws tight?	Fasten those loose screws with a screw driver.
Are there user's manual, QC Pass document or other accessories inside the box?	Check if they are in the box.

Please contact your supplier or contact us if there is any thing wrong.

1.2 Model Number Designation

1.2.1 Nameplate



Nameplate Example

1.2.2 Nameplate Description

WIN - 9GF - 3R7 T4

Product Code	Series Code	Capacity	Voltage	Special Notice
WIN	9G general type 9P for pumps, blowers	3R7: 3.7kW 5R5: 5.5kW 011: 11kW …… 500: 500kW	T4: 380V T6: 660V	Blank: Standard B: With braking Function X: Special type

1.3 Main Structure

Chapter 2 Installation and Wiring

2.1 Dimension (See Appendix 1)

2.2 Requirement to The Installation Place

NOTE!

1. Move the inverter by holding the bottom. The inverter might fall onto your feet and hurt you if you hold its cover.
2. Please install the inverter onto apyrous material like metal. Fire may happen if it is installed on flammable material.
3. Please use cooling fan when install over two inverters in a cabinet. The temperature of the air in-led side should be lower than 40°C. Fire or other accident may happen if it is over heat.

2.2.1 Installation Place

Please install the inverter at the place with the following working conditions:

- Good ventilation
- Ambient temperature -10°C to 40 °C ,for naked inverter -10°C to 50 °C
- Humidity lower than 90% RH. No rain drops.
- Do not install on flammable material like wood.
- No direct sun light
- No flammable and erosive air or liquid
- No dust, oil dust, floating fiber or fine metal powder
- The installation base is strong.
- No vibration.
- Keep the unit away from electromagnetic interference and the interference source Lower than 1000 meters sea level. Within 1000 meters sea level, the higher the sea level, the lower the rated output. The ambient temperature is allowed to decrease by 0.5 C with sea level every 100 meters higher.

2.2.2 Ambient Temperature

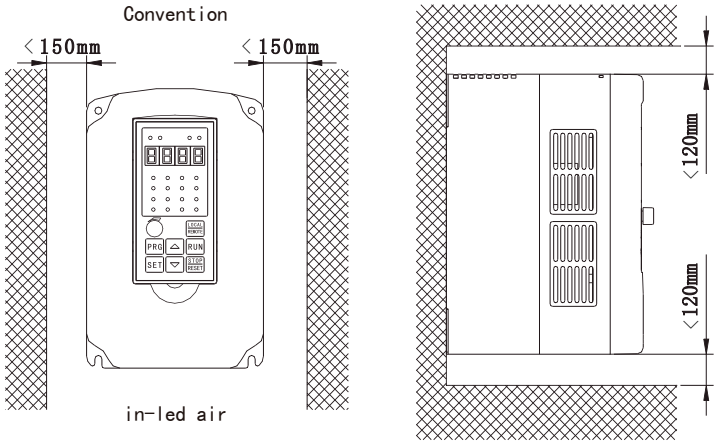
Good ventilation ensures the good performance of the inverter. Keep the ambient temperature below 40°C when it is installed in a closed cabinet by using cooling fan or air conditioner.

2.2.3 Prevention

Please cover the inverter against the dust during installation. Prevent the metal powder entering the inverter. Uncover the inverter after the installation is over.

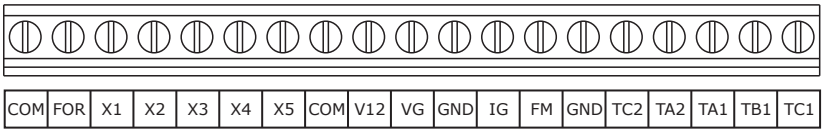
2.3 Installation Direction

The whole WIN-9_F series are forced cool down by fan, therefore, the inverter must be installed vertically and keep enough space etweem objects nearby.

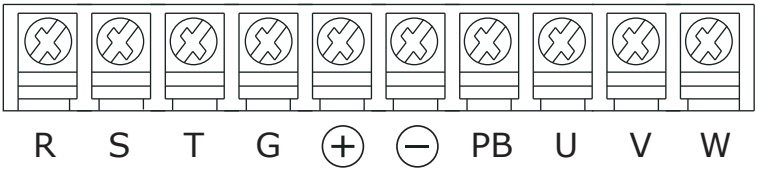


2.4 Wiring

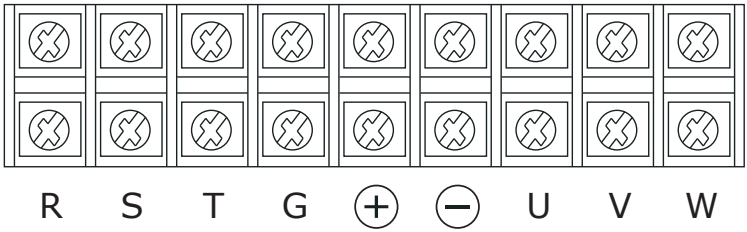
2.4.1 Control Circuit Terminals



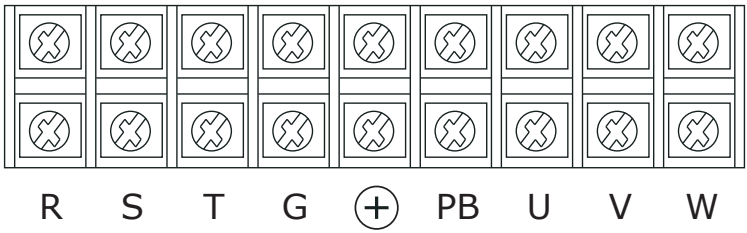
2.4.2 Main Circuit Terminals



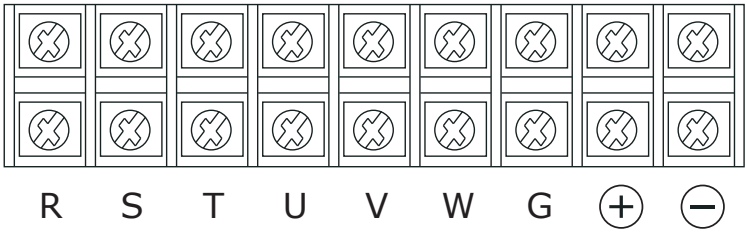
Standard 1.5~15kW Main Circuit Terminals



Standard 18.5~75kW Main Circuit Terminals



Standard 18.5~75kW with Brake Unit Main Circuit Terminals



Above 93kW Main Circuit Terminals (with in-built choker for 220kW and above)

2.4.3 Explanation about Main Circuit Terminals

- Power Input : R, S, T
- Grounding : G
- DC Common Bus: ⊕, ⊖
- Connecting Motor: U, V, W
- Brake Resistor: PB

Note: PB takes place of when there is braking function in 22~75kW inverters,

2.4.4 The Functions of Main Circuit Terminals Terminal Functions

Terminal	Description	Functions
R, S, T	Power input	Connect to 3-phase or single phase AC power
U, V, W	Inverter output	Connect to 3 phase AC motor
⊕, ⊖	For external brake unit	⊕, ⊖are the positive and negative ends of the common DC bus
⊕, PB	For external brake resistor	The two wires of the brake resistor connect to and ⊕ PB
G	Earthing point	Grounded to the earth

Note: Some terminals are not there because the order and number of the terminals in the main circuit of each series are different.

2.4.5 Main Circuit Wiring

Make sure that the motor runs forwardly at FOR command. If it reverses, exchange the connection among any two terminals of U, V, W, or choose the opposite selection of the parameter F046 to change the motor's running direction.

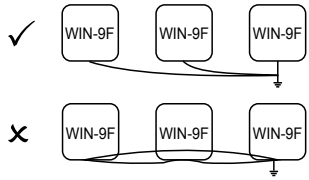
Do not connect the input power cable wrongly to an output terminal; otherwise, the interior components would be damaged. Grounding the output terminal is prohibited. Do not touch or short circuit the output cable to the case, or the inverter might be damaged.

Grounding

The earthing terminal G must be grounded. The earthing resistance of 380V inverters must be lower than 10Ω.

Do not share the earthing cable with the electric welders or the power equipments.

The specifications of the earthing cable should be in line with the electricity equipments technical standards and be short circuit with the earthing point. Do not circuit the earthing cables when more than 2 inverters are applied. The correct and wrong groundings are shown below:



Note: The motor's neutral point in Y connection method cannot be grounded

Phase shift capacitor is prohibited

Do not connect the phase shift capacitor or LC/RC filters to the output circuit, otherwise, the inverter might be damaged.

Electric magnetic switch between the inverter and the motor is prohibited.

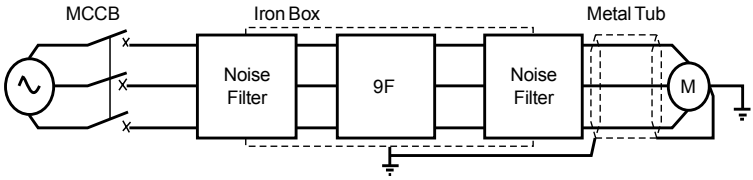
Do not connect the electric magnetic switch or magnetic contactor to the output circuit, otherwise, the surge current of the inverter will trigger the OC protection, more seriously, the inner components of the inverter might be damaged.

Protect the inverter against conduction interference

To compress the conduction interference from the output side, please install noise filter or lead the output cables to the grounding metal tube. When the distance between the output cables and the signal cables is more than 30cm, the conduction interference decreases obviously.

Protect the inverter against RF interference

The input cables, output cables and the inverter give RF interference. If we add noise filter at the input and output sides and screen them with iron utensils, the RF interference will be decreased. The cables connect the inverter with the motor must be as short as possible. See the below sketch, please:



The cable length between the inverter and the motor:

The longer the cable, the higher the carrier frequency and the greater the higher harmonics leak current on the cable. The leak current badly affects the inverter and the surrounding equipments so it must be limited to the smallest. The relationship between the cable length and the carrier frequency is:

The cable length between the inverter and motor	< 50m	< 100m	> 100m
The carrier frequency	< 8kHz	< 4kHz	< 2kHz

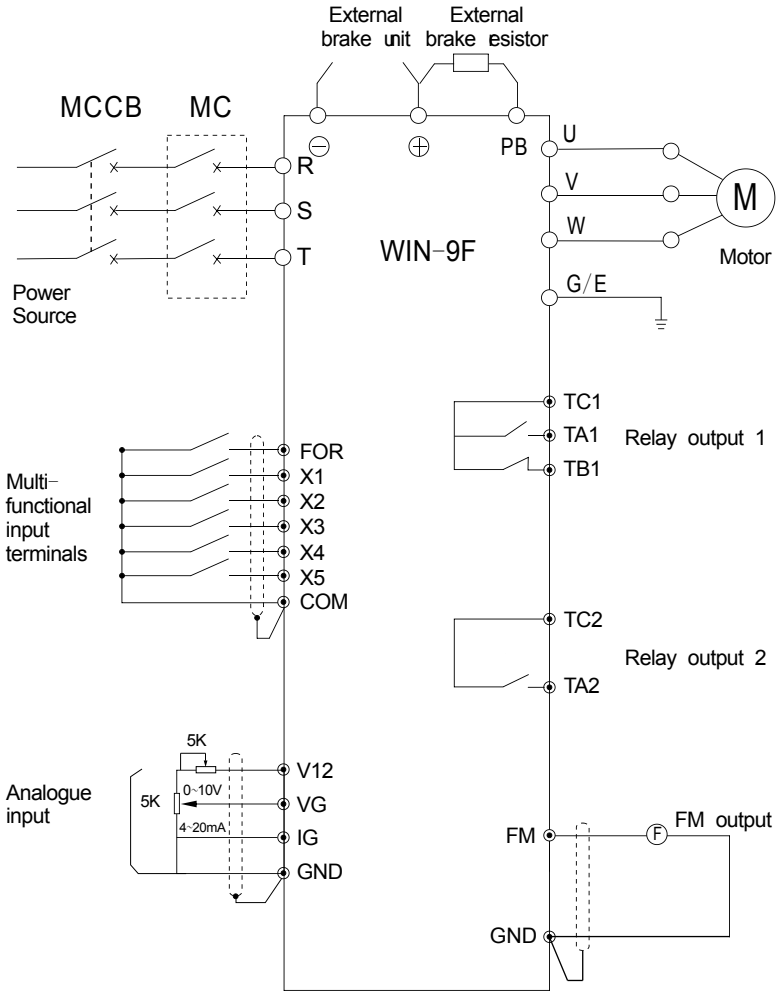
2.4.6 Wiring Terminals Of The Control Circuit

The control signal cable should be no longer than 50m and be more than 30cm away from the power cable to decrease the interference and attenuation of the control signal. Twisted-pair screen cable should be used to connect the analogue input and output signals.

2.4.7 Control Circuit Terminals Functions

Classification	Terminal	Function	Description	
Multi-function Input Signal	FOR	Forward run/stop	Forward run when closed, stop when open	
	X1	Reverse run/stop	Reverse run when closed, stop when open	Multi-function contact inputs (P036 to P039)
	X2	External fault input	Fault when closed, normal state when open	
	X3	Fault reset input	Reset when closed	
	X4	Multi-step speed reference 1	Enabled when closed	
	X5	Multi-step speed reference 2	Enabled when closed	
	COM	Sequence input common terminal	-	
Analog Input Signal	+12V	+12V Power supply output	For analog command +12V power supply	
	VG	Frequency reference input (voltage)	0 to +10V/100%	P042="0": VG enabled P042="1": IG enabled
	IG	Frequency reference input (current)	4 to 20mA/100%	
	GND	Connection to shield sheath of signal lead	-	
Multi-function Output Signal	TA2	During running (ON contact)	Closed when running	Multi-function contact output (P041)
	TC2			
	TA1	Fault contact output	Fault when closed between terminals TA1 and TC1 Fault when open between terminals TB1 and TC1	Multi-function contact output (P040)
	TB1			
	TC1			
Analog Output Signal	FM	Frequency meter output	0 to +10V/100% frequency	Multi-function analog monitor 1 (P048)
	GND	Common		

2.5 Standard Wiring



Note:

1.intends to import given voltage or electric current but P042 sets up from the parameter choosing, leave the factory setting up the mA exporting electric current for voltage presets importing

2.the model controls the circuit terminal V12 maximum being 20mA

3.multifunctional simulation amounts output ought to be used to monitor appearance, but can not be used to couple back system

2.6 Wiring Precaution

- Don't install electromagnetic contactor between the frequency converter and motor.
- To disassemble or replace the motor, the input power supply must be turned off.
- The motor or power supply can be switched on/off only after the converter stops output.
- If electromagnetic contactor, relay, etc. Is too near to the frequency converter, a surge absorbing device should be installed to minimize the electromagnetic interference.
- Use isolation device for inverter's external control lines or use screened cable.
- Except screened cable, a separate circuit should be used to the input command signal lines. Better to keep the circuit far from the main circuit.
- To avoid interference, the twisted screen cable is suggested for control circuit cable connection. The distance should be within 50m.
- Do not touch the screen cable to other signal cables and equipment cases. Wrap the naked screen cable with insulation tapes.
- If the frequency converter is equipped with peripheral devices (such as filter, reactor), please measure its insulation resistance to the earth with 1000V Mohegan meter, and ensure the resistance value is not below 4MΩ.
- If start the frequency converter frequently, do not switch off its power supply. Use COM/FOR to start or stop the converter in order to avoid damaging the diode bridge.
- In order to prevent unexpected accidents, earth terminal E must be grounded securely, otherwise current leakage will occur.

Chapter 3 Operation

DANGER!

1. Close the terminal block's cover before giving power.

Otherwise, electric shock may occur.

2. If the inverter is set to pick up after power resumption, leave it awayfrom other machines because it will restart once the power is on.

Otherwise, injury may occur.

NOTE!

1. The discharge of the high voltage at each side of the brake resistor will generate heat; therefore, do not touch the brake resistor. Otherwise, electric shock or burn may occur.

2. Reaffirm the motor and the machine's application range before they are put into use. Otherwise, injury may occur.

3. Do not check the signal during operation. Otherwise, equipments might be damaged.

4. Do not change the inverter's settings randomly although many parameters can be changed during running. The parameters have been set properly in the factory.

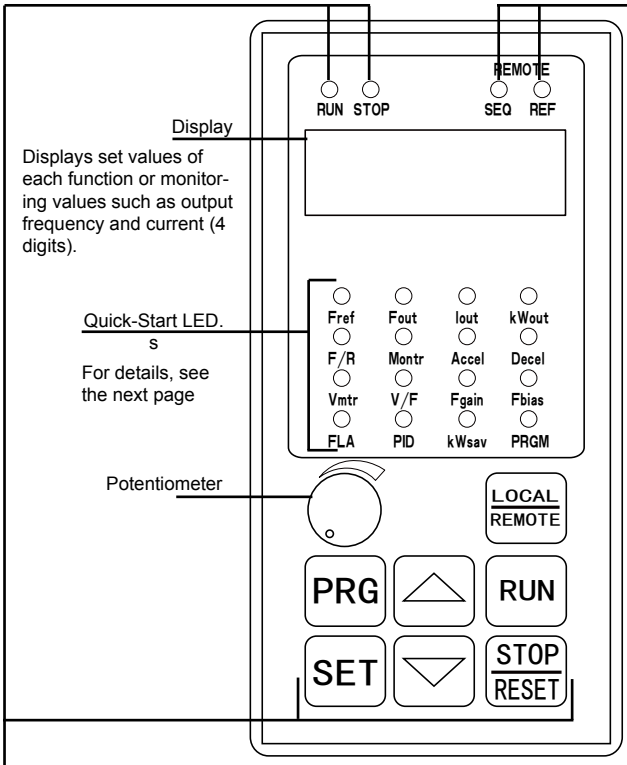
Otherwise, accident may occur because the running status is changed.

3.1 Keypad Functions And Keypad Operation

All models in this series use the same keypad which includes two LED screens of 4 digits and seven segments, keys, analogue potentiometer, running indictors and unit indicators. The user can set parameters, stop/start the inverter and monitor the operation through the keypad.

- DIGITAL OPERATOR DISPLAY

All functions of the WIN-9_F are accessed using the digital operator. Below are descriptions of the display and keypad sections.



Mode Indicator LED.s (Remote Mode)

Lights when selecting input mode from the control circuit terminal or serial communication.

SEQ: Lights when selecting run command from the control circuit terminal or serial communication.

REF: Lights when selecting frequency reference from the control circuit terminals FV or FI, or serial communication.

Display

Displays set values of each function or monitoring values such as output frequency and current (4 digits).

Quick-Start LED.s

For details, see the next page

Potentiometer

Enter Key

Displays each parameter set value. By depressing this key again, the set value is entered.

Number Change Keys

Changes set values or parameter numbers.

∧ : Increment key

∨ : Decrement key

Operation Command Keys

Operation command keys operate the inverter.

STOP/RESET: Red LED lights after depressing STOP key (resets operation after faults;reset is disabled while run command is ON)

RUN: Red LED lights after depressing RUN key.

Operation Mode Selection Key

Alternate between REMOTE and LOCAL (digital operator) operation.

Display Selection Key

Selects Quick-Start LED.s

Content LED details

LED	Description	Set/Read during Run
Fref	Frequency reference setting/monitoring	Available
Fout	Output frequency monitor	Available
Iout	Output current monitor	Available
kWout	Output power monitor	Available
F/R	FWD/REV run command selection	Available
Montr	Monitor selection	Available
Accel	Acceleration time	Available
Decel	Deceleration time	Available
Vmtr	Motor rated voltage	Not Available
V/F	V/f pattern selection	Not Available
Fgain	Frequency reference gain	Not Available
Fbias	Frequency reference bias	Not Available
FLA	Motor rated current	Not Available
PID	PID selection	Not Available
kWsav	Energy saving selection	Not Available
PRGM	Parameter Number/data	Not Available

3.2 OPERATION MODE SELECTION

The WIN-9_f has two operation modes: LOCAL and REMOTE (see table below for description). These two modes can be selected by the digital operator .LOCAL/REMOTE. key only when operation is stopped.The operation mode selected can be verified by observing the SEQ and REF LED.s on the digital operator (as shown below). The operation mode is set to REMOTE (run by control circuit terminals FV and FI frequency reference and run command from control circuit terminals) prior to shipment. Multi-function contact inputs from control circuit terminals S3 to S6 are enabled in both operation modes.

LOCAL: Both frequency reference and run command are set by the digital operator. SEQ and REF LED.s go OFF.

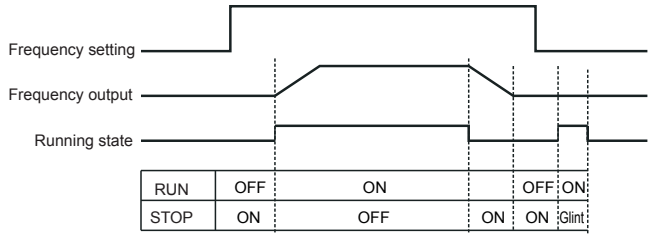
REMOTE: Master frequency reference and run command can be selected as described in the table below.

KB/TB:While switch SW1 being located in the host control panel is in KB location, that the keyboard potentiometer imports is effective , that the terminal imports simulation amounts is effective when being in TB location.

3.2.1 Operation Mode Selection

Set-ting	Operation Method Selection	SEQ LED	Reference Selection	REF LED
0	Operation by run command from digital operator	OFF	Master frequency reference from digital operator	OFF
1	Operation by run command from control circuit terminal	ON	Master frequency reference from digital operator	OFF
2	Operation by run command from digital operator	OFF	Master frequency reference from control circuit terminals FV and FI	ON
3	Operation by run command from control circuit terminal	ON	Master frequency reference from control circuit terminals FV and FI	ON
4	Operation by run command from digital operator	OFF	Master frequency reference set by serial communication	ON
5	Operation by run command from control circuit terminal	ON	Master frequency reference set by serial communication	ON
6	Operation by run command from serial communication	ON	Master frequency reference set by serial communication	ON
7	Operation by run command from serial communication	ON	Master frequency reference from digital operator	OFF
8	Operation by run command from serial communication	ON	Master frequency reference from control circuit terminals FV and FI	ON

3.2.2 Operation state and LED relation



Running state LED

3.3 Test Running

3.3.1 Check Before Test Running

Before test running, please make sure that the main circuit connection is right, the terminal screws are tight, the wiring is correct, the power cable is solid and the load is correct.

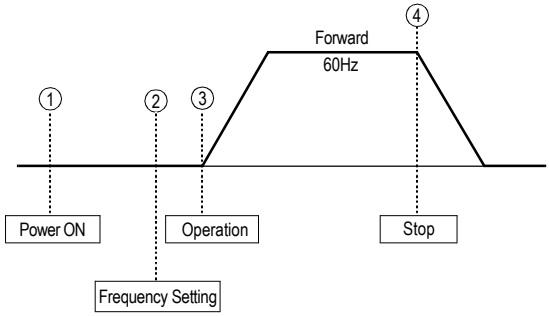
3.3.2 Check During Test Running

During test running, please check that the motor runs smoothly in the correct direction without abnormal vibration, it runs smoothly during acceleration and deceleration, the load is not over current and the display on the keypad correct.

3.4 Test Running keyboard

3.4 1 Operation by Control Circuit Terminal Signal

The diagram below shows a typical operation pattern using the control circuit terminal signals.

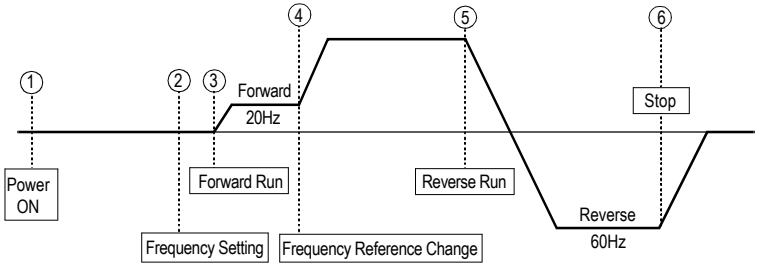


Typical Operation Example

Description	Key Sequence	Display
1.Power ON Displays frequency reference value.LOCAL mode is preset at the factory. 2.Frequency Setting Upper revolution keyboard potentiometer	LOCAL/REMOTE	0.00 60.00
3.Running Press RUN key,Startup Inverter	RUN	60.00 RUN LED ON
4.Stop	STOP/RESET	0.00 STOP LED glitter

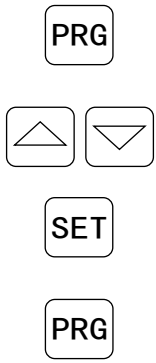
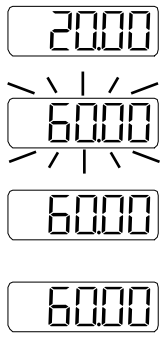
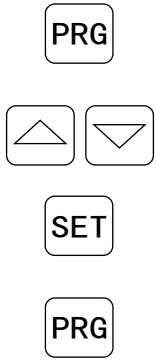
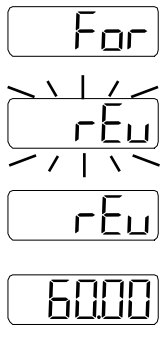
3.4.2 Operation by Digital Operator

The diagram below shows a typical operation pattern using the digital operator.



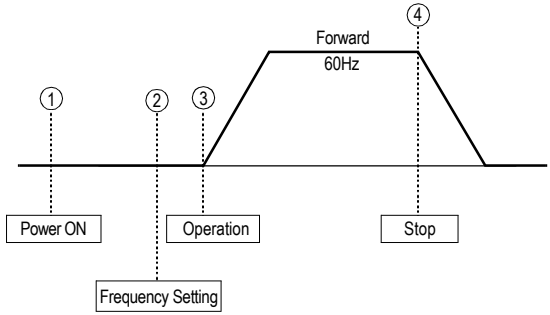
Typical Operation Example by Digital Operator

Description	Key Sequence	Display
1.Power ON Displays frequency reference value.LOCAL mode is preset at the factory.	LOCAL/REMOTE	0.00 REMOTE LED (SEQ. REF) OFF
(2) Frequency Setting · Change frequency reference value. · Write-in set value. · Select output frequency monitor display.	▲ ▼ SET PRG	20.00 20.00 0.00
(3) Forward Run · Forward run (20Hz)	RUN	20.00 RUN LED ON

Description	Key Sequence	Display
(4) Frequency Reference Value Change (15~60Hz) • Select frequency reference value display. • Change set value. • Write-in set value. • Select output frequency monitor display.		
(5) Reverse Run • Select reverse run. • Write-in set value. • Select output frequency monitor display.		
(6) Stop • Decelerates to stop.		

3.5 Operation by Control Circuit Terminal Signal

The diagram below shows a typical operation pattern using the control circuit terminal signals.



Operation Sequence by Control Circuit Terminal Signal

Typical Operation Example by Control Circuit Terminal Signal

Description	Key Sequence	Display
(1) Power ON • Displays frequency reference value.REMOTE mode is preset at the factory.	PRG	0.00 REMOTE LED (SEQ. REF) ON
(2) Frequency Setting • Input frequency reference voltage (current) by control circuit terminal FV or FI and verify the input value by the digital operator. Output Frequency Display • Write-in set value.		60.00 For reference voltage 10V 0.00
(3) Forward Run • Close between control circuit terminals S1 and SC to perform forward run.		60.00 RUN LED ON
(4) Stop • Open between control circuit terminals S1 and SC to stop operation.		0.00 STOP LED ON (RUN LED blinking during deceleration)

Chapter 4 Parameters

WIN-9_F Parameters (P001~n108)

No.	Function Name	Description	Factory Default
P001	Parameter selection/ initialization	0: P001 read and set, P002~n108 read only 1: P001~P034 read and set, P035~n108 read only 2: P001~P049 read & set, P050~n108 read only 3: P001~n108 read and set 4,5: Not used 6: 2 - wire initialization (Japanese specifications) 7: 3 - wire initialization (Japanese specifications) 8: 2 - wire initialization (American specifications) 9: 3 - wire initialization (American specifications)	1
P002	Operation mode selection	Setting Operation Reference 0 Operator Operator 1 Terminal Operator 2 Operator Terminal 3 Terminal Terminal 4 Operator Serial com 5 Terminal Serial com 6 Serial com Serial com 7 Serial com Operator 8 Serial com Terminal	3
P003	Input voltage	Unit: 0.1V Setting range: 150.0~255.0V (510V for 460V units)	230.0V (460.0V)
P004	Stop method	0: Ramp to stop 1: Coast to stop 2: Coast to stop with timer (Run command cycle) 3: Coast to stop with timer (auto-start after time out)	0
P005	Power rotation	0: CCW shaft rotation 1: CW shaft rotation	0
P006	Prohibit reverse operation	0: reverse operation enabled 1: reverse operation disabled	0
P007	Local/remote key function	0: disabled 1: enabled	1
P008	Stop key function	0: Stop key is ineffective when operated from terminals 1: Stop key is always effective	1
P009	Frequency reference setting method from operator	0: Enter key not used 1: Enter key used	1
P010	V/f pattern selection (same as V/F LED)	0~E: 15 preset V/f patterns F: Custom V/f pattern	1

No.	Function Name	Description	Factory Default
P011	Motor rated voltage (same as Vmtr LED)	Unit: 0.1V Setting range: 150.0~255.0V (510V for 460V units)	230.0V (460.0V)
P012	Maximum frequency	Unit: 0.1Hz Setting range: 50.0~400.0Hz	60.0Hz
P013	Maximum voltage	Unit: 0.1V Setting range: 0.1~255.0V (510V for 460V units)	230.0V
P014	Max. output voltage frequency	Unit: 0.1Hz Setting range: 0.2~400.0Hz	60.0Hz
P015	Mid. output frequency	Unit: 0.1Hz Setting range: 0.1~399.9Hz	3Hz
P016	Mid. frequency voltage	Unit: 0.1V Setting range: 0.1~255.0V (510V for 460V units)	15.0V
P017	Minimum output frequency	Unit: 0.1Hz Setting range: 0.1~10.0Hz	1.5Hz
P018	Minimum output voltage	Unit: 0.1V Setting range: 0.1~50.0V	10.0V
P019	Acceleration time 1 (same as Accel LED)	Unit: 0.1 sec (1 sec for 1000 sec and above) Setting range: 0.0~3600 sec	10.0 sec
P020	Deceleration time 1 (same as Decel LED)	Unit: 0.1 sec (1 sec for 1000 sec and above) Setting range: 0.0~3600 sec	10.0 sec
P021	Acceleration time 2	Unit: 0.1 sec (1 sec for 1000 sec and above) Setting range: 0.0~3600 sec	10.0 sec
P022	Deceleration time 2	Unit: 0.1 sec (1 sec for 1000 sec and above) Setting range: 0.0~3600 sec	10.0 sec
P023	S-curve selection	Setting 0 1 2 3 S-curve time No S-curve 0.2 sec 0.5 sec 1.0 sec	1
P024	Display mode	Setting 0 1 2~39 40~3999 Display 0.1Hz 0.1% rpm (input # of motor poles) custom	0
P025	Frequency reference 1 (same as Fref LED)	Setting depends on P024 setting. Range: 0~9999	0.0Hz
P026	Frequency reference 2	Setting depends on P024 setting. Range: 0~9999	0.0Hz
P027	Frequency reference 3	Setting depends on P024 setting. Range: 0~9999	0.0Hz
P028	Frequency reference 4	Setting depends on P024 setting. Range: 0~9999	0.0Hz
P029	Jog frequency	Setting depends on P024 setting. Range: 0~9999	6.0Hz
P030	Frequency upper limit	Unit: 1% Setting range: 0~100%	100%

No.	Function Name	Description	Factory Default
P031	Frequency lower limit	Unit: 1% Setting range: 0~100%	0%
P032	Motor rated current (same as FLA LED)	Unit: 0.1A Range: 10~200% inverter rated current Unit is 1A, when setting is more than 1,000A	kVA dependent
P033	Motor thermal protection (OL1)	Setting Characteristics 0 Protection disabled 1 General-purpose motor (time constant 8 min.) 2 General-purpose motor (time constant 5 min.) 3 Blower-cooled motor (time constant 8 min.) 4 Blower-cooled motor (time constant 5 min.)	1
P034	Stop method selection (OH1) for inverter overheat pre-alarm	Setting Stop method 0 Ramp to stop - Decel 1 (fault) 1 Coast to stop (fault) 2 Ramp to stop - Decel 2 (fault) 3 Continue operation (alarm)	3
P035	Multi-function input selec-tion (Terminal S2)	0: Reverse run (2-wire sequence) 1: Fwd / Rev command (3-wire sequence) 2: External fault (normally open) 3: External fault (normally closed) 4: Fault reset 5: Remote/local selection 6: Serial com/inverter selection (Fref, RUN command) 7: Stop command using Decel 2 (fast stop) 8: Master freq. ref. selection (FV-open or FI-closed) 9: Multi-step speed reference command 1 10: Multi-step speed reference command 2 11: Jog command 12: Accel / Decel time change command 13: External Baseblock (normally open) 14: External Baseblock (normally closed) 15: Speed search from maximum frequency 16: Speed search from set frequency 17: Parameter change enable 18: I value reset (PID) 19: PID control off 20: Timer function 21: OH3 22: Analog reference sample hold command 23: Inertia ride through command (normally open) 24: Inertia ride through command (normally closed)	0
P036	Multi-function input (Terminal S3)	Set items are same as P035	2

No.	Function Name	Description	Factory Default
P037	Multi-function input (Terminal S4)	Set items are same as P035	4
P038	Multi-function input (Terminal S5)	Set items are same as P035	9
P039	Multi-function input (Terminal S6)	Set items are same as P035 25: Up / Down command 26: Loop test (Modbus)	10
P040	Multi-function output (Terminal MA-MB-MC)	0: Fault 1: During running 2: Speed agree 3: Desired speed agree 4: Frequency detection 1 5: Frequency detection 2 6: Overtorque detection (normally open) 7: Overtorque detection (normally closed) 8: During base block 9: Operation mode 10: Ready 11: Timer function 12: During auto restart 13: OL pre-alarm (80% OL1 or OL2) 14: Frequency reference loss 15: Closed by serial communication (DO function) 16: PID feedback loss 17: OH1 Alarm (set if P034 set to "3")	0
P041	Multi-function output (Terminal M1-M2)	Set items are as same as P040	1
P042	Master analog input selec-tion (FV or FI terminal)	0: 0~10V input (FV terminal) 1: 4~20mA input (FI terminal)	0
P043	Aux. analog input selection (FI terminal)	0: 0~10V input (Jumper must be cut) 1: 4~20mA input	1
P044	Frequency reference retention (for Up/Down, sample/hold functions)	0: Retained in frequency reference 1 (P025) 1: Not retained after power-down	0
P045	Operation method for frequency reference loss detection	0: No detection 1: Continue to run at 80% of previous Fref.	0
P046	Frequency gain (same as Fgain LED)	Unit: 1% Setting range: 0~200%	100%
P047	Frequency bias (same as Fbias LED)	Unit: 1% Setting range: -100~100%	0%

No.	Function Name	Description	Factory Default
P048	Multi-function analog output (AM)	Setting Monitor 0 Output frequency 1 Output current 2 Output power 3 DC bus voltage	0
P049	Analog monitor gain	Unit: 0.01 Setting range: 0.01~2.00	1
P050	Carrier frequency	Unit: 1 Setting range: 1~6 (x2.5kHz), 7~9 (custom pattern)	kVA dependent
P051	Momentary power loss ride through method	Setting Method 0 Not provided 1 Continuous operation after power recovery within 2 sec 2 Continuous operation after power recovery within control logic time (no fault output)	0
P052	Speed search level (decel time fixed at 2 sec)	Unit: 1% Setting range: 0~200% 100% = inverter rated current	150%
P053	Minimum baseblock time	Unit: 0.1 sec Setting range: 0.5~5.0 sec	kVA dependent
P054	V/f reduction level during speed search	Unit : 1% Setting range: 0~100%	kVA dependent
P055	Power loss ride through time	Unit: 0.1sec Setting range: 0.0~2.0 sec	kVA dependent
P056	Automatic retry attempts	Unit: 1 time Setting range: 0~10	0
P057	Fault contact selection during automatic retry	0: Closed during fault retry 1: Open during fault retry	1
P058	Jump frequency 1	Unit: 0.1Hz Setting range: 0.0~400.0Hz	0.0Hz
P059	Jump frequency 2	Unit: 0.1Hz Setting range: 0.0~400.0Hz	0.0Hz
P060	Jump frequency bandwidth	Unit: 0.1Hz Setting range: 0.0~25.5Hz	1.0Hz
P061	Elapsed timer selection	0: Accumulated time during power on 1: Accumulated time during running	1
P062	Elapsed timer 1	Unit : 1 hour Range: 0~9999	0
P063	Elapsed timer 2	Unit: 10,000 hours Range: 0~27	0

No.	Function Name	Description	Factory Default
P064	DC injection current	Unit: 1% Setting range: 0~100% 100% = inverter rated current	50%
P065	DC injection time at stop	Unit: 0.1 sec Setting range: 0.0~10.0 sec	0.5 sec
P066	DC injection time at start	Unit: 0.1 sec Setting range: 0.0~10.0 sec	0.0 sec
P067	Torque compensation gain	Unit: 0.1 Setting range: 0.0~3.0 (normally, no adjustment is necessary)	1.0
P068	Motor line to line resistance	Unit: 0.001 Setting range: 0.000~65.53 (normally, no adjustment is necessary)	kVA dependent
P069	Iron loss	Unit: 0W Setting range: 0~9999W (normally, no adjustment is necessary)	kVA dependent
P070	Stall prevention during deceleration	0: Disabled 1: Enabled	1
P071	Current limit/Stall preven-tion level during accelera-tion	Unit: 1% Setting range: 30~200% When level is set to 200%, current limit during acceleration is disabled.	170%
P072	Current limit/Stall prevention level during running	Unit: 1% Setting range: 30~200% When level is set to 200%, current limit during running is disabled.	160%
P073	Desired frequency detec-tion (multi-function output)	Unit: 0.1Hz Setting range: 0.0~400.0Hz	0.0Hz
P074	Overtorque detection (OL3)	Setting Function 0 Detection disabled 1 Detection begins at speed agree Continue running after detection (alarm) 2 Detection always Continue running after detection (alarm) 3 Detection begins at speed agree Coast to stop after detection (fault) 4 Detection always Coast to stop after detection (fault)	0
P075	Overtorque detection level (OL3)	Unit: 1% Setting range: 30~200% 100% = inverter rated current	160%
P076	Overtorque detection delay time (OL3)	Unit: 0.1 sec Setting range: 0.0~10.0 sec	0.1 sec

No.	Function Name	Description	Factory Default
P077	On-delay timer	Unit: 0.1 sec Setting range: 0.0~25.5 sec	0.0 sec
P078	Off-delay timer	Unit: 0.1 sec Setting range: 0.0~25.5 sec	0.0 sec
P079	dB resistor overheat function (rH)	0: No dB protection calculated or provided 1: Protection provided for installed WINNER resistor only	0
P080	Input phase loss detection level (SPI)	Unit: 1% Setting range: 1~100% When setting is 100%, this function is disabled.	7%
P081	Input phase loss detection delay time (SPI)	Unit: 1 (1.28 sec) Setting range: 2~255 (2.56~326.4 sec)	8 (10.24 s)
P082	Output phase loss detection level (SPO)	Unit:1% Setting range: 0~100% When setting is 0%, this function is disabled.	0%
P083	Output phase loss detection delay time (SPO)	Unit: 0.1 sec Setting range: 0.0~2.0 sec	0.2 sec
P084	PID selection (same as PID LED)	0: PID disabled 1: PID enabled 2: PI w/ Feed forward	0
P085	Feedback calibration gain (PID)	Unit: 0.01 Setting range: 0.00~10.00	1.00
P086	Proportional gain (PID)	Unit: 0.01 Setting range: 0.0~10.0	1.0
P087	Integral time (PID)	Unit: 0.1 sec Setting range: 0.0~100.0 sec	10.0 sec
P088	Derivative time (PID)	Unit: 0.01 sec Setting range: 0.00~1.00 sec	0.00 sec
P089	Offset (PID)	Unit: 1% Setting range: -109~109%	0%
P090	Limit of (PID) integral value	Unit: 1% Setting range: 0~109%	100%
P091	Output lag filter time (PID)	Unit: 0.1 sec Setting range: 0.0~2.5 sec	0.0 sec
P092	Feedback loss detection (PID)	0: Detection is disabled. 1: Detection is enabled.	0
P093	Feedback loss detection level (PID)	Unit: 1% Setting range: 0~100%	0%
P094	Feedback loss detection delay time (PID)	Unit: 0.1sec Setting range: 0.0~25.5 sec	1.0 sec

No.	Function Name	Description	Factory Default
P095	Energy saving selection (same as kWsav LED)	0: Energy saving is disabled. 1: Energy saving is enabled.	0
P096	Energy saving gain K2	Unit: 0.01 Setting range: 0.00~655.0	kVA dependent
P097	Energy saving voltage lower limit at 60Hz	Unit: 1% Setting range: 0~120%	50%
P098	Energy saving voltage lower limit at 6Hz	Unit: 1% Setting range: 0~25%	12%
P099	Time of average kW (Energy saving)	Unit: 1 = 25ms Setting range: 1~200	1
n100	Tuning voltage limit (Energy saving)	Unit: 1% Setting range: 0~100%	0%
n101	Tuning step voltage at 100% output voltage (Energy saving)	Unit: 0.1% Setting range: 0.0~10.0%	0.5%
n102	Tuning step voltage at 5% output voltage (Energy saving)	Unit: 0.1% Setting range: 0.0~10.0%	0.2%
n103	Modbus time over detection	0: Time over detection is disabled. 1: Time over detection is enabled.	1
n104	MODBUS stop method at communication error (CE)	Setting Stop method 0 Ramp to stop - Decel 1 (fault) 1 Coast to stop (fault) 2 Ramp to stop - Decel 2 (fault) 3 Continue operation (alarm)	1
n105	MODBUS frequency reference unit	Setting Frequency unit 0 0.1Hz / 1 1 0.01Hz / 1 2 100% / 30000 3 0.1% / 1	0
n106	MODBUS slave address	Unit: 1 Setting range: 0~31	0
n107	MODBUS BPS selection	Setting BPS rate 0 2400 BPS 1 4800 BPS 2 9600 BPS	2
n108	MODBUS parity selection	Setting Parity 0 No parity 1 Even parity 2 Odd parity	1

Chapter 5 Enlarged upon the Parameters

5.1 PARAMETER SET-UP & INITIALIZATION

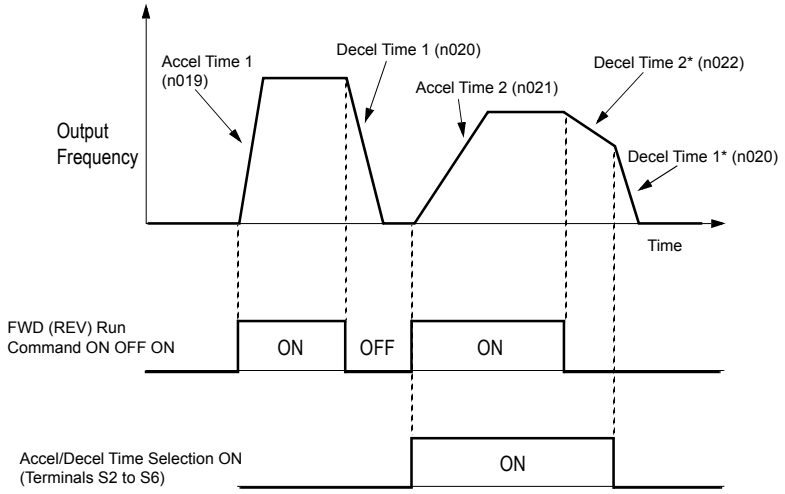
Parameter Selection/Initialization (P001)

The following table describes data which can be set or read when parameter P001 is set.

Setting	Parameters that can be set	Parameters that can be read
0 (parameter read-only)	P001	P001 to n108
1 (factory default)	P001 to P034	P001 to n108
2	P001 to P049	P001 to n108
3	P001 to n108	P001 to n108
4,5	Not used	
8	Initialize: 2-wire sequence (American specifications)	
9	Initialize: 3-wire sequence (American specifications)	

5.2 WIN-9_F OPERATION

Accel/Decel Time Adjustment



* When .deceleration to stop. is selected (P004 = “0”)

Figure 18 Timing Diagram of Accel/Decel Time Adjustment

When any of the multi-function contact input terminal selections (P035, P036, P037, P038 or P039) are set to “12”, accel/decel times can then be selected by

opening or closing the appropriate accel/decel time selection (terminal S2, S3, S4, S5 or S6).

At OFF: P019 (accel time 1) P020 (decel time 1)

At ON: P021 (accel time 2) P022 (decel time 2)

Parameter No.	Name	Unit	Setting Range	Factory Default
P019	Acceleration time 1	0.1 s *	0.0 to 3600 s	10.0 s
P020	Deceleration time 1	0.1 s *	0.0 to 3600 s	10.0 s
P021	Acceleration time 2	0.1 s *	0.0 to 3600 s	10.0 s
P022	Deceleration time 2	0.1 s *	0.0 to 3600 s	10.0 s

* Setting unit is 1 s for 1,000 s and above.

- Acceleration time

  Sets the time necessary for the output frequency to move from 0Hz to maximum output frequency (P012).

- Deceleration time

  Set the time necessary for the output frequency to move from maximum output frequency (P012) to 0Hz.

5.2.1 Automatic Fault Retry (P060)

After a fault occurs, the inverter and its fault detection circuit are reset.

The number of retry attempts and self-diagnostic tests can be set up to 10 times in parameter P060. The inverter can be set to automatically restart after the following faults occur:

- Overcurrent (OC)
- Overvoltage (OV)
- Undervoltage PUV (UV1)
- Ground fault (GF)
- Regenerative transistor fault (rr)

The number of retry attempts are cleared to “0” in the following cases:

- If no other fault occurs within 10 minutes after retry.
- When the fault reset signal is ON after the fault is detected.
- Power supply is turned OFF.

5.2.2 Automatic Restart After Momentary Power Loss (P051)

When momentary power loss occurs, operation restarts automatically.

Setting	Description
0	Not provided (factory default)
1 *	Continuous operation after power recovery within 2 seconds
2 **	Continuous operation after power recovery within control logic time (no fault output)

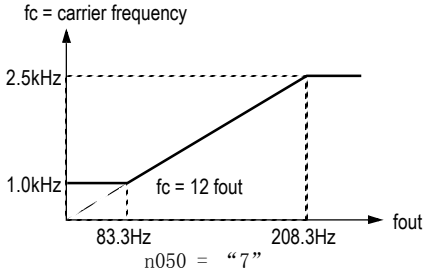
* Holds the operation signal to continue operation after recovery from momentary power loss.

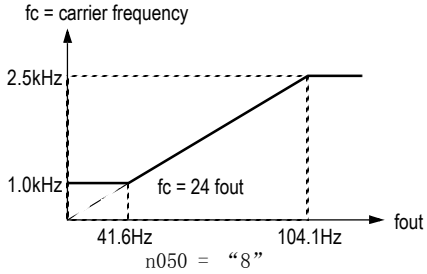
** When “2” is selected, operation restarts if power supply voltage returns to its normal level (level before power loss). No fault signal is output.

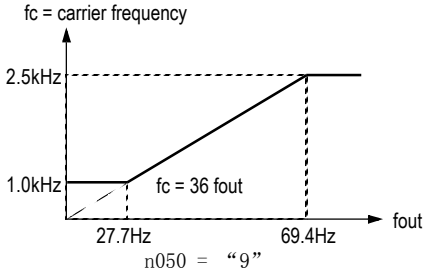
5.2.3 Carrier Frequency (P050)

This function sets the inverter output transistor switching frequency (carrier frequency). This is used to reduce motor noise and leakage current.

Setting	Carrier Frequency (kHz)	Metallic Noise from Motor	Leakage Current
1	2.5	Louder	Smaller
2	5.0	⇕	⇕
3	8.0		
4	10.0		
5	12.5		
6	15.0	Inaudible	Larger







Custom Setting of Carrier Frequency Patterns

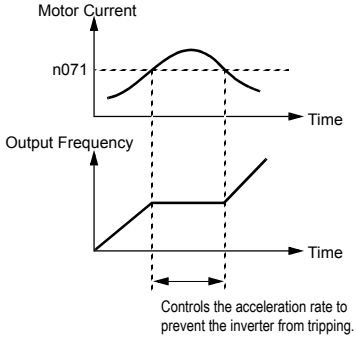
5.2.4 Current Limit (Stall Prevention)

This function automatically adjusts the output frequency and thus output current according to the load, to continue operation without tripping the inverter.

- Current Limit Level During Acceleration (P071)

  The current limit level during acceleration can be set in units of 1% (inverter rated current = 100%). Factory setting: 170%

  A setting of 200% disables current limit during acceleration. During acceleration, if the output current exceeds the value set for P071, acceleration stops and frequency is maintained. When the output current goes down to the value set for parameter P071, acceleration restarts.



Current Limit During Acceleration

In the constant output area [output frequency ≥ max. voltage output frequency (P014)], the current limit level during acceleration is changed by the following equation:

$$\boxed{\text{Current Limit Level During Accel in Constant Output Area}} = \boxed{\text{Current Limit Level During Acceleration (n071)}} \times \frac{\text{Max. Voltage Output Frequency (n14)}}{\text{Output Frequency}}$$

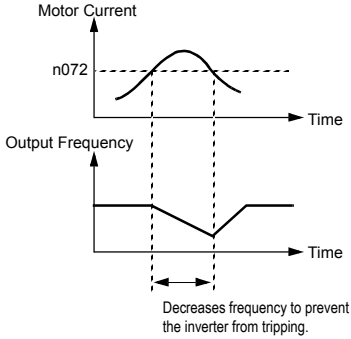
- Current Limit Level During Running (P072)

  The current limit level during running can be set in units of 1% (inverter rated current = 100%).

  Factory setting: 160%

  A setting of 200% disables current limit during running. During speed agree, if the output current exceeds the value set for parameter P072, then deceleration starts.

  When the output current exceeds the value set for P072, deceleration continues. When the output current goes down to the value set for parameter P072, acceleration starts, up to the set frequency.

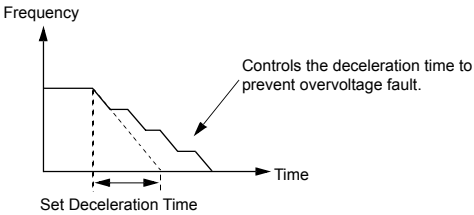


Current Limit During Running

- Stall prevention during deceleration (P070)

  To prevent overvoltage during deceleration, the inverter automatically extends the deceleration time according to the value of main circuit DC voltage. When using an optional braking resistor for the WIN-9_F, set parameter P070 to“1”.

Setting	Stall Prevention During Deceleration
0	Enabled (factory default)
1	Disabled (when optional braking resistor mounted)



Stall Prevention During Deceleration

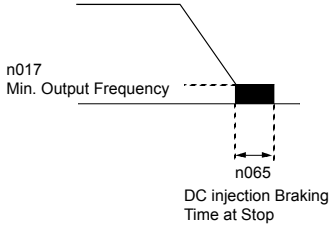
5.2.5 DC Injection Braking

- DC Injection Braking Current (P064)

  DC injection braking current can be set in increments of 1%. (inverter rated current = 100%)

- DC injection Braking Time at Stop (P065)

  DC injection braking time at stop can be set in increments of 0.1 second. When parameter P065 is set to “0”, DC injection braking is disabled, so the inverter output shuts OFF.



DC Injection Braking Time at Stop

When coast to stop is selected in the stopping method selection (P003),DC injection braking at stop is disabled.

5.2.6 Energy Saving Control

To enable energy saving control, set energy saving selection (P095) to “1”.

Setting	Description
0	Energy saving is disabled (factory default).
1	Energy saving is enabled.

Since the parameters used in the energy saving control mode have been preset at the factory to the optimum values, it is not necessary to adjust them under normal operation. If your motor characteristics differ greatly from those of standard induction motors, refer to the following description to adjust the parameters.

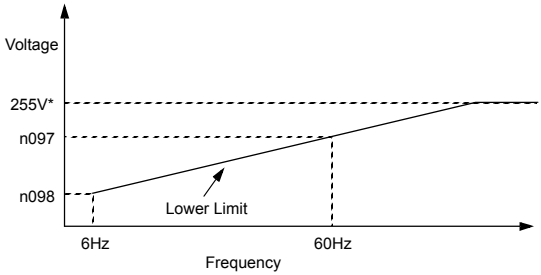
5.2.7 Energy Saving Control Mode

- Energy Saving Gain K2 (P096)

  Use this energy saving gain when running in the energy saving control mode to calculate the voltage at which motor efficiency will be greatest, and set it as the output voltage reference. This value is preset at the factory to the standard induction motor value prior to shipment. As the energy saving gain increases, output voltage increases also.

- Energy Saving Voltage Lower Limit (P097, P098)

  Sets the output voltage lower limit. If the voltage reference value calculated in the energy saving mode is smaller than the specified lower limit, this lower limit value is output as the voltage reference value. The lower limit value is set in order to prevent stalling at light loads. Set voltage limits at 6Hz and 60Hz; a value obtained by linear interpolation should be set to any limit values other than at 6Hz or 60Hz. Setting is made as a percentage of motor rated voltage.



* This value is doubled for 460V class inverters.

Energy Saving Voltage Lower Limit

5.2.8 Energy Saving Tuning

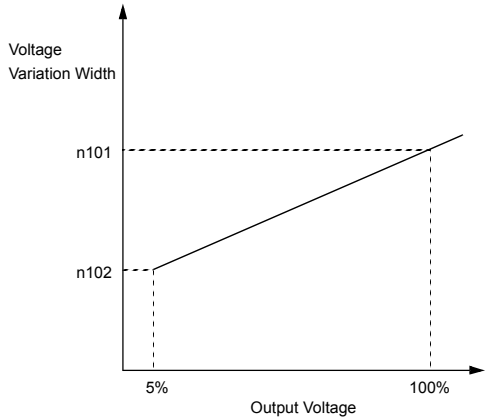
In the energy saving control mode, the optimum voltage is calculated according to load power, and the voltage is supplied to the load. However, the set parameter may vary due to temperature variations or using various manufacturers. motors; therefore, the optimum voltage may not be supplied in some cases. Automatic tuning controls voltage so that highly efficient operation is maintained.

- Tuning Voltage Limit (n100)

  Limits the range in which voltage is controlled by tuning. Setting is made in a percentage of motor rated voltage. Tuning is disabled when this parameter is set to “0”.

- Tuning Step Voltage (n100, n101)

  Sets voltage variation width of one tuning cycle. Setting is made in a percentage of motor rated voltage. By increasing this value, the rotating speed variation increases. This voltage variation width is set when starting tuning voltage is 100% and motor rated voltage is 5%. Value obtained by linear interpolation are set to any voltage values other than these values.



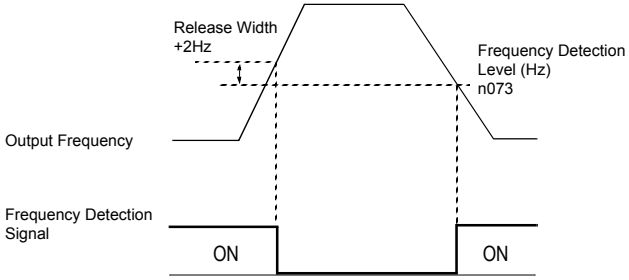
Energy Saving Voltage Variation Width

5.2.9 Frequency Detection (P073)

When multi-function contact output selections P040 or P041 are set to “4”or “5”, frequency detection is enabled. This function is activated when the output frequency is higher or lower than the frequency detection level (P073).

- Output frequency ≤ Frequency detection level

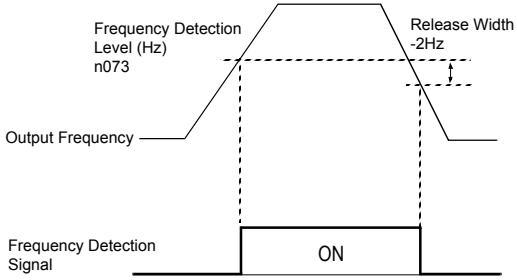
Set P040 or P041 to “4”.



Frequency Detection Example (Fout ≤ Frequency detection level)

- Output frequency ≥ Frequency detection level

Set P040 or P041 to “5”.



Frequency Detection Example (Fout ≥ Frequency detection level)

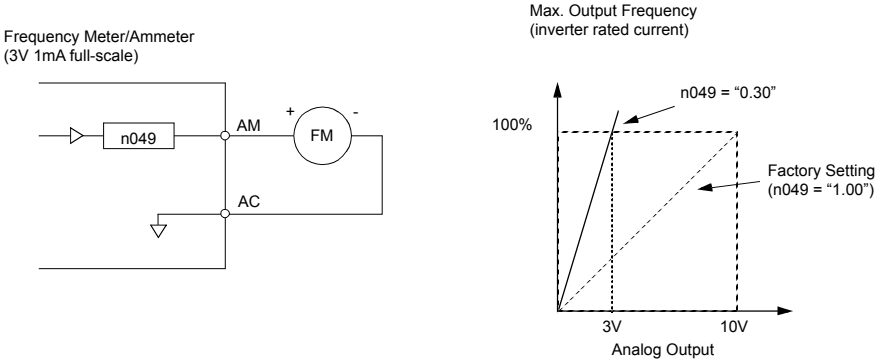
5.2.10 Frequency Meter or Ammeter (P048)

This function selects between outputting either output frequency or output current to analog output terminals AM and AC for monitoring.

Setting	Analog Monitor Output Selection
0	Output frequency (10V/max. frequency) -factory default
1	Output current (10V/inverter rated current)
2	Output power (10V/inverter rated power)
3	DC bus voltage [10V/400VDC (230V class), 10V/800VDC (460V class)]

Frequency Meter or Ammeter Calibration (P049)

This function is used to adjust the analog output gain.



Frequency Meter/Ammeter Calibration

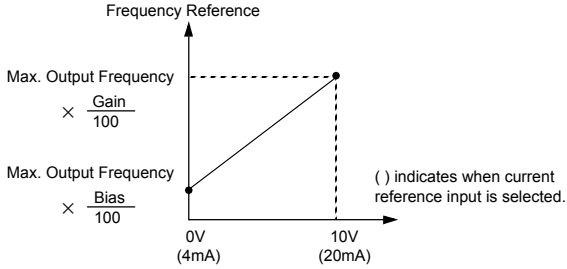
Set the analog output voltage to 100% of output frequency (or output current).The frequency meter displays 0 to 60Hz at 0 to 10V.

$$10V \times \frac{\text{n049 setting}}{0.30} = 3V$$

Output frequency becomes 100% at this value.

5.2.11 Frequency Signal Adjustment

When the frequency reference is given by an analog signal at control circuit terminals FV and FI, the relation between analog voltage (or current) and frequency reference can be set.



Frequency Signal Adjustment

- Frequency Reference Gain (P046)

  The analog input voltage value for the maximum output frequency (P012) can be set in units of 1%, from 0 to 200%.

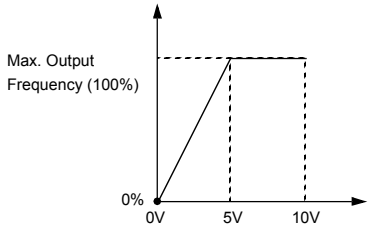
  Factory setting: 100%

- Frequency Reference Bias (P047)

  The frequency reference provided when the analog input is 0V (4mA) can be set in units of 1%, from -100% to 100%. (P012: maximum output frequency = 100%) Factory setting: 0%

- Examples

  To operate the inverter with a frequency reference of 0% to 100% at a 0 to 5V input:

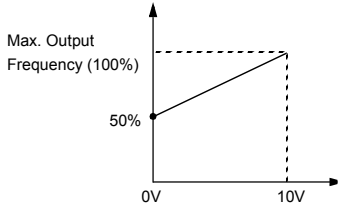


Frequency Signal Adjustment Example - 0 to 5V inp

Gain: Parameter P046 = “200”

Bias: Parameter P047 = “0”

To operate the inverter with a frequency reference of 50% to 100% at a 0 to 10V input:



Frequency Signal Adjustment Example - 0 to

Gain: Parameter P046 = “100”

Bias: Parameter P047 = “50”

5.2.12 Jog Operation

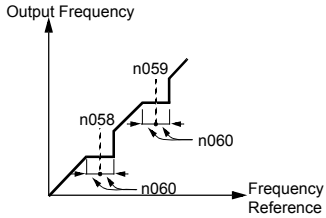
Set jog frequency reference selection in multi-function contact input terminals S2 to S6. Operation is then enabled at the jog frequency reference set in parameter P029. When multi-step speed references 1 or 2 are input simultaneously with the jog frequency reference, the jog frequency reference has priority.

Name	Parameter No.	Setting
Jog frequency reference	P029	6.0Hz (Factory default)
Multi-function contact input selection (S2 to S6)	P035, P036, P037, P038, P039	Set to “11” for any parameter.

5.2.13 Jump Frequencies (P058 to P060)

This function allows the prohibition or .jumping. of critical frequencies so that the motor can operate without resonant vibrations caused by machine systems. This function is also used for deadband control. Setting the value to 0.0Hz disables this function.

Set jump frequency 1 or 2 such that P058 ≤ P059. If this condition is not satisfied, the inverter displays the parameter setting error “OPE6”.



Jump Frequencies

5.2.14 MODBUS Communication

The WIN-9_F can perform serial transmission by using a programmable controller (PLC) and MODBUS communication. MODBUS is composed of one master PLC and 1 to 31 (maximum) slave inverters. In signal transmission between master and slave units, the master unit always starts transmission and the slave units respond to it.

The master unit performs signal transmission with one slave unit at a time. Hence, address numbers are assigned to each slave unit in advance and the master unit specifies a number to perform signal transmission.

The slave unit which receives the command from the master unit executes the function and returns the response to the master unit. Communication Specifications

- Interface:

  RS-485, RS-422 (communication interface card SI-K2/P must be mounted.)
- Synchronization:

  Asynchronous
- Transmission parameter:

  Baud rate: selectable from 2400, 4800, 9600 BPS (parameter n107) Data length: fixed at 8 bits Parity: parity/no parity, even/odd selectable (parameter n108) Stop bit: fixed at 1 bit
- Protocol:

  In accordance with MODBUS
- Maximum number of units to be connected:

  31 units (when RS-485 is used)

Data to be Sent/Received by Communication

Data to be sent/received by communication are run commands, frequency reference, fault contents, inverter status and parameter setting/reading.

- Operation Mode Selection (P002)

  Select the run command and frequency reference input method in parameter P002. To provide a run command and frequency reference by communication, set this parameter to settings “4” to “8”. Also, without regard to this selection, monitoring of running status, parameter setting/ reading, fault reset and multi-fucntion input commands from the PLC are enabled. The multi-function input command becomes .OR. with the command input from control circuit terminals S2 to S6.

- MODBUS Frequency Reference Unit (n105)

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

The output frequency resolution of the WIN-9_F is 0.1Hz. Even if the frequency reference unit is changed to 0.01Hz in parameter n105, the value in the hundredth digit of 0.01Hz of the received frequency reference is rounded off internally. When 30,000/100% in units of 0.1% is selected, the value is rounded off in the same way.

- MODBUS Slave Address (n106)

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

  Note: To change the values set in parameters n106 to n108 and enable new settings, it is necessary to cycle power.

5.2.15 Motor Overload Detection

The WIN-9_F protects against motor overload with a UL-recognized, built-in electronic thermal overload relay.

- Motor Rated Current (P032)

  Set to the rated current value shown on the motor nameplate.

  Note: setting to 0.0A disables the motor overload protection function.

- Motor overload protection selection (P033)

Setting	Electronic Thermal Characteristics
0	Protection disabled
1	Applied to general-purpose motor, standard rating (Class 20 overload)
2	Applied to general-purpose motor, short time rating (Class 10 overload)
3	Applied to blower-cooled motor, standard rating (Class 20 overload)

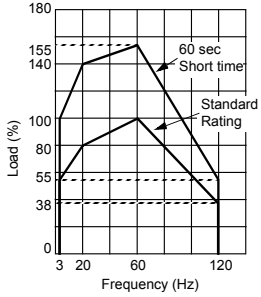
4	Applied to blower-cooled motor, short time rating (Class 10 overload)

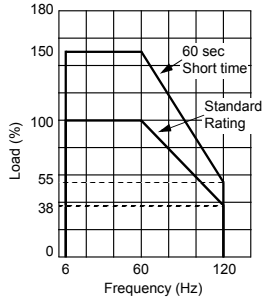
The electronic thermal overload function estimates motor temperature, based on inverter output current and time, to protect the motor from overheating. When the electronic thermal overload relay is activated, an .oL1. error occurs, shutting OFF the inverter output and preventing excessive overheating in the motor.

When operating with one inverter connected to one motor, an external thermal relay is not needed. When operating several motors with one inverter, install a thermal relay on each motor. In this case, set parameter P033 to “0”.

- General-purpose and Blower-cooled Motors

Induction motors are classified as general-purpose or blower-cooled motors, based on their cooling capabilities. Hence, the motor overload detection function operates differently for each of these two motor types.

	Cooling Effectiveness	Torque Characteristics	Electronic Thermal Overload
General-purpose	Effective when operated at 50/60Hz from commercial power supply.	 Base Frequency 60Hz (V/f for 60Hz, 230V Input Voltage) During continuous operation at low speeds, the load must be limited in order to limit motor temperature rise.	.OL1. error (motor overload protection is enabled when motor is continuosly operated at 50/60Hz or less at 100% load).

Blower-cooled	Effective when operated at low speeds (approx. 6Hz).	 Base Frequency 60Hz (V/f for 60Hz, 230V Input Voltage) Use blower-cooled motor for continuous operation at low speeds.	Effective when operated at low speeds (approx. 6Hz).

5.2.16 Multi-Step Speed Selection

This function allows the programming of up to 4 preset speeds, through multi-function contact input function selections.

4-step speed selection

P002 = “1” (operation mode selection)

P025 = 30.0Hz (factory default)

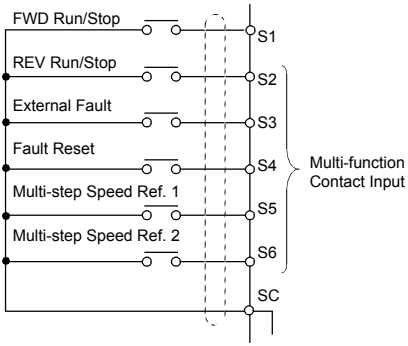
P026 = 40.0Hz (factory default)

P027 = 50.0Hz (factory default)

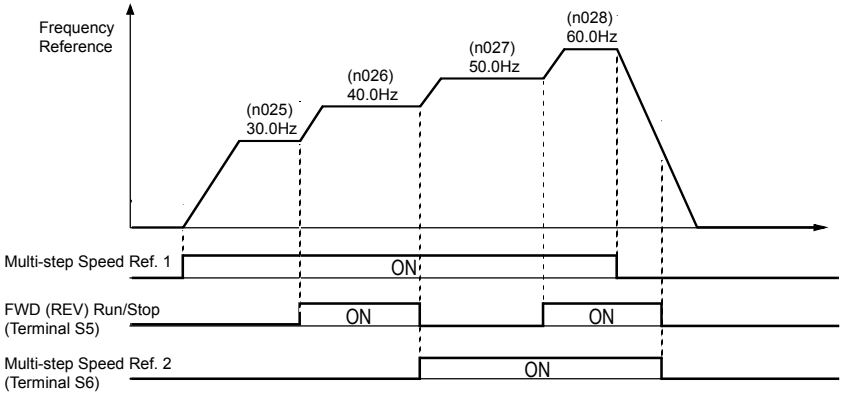
P028 = 60.0Hz (factory default)

P038 = 9 (multi-function contact input terminal S5)

P039 = 10 (multi-function contact input terminal S6)



Multi-step Speed Selection - Control Circuit Terminals



5.2.17 Phase Loss Protection

- Input Phase Loss Detection (P080, P081)

  The input phase loss detection circuit monitors the DC bus current ripple and activates when the one of the input phases are lost. The detection circuit calculates the maximum and minimum values of the DC bus voltage in 1.28 second intervals, and compares the difference (ΔV) between these values with the input phase loss detection level (P080). If ΔV ≥ P080, then input phase loss is detected; and after the input phase loss detection delay time (P081), an SPI fault occurs, and the motor coasts to stop.

No.	Name	Description	Factory Default

P080	Input phase loss detection level	Unit: 1% Setting range: 1 to 100% of input voltage	7%
P081	Input phase loss detection delay time	Unit: 1 (1.28 s) Setting range: 2 to 255 (2.56 to 326.4 s)	8 (10.24 s)

Input phase loss detection is disabled in the following cases:

- Parameter P080 is set to .100%..
- A Stop command is input.
- Magnetic Contactor (MC) shuts OFF.
- CPU A/D converter fault (CPF5).
- During deceleration.
- Output current ≤ 30% of Inverter rated current

• Output Phase Loss Detection (P082, P083)

The output phase loss detection circuit monitors the DCCT.s and activates when one of the output phases are lost. The detection circuit calculates the RMS current value (IRMS) and compares it with output phase loss detection level (P082). If IRMS ≤ P082, then output phase loss is detected; and after the output phase loss detection delay time (P083), an SPO fault occurs, and the motor coasts to stop.

No.	Name	Description	Factory Default
P082	Output phase loss detection level	Unit: 1% Setting range: 0 to 100% of inverter rated current	0%
P083	Output phasetime loss detection delay	Unit: 0.1 s Setting range: 0.0 to 2.0 s	0.2 s

Output phase loss detection is disabled in the following cases:

- Parameter P082 is set to“0%”.
- Parameter P083 is set to“0 s”.

5.2.18 PID Control

To enable PID control, set PID selection (P084) to“1”or“2”, according to the description below.

Setting	Description
0	PID disabled (factory default)
1	PID enabled (deviation is D-controlled.)
2	PID with feed forward (feedback value is D-controlled)

Then select the PID control intended value setpoint or detected feedback value setpoint as follows:

- Intended Value Setting

  The control circuit terminal FV voltage signal (0 to 10V) or multi-step speed parameters P025 to P029 can be used to set the PID intended value.

  Control circuit terminal FV voltage signal:

  Set operation mode selection (P002) to“2”or“3”.

  Multi-step speed constants (P025 to P029):

  Set operation mode selection (P002) to“0”or“1”. (combination of multi-step speed reference and jog frequency reference)

- Detected Value Setting

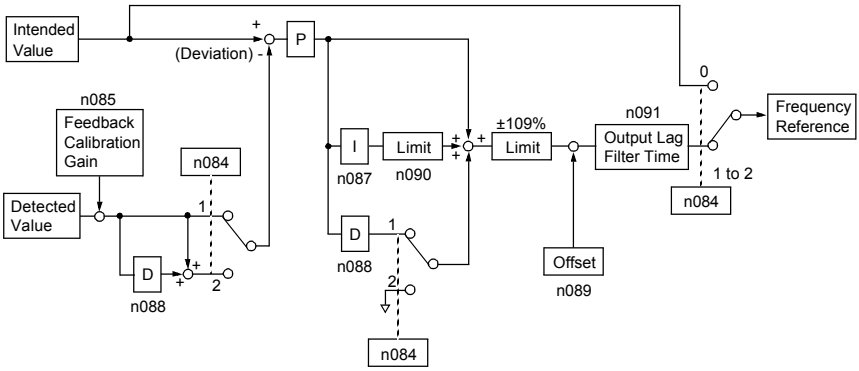
  The control circuit terminal FI current signal (4 to 20mA) or voltage signal (0 to 10V) can be used to set the PID detected value. Control circuit terminal FI current signal:

  Set aux”analog input selection (P043) to“1”.

  Control circuit terminal FI voltage signal:

  Set operation mode selection (P043) to“0”.

  (Cut jumper J1 on the control PCB board.)



PID Control Block Diagram

Notes:

1. Value I is reset to .0. in the following cases:

   When operation stops When the integral value reset signal is input by multi-function contact input selection (Any of parameters P035 to P039 are set to “18”.)

2. The upper limit of value I can be set by parameter P090.

   Increase the value of parameter P090 to upgrade control capability by integration. If the control system vibrates and it cannot be stopped by adjusting

the integral time, output lag filter time, etc., decrease the set value of parameter P090.

3. PID control can be canceled by a multi-function contact input signal.

   By setting any of parameters P035 to P039 to .19. and by closing the contact during running, PID control is disabled and the intended value signal itself is used as a frequency reference signal.

5.2.19 Reverse Run Prohibit (P006)

A .reverse run disabled. setting does not allow a reverse run command from the control circuit terminal or the digital operator. This setting is used in applications where a reverse run command can cause problems.

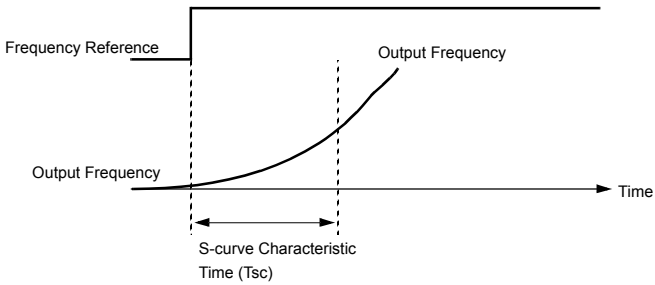
Setting	Description
0	Reverse run enabled (factory default)
1	Reverse run disabled

5.2.20 Soft-Start Characteristics (P023)

An S-curve pattern is used to reduce shock and provide smooth transitions during machine acceleration and deceleration.

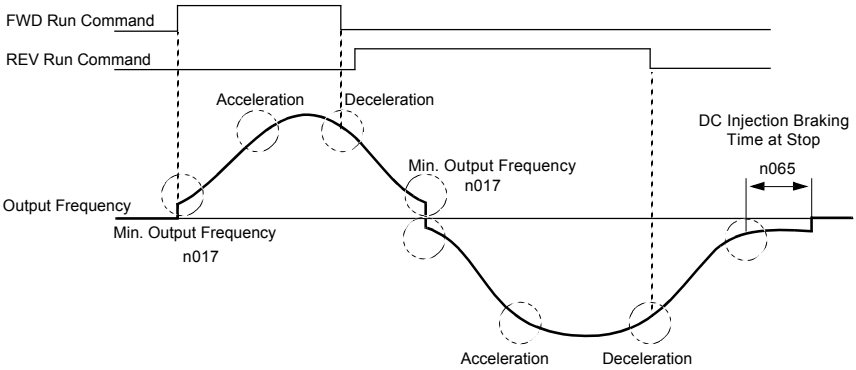
Setting	Description
0	S-curve not provided
1	0.2 second (factory default)
2	0.5 second
3	1.0 second

Note: S-curve characteristic time is the time from current frequency to the set accel/decel time.



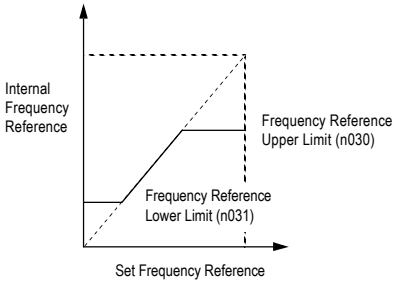
S-curve Characteristic Timing Diagram

The following figure shows FWD/REV run switching during deceleration to stop.



S-curve Characteristics - FWD/REV Operation

5.2.20 Speed Limit Adjustment



Setting Frequency Upper and Lower Limits

- Frequency Reference Upper Limit (P030)

  The upper limit of the frequency reference can be set in increments of 1%. (P012: maximum output frequency = 100%)

  Factory setting: 100%

- Frequency Reference Lower Limit (P031)

  The lower limit of the frequency reference can be set in increments of 1%. (P012: maximum output frequency = 100%)

  Factory setting: 0%

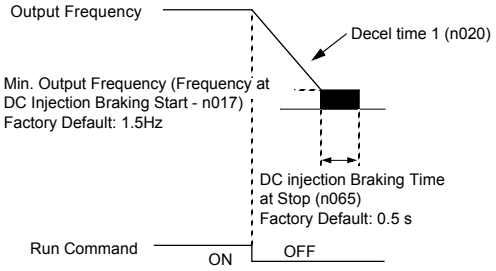
When operating at a frequency reference of 0Hz, operation continues at the frequency reference lower limit. However, when the lower limit is set to less than the minimum output frequency (P017), operation discontinues.

5.2.21 Stopping Method (P004)

This function selects the stopping method suitable for the particular application.

Setting	Description
0	Deceleration to stop (factory default)
1	Coast to stop
2	Coast to stop with timer 1 (run command cycle)
3	Coast to stop with timer 2 (auto-start after time out)

- Deceleration to Stop (P004 = “0”)



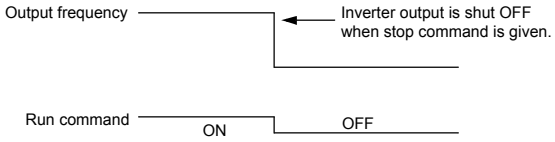
Stopping Method - Deceleration to Stop

Upon removal of the FWD (REV) run command, the motor decelerates at a deceleration rate determined by the time set in deceleration time 1 (P020) and DC injection braking is applied immediately before stop. If the deceleration time is short or the load inertia is large, an overvoltage fault (OV) may occur during deceleration. In this case, increase the deceleration time or install an optional braking resistor .

Braking torque: w/out braking resistor, approx. 20% of motor rated torque

with braking resistor, approx. 150% of motor rated torque

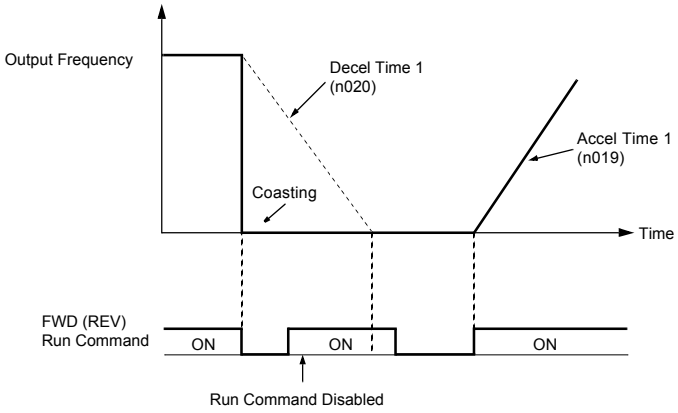
- Coast to Stop (P004 = “1”)



Stopping Method - Coast to Stop

Upon removal of the FWD (REV) run command, the motor starts to coast.

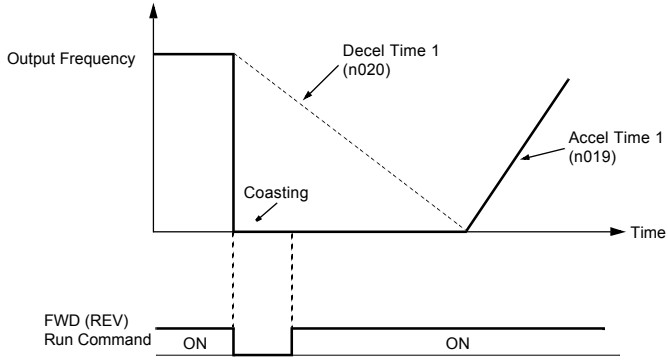
- Coast to Stop with Timer 1 (P004 = “2”)



Example of Stopping Method - Coast to Stop w/ Timer 1

A run command is not accepted while the motor decelerates after a stop command is given. However, if the time required for the motor to decelerate to stop is shorter than the minimum baseblock time (P053), a run command is not accepted during the baseblock time.

- Coast to Stop with Timer 2 (P004 = “3”)



Example of Stopping Method - Coast to Stop w/ Timer 2

Operation is disabled while the timer is activated after a stop command is given. A run command can be accepted, but operation does not start until the timer runs out. However, if the deceleration time is shorter than the minimum baseblock time (P053), the inverter does not operate during the baseblock time.

5.2.22 Torque Adjustment (P067)

Motor torque can be adjusted by changing the V/f pattern (P010) or by adjusting the torque compensation gain (P067). For details on setting the V/f pattern, see .V/f Pattern Adjustment., on page 74.

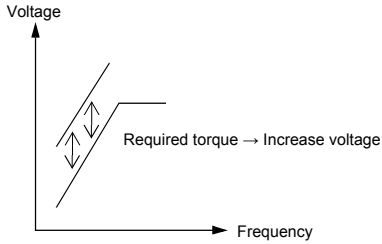
- Full-range Automatic Torque Boost

  The motor torque requirement changes according to load conditions.

  Full-range automatic torque boost adjusts the voltage of the V/f pattern according to the required torque. The WIN-9_F automatically adjusts the voltage during constant-speed operation as well as during acceleration.

  The required torque is calculated by the inverter. This ensures tripless operation and power savings.

  Output voltage □ Torque compensation gain × Required torque



Torque Characteristics

Normally, no adjustment is necessary for torque compensation gain (P067, factory default: “1.0”). When the wiring distance between the inverter and the motor is long, or when the motor generates vibration, change the torque compensation gain.

Increasing torque compensation gain increases motor torque, but an excessive increase may cause the following:

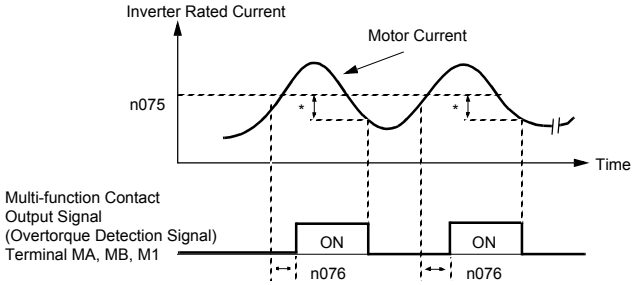
- Inverter fault trips due to motor overexcitation
- Motor overheat or excessive vibration

If adjustment is necessary, adjust in 0.1 increments.

5.2.23 Torque Detection

The overtorque detection circuit will activate when the motor load causes the motor current to exceed the overtorque detection level (P075). When the overtorque condition is detected, alarm signals are sent to multi-function output terminals MA, MB and M1.

To output an overtorque detection signal, set multi-function contact input selection P040 or P041 to “6” (N.O. contact) or “7” (N.C. contact).



* Release width (hysteresis) during overtorque detection is 5% of the inverter rated current level.

Torque Characteristics

- Overtorque Detection Function Selection (P074)

Setting	Description
0	Detection disabled (factory default)
1	Detection begins at speed agree. Continue running after detection (alarm).
2	Detection always. Continue running after detection (alarm).
3	Detection begins at speed agree. Coast to a stop after detection (fault).
4	Detection always. Coast to a stop after detection (fault).

Notes:

- To detect torque during acceleration or deceleration, set to “2” or “4”.
- To continue operation after overtorque detection, set to “1” or “2”. During detection, the digital operator displays .oL3. alarm (blinking).
- To stop the inverter after an overtorque detection fault, set to “3” or “4”. During detection, the digital operator displays .oL3. fault.
- Overtorque Detection Level (P075)

Sets the overtorque detection current level in units of 1%

Inverter rated current: 100%

Factory default: 160%

- Overtorque Detection Time (P076)

The overtorque detection delay time inserts a delay, between the time motor current exceeds the overtorque detection current level (P075) and when the overtorque detection function is enabled.

Factory default: 0.1 second

If the time during which motor current exceeds the overtorque detection level

(P075) is longer than the overtorque etection time (P076), the overtorque detection function is enabled.

5.2.24 Tripless Operation

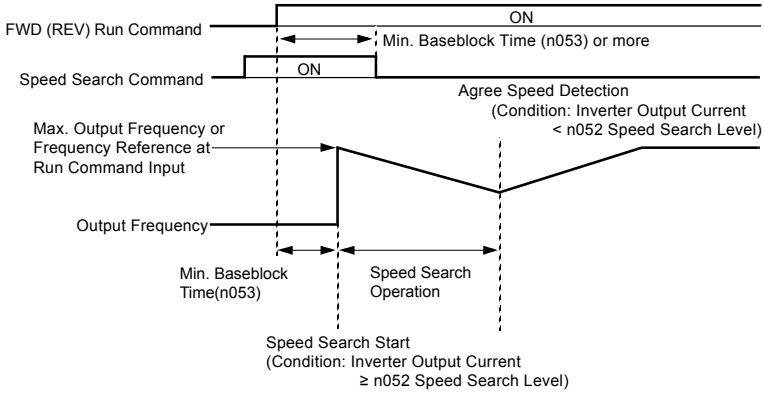
When starting into a coasting motor, use the speed search command or DC injection braking at start, to prevent a drive trip and motor burnout.

- Speed search

  This function allows the restart of a coasting motor without the necessity to stop. It is useful during inverter bypass operation, when switching between the motor receiving power directly from the line and from the inverter.

  Set the multi-function contact input selection (P035 to P039) to .15. (start search command from maximum output frequency) or .16. (start search command from the set frequency).

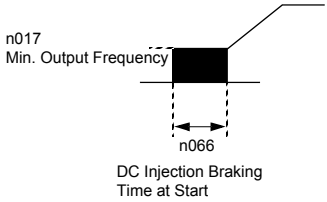
  Build a sequence so that the FWD (REV) run command is input at the same time as the search command, or after the search command. If the run command is input before the search command, the search command is not effective. Below is a timing diagram of the search command input:



Search Command Input Timing Diagram

- DC Injection Braking at Start (P064, P066)

  This function restarts a coasting motor after first stopping it. DC injection braking time at start (P066) is set in units of 0.1 second. DC injection braking current is set in parameter P064 in units of 1%. When parameter P066 is set to “0”, DC injection braking is disabled and acceleration starts from the minimum output frequency.



DC Injection Braking at Starting

5.2.25 V/f Pattern Adjustment

Set the V/f pattern using parameter P010 as described below. It may be necessary to change the V/f pattern when using a high-speed motor, or when special torque adjustment is required in the application.

Set values 0 to E: preset V/f pattern can be selected

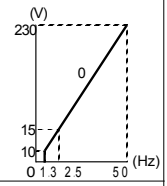
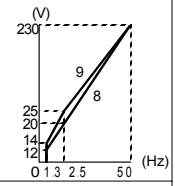
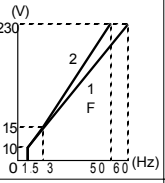
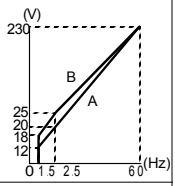
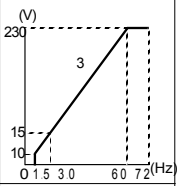
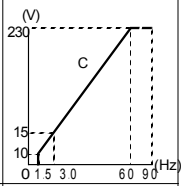
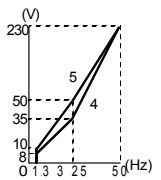
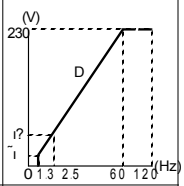
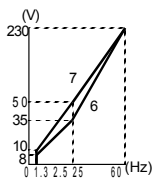
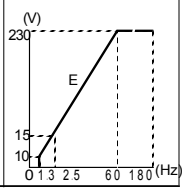
F: custom V/f pattern can be set

- Preset V/f Patterns

  Preset V/f patterns are automatically scaled by the motor rated voltage value set in parameter P011.

  Set the V/f pattern according to the applications described in the table on the following page:

5.2.26 Preset V/f Patterns

	Specifications		n010	V/f Pattern *1		Specifications		n010	V/f Pattern *1
General-purpose	50Hz		0		High Starting Torque *2	50Hz	Low Starting Torque	8	
							High Starting Torque	9	
	60Hz	60Hz Saturation	1F			60Hz	Low Starting Torque	A	
		50Hz Saturation	2				High Starting Torque	B	
	72Hz		3		High Speed Operation	90Hz		C	
Variable Torque	50Hz	Variable Torque 1	4			120Hz		D	
		Variable Torque 2	5						
	60Hz	Variable Torque 3	6			180Hz		E	
		Variable Torque 4	7						

Notes:

*1 The following conditions must be considered when selecting a V/f pattern:

- The voltage and frequency characteristics of the motor.
- The maximum speed of the motor.

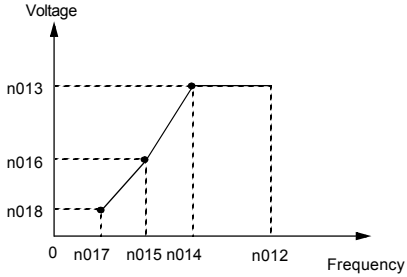
*2 Select a high starting torque V/f pattern only under the following conditions:

- The wiring distance is long - 492 ft (150m) and above.
- Large voltage drop at start-up.
- AC reactor is connected to the inverter.s input or output.
- A motor rated below the nominal output of the inverter is used.

• Custom V/f Pattern

Set up a custom V/f pattern by setting parameter P010 to .F., and then setting the values in parameters P012 to P018.

Be sure to satisfy the following conditions for setting parameters n012 to n018:
n017 ≤ n015 < n014 ≤ n012



Custom V/f Pattern Setting

Parameter No.	Name	Unit	Setting Range	Factory Default
P012	Maximum output frequency	0.1 Hz	50.0 to 400 Hz	60.0 Hz
P013	Maximum voltage	0.1 V	0.1 to 255 V *	230 V *
P014	Maximum voltage output frequency (base frequency)	0.1 Hz	0.2 to 400 Hz	60.0 Hz
P015	Mid. output frequency	0.1 Hz	0.1 to 399 Hz	3.0 Hz
P016	Mid. output frequency voltage	0.1 V	0.1 to 255 V *	12.0 V *
P017	Minimum output frequency	0.1 Hz	0.1 to 10.0 Hz	1.5 Hz
P018	Minimum output frequency voltage	0.1 V	0.1 to 50.0 V *	12.0 V *

* For 460V class units, the value is twice that of 230V class units.

Increasing the voltage in the V/f pattern increases motor torque, however, an excessive increase may cause:

- Inverter fault trips as a result of motor overexcitation
- Motor overheat or excessive vibration

Increase voltage gradually while checking the motor current.

5.3 INPUTS & OUTPUTS

5.3.1 Multi-function Input Signals (P035 to P039)

Multi-function contact input terminal S2 to S6 functions can be changed when necessary by setting parameters P035 to P039, respectively. Neither of these parameters can receive a setting common with the other.

· Terminal S2 function: set to P035

· Terminal S3 function: set to P036

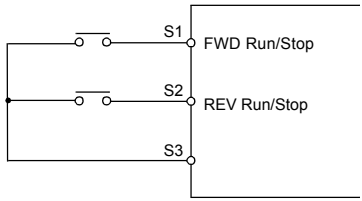
· Terminal S4 function: set to P037

· Terminal S5 function: set to P038

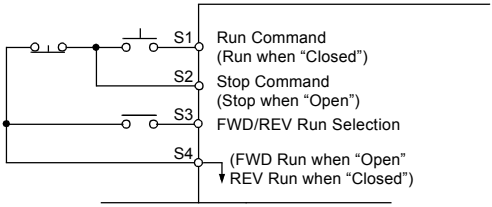
· Terminal S6 function: set to P039

Set-ting	Name	Description
0	REV run command (2-wire sequence)	Only parameter P035 can be set to this value.
1	FWD/REV run command(3-wire sequence)	
2	External fault (NO contact input)	Inverter stops at fault when external fault signal is input. Digital operator displays “EF0”.
3	External fault (NC contact input)	
4	Fault reset	Resets fault. Fault reset is disabled during run command input.
5	LOCAL/REMOTE selection	-
6	Serial communication/control circuit terminal selection	-
7	Fast stop	Decelerates to stop by decel time 2 (P022) when fast stop is input.
8	Master frequency reference inputselection level selection	Master frequency reference input level (voltage input at“open”current input at“closed”) can be selected.
9	Multi-step speed reference 1	-
10	Multi-step speed reference 2	
11	Jog frequency selection	
12	Accel/decel time selection	
13	External baseblock (NO contact input)	Coasting signal. Motor starts coasting when the signal Digital operator displays “bb” (blinking).
14	External baseblock (NC contact input)	
15	Search command from maximum frequency	Speed search command signals.
16	Search command from set frequency	
17	Constant setting enable/disable	Permission or prohibition of constant setting from the digital operator or serial communication (setting disabled at“closed”, enabled at“open”) can be selected.
18	PID integral value reset	-
19	PID control disable	
20	Timer function	-
21	OH3 (inverter overheat alarm)	When this signal is input, the digital opertor displays “OH3” (blinking). Inverter continues operation.
22	Analog reference sample/hold	Analog frequency reference is sampled at closed and held at open.
25	UP/DOWN command	Only parameter P039 can be set to this value.
26	Loop test	Only parameter P039 can be set to this value.

* 2 to 6 are displayed in_corresponding to S2 to S6, respectively.Factory settings:P035=0,P036=2,P037=4,P038=9,P039=10



Terminal Function at 2-Wire Sequence Selection (setting:



Terminal Function at 3-Wire Sequence Selection (setting:

- Local/Remote Selection (setting:5)

  Selects whether an operation reference is received from the digital operator or the control circuit terminal. Local/Remote selection is available only while the inverter is stopped.

  Open: run according to the setting of operation mode selection (P002).

  Closed: run by frequency reference and run command from the digital operator.

  Example: Set P002 to 3.

  Open: run by frequency reference from control circuit terminals FV & FI, and run command from control circuit terminals S1 and S2.

  Closed: run by frequency reference and run command from the digital operator.

- Serial Communication/Control Circuit Terminal Selection (setting: 6)

  Selects operation reference by serial communication or by the control circuit terminal. This selection is available only during stop.

  Open: run according to the setting of operation mode selection (P002).

  Closed: run by frequency reference and run command from serial communication.

  Example: Set P002 to 3.

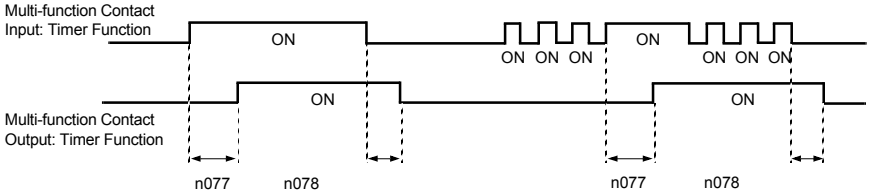
  Open: run by frequency reference from control circuit terminals FV & FI, and run command from control circuit terminals S1 and S2.

Closed: run by frequency reference and run command from serial communication.

- Timer Function (setting: 20)

  When the timer function input is longer than the ON-delay timer (P077), the timer function output closes.

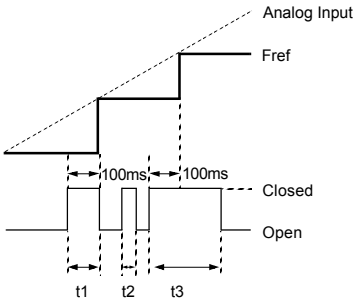
  When the timer input is open for longer than the OFF-delay timer (P078), the timer function output opens.



Timing Diagram of Timer Function

- Analog Reference Sample/Hold Selection (setting:22)

  If input terminal is closed for 100ms or longer, the analog frequency reference is sampled; when it opens, the analog frequency reference is held.



Sample/Hold Selection - Analog Reference

Note: t1, t3 - Reference is held at 100ms or longer.

t2 - Reference is not held at less than 100ms.

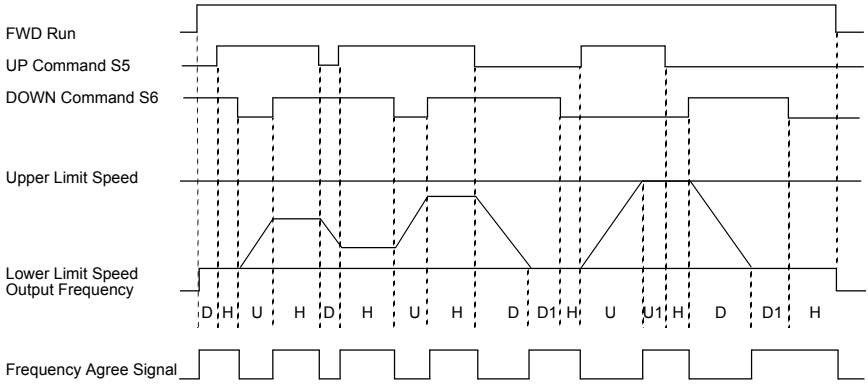
- Up/Down Command (setting: P039 = 25)

  With the FWD (REV) run command entered, a change in frequency is

  performed by inputting the Up or Down signals to control circuit terminals S5 and S6, so that operation can be performed at the desired speed.

  When Up/Down commands are specified by P039, any function set to P038 becomes disabled; terminal S5 becomes an input terminal for the Up command and terminal S6 an input terminal for the Down command.

Control Circuit Terminal S5 (UP command)	Closed	Open	Open	Closed
Control Circuit Terminal S6 (DOWN command)	Open	Closed	Open	Closed
Operation Status	Accel	Decel	Hold	Hold



U: Up (accelerating) status
D: Down (decelerating) status
H: Hold (constant speed) status
UI: Up status, with clamping at upper limit speed
DI: Down status, with clamping at lower limit speed

Timing Diagram of UP/DOWN Command Input

Notes:

1) When the UP/DOWN command is selected, the upper limit speed is set regardless of frequency reference.

   Upper limit speed = Maximum output frequency (P012) × Frequency reference upper limit (P030) /100

2) The lower limit value is either the analog frequency from control circuit terminals FV or FI, or the frequency reference lower limit (P031), whichever is larger.

3) When the FWD (REV) run command is input, operation starts at the lower limit speed without an UP/DOWN command.

4) If the jog frequency reference is input while the drive is running by the UP/DOWN command, the jog frequency reference has priority.

- Loop Test (setting: .26.)

  Checks operation in the serial interface circuit. If a fault occurs, the digital operator displays “CE”.

5.3.2 Procedure

1) 1Set multi-function contact input selection (P039) after turning ON the inverter power supply, then turn OFF the inverter power supply.
2) 2Short-circuit terminal S6 to terminal SC and connector 2CN pin 1 to pin 2. (Do not short-circuit when connecting the communication interface card SI-K2/P.)
3) Begin the loop test by turning ON the inverter power supply.

The digital operator displays the frequency reference after the loop test is completed satisfactorily.

5.3.3 Analog Input Signals (P042 to P045)

- Master Analog Input Selection (P042)

  To input the master frequency reference from the control circuit terminal, select voltage reference (0 to 10V) from terminal FV or current reference (4 to 20mA) from terminal FI, by setting parameter P042.

Setting	Master Frequency Reference Terminal	Input Level
0	FV (factory default)	0 to 10V input
1	FI	4 to 20mA input

- Auxiliary Analog Input Selection (P043)

  To change the control circuit terminal FI input level from current to voltage, set parameter P043 according to the table below:

Setting	Input Level
0 *	0 to 10V input
1	4 to 20mA input (factory default)

  *To set parameter P043 to“0”,cut jumper J1 on the inverter control PCB board.

- Frequency Reference Retention (P044)

  Effective when UP/DOWN or Sample/Hold commands are selected for multi-function contact inputs. To retain the held frequency reference at power OFF, set parameter P044 to “1”.

Setting	Description
0	Held frequency retained in frequency reference 1 - P025 (factory default)
1	Not retained

• Operation Method for Frequency Reference Loss Detection (P045) Select operation if the frequency reference from the control circuit terminal decreases rapidly.

Setting	Description

0	Detection disabled (factory default)
1	Detection enabled, continue to run at 80% of previous Fref.

If the frequency reference decreases by 90% within 400ms (when detection is enabled), operation continues at 80% of the reference reached before the rapid decrease.

5.3.4 Multi-function Output Signals (P040, P041)

Multi-function output terminal MA, MB and M1 functions can be changed when necessary by setting parameters P040 and P041.

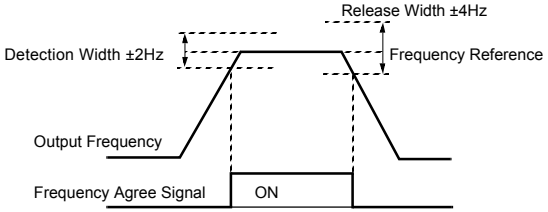
- Terminal MA and MB functions: set to P040
- Terminal M1 functions: set to P041

Setting	Name	Description
0	Fault	Closed when inverter fault occurs.
1	During running	Closed when either FWD or REV run command is input or when the inverter outputs voltage.
2	Frequency agree	-
3	Desired frequency agree	-
4	Frequency detection	-
5		-
6	Overtorque detection (N.O. contact)	-
7	Overtorque detection (N.C. contact)	-
8	During baseblock	“Closed” when inverter output shuts OFF.
9	Operation mode	“Closed” when run command or frequency reference from digital operator is selected.
10	Inverter operation ready	“Closed” when no inverter fault does not occur and the inverter can be operated.
11	Timer function	-
12	Automatic restart	“Closed” during fault retry operation.
13	OL pre-alarm	Outputs an alarm before inverter and motor overload protection are enabled. Pre-alarm level is 150% for 48 sec for the inverter and more than 80% of the overload protection time for the motor.
14	Frequency reference loss	Outputs a contact when detecting a rapid decrease in the frequency reference. The inverter continues operation at 80% of the frequency reference if the reference value is reduced more than 90% within 400ms.
15	Output from serial communication	Activates contact output independently from inverter operation by a command from serial communication (MODBUS).

Set-ting	Name	Description
16	PID feedback loss	Detects a rapid decrease in feedback and outputs a contact when the PID control mode is set. Detects when the feedback value decreases less than the detection level (P093) for longer than the feedback loss detection delay time (P094); the inverter continues operation.
17	OH1 alarm	“Closed” during heat sink overtemperature (digital operator displays“OH1”blinking).

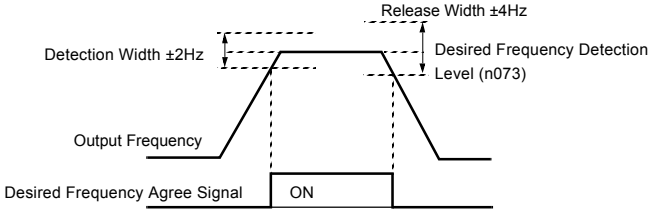
Factory defaults: P040 = “0”, P041 = “1”

See Figure 51 below for an example of selecting the frequency agree signal as the function of output terminals MA, MB or M1.



Example of Frequency Agree Signal (setting: “2”)

See Figure 52 below for an example of selecting the desired frequency agree signal as the function of output terminals MA, MB or M1.



Example of Desired Frequency Agree Signal (setting: “3”)

Chapter 6 DIAGNOSTICS

6.1 Fault Display

When the WIN-9_F detects a fault, the fault is displayed on the digital operator and activates a fault contact output, after which the motor coasts to a stop. Check the causes listed in the table below and take the corresponding corrective actions. To restart the inverter, remove any run command and turn ON the reset input signal or depress the RESET key on the digital operator, or cycle power to reset the stop status. If taking the corrective actions described does not solve the problem, contact your WINNER representative immediately.

Fault Diagnosis and Corrective Actions

Fault Display	Name	Description	Corrective Action
Uu1	Main circuit undervoltage (PUV)	Undervoltage in the DC main circuit during running.	• Check the power supply wiring. • Correct the line voltage
Uu2	Control circuit undervoltage (CUV)	Undervoltage in the control circuit during running.	
Uu3	MC fault	The pre-charge contactor opened during running.	
oC	Overcurrent (OC)	The inverter output current exceeded the OC level.	• Check the motor coil resistance. • Extend the accel/decel • time.Check the motor insulation. • Multi-meter check.
ou	Overvoltage (OV)	The main circuit DC voltage exceeded the OV level. Detection level 230V class: approx. 400VDC or less 460V class: approx. 800VDC or less	Extend the deceleration time, add braking circuit.
GF	Ground fault (GF)	Inverter output grounding current exceeded 50% of inverter rated current.	• Check that motor insula-tion has not deteriorated. • Check that connection between inverter and motor is not damaged.
PUF	Main circuit fault (PUF)	·The DC bus fuse is blown. ·The output transistors were damaged.	Check for damaged transis-tor, load side short circuit, grounding, etc.

Fault Display	Name	Description	Corrective Action
*oH1	Heatsink overheat (OH1)	The transistor heatsink temperature exceeded the allowable value (Fin temperature > OH1 detection level).	Check the fan and ambient temperature.
oH2	Heatsink overheat (OH2)	The transistor heatsink temperature exceeded the allowable value (Fin temperature > OH2 detection level).	
oL1	Motor overload (OL1)	Inverter output exceeded the motor overload level (see P011 & P013).	Reduce the load.
oL2	Inverter overload (OL2)	Inverter output exceeded inverter theoverload level.	Reduce the load, extend the acceleration time.
*oL3	Overtorque detection (OL3)	Inverter output current exceeded the overtorque detection level (P075).	
SC	Load short-circuit (SC)	Inverter output (load) is short-circuited.	· Check the motor coil resistance. · Check the motor installation.
EF0	External fault from serial communication	Fault occurred in the external control circuit.	Check the external control circuit.
EF2	External fault at terminal S2	Fault occurred in the external control circuit.	Check the condition of the input terminal. If the LED lights when terminal is not connected, replace the inverter.
EF3	External fault at terminal S3		
EF4	External fault at terminal S4		
EF5	External fault at terminal S5		
EF6	External fault at terminal S6		
SPI	Excessive ripple in the DC bus	· Inverter input power supply has open phase. · Large unbalance in input line voltage.	· Check the line voltage. · Re-tighten the output terminal screws.
SPo	Output open-phase	Inverter output has open phase.	· Check the output wiring.
*CE	MODBUS transmission fault	Control data cannot be received nor-mally.	Check the transmission devices or signals.
CPF0	Control circuit fault 1 (CPFO) Digital operator transmission fault	· Transmission between the inverter and digital operator cannot be established 5 seconds after supplying power. · MPU peripheral element check fault (on-line)	· Insert the digital operator connector again. · Check the control circuit wiring. · Replace the control card.

Fault Display	Name	Description	Corrective Action
CPF1	Control circuit fault 2 (CPF1) Digital operator transmission fault	· Transmission between the inverter and digital operator is established once after supplying power, but later trans-mission fault continues for more than 2 seconds. · MPU peripheral element check fault (on-line).	· Insert the digital operator connector again. · Check the digital control circuit wiring. · Replace the control card.
CPF4	EEPROM fault (CPF4)	Inverter PCB control board fault.	Replace the control card.
CPF5	CPU A/D converter fault (CPF5)		

* Stopping method selection is available for these faults.

6.2 Alarm Display

Unlike faults, alarms do not activate fault contact outputs. After the cause of the alarm is corrected, the inverter returns to its former operation status automatically.

Alarm Display and Explanations

Alarm Display	Contents	Explanation
Uu (blinking)	Undervoltage detection	Undervoltage has been detected.
ou (blinking)	OV during stop	Main circuit DC voltage exceeds the overvoltage detection level while the inverter output is OFF.
oH1 (blinking)	Heatsink overheating	When heatsink temperature ≥ OH1 detection level, continuous operation at 0H1 detection is selected.
oL3 (blinking)	Overtorque detection	When inverter output current > P075 (overtorque detection level), continuous operation at overtorque detection is selected.
bb (blinking)	External baseblock	External baseblock command is input from control circuit terminal.
EF (blinking)	Simultaneous forward/reverse run commands	Both forward and reverse run commands are simultaneously input for over 500ms.
CALL (blinking)	MODBUS transmission waiting	When parameter P002 (operation method selection) is set to “4” or above, the inverter has not received the nor-mal data from serial communication after power ON.
oH3 (blinking)	Inverter overheat pre-alarm	Inverter overheat pre-alarm signal is input from control circuit terminal.
CE (blinking)	MODBUS transmission error	Continuous operation is selected at MODBUS transmission error.
oPE1	Inverter kVA setting fault	Inverter kVA setting error.
oPE3	Multi-function contact input setting error	One of the following setting errors occurred in the multi-function contact input selection (P035 to P039).· Two or more of the same values are set. · Both 15 and 16 are set at the same time. · Both 22 and 25 are set at the same time. · Either of P035 to P038 are set to “25” or “26”.
oPE5	V/f data setting error	Setting error of P012 to P018 (V/f data)
oPE6	Parameter setting error	One of the following setting errors occurred. · P058 (jump frequency 1) > P059 (jump frequency 2) · P030 (frequency upper limit) < P031 (frequency lower limit) · P032 (motor rated current) < 10% of inverter rated current, or P032 > 200% of inverter rated current setting

6.3 Motor Faults

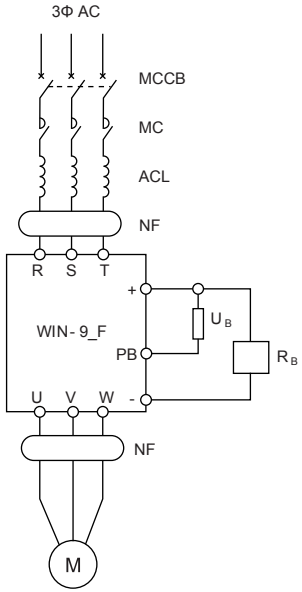
If a motor fault occurs, follow the checkpoints listed in the table below and take the corresponding corrective actions. If taking the corrective actions described does not solve the problem, contact your WINNER representative immediately.

Motor Faults and Corrective Actions

Fault	Check Point	Corrective Action
Motor does not rotate	Power supply voltage applied to power supply terminals L1, L2, L3? Charge LED is ON?	• Turn ON power supply. • Turn OFF power supply, and then ON again. • Check power supply voltage. • Make sure terminal screws are tight.
	Use rectifier type voltmeter to test. Voltage output to output terminals T1, T2, T3 correct?	Turn OFF power supply, then turn ON again.
	Motor locks due to excessive load?	Reduce the load and release the lock.
	Fault displayed in operator display?	Check troubleshooting table.
	FWD or REV run command entered?	Check the wiring.
	Frequency setting voltage entered?	• Check the wiring. • Check frequency setting voltage.
	Operation mode setting correct?	Check the operation mode selection (P002).
Motor rotation reverses	Wiring of terminals T1, T2, T3 correct?	Match wiring to the phase order of the motor leads U, V, W.
	FWD and REV wiring run signals entered?	Correct the wiring.
Motor rotates, but variable speed not available.	Wiring of frequency setting circuit correct?	Check the operation mode selection (P002).
	Operation mode setting correct?	Check the operation mode selection (P002).
	Load excessively large?	Reduce the load.
Motor r/min. too high or too low	Motor ratings (number of poles, voltage correct?)	Check motor nameplate specifications.
	Accel/decel speed change ratio for gears, etc. correct?	Check speed changer (gears, etc.)
	Maximum frequency set value correct?	Check the maximum frequency set value.
	Use rectifier voltmeter. Voltage between motor terminals not excessively reduced?	Check V/f characteristics values.
Motor r/min not stable during operation	Load excessively large?	Reduce the load.
	Load variation excessively large?	• Reduce the load variation. • Increase inverter motor capacity.
	3-phase or single-phase power supply used? For 3-phase power supply, open phase?	• For 3-phase power supply, check the wiring if power supply is open phase. • For single-phase power supply, connect AC reactor to the power supply.

Chapter 7 Main Circuit Wiring

7.1 Input Wiring



Ancillary equipment connection layout

- Molded-Case Circuit Breaker (MCCB)

Be sure to connect MCCB's or fuses between the AC main circuit power supply and WIN-9_F input terminals L1, L2 and L3, to protect wiring.

- Ground Fault Interrupter

When connecting a ground fault interrupter to input terminals L1, L2 and L3, select one that is not affected by high frequency.

Examples:

NV series by Mitsubishi Electric Co., Ltd. (manufactured in or after 1988), EGSG series by Fuji Electric Co., Ltd. (manufactured in or after 1984).

- Magnetic Contactor (MC)

Inverters can be used without an MC installed on the power supply side.

When the main circuit power supply is shut OFF in the sequence, an MC can be used instead of an MCCB. However, when an MC is switched OFF on the primary side, dynamic braking does not function and the motor coasts to stop.

The load can be operated/stopped by opening/closing the MC on the primary

side. However, frequent switching may cause the inverter to malfunction.

When using a braking resistor unit, use a sequencer to break the power supply side of the inverter in the event of an overload relay trip contact.

If the inverter malfunctions, the braking resistor unit may be burned out.

• Terminal Block Connection Sequence

Input power supply phases can be connected to any terminal regardless of the order of L1, L2 and L3 on the terminal block.

• AC Reactor

When connecting an inverter (230V/460V, 25HP or less) to a large capacity power supply transformer (600kVA or more), or when switching a phase-advancing capacitor, excessive peak current flows through the input power supply circuit, which may damage the converter section. In such cases, install a DC reactor (optional) between inverter 1 and 2 terminals, or an AC reactor (optional) on the input side. Installation of a reactor is effective for improvement of power factor on the power supply side.

• Surge Suppressor

For inductive loads (i.e. magnetic contactors, magnetic relays, magnetic valves, solenoids, magnetic brakes, etc.) connected near the inverter, use a surge suppressor.

7.2 Output Wiring

• Motor Connection

Connect motor lead wires to output terminals T1, T2 and T3. Verify that the motor rotates in the forward direction (CCW: counterclockwise when viewed from the motor load side) with the forward run command.

If the motor rotation is incorrect, exchange any two of the motor leads.

• Magnetic Starter

Do not connect a magnetic starter or a magnetic contactor to the output circuit. If the motor load is connected or disconnected while the inverter is running, the inverter overcurrent protective circuitry will trip.

• Thermal Overload Relay

An electronic overload protective function is incorporated into the inverter. However, when driving several motors with one inverter, or when switching between multiple windings of a multiple winding motor, connect an external thermal overload relay. In this case, set parameter P033 to 0. Also, when running at 50Hz, set the same rated current value from the motor nameplate, and at 60Hz, 110% of the rated current value from the motor nameplate.

• Wiring Distance Between Inverter and Motor

If the total wiring distance between inverter and motor is excessively long and the inverter carrier frequency (IGBT switching frequency) is high, harmonic leakage current from the wiring will adversely affect the inverter and peripheral devices. If the wiring distance is long, reduce the inverter carrier frequency as described below. Carrier frequency can be set by parameter P050.

Wiring Distance Between Inverter and Motor

Wiring Distance between Inverter and Motor	Up to 164 ft. (50m)	Up to 328 ft. (100m)	More than 328 ft. (100m)
Carrier Frequency (Set value of parameter P050)	15kHz or less (6)	10kHz or less (4)	5kHz or less (2)

Chapter 8 MAINTENANCE & INSPECTION

DANGER!

1) Never touch high voltage terminals in the inverter.

2) Replace all protective covers before powering up the inverter. When removing the cover, be sure to shut OFF the power supply to the inverter.

3) Perform maintenance or inspection only after verifying that the charge LED has gone OFF, after the main circuit power supply is turned OFF.

4) Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.

NOTE!

1) The control PCB board employs CMOS ICs. Do not touch the CMOS elements.

2) Do not connect or disconnect wiring or connectors while power is applied to the circuit.

3) Failure to observe these precautions may result in equipment damage.

8.1 Maintenance

Under normal working conditions, in addition to daily inspection of the inverter, it should be subject to regular inspection (for example a overall maintenance in at most six months).

8.1.1 Daily Inspection Maintenance

When you switch on the inverter, please check

- If there is abnormal sound or vibration from the motor
- If the inverter and the motor are over heat
- If the ambient temperature is too high
- If the load current meter is the same as before
- If the cooling fan runs correctly

Daily check point:

Rf.	What to check	Where to check	How to check	Criteria
1	Display	LED monitor	Any display error?	According to the running status
2	Cooling system	Cooling fan	Is there strange noise? Does it run smoothly?	Normal
3	Body	Inside the housing	Is there temperature rise, strange noise, or smell?	Normal
4	Environment	Environment	Check the temperature, humidity, dust and poisonous air.	Section 2.2
5	Voltage	Input, output terminals	Check the input, output voltage	Refer to Specification Table
6	Load	Motor	Is there temperature rise, strange noise, or vibration?	Normal

8.1.2 Regular Maintenance

Please cut off the power supply and wait 5-10 minutes after the main circuit indictor is off before carrying out regular maintenance. Otherwise, electric shock may occur.

Regular check point:

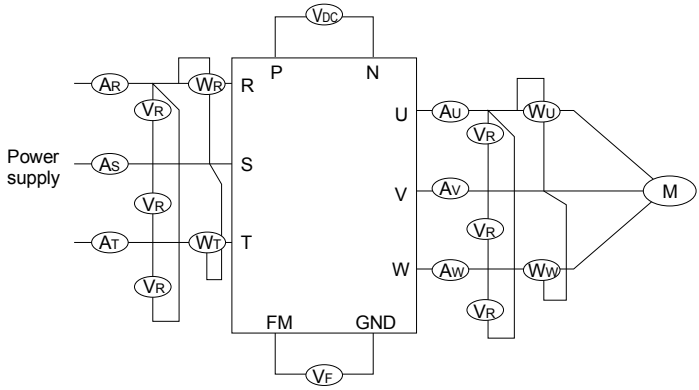
Where to Check	What to Check	Solution
Screws on the main circuit and control circuit terminals	Are they loose	Screw them tight
Heat sink	Is there dust	Blow the dust off with a 4~6kg/cm compressor 2
PCB	Is there dust	Blow the dust off with a 4~6kg/cm compressor2
Cooling fan	Does it run smoothly.Is there strange noise or vibration	Change the cooling fan
Power components	Is there dust	Blow the dust off with a 4~6kg/cm compressor 2
Electrolysis capacitors	Is there color change, strange smell, bubble or leak	Change the electrolysis capacitors

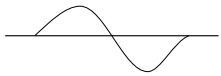
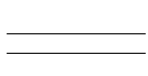
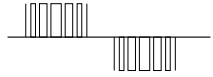
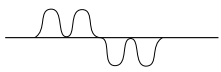
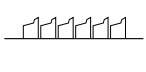
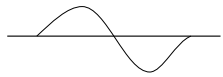
During inspection, do not disassemble or shake the components without reason, and still less pull off the plug-in-parts at will. Otherwise, the unit will operate wrongly or enter the mode of fault display, even the components might be fault or the main switch components of IGBT module may be damaged.

If measure is necessary, please be noted that there may be measurement difference with different measuring instruments. It is recommended that the input voltage be measured with pointer-type voltmeter, output voltage with rectification voltmeter, current input and output with tong-test ammeter and power with electri-

cally driven wattmeter.

Please use the oscilloscope whose scan frequency is greater than 40 MHz to test the waveform. Oscilloscope whose scan frequency over 100 MHz is recommended for measuring transient waveform. Electric isolation must be done before measure. The Connection method is recommended as below for main circuit measure.



Item		Input (power supply) side			DC	Output (motor) side			FM terminal
WF	V								
	C								
Name of meter		Voltage meter $V_{R,S,T}$	Current meter $A_{R,S,T}$	Power meter $W_{R,T}$	DC voltage meter V_{DC}	Voltage meter $V_{U,V,W}$	Current meter $A_{U,V,W}$	Power meter $W_{U,V}$	Voltage meter V_F
Para-meter		Base wave virtual value	Total virtual value	Total virtual power	DC voltage	Base wave virtual value	Total virtual value	Total virtual power	DC voltage

Electric insulation test and dielectric test have been made in the factory, so users do not need to test again. These tests will decrease the inverter's insulation level.

When perform electrical pressure withstand test to the main circuit, please adopt electrical pressure device whose time and leak current can be adjusted. This test will shorten the life of the inverter. When perform insulation test to the main cir-

cuit, R, S, T, U, V, W, P, N etc. main circuit terminals must be short circuited and be measured by megaohm meter. (250V meter for 220V inverter, 500V for 380V inverter, 1000V for 660V inverter).

Do not measure the control circuit with a megaohm meter. Please use the high resistance level of a multi-meter.

To 380V inverters, the grounding insulation resistance of main circuit must be no less than 5MΩ and of the control circuit must be no less than 3MΩ.

8.1.3 Components Which Should Be Changed Regularly

To make the inverter run stably for a long term, please maintain and renew some components regularly according their life expectance. Generally, the life expectance of components under normal work condition is as the following table:

Part name	Life expectance
Cooling fan	2 ~ 3 years
Electrolysis capacitor	4 ~ 5 years
Fuse	10 years
PCB	5 ~ 8 years

8.2 Storage

If the inverter is not put into use immediately and need to be kept well for some time or stored for a long time, the following measurements must be taken:

1) Keep it in a dry and adequately ventilated place without dust and metal powder
2) at the temperature specified in the specifications.
3) If the inverter is not put into use in one year, a charge test should be made, so as to resume the performance of the electrolysis capacitor of main circuit in it. For charging, a voltage regulator should be used to slowly increase the input voltage of the inverter until it reaches the rating, and the charge should last more than 1 ~ 2 hours. This test should be made at least once a year.
4) Repeat the above action at least once a year.
5) Don't perform breakdown test at random, for this test will shorten the life of the inverter. The dielectric test must be performed after the insulation resistance is measured with a 500 V megohm meter and this value must not be less than 4MΩ.

Chapter 9 Warrantee

The warrantee period for the inverter itself is 12 months from the delivery date and no longer than 24 months since the manufacture date marked on the nameplate.

Repair service is charged even in warrantee period if the failure is caused by the following occasion:

- Improper operation, repair or alternation without our permission;
- Apply the inverter exceeding the specification;
- Rough handing;
- The work environment does not comply with the requirement on the user's manual
- Wrong wiring;
- Earth quake, fire, flood, lightning strike, abnormal voltage or other natural disaster.

We are entitled to ask the third party to repair the defective inverter.

The warrantee product used in China

- Can be replaced, refunded and repaired within the first month after delivery.
- Can be replaced and repaired within the first 3 months after delivery.
- Can be repaired within 12 months.

Inverters used in abroad has 3 months warrantee since the day of delivery.

Agreed cost prior to the actual cost.

After-sale service can be provided by our distributors, production bases and agents all over the country.

We are irresponsible for

Any fault caused by improper operation which doe not follow the user's manual.

Any loss, effect, subsequent damages resulted from the inverter's failure.

Please keep in mind:

- This user's manual is only suitable for this series of products.
- We are always responsible for our product and provide service for the application of it.
- Please inquire us before you apply the product to the equipments which may lead to injury or death, such as:

- Vehicles
- Medical equipment
- Nuclear, electricity equipment
- Aviation equipment
- Security equipment
- Other special equipment

Your complaint or suggestion on the design, performance, quality and service about our product will be appreciated.

Appendix 1 Installation Dimension

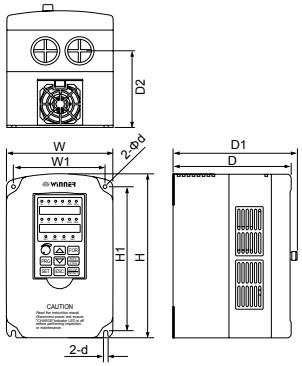


Fig.1

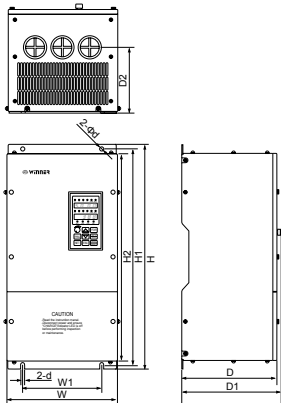


Fig.2

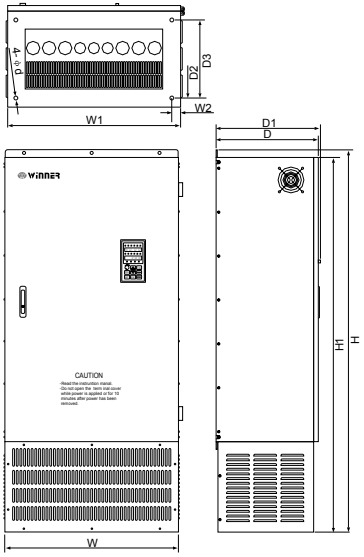


Fig.3

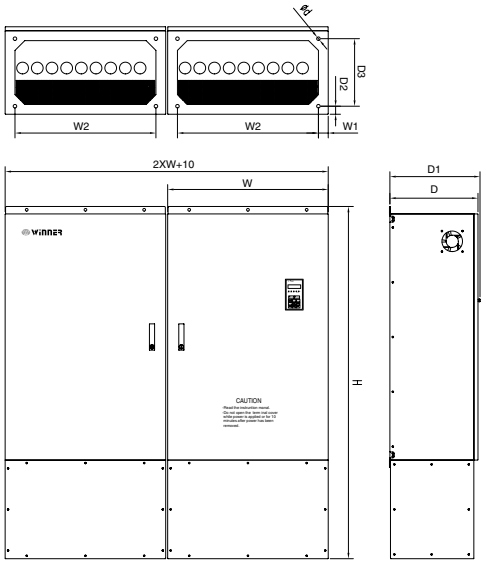


Fig.4

WIN-9_F-T4 Series Wall-hanging type

Model Code	W	W1	H	H1	H2	D	D1	D2	d	Fig
WIN-9_F - 1R5~3R7T4	150	130	252	205	—	167	175	109	5.5	1
WIN-9_F - 5R5 _ 7R5T4	190	170	290	260	—	187	195	105	5.5	1
WIN-9_F - 011~015T4 / 9P-018T4	245	200	410	390	367	240	245	140	7	2
WIN-9_F - 018~030T4	278	200	550	530	490	250	260	155	10	2
WIN-9_F - 037T4	348	200	550	530	490	250	260	185	10	2
WIN-9_F - 045T4 / 9P-055T4	348	240	700	680	640	335	345	215	10	2
WIN-9_F - 055~075T4	375	300	785	760	717	335	345	240	12	2
WIN-9_F - 093~132T4 / 9P-160T4	530	420	920	890	852	335	345	250	12	2
WIN-9_F - 160~200T4	695	580	1140	1110	1072	335	345	250	14	2
WIN-9_F - 220~400T4	820	600	1334	1300	1260	450	460	240	14	2

WIN-9_F-T4 Series Cabinet type

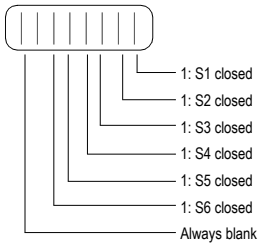
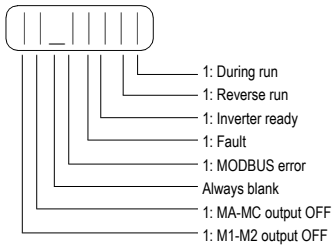
Model Code	W	W1	W2	H	H1	D	D1	D2	D3	d	Fig
WIN-9_F - 160~200T4	700	40	620	1800	1760	455	465	40	345	18	3
WIN-9_F - 220~400T4	820	40	690	1800	1760	455	465	40	345	18	3
WIN-9_F - 500T4	1100	75	950	2200	2160	455	465	40	345	18	3
WIN-9_F - 560~800T4	1640	40	720	1800	1760	455	465	40	345	18	4
WIN-9_F - 1000T4	2200	75	950	2200	2160	455	465	40	345	18	4

Appendix 2 WIN-9_F technical specification

Item		Specification															
Output	Output rated voltage	Max. output voltage is the same as the input power supply voltage															
	Suitable motor power (kW)	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	93	110
	Output rated current (A)	4.8	6.2	8	14	18	27	34	41	52	65	80	96	128	165	180	224
	Suitable motor power (kW)	132	160	185	200	220	245	280	315	355	400	500	560	630	710	800	1000
	Output rated current (A)	260	302	340	380	450	470	530	605	660	750	940	1050	1200	1300	1500	1860
	Ration	100% continuouseness															
	Max. overload current	G: 150% 1min, 180% 6sec (P series: 120%1min, 140% 18sec)															
Power supply	Rated voltage & frequency	3 phase 380V (+10% ~ -15%) 50/60Hz±5%															
Control characters	Frequency range	0 ~ 400Hz															
	Frequency accuracy	Digital command±0.01%(-10°C ~ +40°C)															
	Set frequency resolution	Digital command 0.1Hz; analogue command 0.1Hz															
	Output freq. resolution	0.1Hz															
	Overload durance	G series: 150% of output rated current 1min, P series: 120% of output rated current 1min															
	Frequency set signal	0~+10V (20kΩ) 4~20mA (250Ω)															
	Accel / Decel feature	0.1~3600sec (Accel/Decel time is set separately)															
	Brake torque	125% with additional brake resistor															
	V/f pattern	15 fixed V/F features selectable, any V/F features can be set															
Protection		Over voltage, Under voltage, Over current, Overload, Electronic thermal relay, Overheat, Over voltage stalling															
Environment	Temperature / humidity	-10°C ~ +40°C / 20 ~ 90% RH (no dewing)															
	Installed place	In door(no corrosive gas), No higher than 1000m above sea level, without dust, corrosive air and direct sunlight															
	Vibration	Lower than 0.2g when below 20Hz															
Cooling method		Forced air cooling															

Appendix 3 Digital Operator Monitor Display

LED	Name	Description	
Fref	Frequency Reference	• Frequency reference can be monitored/set. • Setting/display unit depends on display mode (P024).	
Fout	Output Frequency	• Output frequency is displayed. • Display unit depends on display mode (P024).	
Iout	Output Current	Output is displayed in units of 0.1A (1A current for 1,000A and above).	
kWout	Output Power	Output is in units of 0.1kW (1kW for 1,000kW powerand displayed-above).	
F/R	FWD/REV Run Command	• FWD/REV run command can be monitored/set. • Setting enabled during run command from digital operator. • FWD run displays “For”, REV run displays “rEv”.	
Accel	Acceleration Time 1	Acceleration time 1 (P019) can be set/read in units of 0.1 sec (1 sec for 1,000 sec and above).	
Decel	Deceleration Time 1	Deceleration time 2 (P020) can be set/read in units of 0.1 sec (1 sec for 1,000 sec and above).	
Vmtr	Motor Rated Voltage	Motor rated voltage (P011) can be set during stop.	
V/F	V/f Pattern Selection	V/f pattern selection (P010) can be set during stop.	
Fgain	Frequency Reference Gain	Frequency reference gain (P046) can be set during stop.	
Fbias	Frequency Reference Bias	Frequency reference bias (P047) can be set during stop.	
FLA	Motor Rated Current	Motor rated current (P032) can be set during stop.	
PID	PID Selection	PID selection (P084) can be set during stop.	
kWsav	Energy Saving Selection	Energy saving selection (P095) can be set during stop.	
PRGM	PRGM Mode	Parameters can be set/read during stop.	
Montr	Monitor	The following conditions can be monitored.	
		No.	Contents
		U-01	Frequency reference (same as Fref)
		U-02	Output frequency (same as Fout)
		U-03	Output current (same as Iout)
		U-04	Output voltage reference is displayed in units of 1V.
		U-05	DC voltage is displayed in units of 1V.
		U-06	Output power (same as kWout)

LED	Name	Description	
Montr	Monitor	U-07	Input terminal status is displayed (terminals S1 to S6). 
		U-08	Inverter status is displayed. 
		U-09	Last 4 faults are displayed.
		U-10	Last 4 digits of software revision number are displayed.
		U-11 U-12	Elapsed time is displayed as follows: X X (U-11 first 2 digits)X X X X(U-10 last 4 digits) Elapsed time (in units of 1 hour),279,620 hours maximum
		U-13	PID feedback is displayed in units of 0.1Hz.