

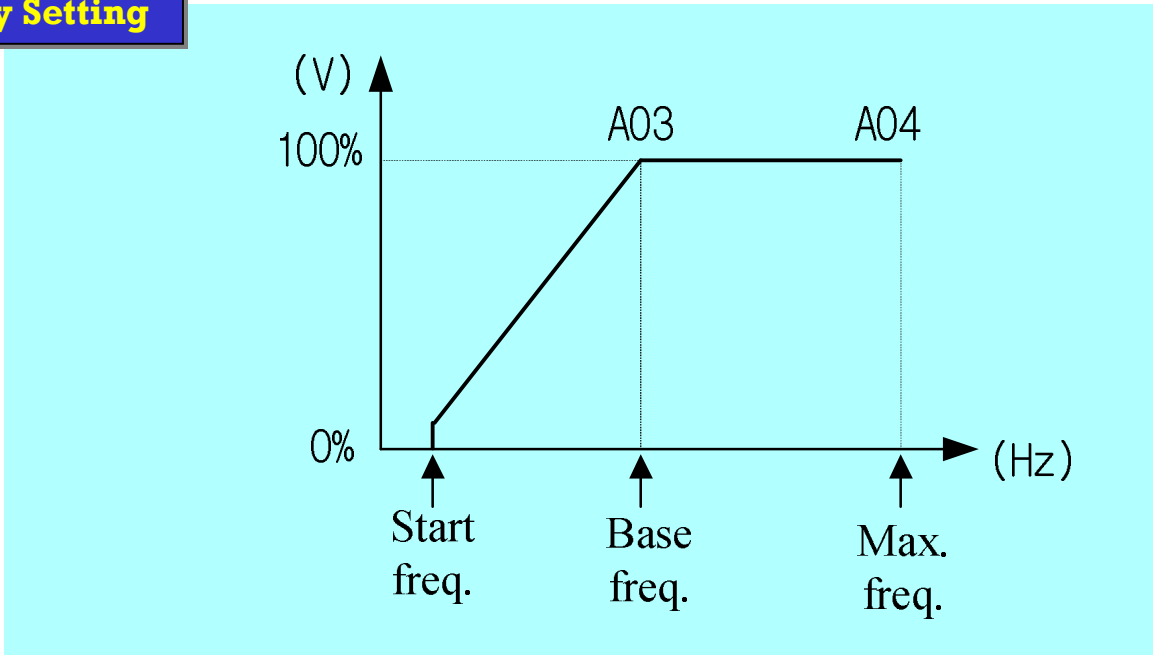


ELECTRO ELECTRIC SYSTEMS

>> Hyundai industrial inverter

➤ N-Series Inverter Main Function

Frequency Setting

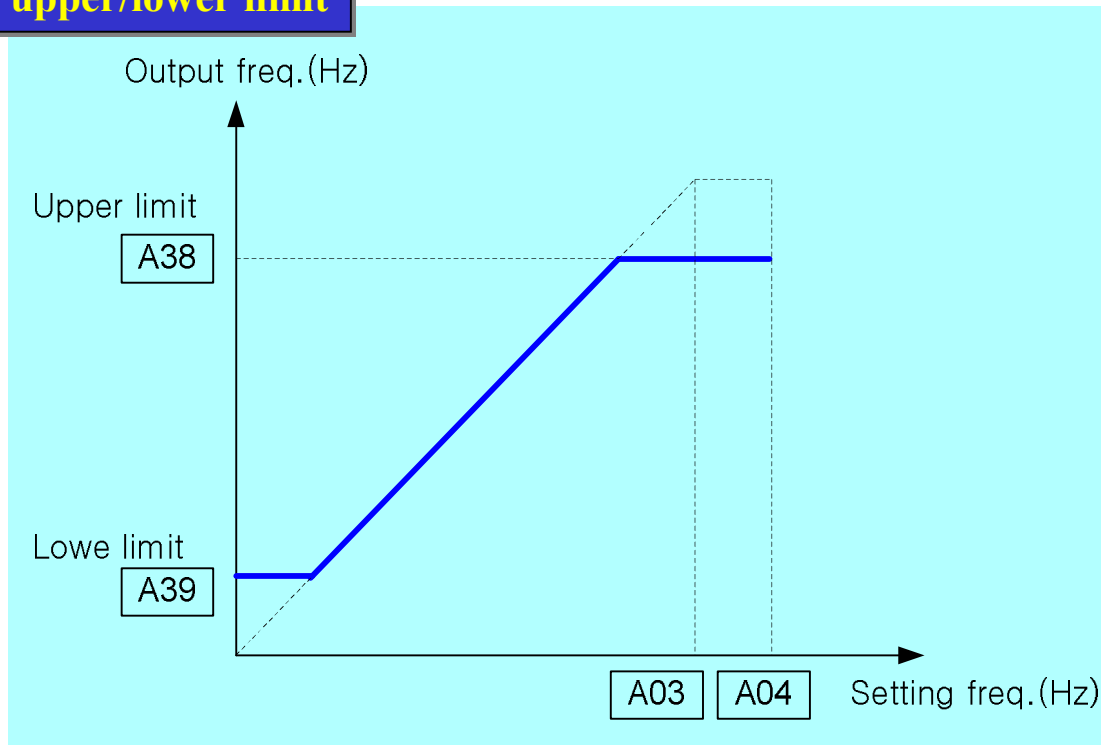


inverter parameter

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A03	Set base frequency	60.00	0.0	A04	Hz	frequency at maximum output voltage
A04	Set maximum frequency	60.00	A03	400	Hz	Settable from 0 to maximum frequency in units of 0.01Hz
A32	Set output voltage gain	100.0	20	100	%	Set output voltage gain of the inverter from 20 to 100%
A53	Set motor input voltage	220/ 380	-	-	V	200/220/230/240 [200V class (SF/ LF type)] 380/400/415/440/460 [400V class (HF type)]



Set frequency upper/lower limit

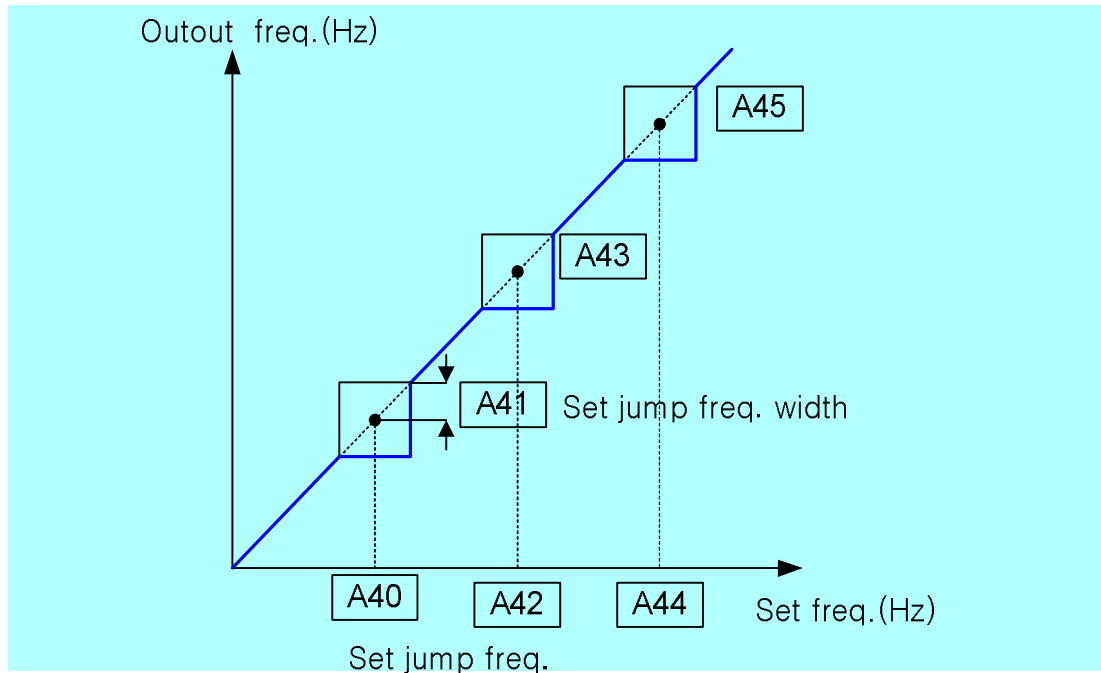


inverter parameter

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A38	Set frequency upper limit	60.00	0.0	A04	Hz	frequency at maximum output voltage
A39	Set frequency lower limit	60.00	A03	400	Hz	Set a limit on output frequency greater than zero

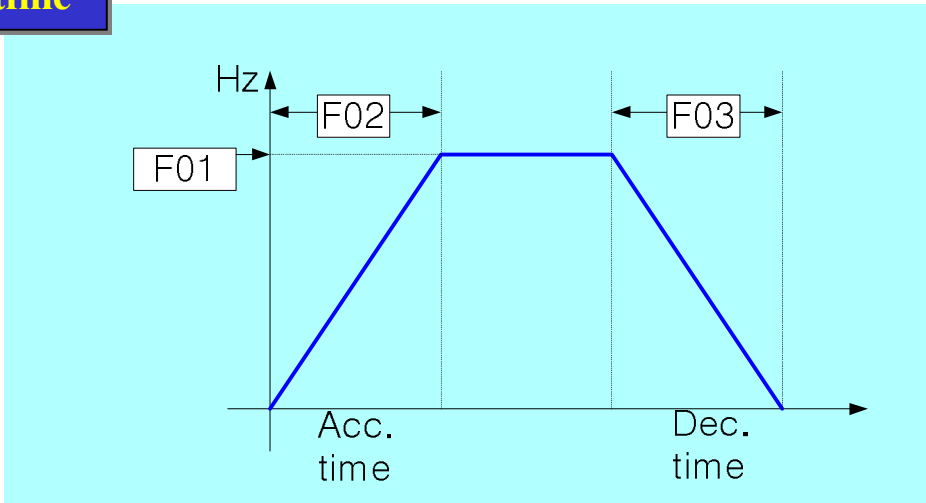


Set jump frequency



Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A40 / A42 / A44	Set jump(center) frequency	0.00	0.00	400.0	Hz	Up to 3 output frequencies can he defined for the output to jump past to avoid motor resonances.
A41 / A43 / A45	Set jump frequency width	0.00	0.00	400.0	Hz	Defines the distance from the center freq. at which the jump around occurs.

Set acc./dec. time

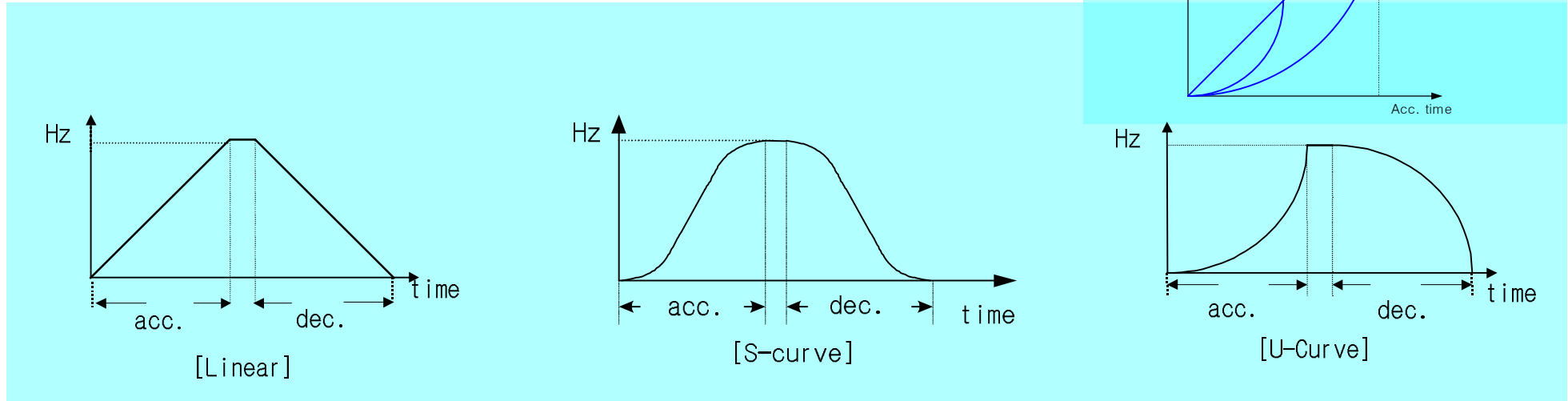


▪ Set acc./dec. time

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
F01	Set output frequency	-	0.00	400.0	Hz	A01=0 : keypad potentiometer A01=1 : control circuit terminal input A01=2 : standard operation A01=3 : Remote operator (option-DOP, NOP)
F02	Set acc. time 1	10.0	0.1	3000	sec.	time arrive at base frequency
F03	Set dec. time 1	10.0	0.1	3000	sec.	time arrive at stop
F04	Set running direction	0	0	1	-	0 : Forward run 1 : Reverse run

Set acc./dec. pattern

Set acc./dec. pattern

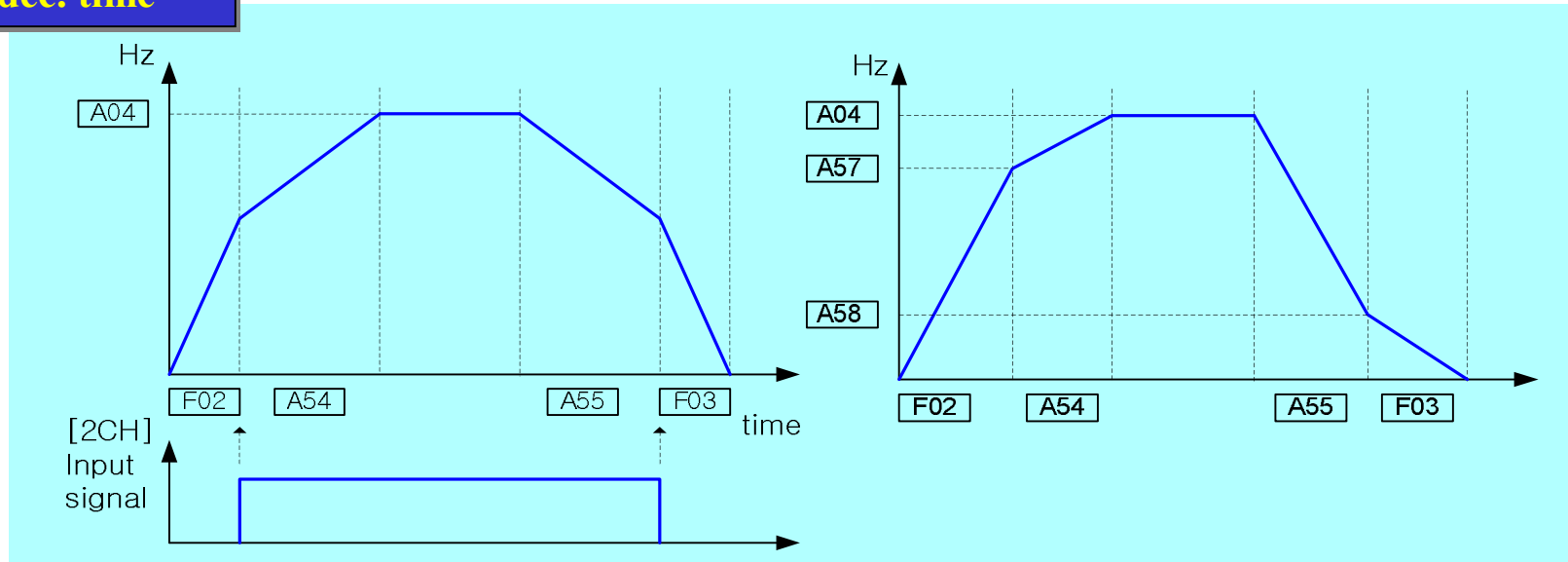


Set acc./dec. pattern

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A59	Acceleration curve selection	0	0	2	-	0 : linear 1 : S - curve 2 : U - curve
A60	Deceleration curve selection	0	0	2	-	0 : linear 1 : S - curve 2 : U - curve



Set 2nd acc./dec. time



Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A54	Set 2 nd acc. time	10.0	0.0	3000	sec.	Settable 2 nd acceleration time from 0.1 to 3000
A55	Set 2 nd dec. time	10.0	0.0	3000	sec.	Settable 2 nd deceleration time from 0.1 to 3000
A56	acc./dec. switching method selection	0	0	1	-	Two options for switching from 1 st to 2 nd acc. /dec. 0 : [2CH] intelligent input terminal 1 : transition frequency
A57	acc.1 to acc. 2 frequency transition point	0.00	0.00	400.0	Hz	output frequency at which acc. 1 switched to acc. 2
A58	Dec.2 to ded. 1 frequency transition point	0.00	0.00	400.0	Hz	output frequency at which dec. 2 switched to dec. 1

❑ Select frequency commanding method

❑ parameter

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A01	Frequency commanding	0	0	3	-	0 : keypad potentiometer 1 : control circuit terminal input(analog voltage or current) 2 : standard operation 3 : Remote operator (option-DOP, NOP)

1. Keypad potentiometer

A01=0, A02=0

settable frequency command(F01) using potentiometer

2. Control circuit terminal input

i) A01=1, A02=0, C01=13(AT)

SW=off : Voltage Source(0~5V or 0~10V)

SW=on (AT) : Current Source(4~20mA)

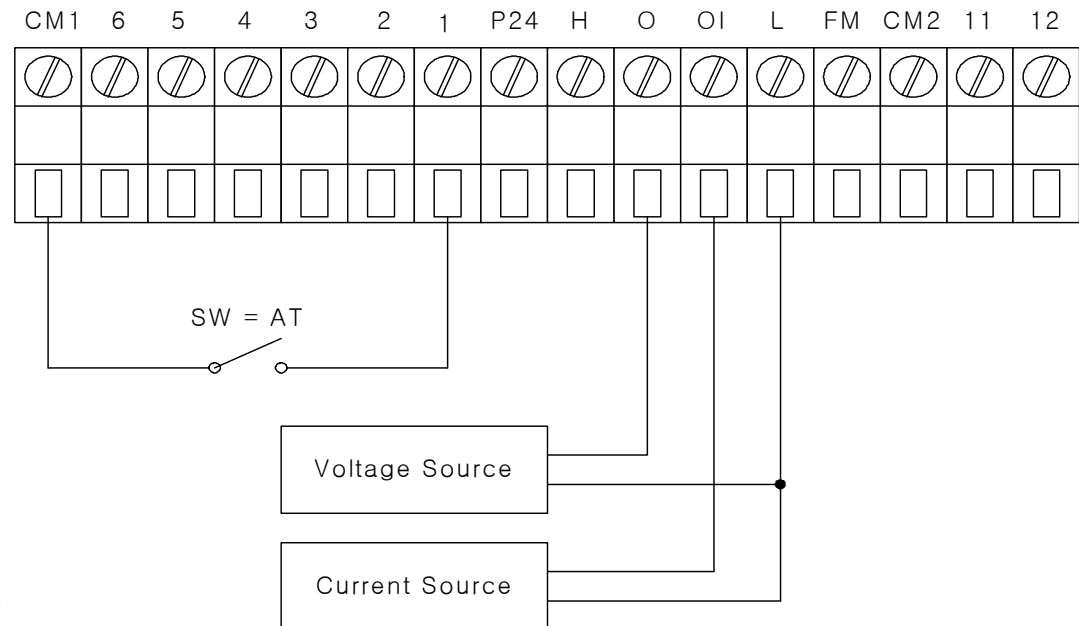
ii) A01=1, A02=0, C01≠13(AT)

Voltage Source + Current Source

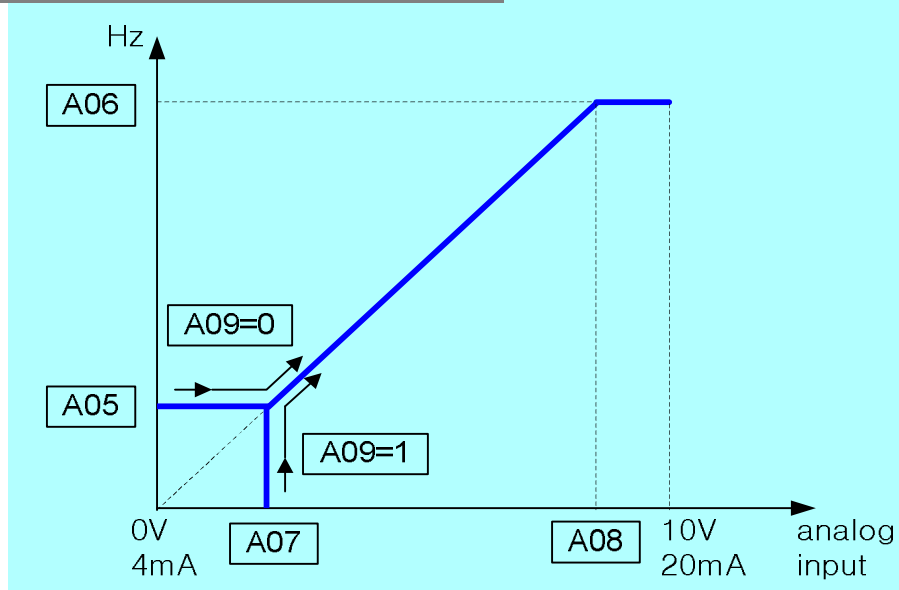
3. Standard operation

A01=2, A02=0

settable frequency command(F01) using UP/DONW key



Set analog input for freq. command



Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A05	set external frequency start	0.00	0.00	A04	Hz	Output freq. at 0V or 4mA
A06	set external frequency end	0.00	0.00	A04	Hz	Output freq. at 10V or 20mA 10V(20mA)
A07	set external frequency start rate	0.0	0.0	100.0	%	starting point (offset) for the active analog input range
A08	set external frequency end rate	100.0	0.0	100.0	%	Ending point (offset) for the active analog input range
A09	set external frequency start pattern	0	1	1	-	Two options; 0 : start at start freq. (=A05) 1 : start at 0Hz
A65	set external voltage input frequency selection	0	0	1	-	0 : 0~5V input 1 : 0~10V input



- test for frequency command using analog voltage input

$$F_{out} = A05 + \frac{(A06 - A05) \times (A_{in} - A07)}{(A08 - A07)}$$

Input voltage < A07 ; output freq. = A05

Input voltage >= A08 : output freq. = A06

- ex)

Parameter setting

parameter	Setting value
A05	20.00
A06	0.00
A07	20.0
A08	100.0
A09	0
A65	1

Test value

Input voltage (V)	Freq. command (FO1) (Hz)
0.0	20.00
1.0	20.00
2.0	20.00
3.0	25.00
4.0	30.00
5.0	35.00
6.0	40.00
7.0	45.00
8.0	50.00
9.0	55.00
10.0	60.00



- test for frequency command using analog current input

$$F_{out} = A05 + \frac{(A06 - A05) \times (A_{in} - A07)}{(A08 - A07)}$$

Input voltage < A07 ; output freq =0

Input voltage >= A08 : output freq. =A06

- ex) - C01=13(AT), S/W=0N

Parameter setting

parameter	Setting value
A05	10.00
A06	50.00
A07	20.0
A08	100.0
A09	1
A65	1

Test value

Input current (mA)	Freq. command (FO1) (Hz)
4.0	0.00
5.6	0.00
7.2	10.00
10.4	20.00
13.6	30.00
16.8	40.00
20.0	50.00



Set multi-speed

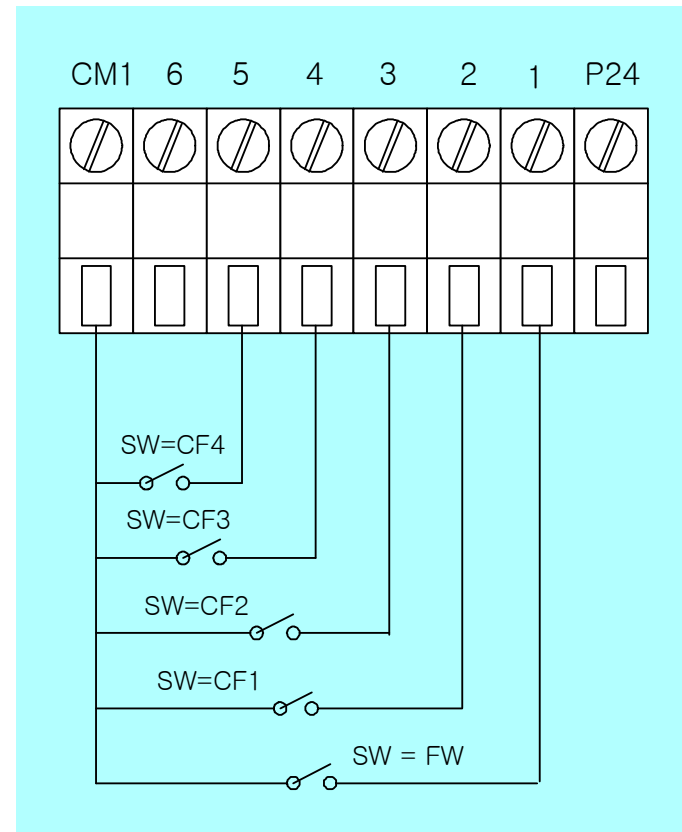
- Settable multi-speed(0~15) operation using intelligent input terminal

set CF1,CF2,CF3,CF4 at C01~C06
CF1=02, CF2=03, CF3=04, CF4=05

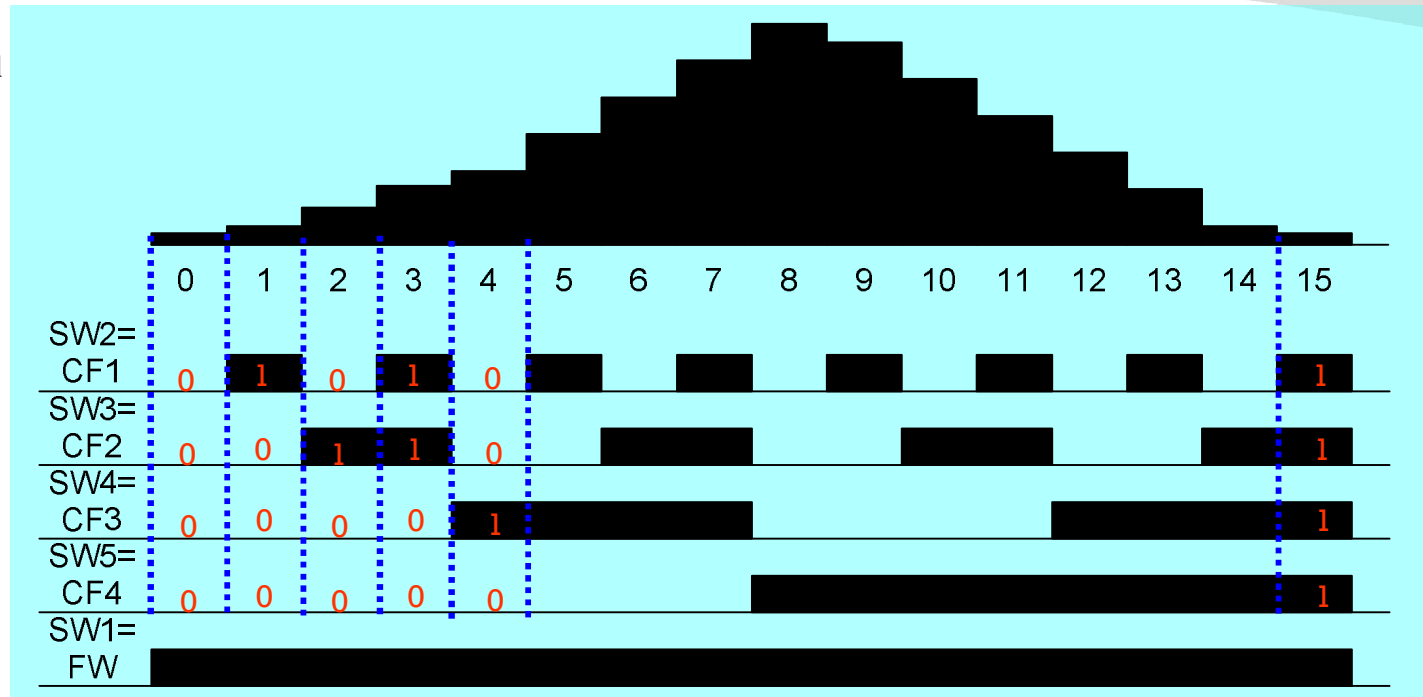
- set frequency

- F01 ; 0-speed

-A11~A25 ; 1 ~ 15-speed



□ ex) operation of 16-multispeed



multi-speed	Intelligent input					setting Value (Hz)	para-meter
	SW5	SW4	SW3	SW2	SW1		
	CF4	CF3	CF2	CF1	FW		
0-speed	0	0	0	0	1	2	F01
1-speed	0	0	0	1	1	5	A11
2-speed	0	0	1	0	1	10	A12
3-speed	0	0	1	1	1	15	A13
4-speed	0	1	0	0	1	20	A14
5-speed	0	1	0	1	1	30	A15
6-speed	0	1	1	0	1	40	A16
7-speed	0	1	1	1	1	50	A17

multi-speed	Intelligent input					setting Value (Hz)	para-meter
	SW5	SW4	SW3	SW2	SW1		
	CF4	CF3	CF2	CF1	FW		
8-speed	1	0	0	0	1	60	A18
9-speed	1	0	0	1	1	55	A19
10-speed	1	0	1	0	1	45	A20
11-speed	1	0	1	1	1	35	A21
12-speed	1	1	0	0	1	25	A22
13-speed	1	1	0	1	1	15	A23
14-speed	1	1	1	0	1	5	A24
15-speed	1	1	1	1	1	2	A25



Set jogging operation

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A26	Jogging frequency	0.50	0.50	10.00	Hz	jogging signal at intelligent input terminal C01~C06 = 6(jogging operation)
A27	Jogging stop operation selection	0	0	2	-	0 : Free-run stop 1 : deceleration stop 2 : DC braking stop

Free-run stop

Set parameter : A26=10.0, **A27=0**,
C03=6, C17=2, F02=F03=5.0

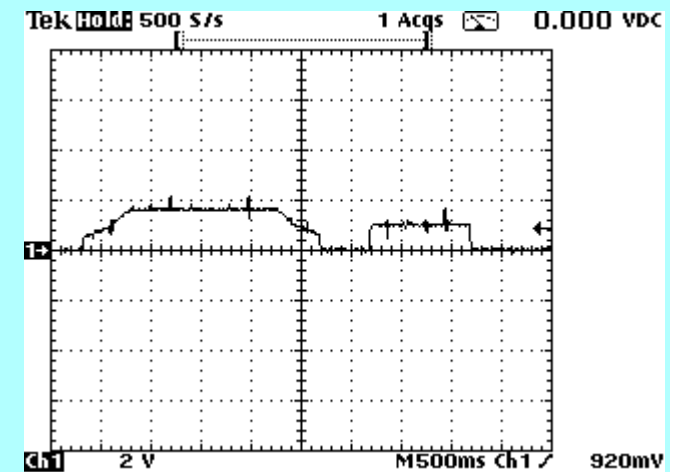
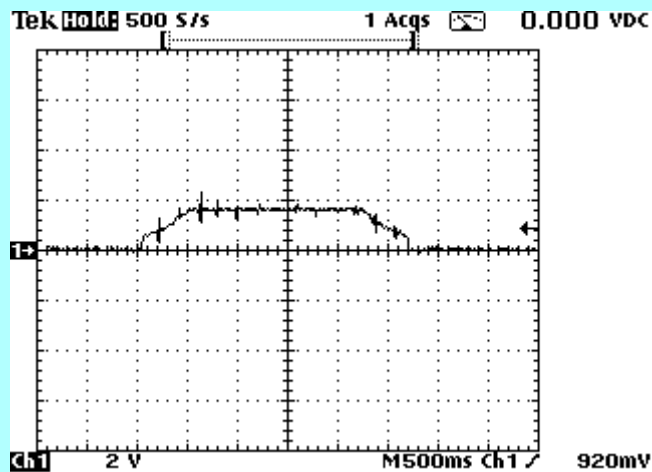
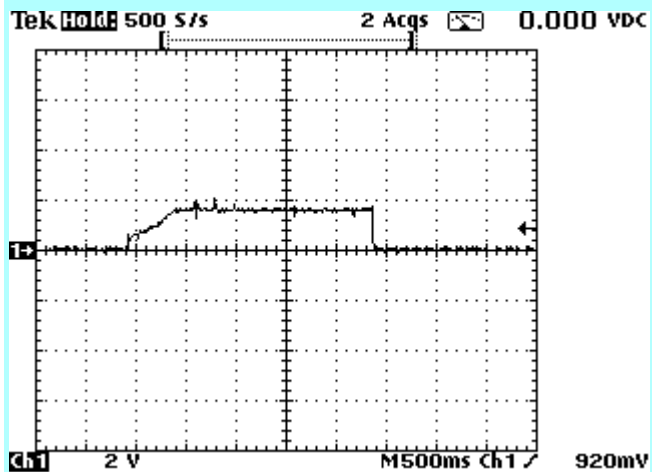
deceleration stop

Set parameter : A26=10.0, **A27=1**
C03=6, C17=2, F02=F03=5.0

DC braking stop

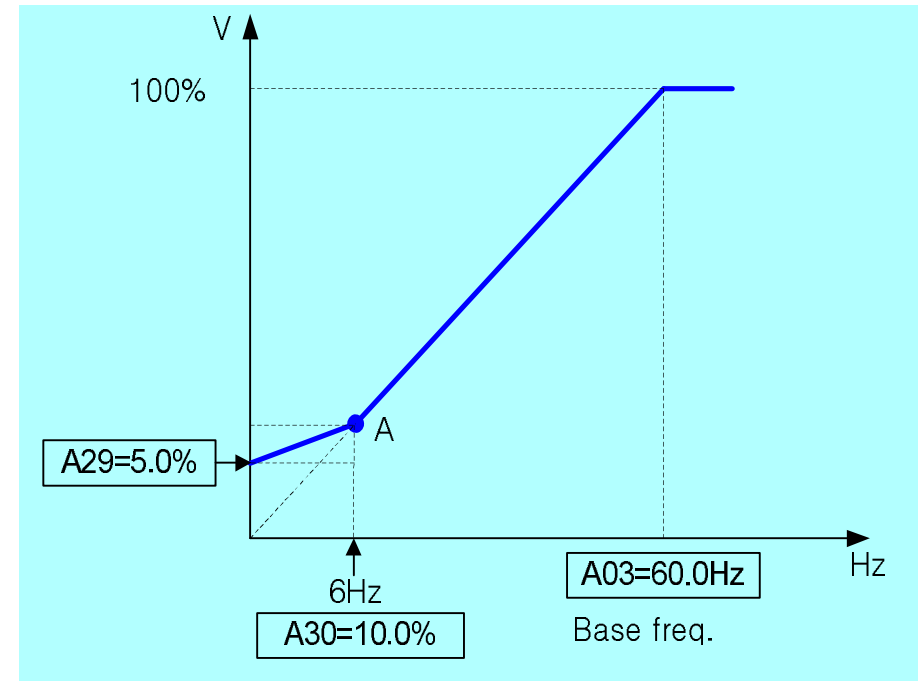
Set parameter : A26=10.0, **A27=2**
A34=1.00Hz, A35=0.5
A36=10.0, A37=1.0
C03=6, C17=2, F02=F03=5.0

Test waveform using FM output-terminal



Torque boost

- torque boost function
 - Boost starting torque at insufficiency starting torque in case of V/f control
 - Be aware that excessive torque boost can cause motor damage and inverter trip.

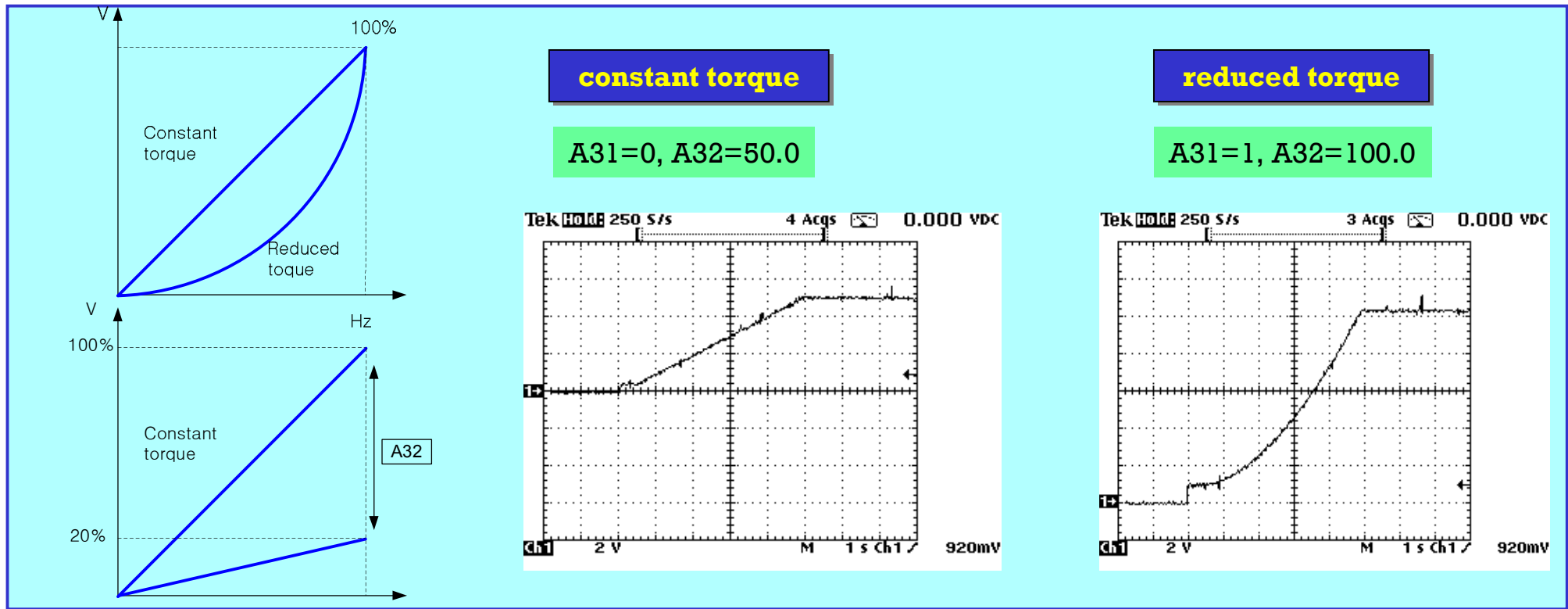


Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A28	torque boost mode selection	0	0	1	-	0 : manual torque boost 1 : automatic torque boost
A29	Manual torque boost setting	5.0	0	50.0	%	Set manual torque boost voltage
A30	Manual torque boost frequency setting	10.0	0	100	%	

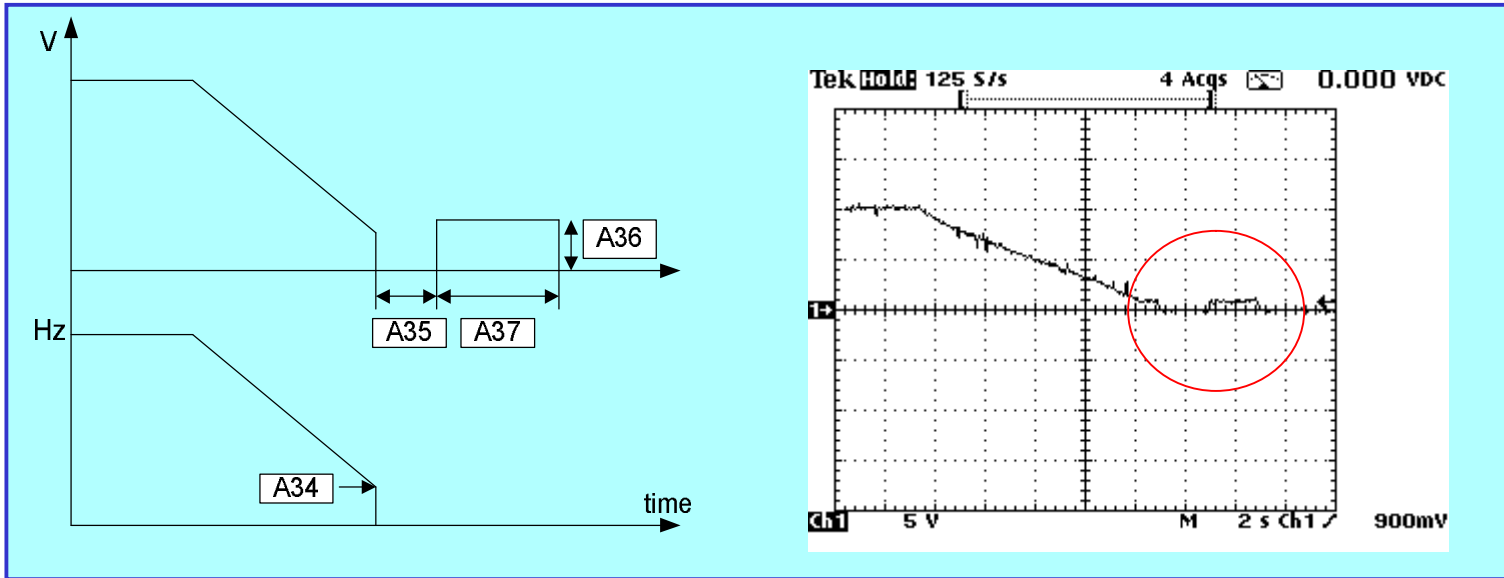


Set control method

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A31	Control method	0	0	2	-	0 : constant torque 1 : reduced torque (reduction of the 1.7 th power) 2 : sensorless vector control
A32	V/F gain	100.0	20	100	%	Output voltage gain



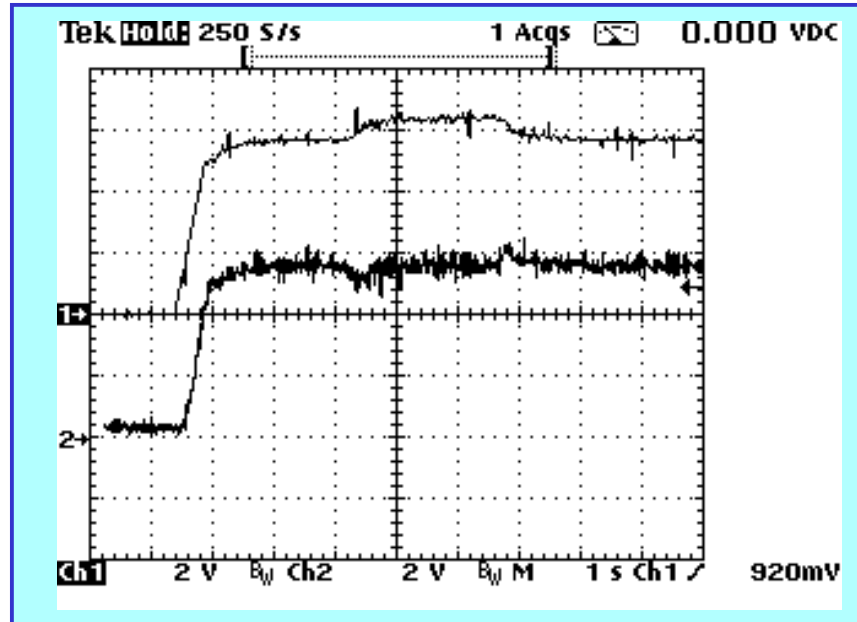
DC braking



Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A33	dc braking function selection	0	0	1	-	0 : dc braking disable 1 : dc braking enable
A34	dc braking freq.	0.50	0.0	10.0	Hz	Set the freq. at which dc braking occurs
A35	dc braking output delay time	0.0	0.1	5.0	Sec	delay time from dc braking freq. to starting dc braking
A36	dc braking force	10.0	0	50	%	
A37	dc braking time	0.0	0.1	10.0	sec	Duration for dc braking



PID feedback control

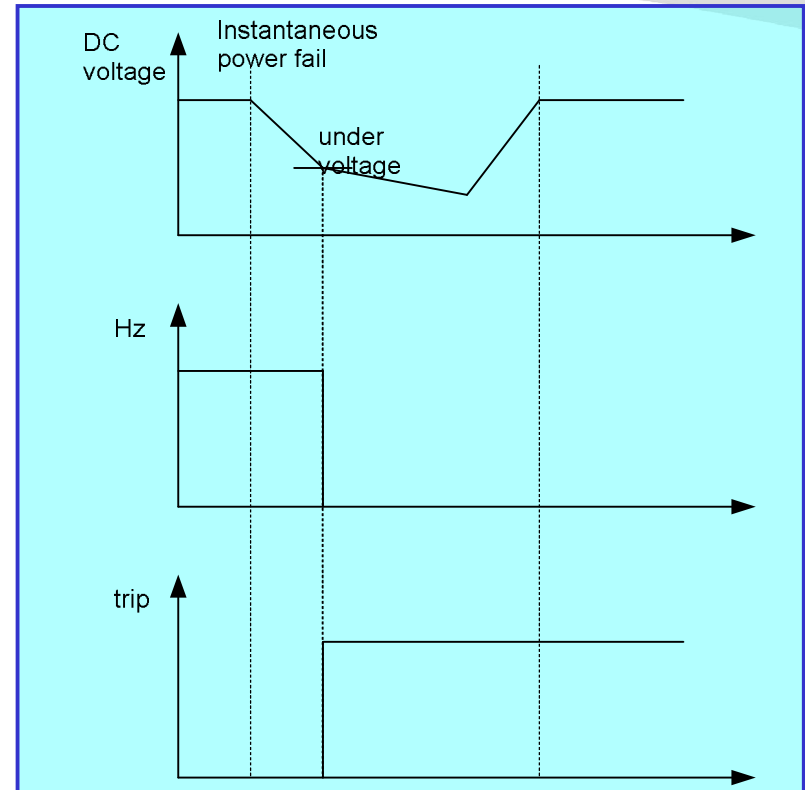


Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A46	PID function selection	0	0	1	-	0 : PID control disable 1 : PID control enable
A47	P gain	10.0	0.1	100	%	
A48	I gain	10.0	0.0	100.0	Sec	
A49	D gain	0.0	0.0	100.0	Sec	
A50	PID scale factor	100.0	0.1	1000	-	Set PID scale factor (multiplier)
A51	Feed-back method	0	0	1	-	set source of feedback method 0 : current input 1 : voltage input



Automatic Voltage Regulation

- AVR : maintain inverter output voltage in spite of change input voltage



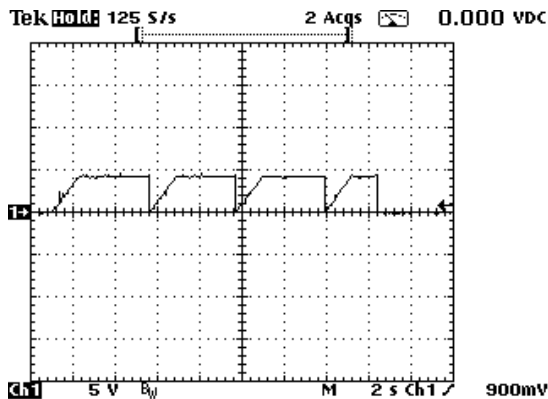
Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
A52	AVR function selection	0	0	2	-	0 : constant ON 1 : constant OFF 2 : OFF during deceleration
A53	Motor input voltage	220/ 380	200/ 380	240/ 460	V	200/220/230/240 (200V class) 380/400/415/440/460 (400V class)



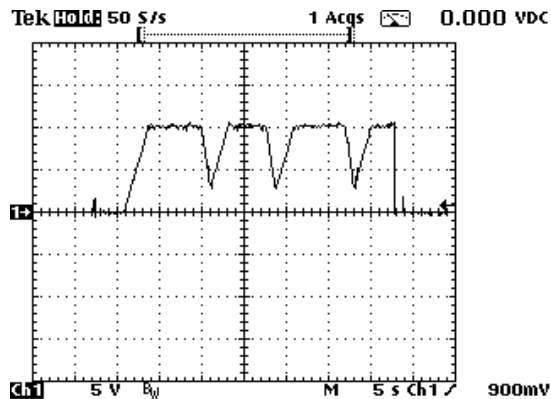
Restart for instantaneous power failure

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
b01	Selection of restart mode	0	0	3	-	0 : alarm output after trip 1 : restart at 0Hz 2 : resume operation at frequency matching 3 : resume previous frequency after frequency matching, then decelerate to stop and display trip
b02	Allowable instantaneous power failure time	1.0	0.3	1.0	sec	amount of time a power input under voltage can occur without tripping the power failure alarm
b03	Reclosing stand by after instantaneous power failure recovered	1.0	0.3	3	sec	Time delay after under voltage condition goes away, before the inverter runs motor again

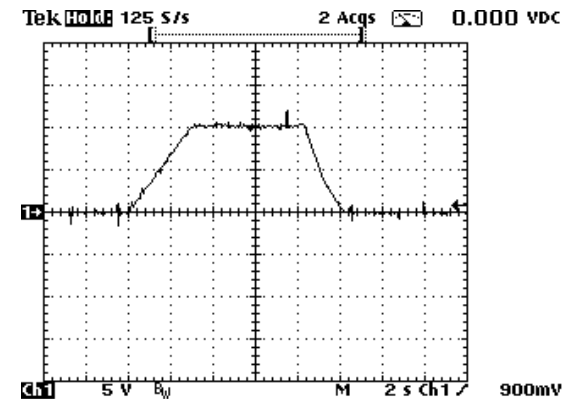
restart at 0Hz



resume operation at frequency matching



resume previous frequency after frequency matching, then decelerate to stop & trip



Overload Restriction

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
b06	over-load/over-voltage restriction mode selection	1	0	3	-	0 : over-load/over-voltage restriction OFF 1 : over-load restriction ON 2 : over-voltage restriction ON 3 : over-load/over-voltage restriction ON
b07	over-load restriction level	125	20	200	%	set the level for overload restriction
b08	over-load restriction constant	0.1	0.1	30.0	sec	Set the deceleration rate



Software Lock

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
b09	Software Lock mode selection	0	0	3	-	0 : All parameters except b09 are locked when [SFT] terminal ON 1 : All parameters except b09, F01 are locked when [SFT] terminal ON 2 : All parameters except b09 are locked 3 : All parameters except b09, F01 are locked



Parameter Initialization

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
b12	Initialization mode selection	0	0	1	-	0 : trip history clear 1 : parameter initialization

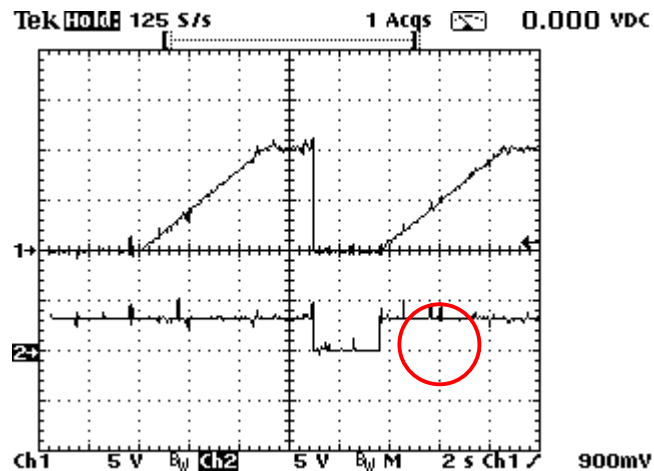


Resume on Free Run Stop cancellation mode

Parameter	name	default	Min.	Max.	unit	description
N50 & N100						
b16	Resume on Free Run Stop cancellation mode selection	0	0	1	-	0 : Restart from 0Hz 1 : Restart from frequency detected from real speed of motor

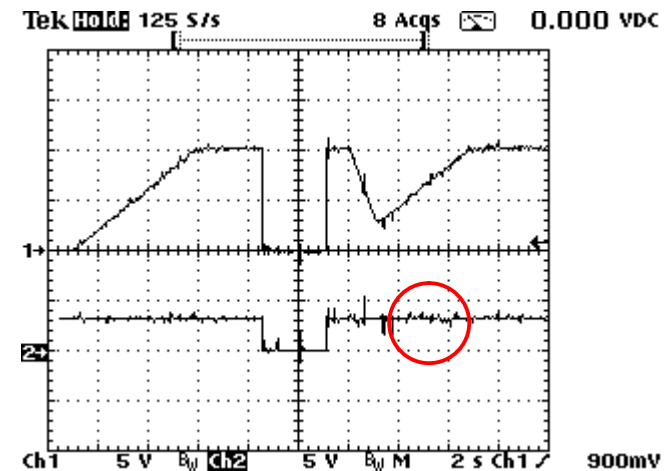
test 1 : Restart from 0Hz

- b16=0, C01=0, C05=9



test 2 : Restart from frequency detection

- b16=1, C01=0, C05=9



□ Intelligent Input Terminals function setting

- 0 : FW (forward run)
- 1 : RV (reverse run)
- 2 : CF1 (1st multi-speed)
- 3 : CF2 (2nd multi-speed)
- 4 : CF3 (3rd multi-speed)
- 5 : CF4 (4th multi-speed)
- 6 : JG (jogging operation)
- 7 : SET (2nd function setting)
- 8 : 2CH (2-stage acc./dec.)
- 9 : FRS (free run stop)
- 10 : EXT (external trip)
- 11 : USP (unattended start protection)
- 12 : SFT (software lock)
- 13 : AT (analog input current/voltage selection)
- 14 : RS (reset)

parameter	name	default	Min.	Max.	unit	Description
C01	Intelligent Input Terminal 1 setting	0	0	14	-	forward run
C02	Intelligent Input Terminal 2 setting	1	0	14	-	reverse run
C03	Intelligent Input Terminal 3 setting	2	0	14	-	1st multi-speed
C04	Intelligent Input Terminal 4 setting	3	0	14	-	2nd multi-speed
C05	Intelligent Input Terminal 5 setting	8	0	14	-	analog input current/voltage selection
C06	Intelligent Input Terminal 6 setting	14	0	14	-	reset

parameter	name	default	Min.	Max.	unit	Description
C07	Input Terminal 1 a/b contact setting	0	0	1	-	0 : a-contact (Normal Open) [NO] 1 : b-contact (Normal Close) [NC]
C08	Input Terminal 2 a/b contact setting	0	0	1	-	"
C09	Input Terminal 3 a/b contact setting	0	0	1	-	"
C10	Input Terminal 4 a/b contact setting	0	0	1	-	"
C11	Input Terminal 5 a/b contact setting	0	0	1	-	"
C12	Input Terminal 6 a/b contact setting	0	0	1	-	"



□ Intelligent Output Terminals function setting

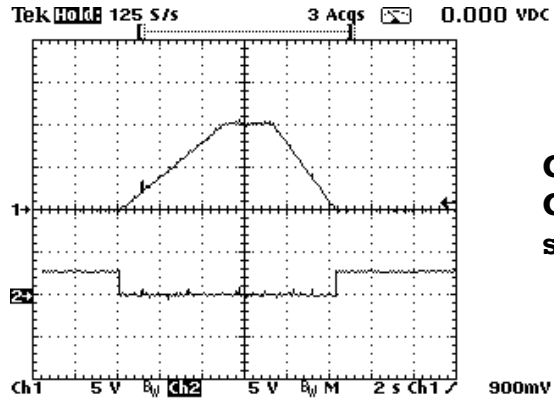
- 0 : RUN (Run signal)
- 1 : FA1 (Frequency arrival signal ; command arrival)
- 2 : FA2 (Frequency arrival signal ; setting frequency or more)
- 3 : OL (Overload advance notice signal)
- 4 : OD (Output deviation for PID control)
- 5 : AL (alarm signal)

parameter	name	default	Min.	Max.	unit	Description
C13	Output Terminals 11 setting	1	0	5	-	
C14	Output Terminals 12 setting	0	0	5	-	
C15	Terminal 11 a/b contact setting	0	0	1	-	0 : a-contact (Normal Open) [NO] 1 : b-contact (Normal Close) [NC]
C16	Terminal 12 a/b contact setting	0	0	1	-	"
C20	Overload advance notice signal	100.0	50	200	%	Set overload signal level 50%~200% of inverter rated current
C21	Acc. arrival signal freq.	0.00	0.00	400.0	Hz	
C22	Dec. arrival signal freq.	0.00	0.00	400.0	Hz	
C23	PID Deviation level	10.0	0.0	100.0	%	



test 1 : **RUN signal output**

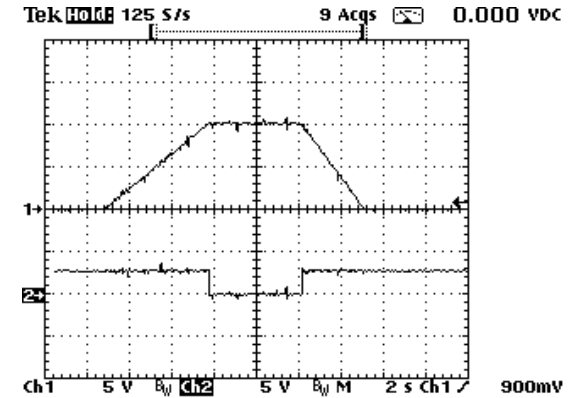
parameter : C13=0, C15=0



**CH.1 output freq.
CH.2 terminal 11 output
signal
(0V: ON, High : Off)**

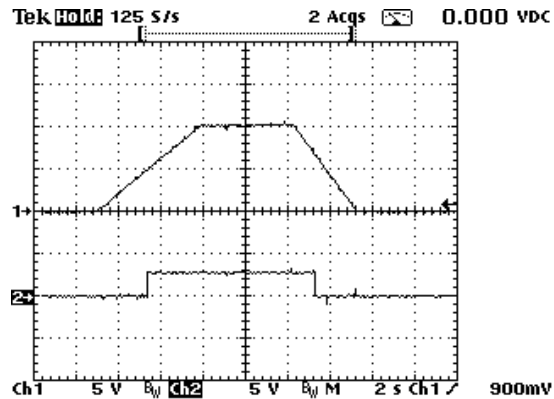
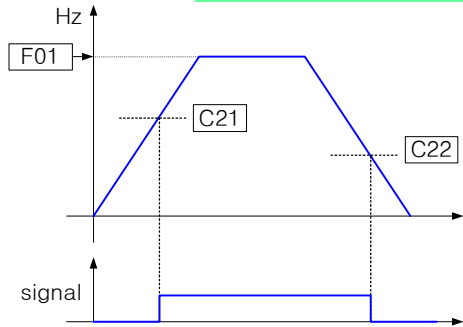
test 2 : **FA1**

parameter : C13=1, C15=0



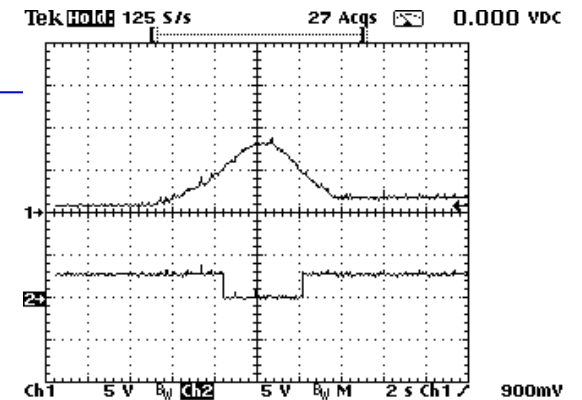
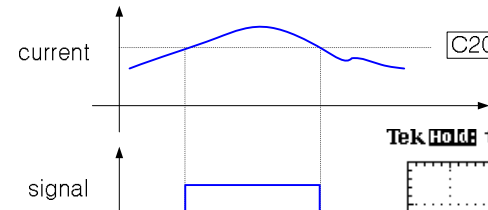
test 3 : **FA2**

parameter : C13=2, C15=0, C21=30.0, C22=40.0



test 4 : **OL**

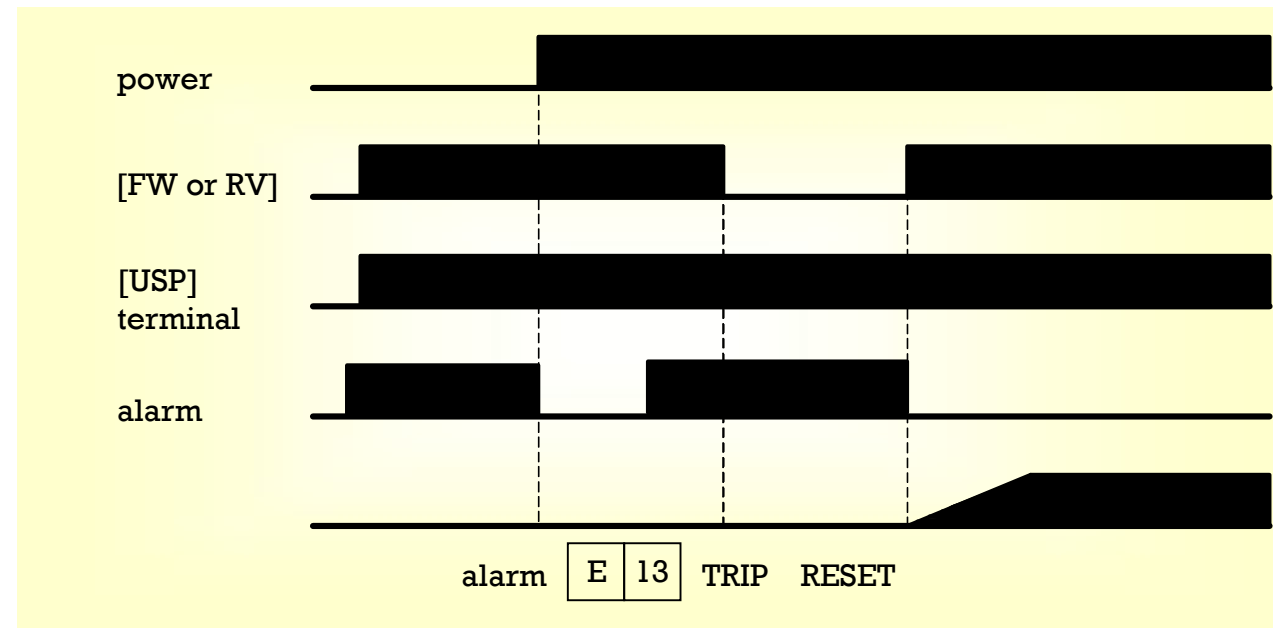
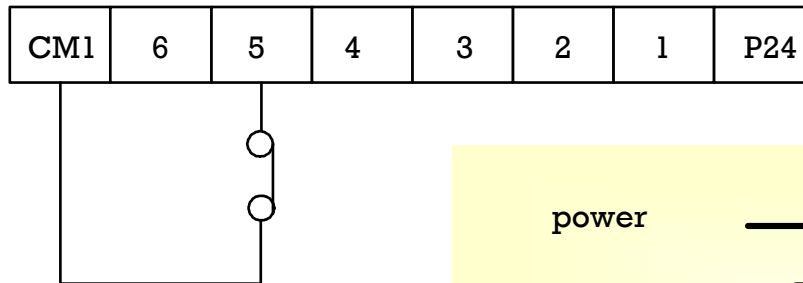
parameter : C4=3, C16=0, C20=100.0



- USP function prevents that automatic start up, so that the inverter will not run without outside intervention.

Ex.) terminal setting method

C05 = 11(USP)



- the function of measuring motor parameter automatically

Parameter setting

- (1) H03 : motor capacity
 0~4 : 004SF/LF, 007SF/LF, 015SF/LF, 022LF, 037LF
 5~9 : 004HF, 007HF, 015HF, 022HF, 037HF
 10/11 : 055LF / 075LF
 12/13 : 055HF / 075HF
- (2) H04 : motor pole
- (3) A01=0
- (4) A03 : set base frequency
- (5) H01=1 (auto tuning mode)
- (6) RUN command

Auto-tuning procedure

Motor connection

Auto tuning mode
H01=1

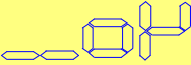
Run command ON

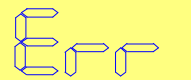
Motor parameter
setting

Parameter setting
completed, stop

- ① AC excitation
- ② DC Excitation
- ③ Motor accelerates to 80% of base freq., the stop

Display end

Auto tuning completed : 

Auto tuning failed : 



➤ Protective Code (N50 & N100) ;

Function	Description	Display	
		Standard operator	Remote operator
Overcurrent protection	When the inverter output current exceeds the rated current by more than approximately 200% while the motor is locked or reduced in speed, the protection circuit activates, halting inverter output.	E04	Over.C
Overload protection (electronic thermal regenerative)	When the inverter output current causes the motor to overload, the electronic thermal trip in the inverter cuts off the inverter output.	E05	Over.L
Overvoltage protection	If regenerative energy from the motor or the main power supply voltage is high, the protective circuit activates to cut off the inverter output when the voltage of DC link exceeds the specification.	E07	Over.V
Communication error	The inverter output is cut off when communication to the inverter has an error due to external noise, excessive temperature rise, or other factors.	E60	Com.ERR
Undervoltage protection	When the input voltage to the inverter decreases, the control circuit does not function normally. When the input voltage is below the specification, the inverter output is cut off.	E09	Under.V
Output short-circuit	The inverter output was short-circuited. This condition causes excessive current for the inverter, so the inverter output is turned off.	E34	PM.ERR
USP error	The USP error is indicated when the power is turned on with the inverter in RUN state. (Enabled when the USP function is selected.)	E13	USP
EEPROM error	The inverter output is cut off when the EEPROM in the inverter has an error due to external noise, excessive temperature rise, or other factors.	E08	EEPROM
External trip	When the external equipment or unit has an error, the inverter receives the corresponding signal and cuts off the output.	E12	EXTERNAL
Temperature trip	When the temperature in the main circuit increases due to cooling fan failure, the inverter output is cut off (only for the model with a cooling fan).	E21	OH.FIN

